Regulations

1. Candidates for admission to the degree of Bachelor of Science in Horticulture B.Sc.(Hort.) – shall be required to have passed the Higher Secondary Course (10+2) or any other examination recognized as equivalent there to and fulfilling the following requirements

A. Eligible Subjects of Study in the Qualifying Examination

HSC/ Equivalent- Academic Stream

1. Mathematics / Botany / Biology as first subject.
2. Physics as second subject.
3. Chemistry as third subject.
4. One elective as fourth subject*

Subjects of study are grouped below

<table>
<thead>
<tr>
<th>Subject 1</th>
<th>Subject 2</th>
<th>Subject 3</th>
<th>Subject 4 (elective subject)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>Physics</td>
<td>Chemistry</td>
<td>Computer Science/ Microbiology/ Biotechnology/ Biochemistry/Nursing/ Nutritional Dietetics</td>
</tr>
<tr>
<td>Botany</td>
<td>Physics</td>
<td>Chemistry</td>
<td>Zoology</td>
</tr>
<tr>
<td>Mathematics</td>
<td>Physics</td>
<td>Chemistry</td>
<td>Biology/Computer Science/ Statistics/Biochemistry/ Home science</td>
</tr>
</tbody>
</table>

*In case of failure to qualify with the first three subjects, his marks in the subject listed as fourth will be considered for calculating eligible minimum qualifying aggregate marks. The aggregate marks will be computed using the following formula

\[
\frac{\% (Sub 1) + \% (Sub 2) + \% (Sub 3)}{3} \times 2 = \_\_\_\_\_\_\_\_\_
\]

(or)

\[
\frac{\% (Sub 1) + \% (Sub 2) + \% (Sub 3) + \% (Sub 4)}{4} \times 2 = \_\_\_\_\_\_\_\_\_\_\_
\]

B. HSC/ Equivalent

Biology with three vocational subjects.

C. Eligible Minimum Qualifying Marks

C1. Open Competition (OC): 50 % aggregate in the qualifying subjects as mentioned above.

C2. Backward Class (BC), Backward Class Christians (BCC) and Backward Class Muslims (BCM): 45 % aggregate in the qualifying subjects as mentioned above.

C3. Most Backward Class (MBC) / De notified Community (DNC): 40 % aggregate in the qualifying subjects as mentioned above.


D. Number of Attempts to Pass

The maximum number of attempts to pass the qualifying examination for admission to all the courses are as follows

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Community</th>
<th>Maximum Number of Attempts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Scheduled Caste / Scheduled Tribe</td>
<td>Three</td>
</tr>
<tr>
<td>2</td>
<td>All others Communities</td>
<td>Two</td>
</tr>
</tbody>
</table>
E. Award of B.Sc.(Hort.) Degree
The candidates should have undergone successfully the prescribed course of study in the University. They shall further be required to have completed and passed 165 course credits and shall have earned an overall grade point average (OGPA) of 5.50 out of 10 for all courses completed in B.Sc. (Hort.) degree programme. In addition to the above, students shall in the judgment of the Faculty, possess good conduct and character.

2. The syllabi for the courses shall be prescribed from time to time by the Academic Council on the recommendations of the Board of Studies.

3. The B.Sc.(Hort.) degree course shall be of four academic years. Each academic year shall comprise two semesters as shown below.

<table>
<thead>
<tr>
<th>Year</th>
<th>B.Sc.(Hort.)</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Year</td>
<td></td>
<td>I and II</td>
</tr>
<tr>
<td>II Year</td>
<td>B.Sc.(Hort.)</td>
<td>III and IV</td>
</tr>
<tr>
<td>III Year</td>
<td>B.Sc.(Hort.)</td>
<td>V and VI</td>
</tr>
<tr>
<td>IV Year</td>
<td>B.Sc.(Hort.)</td>
<td>VII and VIII</td>
</tr>
</tbody>
</table>

4. SEMESTER DURATION: A Semester consists of 110 working days including semester examination days.

5. DEFINITIONS

5.1. “Course” is a teaching unit of a discipline to be covered within a semester as detailed in the curricula and syllabi issued by the University.

5.2. A “Credit” in theory means 60 minutes of class room lecture plus two hours of library or homework, and a “Credit” in practical means two hours of laboratory or three hours of field work per week.

5.3. “Curriculum” is a group of courses and other specified requirements for the fulfillment of the degree programme.

5.4. “Credit load” of a student during a semester is the total number of credits of all the courses he/she registers during that particular semester.

5.5. “Grade Point” means the total marks in percentage divided by 10 and rounded to two decimals.

5.6. “Credit Point” means the grade point multiplied by credit.

5.7. “Overall Grade Point Average” (OGPA) means the total credit points of the courses completed by the student divided by total credit hours of the course and rounded to two decimals. The OGPA shall be the basis to determine the student’s merit and to decide whether or not a student meets the academic requirements for getting the degree.

5.8. “Transcript Card” is a consolidated report of grades secured by the student issued by the University.

5.9. a) The result of evaluation of a course shall be indicated by grade points ranging from 0 to 10. Grade point is the total marks in percentage divided by 10. The minimum grade point to be secured for the successful completion of a course will be 5.00; Less than 5.00 will be treated as ‘F’ grade and the grade point will be 0 for calculating the GPA/OGPA.

b) The following symbols shall be used in the grade sheets.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>Incomplete (due to attendance deficiency)</td>
</tr>
<tr>
<td>F</td>
<td>Failed</td>
</tr>
<tr>
<td>RR</td>
<td>Re registration</td>
</tr>
<tr>
<td>SE</td>
<td>Supplementary Examination</td>
</tr>
<tr>
<td>IE</td>
<td>Improvement Examination</td>
</tr>
<tr>
<td>EE</td>
<td>Incomplete for reasons other than attendance</td>
</tr>
</tbody>
</table>

6. EXAMINATIONS
Each course shall carry a maximum of 100 marks for the purpose of grading. The distribution of marks shall be as follows.
6.1. Course with both theory and practical Marks

i) Mid Semester Examination 20
ii) Practicals, records, term papers and other assignments including field trips, if any, (Written = 25, Record = 5 Specimen collection = 5 and Viva-Voce = 5) 40
iii) Final Theory Examination 40

Total 100

6.2. Course with only Theory / Practical* Marks

i) Mid Semester Examination 40
ii) Final Semester Examination 60

Total 100

* Except Five courses: NSS / NCC, EXP 411, EXP 421, RHWEP 412, and RHWEP 422 the distribution of marks of these courses are furnished in Regulations 6.4 to 6.6.

6.3. A student should secure a minimum of 50 per cent of marks in the aggregate and 45 per cent of marks in theory and practical separately to successfully complete a course. The candidate who does not satisfy the above criteria shall be awarded ‘F’ grade.

6.4. NSS / NCC (0+1)

The duration of NCC / NSS training is for four semesters (I,II,III and IV).

NSS
Each student enrolled in NSS should serve in four semesters (I, II, III and IV). He / She should also attend at least one special camp not exceeding 10 days duration. Marks will be awarded as follows.

<table>
<thead>
<tr>
<th>Marks</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NSS Regular Programme</td>
<td>60</td>
</tr>
<tr>
<td>NSS Special camp not exceeding 10 days duration</td>
<td>40</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

At the end of the fourth semester the course teacher shall send the marks awarded to the Controller of Examinations through the Dean, Faculty of Agriculture.

NCC
Each student enrolled in NCC should attend 10 parades per semester. Marks will be awarded at the rate of two marks per parade (2 x 40 = 80). The final semester examination will be for 20 marks. There will be no supplementary examination for the final NCC examination.

6.5. Course on Rural Horticultural Work Experience (RHWEP) Viz., RHE-412 Village stay programme, RHE-422 Placement in Industries will be offered in the VII & VIII Semesters respectively. The students will be evaluated by the teachers in charge of the group and the evaluation procedure as follows:

a. **RHE-412 Village stay programme**
   1. Daily record (Observation note book) - 20 By the teacher in-charge
   2. Skills learned - 20
   3. Commendable Activities - 10
   4. Village stay programme record - 30 By the examiners
   5. Viva-voce - 20

   **Total** 100
b. RHE-422 Attachment to Horticultural Industries

i) Visit to NGO/Agri clinics/Input Industry / Agricultural Finance Institutions
- Daily Record - 20
- Project Report - 20

Total 40

ii) Horticultural Industrial Tie-Up
- Daily observation note book - 20
- CD preparation/Project report - 20
- Viva-voce - 20

Total 60

6.6. Experiential learning courses: EXP 411 and EXP 421 will be offered in the VII and VIII semesters. Periodical evaluation of the above course will be done by the course teacher during the different stages of work. Final evaluation of the above course will be done by the course teachers and the Head of the Department. The final semester examination will be conducted by the University before the commencement of regular final semester examinations. The distribution of marks will be 40 for periodical evaluation and 60 for final examination. The evaluation will comprise of skills learnt, proficiency in project execution, project report and viva-voce.

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Daily Record (Observation note book)</td>
<td>20</td>
</tr>
<tr>
<td>2. Skills learned</td>
<td>20</td>
</tr>
<tr>
<td>3. Proficiency in project execution</td>
<td>10</td>
</tr>
<tr>
<td>4. Project Report</td>
<td>30</td>
</tr>
<tr>
<td>5. Viva-Voce</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

7. MID-SEMESTER EXAMINATION (MSE)

7.1. The appearance of the candidate for the mid-semester examinations is compulsory. If a student does not appear for MSE he/she is not eligible to appear for the final examinations. Such candidate has to reappear for the MSE as and when the respective examinations are conducted only after getting permission from the Dean, Faculty of Agriculture two weeks before the schedule of MSE on payment of fee prescribed by the University. They will be conducted by the Dean, Faculty of Agriculture. The answer scripts will be shown to the student after valuation, retained for 10 days and returned to the course teacher. The Head of the Department/Division will be responsible to ensure the distribution of answer papers to the students.

7.2. The MSE marks will not be shown separately in the grade sheet but will be combined with the respective final theory and practical marks. MSE marks awarded in a course will be added to the supplementary examinations also.

7.3. The MSE marks will be furnished to the Dean, Faculty of Agriculture through HOD’s within 10 days after the conduct of MSE. If the student is not satisfied with the award of the marks, he/she shall appeal to the Dean, within three working days after the announcement of marks. The appeal will be considered and the results reviewed by a cell consisting of the Dean and the Head of the Department /Division of Studies concerned. The decision of the Review Cell shall be final. If the H.D. himself is the course teacher, one senior member of the department concerned shall be nominated by the Dean.

7.4. The MSE of theory will be one hour duration for 20 marks which will be apportioned as shown below.

<table>
<thead>
<tr>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>i) Objective questions @ ½ mark for 10 questions out of 12</td>
</tr>
<tr>
<td>ii) Definition @ 1 mark for 5 questions out of 7</td>
</tr>
<tr>
<td>iii) Short notes @ 2½ marks for 2 questions out of three</td>
</tr>
<tr>
<td>iv) Essay type @ 5 marks for 1 question out of two</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>
7.5. If the student is not able to write the MSE due to his or her deputation by the University or due to other genuine reasons as judged by the Dean in consultation with Head of the Department and course teacher, he/she may be permitted to take up a make-up test of the particular examination. Such tests should be completed ordinarily within 15 working days after the respective MSE.

8. FINAL EXAMINATIONS
8.1. The final theory and practical examinations will be of three hours duration each.
8.2. Theory examinations will be conducted after practical examinations.
8.3. The question papers for the final theory examinations will be set by the external examiners.
8.4. Central valuation of answer books will be done by examiners on the advice of the Chairman, Board of Examiners.
8.5. Practical Examination
   Practical examinations will be conducted in the practical classes itself towards the end. Proper maintenance and regular submission of practical records are required. Those who do not bring with them the certified practical records/specimen collection / assignments will not be allowed to appear for the practical examination. The marks awarded for specimen collection and assignments shall be noted in the record, at the time of first appearance and will be taken into account for subsequent appearances. Such marks awarded by the examiner will be furnished to the Head of the Department.
8.6. Two examiners appointed by the University, of whom one will be the course teacher concerned and one teacher nominated by HOD will conduct the practical examination.

9. SUPPLEMENTARY EXAMINATION
9.1. A student who has failed in a course (subject) or awarded EE can take up supplementary examination without undergoing regular classes. A student who has not fulfilled attendance requirement should repeat the course to earn attendance before he/she is permitted to proceed to the next semester.
9.2. A candidate with OGPA of less than 5.50 shall be allowed to appear for the examination of the courses completed earlier in which he/she had obtained GPA of 6.00 or less.
9.3. Students with arrear subjects can reappear for the same at the time of regular semester examination only.
9.4. A continuing candidate cannot appear for more than six subjects in the supplementary examination at a time. The candidate who has completed the tenure of four years in the B.Sc. (Hort.) Degree Programme cannot appear for more than 16 subjects in the supplementary examination at a time.
9.5. a. There will be no supplementary examination for the courses viz., EXP 411, EXP 421, RHWEP 412, and RHWEP 422. Those who fail in the above subject shall have to repeat the course in the subsequent year/ years.
b. The supplementary viva-voce examination for these courses will be arranged as decided by the Dean for those who would have completed the course requirements but were unable to take up viva-voce due to medical or other compelling circumstances.
9.6. The candidates for the supplementary examinations will submit their applications through the Dean, Faculty of Agriculture who will scrutinize the applications to ensure compliance of regulation 9.2 and 9.4. The attested copy of all grade sheets pertaining to the supplementary examinations should be enclosed along with the applications.

10. ATTENDANCE REQUIREMENT
10.1. One hundred per cent class attendance is expected from each student. A student who fails to secure 75 per cent of attendance prescribed for a course (subject) of study, separately in theory and practical shall not be permitted to appear for both theory and practical examinations in that course (subject) and shall be given ‘E’ (incomplete) and will be required to repeat the course (subject).
10.2. Students abstaining from the classes by prior permission from the Dean, Faculty of Agriculture on Official University business, shall be given due consideration in computing attendance requirements. Such information should be forwarded to the course teacher within three working days.
10.3. However, condonation of attendance deficiency may be considered by the Vice-Chancellor only in case of genuine reasons including indoor hospitalization with evidence in the form of Hospitalization certificate and Discharge summary recommended by the Dean, Faculty. The Vice-Chancellor may decide whether or not a condonation fee is required, based on the reason for condonation fee.
11. EVALUATION

11.1. Final Grade Point Average
Based on the total credits offered, the final grade point average shall be calculated and given. The various courses taken by a student along with credits and the grades obtained shall be shown on his/her transcript.

11.2. At the end of each semester, the student will be given the grade card of the grades obtained along with the cumulative average of grades up to that semester by the University.

11.3 Calculation of OGPA

To arrive at the “Overall Grade Point Average (OGPA)” at the end of a semester, the grade point of each course is multiplied by the credit hours of the course to obtain the credit points. Then, the sum of the credit points secured by the student in all the courses taken till the end of that semester is divided by the total number of credit hours of the courses, provided that the credit hours and credit points of courses which are repeated are not counted more than once for this purpose.

For Example

i. Total credit hours till the end of last semester : 18
ii. Total credit points till the end of last semester : 140.50
iii. Total credit hours in the current semester : 22
iv. Total credit points obtained in the current semester : 156
v. Total credit hours including the current semester : (18+22) = 40
vi. Total credit points including the current semester : 140.50 +156.00 = 296.50
vii. Overall Grade Point Average : (296.50/40) = 7.412
viii. Corrected to two decimals : 7.41 / 10.00

11.3. The student should complete the requirements for getting B.Sc. (Hort.) degree, namely, OGPA of 5.5 out of 10.00 for all courses within a period of eight years from the date of his/her admission. If the candidate does not complete the requirements within the above said period he/she should seek readmission.

12. TUITION FEES AND SCHOLARSHIPS

The various fees payable by the students will be decided by the University from time to time.

a) In case of new admission, the fees for the semester are payable in advance failing which they will not be admitted.

b) In other cases, the fees are payable within seven working days from the commencement of the semester.

c) In the case of default, a fine as per the University rules will be collected.

d) The students who fail to pay the tuition fees within a month of commencement of the semester will not be allowed to attend the classes and their names will be struck off from the rolls. However, if the defaulting students pay the fees along with the fines in addition to a prescribed readmission fee, they will be permitted to attend the classes. The period for which his/her name is struck off from the rolls will be treated as absence for the purpose of calculating the minimum attendance requirements.

e) Students who are away on study tour, camp activities or other extracurricular activities organised by the University or the Faculty at the commencement of the semester may, however, pay their semester tuition fees and other fees within the third working day after they return form such programmes, without fine.

f) A student who has been granted scholarships by the Welfare Departments or by the Government of India or by the State Government will, however, be exempted from the levy of fines, provided the fees are paid on the next day after the scholarship amount is actually disbursed to him/her. The concession referred above will apply to those who have actually been granted scholarships and not to those who have only applied and are expecting sanction.

g) The candidate should obtain a Hall Ticket from the Controller of Examinations through the Dean after clearing all arrears including the hostel dues before the commencement of each semester final examination.

13. TRANSITORY REGULATIONS

Separate time table of course work under old semester system will be arranged by the H.D. for students with attendance deficiency in a course/courses provided such course/courses are not currently offered due to the introduction of the revised syllabi with effect from 2012 – 2013.

The candidates under old semester system will, however, complete all the examinations within a period of eight academic years from the year of admission.
### B.Sc. Horticulture
#### SEMESTER-WISE DISTRIBUTION OF COURSES (2012)

#### SEMESTER-I

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Course No.</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Theory</td>
<td>Practical</td>
</tr>
<tr>
<td>01.</td>
<td>HOR 111</td>
<td>Fundamentals of Horticulture</td>
<td>2</td>
</tr>
<tr>
<td>02.</td>
<td>HOR 112</td>
<td>Plant Propagation and Nursery Management</td>
<td>1</td>
</tr>
<tr>
<td>03.</td>
<td>AGR 113</td>
<td>Introductory Meteorology</td>
<td>1</td>
</tr>
<tr>
<td>04.</td>
<td>SAC 114</td>
<td>General biochemistry</td>
<td>2</td>
</tr>
<tr>
<td>05.</td>
<td>GPB 115</td>
<td>Crop Physiology</td>
<td>2</td>
</tr>
<tr>
<td>06.</td>
<td>ENT 116</td>
<td>Fundamentals of Entomology</td>
<td>2</td>
</tr>
<tr>
<td>07.</td>
<td>TAM 117</td>
<td>Tamil/ Development Education</td>
<td>0</td>
</tr>
<tr>
<td>08.</td>
<td>NSS/NCC 101*</td>
<td>NSS /NCC</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>10</td>
</tr>
</tbody>
</table>

Note: * The Courses on NSS/NCC has to be offered for four semesters I, II, III & IV

#### SEMESTER-II

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Course No.</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Theory</td>
<td>Practical</td>
</tr>
<tr>
<td>01.</td>
<td>HOR 121</td>
<td>Growth and Development of Horticultural Crops</td>
<td>1</td>
</tr>
<tr>
<td>02.</td>
<td>AGR 122</td>
<td>Introduction to Major Field Crops</td>
<td>2</td>
</tr>
<tr>
<td>03.</td>
<td>PAT 123</td>
<td>Principles of Plant Pathology</td>
<td>2</td>
</tr>
<tr>
<td>04.</td>
<td>AGM 124</td>
<td>Introductory Micro Biology</td>
<td>2</td>
</tr>
<tr>
<td>05.</td>
<td>SAC 125</td>
<td>Fundamentals of Soil Science</td>
<td>1</td>
</tr>
<tr>
<td>06.</td>
<td>AEX 126</td>
<td>Fundamentals of Extension Education</td>
<td>1</td>
</tr>
<tr>
<td>07.</td>
<td>AHS 127</td>
<td>Live stock and poultry production</td>
<td>2</td>
</tr>
<tr>
<td>08.</td>
<td>COM 128</td>
<td>Introduction to Computer and Application</td>
<td>1</td>
</tr>
<tr>
<td>09.</td>
<td>AEC 129</td>
<td>Farm Power and Machinery</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>15</td>
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</tbody>
</table>

#### SEMESTER-III

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Course No.</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Theory</td>
<td>Practical</td>
</tr>
<tr>
<td>01.</td>
<td>HOR 211</td>
<td>Production Technology of Tropical and Arid Zone Fruits</td>
<td>2</td>
</tr>
<tr>
<td>02.</td>
<td>HOR 212</td>
<td>Production Technology of Tropical Vegetables</td>
<td>2</td>
</tr>
<tr>
<td>03.</td>
<td>HOR 213</td>
<td>Production Technology of Plantation Crops, Spices and Condiments</td>
<td>2</td>
</tr>
<tr>
<td>04.</td>
<td>HOR 214</td>
<td>Bio-technology of Horticultural crops</td>
<td>1</td>
</tr>
<tr>
<td>05.</td>
<td>AGR 215</td>
<td>Water Management in Horticultural Crops</td>
<td>1</td>
</tr>
<tr>
<td>06.</td>
<td>ENT 216</td>
<td>Beneficial Insects and Nematode Pests</td>
<td>2</td>
</tr>
<tr>
<td>07.</td>
<td>SAC 217</td>
<td>Soil and Plant Analysis</td>
<td>1</td>
</tr>
<tr>
<td>08.</td>
<td>GPB 218</td>
<td>Genetics and Cytogenetics</td>
<td>2</td>
</tr>
<tr>
<td>09.</td>
<td>AEC 219</td>
<td>Introductory Economics</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>14</td>
</tr>
</tbody>
</table>

#### SEMESTER- IV

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Course No.</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Theory</td>
<td>Practical</td>
</tr>
<tr>
<td>01.</td>
<td>HOR 220</td>
<td>Production Technology of Medicinal and Aromatic Crops</td>
<td>1</td>
</tr>
<tr>
<td>02.</td>
<td>HOR 221</td>
<td>Ornamental and Landscape Gardening</td>
<td>2</td>
</tr>
<tr>
<td>03.</td>
<td>HOR 222</td>
<td>Protected and Precision Horticulture</td>
<td>1</td>
</tr>
<tr>
<td>04.</td>
<td>HOR 223</td>
<td>Crop production in Vegetable Crops (or)</td>
<td>0</td>
</tr>
<tr>
<td>05.</td>
<td>ENT 224</td>
<td>Insect Pests of Fruit, Plantation, Medicinal and Aromatic Crops and their management</td>
<td>1</td>
</tr>
<tr>
<td>06.</td>
<td>PAT 225</td>
<td>Mushroom Culture</td>
<td>0</td>
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### I. HORTICULTURE

#### DISCIPLINE-WISE DISTRIBUTION OF COURSES (2012)

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### VI. SOIL SCIENCE AND AGRICULTURAL CHEMISTRY

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### XI. COURSES OFFERED BY OTHER DEPARTMENTS

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#### STATISTICS

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XIII. Experiential Learning:

Experiential learning is introduced in final year B.Sc. (Hort.). Four areas have been detailed as a model with different activities for learning and evaluation. For this purpose the students would be required to prepare a work plan in the area selected with an end-to-end approach i.e. from purchasing the input to producing a product and marketing. It would also have components of project development, monitoring and accounting. Students at the end of completion of project will submit report for evaluation. For this programme an advisor will guide students and the Committee appointed by the Dean of the College should do the evaluation of the project. The evaluation will comprise of skills learnt, proficiency in project execution, project report and viva-voce.

Hands on Training/Experiential Learning Models

Final year B.Sc. (Hort.) students to select any two areas of the following ie. One each at VII and VIII semesters, to undergo specialized training:
1. EXP 411* - Protected cultivation of High value crops
2. EXP 411* - Post harvest technology and value addition
3. EXP 421* - Nursery production and management
4. EXP 421* - Floriculture and landscape gardening

S.No. | Activity                                                | Credits | Duration in Weeks |
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<td><strong>Total</strong></td>
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* Choose any one course in a semester

Professional Packages: 14 weeks duration

XIV. RHWEP courses:

RHE-412 Village stay programme and RHE-422 Placement in Industries

Village stay programme & Placement in industries will be conducted in VII and VIII semesters respectively. The duration will be of three weeks each. The students will be evaluated by the teachers in charge of the group.

EXP 411*

I. Protected Cultivation of High Value Horticultural Crops

1. Visit to commercial poly-houses, Project preparation and planning. Specialized lectures by commercial export house
2. Study of designs of green-house structures for cultivation of crops
3. Land preparation and soil treatment
4. Planting and production:
   i. Cultural management including soil/media management in poly houses
   ii. Fertigation and irrigation management
   iii. Integrated Pest Management
   iv. Harvesting and post harvest management; certification and distribution
   v. Cost of production
5. Visit to export houses; Market intelligence; Marketing of produce; cost analysis; Institutional management
6. Report writing and viva-voce
EXP 411*
II Nursery Production and Management
1. Project preparation
2. Nursery registration, methodology and certification
3. Establishment and management of plant propagating structures
4. Establishment of progeny blocks, identification of mother plants and maintenance of bud wood bank
5. Procurement of inputs (pots, polythene, FYM etc.)
6. Techniques and environ management for large scale production
7. Packaging and selling of plant material
8. Working out economics

EXP 421 *
III Post Harvest Technology and Value-Addition
1. Design and project formulation
2. Design and layout of pilot plant, cold store, grading – packing line, cool chain
3. Pre harvest practices to extend shelf life
4. Quality standards of fruits and vegetables for processing
5. Procurement of raw material, inventory control
6. Post harvest handling; grading; packaging; cool chain transportation and storage of fresh Produce
7. Processing (juice/pulp extraction, concentration, product preparation; dehydration; waste Management; In-plant quality control)
8. Packaging (bottling, corking, sealing, labeling, aseptic packaging, storage)
9. Quality laboratory exercises, quality assurance, analytical tools, hygiene, machineryMaintenance, HACCP, International standards, FPO Licence, PFA standards, codex Laws
10. Sales promotion, certification, distribution and marketing, banking, finance and Institutional management
11. Work experience in food processing plant

EXP 421 *
IV Floriculture and Landscape Gardening
1. Preparation of project report, soil and water analysis, preparation of land and layout.
2. Production and Management of commercial flowers
3. Harvesting and post harvest handling of produce
4. Marketing of produce
5. Cost Analysis
6. Institutional Management
7. Visit to Flower growing areas and Export House
8. Attachment with private landscape agencies
9. Planning and designing, site analysis, selection and use of plant material for landscaping
10. Formal and informal garden, features, styles, principles and elements of landscaping
11. Preparation of landscape plans of home gardens, farm complexes, public parks, institutions, high ways, dams and avenues.
12. Making of lawns, use of software in landscape,
13. Making of bouquets, button hole, wreath, veni and gazaras, car and marriage palaces
14. Dry flowers Technology (identification of suitable species, drying, packaging and forwarding techniques)

* Choose any one course in a semester

SEMESTER – WISE CREDIT DISTRIBUTION

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OBJECTIVE

This is a basic course, which outlines the importance of horticulture and its scope global scenario on the export and import of horticultural crops and their products besides the high nutritive potential of fruits and vegetables. Orchard is an important component in horticulture for the cultivation of horticultural crops and hence greater emphasis is given in Orchard planning and layout. Due to perennial nature of fruit trees, the need for maintaining of framework will be emphasized with teaching of appropriate training and pruning methods to enhance productivity. Protected cultivation i.e., production in green houses and shade houses is an upcoming field in horticulture for the year round production of fruits, vegetables and flowers by which we can increase our export potential. Hence, this course will clearly impart the basic knowledge in horticulture and serve as a platform over which advanced technologies of Horticulture can be built up.

THEORY

Unit I – Scope and Importance of Horticulture
Scope and importance of horticultural crops – Divisions of Horticulture – Area and production – Export and import - global scenario – Classification of horticultural crops – nutritive –value – Horticultural zones of India and Tamil Nadu – Special features of horticulture crops grown in India.

Unit II – Establishment of Orchard and Production techniques

Unit III – Cropping System

Unit IV – Bearing Habits, Floral Physiology and Crop regulation
Bearing habits - flowering, pollination and fruit set – unfruitfulness – fruit drop – causes and prevention – training and pruning- use of growth regulators - rejuvenation of old orchards.

Unit V – Protected cultivation and Post harvest technology
Basics of Protected cultivation – Green house components – Structure for environmental control - Hydroponics – Media and methods – Advantages – Post harvest technology- importance and causes for post harvest losses- maturity indices- harvesting methods and post harvest handling- processing, value addition, storage and marketing of horticultural produce.

PRACTICAL


LECTURE SCHEDULE
1. Scope, importance and nutritive value of horticultural crops
2. Divisions of horticulture
3. Area and production of horticultural crops.
4. Export and import of horticulture crops and their products – global scenario
5. Classification of horticulture crops – different climate zones of India and Tamil Nadu in relation to horticulture crops.
6. Special features of horticulture crops grown in India.
8. Different planting systems
9. Nursery techniques for horticulture crops
10. Soil and climate in relation to horticulture crop production and other factors limiting horticulture crop production.
11. Fertility management in Orchards
14. Study of cropping systems.
15. Study of multi-tier, inter cropping and cover crops- planting methods.
17. Mid-Semester Examination.
19. Detailed study on bearing habits of horticulture crops.
20. Study of flowering, pollination and fruit set in horticulture crops.
22. Fruit drop - causes and prevention in horticulture crops.
25. Rejuvenation of old orchards and role of growth regulators in horticultural crops.
27. Study of different types of media and protected structures for propagation.
28. Study of green house components and environmental control for crop production.
29. Study of hydroponics – deep water culture, flood and drain system, Nutrient Film Technique (NFT) and aeroponics.
30. Post harvest technology- importance and causes for post harvest losses
31. Maturity indices-climacteric and non climacteric fruits
32. Harvesting methods and post harvest handling
33. Processing and value addition.
34. Storage and marketing of horticultural produce.

PRACTICAL SCHEDULE
1. Study of different features of Orchard.
2. Planning and layout and planting fruit trees
3. Identification of tools and implements.
4. Preparation of nursery beds and sowing vegetable seeds and transplanting of vegetable crops.
5. Practicing training of fruit trees
6. Practicing pruning of fruit trees
7. Identification of growth regulators and preparation and application.
8. Preparation of fertilizer mixture and field application
9. Practicing weeding including chemical weed control
10. Layout of different irrigation systems and irrigation methods
11. Study of bearing habits of horticultural crops
12. Study of different structures for protected cultivation.
13. Study of different media for protected cultivation
14. Practicing in judging the maturity indices of fruits and vegetables.
15. Study of harvesting methods and post harvest handling
16. Study of different storage methods
17. Visit to Green houses and processing units.

REFERENCE BOOKS
OBJECTIVES

Plant propagation is one of the fundamental agricultural operations which involves multiplication and perpetuation of seeds and planting material to achieve to achieve uniform stand of crops with high yield potential. This course deals with different methods of plant propagation and strategies for nursery management of various fruit crops. Knowledge of tools and implements is essential to carryout all scientific horticultural operations and also nursery management practices.

The above themes are discussed-elaborately this course and the basic knowledge gained will be useful for the career development of students in commercial nursery business.

THEORY

Unit- I: Methods of propagation

Scope and importance - Propagation- overview-sexual methods of propagation-advantages and disadvantages of seed and vegetative propagation.

Unit - II: principles and methods of seed propagation


Unit - III: Propagation Structures


Unit - IV: Asexual propagation Techniques


Unit – V: Propagation through specialized organs

Propagation through specialized organs – tuber, bulb, corm, bulbils rhizome, runner, offshoot, crown, slip, sucker and micro propagation.

PRACTICAL


LECTURE SCHEDULE

1. Scope and importance of plant propagation, study of sexual and asexual methods of propagation.
2. Advantages and disadvantages of seed and vegetative propagation.
3. Seed dormancy – Internal and external factors.
4. Study about nursery techniques, protray culture, monoembryony and polyembryony.
5. Study of propagation structures mistchambers, cold frames, hot beds, phytotron, humidifiers.
6. Construction of green houses and glass houses controlling system.
7. Study about pit nursery techniques and important tools and implements.
8. Use of growth regulators in seed and vegetative propagation.
9. Mid Semester Examination
10. Types of cuttings and techniques of preparation.
11. Study about types of layering and techniques of preparation.
15. Study about propagation by specialized plant parts – bulbs and tubers.
16. Study about propagation by specialized plant parts – Runners, suckers and other organs.
17. Study about micro propagation techniques including Tissue culture.
PRACTICAL SCHEDULE
1. Preparation of nursery beds, seed treatment and sowing
2. Identification of various tool and implements
4. Preparation of pot mixture and study of various containers
5. Study of special structures for propagation viz., Mist chamber, coldframes, hot beds, poly house, shade net house,
7. Mist propagation techniques.
8. Practice in propagation by cuttings
9. Practice in propagation by layering
10. Practicing budding methods
11. Practicing grafting methods
12. Use of growth regulators in propagation
13. Practices in separation and description of plant parts used for propagation.
14. Rejuvenation, top working and bridge grafting.
15. Practice in micro propagation and Hardening methods.
16. Visit to tissue culture laboratory and controlled green houses.
17. Project preparation for commercial nurseries and visit to private nurseries.

REFERENCE BOOKS

AGR 113: INTRODUCTORY METEOROLOGY (1+1)

OBJECTIVES
This course is scheduled to study the problems of plant growth and yield in relation to environmental factors. Climatic factors alone affect the yield of crops to an extent of about 40%. In India the success of agriculture depends mainly on monsoon rains. Meteorology is mainly concerned with microclimatology in which the influence of the shallow layer of atmosphere immediately above the surface is studied.

THEORY
Unit I: Introduction to Meteorology
Meteorology - Importance and scope in crop production - Co-ordinates of India and Tamil Nadu - Atmosphere - Composition and vertical layers of atmosphere (stratification) - Climate - Weather - Factors affecting climate and weather - Climatic types - Different agricultural seasons of India and Tamil Nadu

Unit II: Solar radiation and temperature

Unit III : Atmospheric pressure, Rainfall and Wind systems of the World
Unit IV: Agro climatic zones and Forecasting
Agroclimatic Zones – Agroclimatic normals - Weather forecasting –importance, synoptic chart - crop weather calendar - Remote sensing - Impact of climate and weather on crop production and pest and diseases.

Unit V: Climate change and its impact
Climate change- climate variability – definition and causes of climate change - Impact of climate change on Agriculture, Forestry, Hydrology, marine and coastal ecosystem.

PRACTICAL
Agromet Observatory - Site selection and layout. Acquiring skill in the use of different instruments and recording data on rainfall, temperature, pressure, humidity, wind direction and velocity, solar radiation, sunshine hours, evaporation, evapotranspiration,Lysimeters - Automatic weather station - Preparation of synoptic charts and crop weather calendars -Mapping of Agro climatic Zones.

THEORY - LECTURE SCHEDULE
1. Meteorology - Definition, their importance and scope in crop production.
3. Climate and weather - Factors affecting climate and weather. Macroclimate - Mesoclimate - Microclimate - Definition and their importance
8. Atmospheric pressure, diurnal and seasonal variation - causes for variation - Isobar - Low, depression, anticyclone, Tornado, hurricane.
9. Mid Semester Examination
11. Evaporation - Transpiration, evapotranspiration - Potential evapotranspiration - Definition and their importance in agricultural production. Agro climatic zones of Tamil Nadu - Agro climatic normals for field crops.
12. Weather forecasting - Types, importance, Agro Advisory Services
14. Remote sensing and its application
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.
2. An introduction to Annamalai University Meteorological Observatory
3. Measurement of air and soil temperature and grass minimum thermometers and thermographs
4. Measurement of solar radiation and sunshine hours
5. Humidity measurements – use of wet and dry bulb, assmannpsychrometer
7. Measurement of rainfall - Ordinary and self-recording rain gauges
9. Measurement of atmospheric pressure - barograph
10. Measurement of Evaporation - Open pan evaporimeter- application of evaporation data-
  Measurement of Evapotranspiration- Lysimeter.
11. Study of Automatic weather station
12. Data analysis for rainfall chart and thermo hygrograph chart data
13. Analysis of weather data
14. Preparation of crop weather calendars and forecast based agro advisories
15. Preparation of Synoptic charts
17. Practical Examination.

REFERENCES

SAC 114 GENERAL BIOCHEMISTRY (2+1)

OBJECTIVE
To impart knowledge on the fundamentals of Biochemistry. The students will have a clear idea of the basic concepts of biochemistry in general and will have an overall view of the different biochemical reactions taking place in plant cells. At the end of the course the students will have a conceptual understanding of the structure of biomolecules, separation of biomolecules using various biochemical techniques and qualitative identification and quantitative estimation of compounds.

THEORY
Unit I: Proteins

Unit II: Enzymes, lipids and carbohydrates

UnitIII: Nucleic acids and metabolism of proteins

Unit IV: Metabolism of lipids and carbohydrates

Unit V: Secondary metabolites
Secondary metabolites – terpenoids – chemical nature – classification and application in food and pharmaceutical industry. Secondary metabolites – alkaloids – chemical nature – classification and
application in food and pharmaceutical industry. Secondary metabolites – phenolics – chemical nature – classification and application in food and pharmaceutical industry

**PRACTICAL SYLLABUS**

Atomic models and reactions of Amino acids; Paper electrophoresis for the separation of plant pigments; Protein denaturation – heat, pH, precipitation of proteins with heavy metals; Protein estimation by Lowry method; Enzyme kinetics, competitive inhibition, enzyme immobilization; Extraction of nucleic acids, column chromatography of RNA hydrolysate; Characterization of lipids by Thin Layer Chromatography.; Extraction of oil from oil seeds; Estimation of fatty acids; Models of sugars, sucrose & starch; Quantitative determination of sugars; Paper chromatography for the separation of sugars; Determination of phenols.

**THEORY LECTURE SCHEDULE**

1. Introduction – importance and scope of biochemistry
2. Plant cell – organelles in plant cell and their functions; Biomolecules – structure, properties and applications
3. Components of plant cell wall – primary and secondary cell wall – composition and functions – role of plant cell wall in livestock, food and paper industry
5. Peptides and their functions – oligopeptides – cyclic and acyclic peptides – hormones – insulin
6. Structure of proteins – primary, secondary, tertiary and quaternary structures
8. Sequencing of amino acids by Edman degradation method – purification techniques – salting in and salting out, gel filtration, ion exchange chromatography
9. Classification of proteins based on function – plant protein quality evaluation methods - Protein Efficiency Ratio (PER), Digestibility Coefficient (DC) and Biological Value (BV)
10. Enzymes – characteristics of enzymes – chemical nature, speed, specificity, activsite and mode of action – activation energy and change in free energy of enzymecatalyzed reaction
12. Classification of enzymes – industrial applications of enzymes
13. Lipids – classification – functions and properties – Fat constants
14. Acyl lipids and their industrial applications in soaps, detergents, paints, rubber, bio-diesel etc.
15. Carbohydrates – functions – structure and classification
16. Role of mono, oligo and polysaccharides in industry
18. Mid Semester Examination
19. Various types of DNAs and RNAs – packing of DNA into chromosomes
20. Metabolism – anabolism – catabolism – stages of respiration – over all metabolic view of carbohydrates, proteins and lipids
22. Post translational modification – enzymatic hydrolysis of protein – general reactions of amino acid metabolism – decarboxylation, transamination and deamination
23. Assimilation of ammonia – entry of carbon skeleton into various metabolic pathways
24. Metabolism of lipids – anabolism of saturated fatty acids, unsaturated fatty acids and triacylglycerols
25. Catabolism of lipids – triacylglycerols – α and β oxidation of fatty acids – glyoxylate acid cycle
26. Metabolism of carbohydrates – anabolism – photosynthesis in brief; catabolism – hydrolysis of starch
27. Glycolysis and Tricarboxylic Acid (TCA) cycle
28. Oxidative pentose phosphate pathway – metabolic energy generation in different cycles
29. Oxidative phosphorylation and substrate level phosphorylation – electron transport chain in mitochondria
30. Electron transport chain in chloroplast – metabolic regulation
31. Secondary metabolites – terpenoids – chemical nature – classification and application in food and pharmaceutical industry
32. Secondary metabolites – alkaloids – chemical nature – classification and application in food and pharmaceutical industry
33. Secondary metabolites – phenolics (lignins, tannins and flavonoids) – chemical nature -
34. Classification and application in food and pharmaceutical industry

**PRACTICAL CLASS SCHEDULE**
1. Atomic models of amino acids
2. Reactions of amino acids
3. Protein denaturation – heat, pH – precipitation of proteins heavy metals, organicsolvents and acidic agents – immune reaction
4. Paper electrophoresis for separation of plant pigments
5. Paper model of protein – protein estimation by Lowry method
6. Enzyme kinetics (graphical representation) – competitive inhibition
7. Enzyme immobilization – enzyme induction
8. Extraction of DNA – test for DNA
9. Column chromatography of RNA hydrolysate
10. Fatty acid model – characterization of lipids by Thin Layer Chromatography (TLC)
11. Extraction of oil from oil seeds
12. Estimation of fatty acids by Gas Chromatography (GC)
13. Atomic models of sugars – paper model of starch
14. Quantitative determination of sugars
15. Separation of sugars and amino acids by paper chromatography
16. Determination of phenols
17. **Practical Examination**

**REFERENCES**

**GPB 115: CROP PHYSIOLOGY (2+1)**

**OBJECTIVE**
- To understand the mechanism of absorption and translocation of water and nutrients from the soil
- To study the different pathways in photosynthesis and respiration
- To study the topics on plant growth regulators and stress 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, Photosynthesis 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.

PRACTICAL


THEORY 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.
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 storage
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
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
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. Final Practical Examination

REFERENCES

ENT 116: FUNDAMENTALS OF ENTOMOLOGY (2+1)

OBJECTIVES
- To study the basic structure and modifications of insect appendages.
- To study the physiology and behavior of insects.
- To know the position of insects in Animal kingdom by studying their taxonomic characters.

THEORY
Unit I: History and Importance

Unit II: Morphology and Behaviour

Unit III: Classification and characters of Apterygota and Exopterygota

Unit IV: Classification and characters of Endopterygota
Distinguishing characters of agriculturally important orders of Endopterygotes - Siphonaptera and Strepsiptera. Distinguishing characters of agriculturally important orders of Endopterygotes up to
families of economic importance – Neuroptera (Chrysopidae, Myrmeleontidae, Mantispidae, Ascalaphidae), Coleoptera (Cicindellidae, Carabidae, Dytiscidae, Curculionidae, Apionidae, Staphylinidae, Coccinellidae, Lampyridae, Hydrophilidae, Scarabaeidae Dynastidae, Cerambycidae, Melolonthidae, Anobiidae, Tenebrionidae, Bruchidae, Meloidae, Cetonidae, Buprestidae, Elateridae and Bostrychidae), Diptera (Cecidomyiidae, Agromyzidae, Tephritidae, Asilidae, Tabanidae, Tachinidae, Hippoboscidae, Culicidae, Sypahidae and Muscidae), Lepidoptera (Nymphalidae, Lycaenidae, Pieridae, Papilionidae, Satyrini, Crambidae, Pyrausta, Noctuidae, Arctiidae, Bombyciidae, Sphingidae, Geometridae, Gelechiidae, Pterophoridae, Saturniidae, Lymantriidae and Hesperiidae) and Hymenoptera (Tenthredinidae, Apidae, Xylocopidae, Megachilidae, Bombidae, Sphecidae, Vespidae, Formicidae, Chalcididae, Ichneumonidae, Betylidae, Braconidae, Encyrtidae, Eulophidae and Trichogrammitidae).

Unit V: Anatomy and physiology


PRACTICAL


Assignment: Each student has to submit five pinned insects of various orders, five double mounted insects, one riker mount and immature stage of insect (wet preservation).

THEORY LECTURE SCHEDULE

2. Characters of phylum Arthropoda and its classes.
3. Factors responsible for Insect dominance.
4. Segmentation and Structure of Insect body wall and cuticular appendages.
7. Modifications of insect mouth parts.
8. Basic Structures of thorax and its appendages, modifications of legs, wings, wing venation and wing coupling apparatus.
10. Metamorphosis and types of eggs, larvae and pupae.
11. Tropism, Biocommunication in insects — Sound and light production, diapause, migration, defense and offence in insects.
13. Distinguishing characters of orders Collembola, Thysanura, Odonata, Phasmida, and Orthoptera (Acrididae, Tetntiigonidae, Gryllidae and Gryllotalpidae).
14. Distinguishing characters of orders Dictyoptera, Dermaptera, Isoptera, and Thysanoptera
15. Distinguishing characters of orders Pscooptera, Mallophaga and Siphunculata
17. Mid Semester Examination
18. Distinguishing characters of orders Strepsiptera and Siphonaptera.
19. Distinguishing characters of order Coleoptera and families of agricultural importance.
20. Distinguishing characters of order Diptera and families of agricultural importance.
21. Distinguishing characters of order Lepidoptera and families of agricultural importance.
22. Distinguishing characters of order Hymenoptera and families of agricultural importance.
23. Elementary knowledge on digestive system, structure of alimentary canal and its modifications in certain groups.
24. Elementary knowledge on Digestive enzymes, digestion and absorption of nutrients.
25. Elementary knowledge on excretory system in insects - malpighian tubules - accessory excretory organs and physiology of excretion.
27. Types of respiratory system - Spiracles - respiration in aquatic and endoparasitic insects.
30. Elementary knowledge on Nerve impulse conduction - axonic and synaptic transmissions.
32. Types of reproduction - oviparous, viviparous, paedomorphosis, polylembrony ovoviporous and parthenogenesis.
33. Elementary knowledge on structure and functions of Exocrine and Endocrine glands
34. Structure of sense organs - types of sensilla – photoreceptors, chemoreceptors and mechanoreceptors.

**PRACTICAL SCHEDULE**
1. Practicing the methods of collection, killing, pinning, labelling, display and preservation of insects including immature stages. Preparation of riker mount.
2. Observations on segmentation and external features of grasshopper / cockroach/ Blister beetle.
3. Observations on various types of insect head orientation and antennae.
4. Demonstration of mouth parts of cockroach and plant bug and study of mouth parts of female mosquito, honeybee, thrips, antlion grub, housefly and butterfly.
5. Observations on the modifications in legs and wings (wing venation, regions, angles and wing coupling).
6. Observations on various types of abdominal appendages.
8. Observation on Distinguishing characters of Collembola, Odonata, Phasmida and Orthoptera (Families: Acrididae, Tettigoniidae, Gryllidae and Gryllotalpidae).
11. Observation on Distinguishing characters of Coleoptera (Families: Cincindellidae, Carabidae, Dytiscidae, Curculionidae, Apionidae, Staphylinidae, Coccinellidae, Lampyridae, Hydrophilidae, Scarabaeidae, Dynastidae, Cerambycidae, Melolonthidae, Anobiidae, Tenebrionidae, Bruchidae, Meloidae, Cetoniidae, Buprestidae, Elateridae and Bostrichidae).
12. Observation on Distinguishing characters of Neuroptera (Families: Chrysopidae, Myrmeliontidae, Mantispidae and Ascalaphidae),
13. Observation on Distinguishing characters of Lepidoptera (Families: Nymphalidae, Lycaenidae, Pieridae, Papilionidae, Satyridae, Crambidae, Pyraustidae, Noctuidae, Arctiidae, Bombycidae, Cochliidae, Geometridae, Gelechiidae, Pyralidae, Blattidae, Diptera, Hemiptera, Hymenoptera, Sphecidae, Formicidae, Apidae, Vespidae, Halictidae, Melittidae, Ichneumonidae, Bembicidae, Cerambycidae, Scarabaeidae, Dynastidae, Coccidae, Coccinellidae, Coleoptera, Lepidoptera, Hymenoptera, Diptera, etc.)
16. Demonstration of digestive system and male and female reproductive systems (grasshopper/cockroach)
17. Final Practical Examination

**REFERENCE BOOKS**
TAM 117: yf;fpap; fspy; ntshz;ika[k; mwptpay; jkpH;g; gadhf;fKk; 0+1
brk; KiwG; gapw; rp ml;; lltz

1. ntshz;ik – brhw; bghUs; tpsf;fk; - bhjy;fHg;gpak; fhl;Lk; epyg; ghFghL; kw;Wk; kZ; zwpwtpay;.
2. r';yf; fpap; fspy; ntshz;ikj; bhjHpy; El;g;fs;
3. gjpbdz; FPh;f;fzf;F Ejy; fspy; ntshz;ik mwptpay; - jpuF; Fws; - ehd; kzpfoif; - dpaIt
   ehw;g;J - d; dh ehw;g;J - le;jpizbaGgJ - jpizkhiy Ejw; iwk; gJ
4. r';yf;fpap; fspy; bey; tiffs; - gs;S Ejy; fspy; bey; tiffs;
5. ntshz;ikg; ghBkhHpsf; - cHlf/ tpij/ ehw;W eLjy/ Vu/ ePh; ghrdk;/ fis/ gaph;g;
   ghJfHg;g;/ mWtlf/ fsh; epyr; rPh;jpUj;ik/ thdpay/; kHgU/ gUt;/ gw; wpA Fwpg;g;fs;
6. ehl;Lg;gLw; ghly;fs; tHg ntshz;ikr; bra;jpfis mwptpj;
7. mwptpay; jkpHpd; tsh;r;rp epiyfs; - jkpHpy; ntshz;ik .JH;/fs; / fl;Lur; RUF;fk; (Abstract)
   vGJ jy;
8. fl;Uj;Gj; ghpkhw;wj; jpwd;fs; (Communication skills) nkilg; ngr;R - nfI;/ly/; NgRjy;/ goj;jy;
   vGJ; jiy - nkkg;gLj;Jljw; fhD tHg KiwFisg; gapw;Wtpj;jy;
9. lI;gq;GLu;j; njh; tJ;th;
10. bkd; jpwd; fis (Soft skills) nkk;gLj; Jly;
11. bkhHpbagah;g;G - Xh; mwptKfGk; bkhHpbagah;g;G tiffs mwptpj; - ntshz;
    bra;jpfisj; jkpHhf;fk; bra;jy;
12. fyr; brhy;yhf;ffk; - fyr brhw; fis Cuthf; Fk; Kiw - fyr; brhw; fisj; jag;gLj;Ljy; - tI/hu
    tHf;F; brhw; fisj; bjHfj;jy;
13. mwptpay; jkpH; tsh;r; r;rpapy; fздpped; g;F;
14. EJy; kD/diu/ mze; JuU; Ejy; kjpg; gPL bra;jy; (kjp;g;GLu)
15. bra; jp tiffs; - bra;jpj; jhs; - thbdyp - bhjyf; fhl;rp MIfa jfly; bhjhl;g; G Cl;/fspy;
    ntshz;ikr; bra;jpfisv; gJg; gapw;rp mspj;jy;
16. ntshz; jkpHpy; El; g;fs; bhjHghd tpsk; guk;/ Jz;Lg; gpuRuk;/ kog; gjiH;fs; / gJbkhHpsf; / fnhAf; fis; jahpj;jy;
17. fye; Juahly;/ neh; fhzv;/ ehlf; ft pij; tpy; Yg; ghL L yk; ntshz;ikr; bra;jpfisg;
    gug; gJjy;

ghh;it Ejy; fs;

- fe;jrhkp/ .y. br. 1974. ntshz; ika[k; gz; ghLk; - jkpH; ehl; ntshz; ikg; gy; fylf; fHfk; / nfhAk; Jh;.
- fe;jrhkp/ .y. br. 1981. yf; fpa;jpy; ntshz; ik - jkpH; ehl; ntshz; ikg; gy; fylf; fHfk; / nfhAk; Jh;.
- fe;jrhkp/ .y. br. 1983. ntshz; ikg; ghBkhHpsf; fyr; brjy; tk; gjpg; gfk; - nfhAk; Jh;.
- FHe; ijrhkpo/ th. br. mwptpay; jkpH;.
- nrhkby. jkpH; .JH;/fs; - brd; idg; fy; fylf; fHfk; 1975.
- kPhdl; rp Re; juk; kh kw; Wk; V. y. trpah; Kp; 2002. jfly; bjhhl; g; jkpH; bhkhHpg; gad; ghL; nh. Mh; v; Mg; Brl; gphpz; ih; nfhit -3.
- kzpnf; fyl; k. 2002. jkpH; bhkhHpj; jlj; jpy; ntshz; mwptpayD; RtlF; sjtp gjiH; gfk; / jpuR; ruhp; gh; sp.
- kzt Kl; Jjgh; ,izaj; jkpH;.
- mide; jpe; jpa mwptpay; jkpH; fHfk; - fy; tp El;gtpay;.
- cybf; jkpHhuah; ; rp epWtk; - jkpHpd; kug; brt; y; fs;.
- .uh. re;jpunrfud; bkhHpg; ghlk; - gilg; ghFf; jwpd; tsh; jiy;
ENG 117 DEVELOPMENT EDUCATION
(Equivalent course for non-Tamil students)

OBJECTIVES
To enable the learner know, understand, apply and value items related to agriculture and help the farmers to implement them.

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.

LECTURE 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. Final Practical Examination

REFERENCES

101 NATIONAL SERVICE SCHEME (0+1)

I and II Semester
III and IV Semester


NATIONAL CADET CORPS (0+1)


REFERENCE:

SEMESTER-II

HOR 121: GROWTH AND DEVELOPMENT OF HORTICULTURAL CROPS (1+1)

OBJECTIVES
Growth is an outward expression of different physiological processes that continuously proceed in plants. This course outlines the different growth functions, flowering, fruit development and senescence in plants which will help the students to assess the time and methods of application of different horticultural practices.

THEORY

UNIT-I: Growth and growth analysis

UNIT –II: Physiological Process of Flowering, Bulb and Fruit development

UNIT-III: Role of Macro and Micronutrients on plant growth

UNIT-IV: Role of plant growth regulators in Horticultural crops
UNIT-V: Senescence and Stress physiology


PRACTICAL

Estimation of photosynthetic potential of Horticultural crops – leaf area index – light intensity measurement in different tier cropping – growth analysis parameters including harvest index – preparation of hormonal solution and induction of rooting in cuttings – ripening of fruits and control of fruit and flower drop. Senescence index in plants – basic principles in identifying the deficiency symptoms of macro and micro elements in fruits, vegetables and flower crops – important physiological disorders and their remedial measures in fruits and vegetables – seed dormancy – tetrazolium test – seed germination and breaking seed dormancy with chemicals and growth regulators

LECTURE SCHEDULE
1. Growth expression, factors influencing growth, types of growth
2. Physiology & biochemistry of perennial, semi perennial and annuals
3. Dormancy, bud break in horticultural crops, their importance, Physiology of rooting of cuttings and graft incompatibility.
4. Flowering – factors affecting – physiology of flowering, photoperiodism – long day, short day, day neutral plants, vernalization
5. Phase transition juvenile, vegetative, reproductive interface
6. Pollination – fertilization – seedlessness – fruit drop control – ripening – climacteric and non climacteric fruits
7. Functions of macro and micro nutrients for plant growth, absorption, nutrients deficiency symptoms, leaf sampling for tissue analysis
8. Induction of fruit set Apomixis, parthenocarpy and their physico chemical basis
9. Mid semester examination
10. Physico-chemical phenomena of pruning on flowering and fruiting
11. Physico-chemical phenomena of training on flowering and fruiting
12. Plant hormones – Auxin, gibberellins, cytokinin, ethylene – basic functions in plants
13. Bio-synthesis, growth retardants, inhibitors, role of growth and development and PGR’s.
14. Propagation, flowering, fruit setting, fruit development and ripening.
15. Mechanism of senescence, longevity of leaves in perennial and annual crops.
16. Stress physiology – heat, cold, moisture and salinity
17. Post harvest physiology in fruits, vegetables and flower crops.

PRACTICAL SCHEDULE
1. Observation on growth in different Horticultural crops
2. Components of growth analysis
3. Measurement of growth due to environmental factors and correlation of the same with growth
5. Use of chemicals in breaking bud dormancy
6. Use of cultural practices in bud break
7. Field visit to study the training and pruning practices in horticulture crops
8. Observation on different Horticultural floral materials on fruit set
9. Maturation induction through growth regulators
10. Crop regulation factors like pinching, pruning & training in young horticultural plants.
11. Identification of plant growth regulators
12. Use of PGR.’s in fruits and vegetables
13. Use of chemicals for ripening and induction of rooting in cuttings
14. Use of chemicals for controlling the flower and fruit drop
15. Identification of deficiency symptoms of fruits and vegetables
16. Use of growth retardants in selected horticultural crops
17. Experiments on post harvest losses in fruits and vegetable crops

REFERENCE BOOKS
AGR 122 INTRODUCTION TO MAJOR FIELD CROPS (2+1)

OBJECTIVES
To study the origin of major field crops and its importance and impart knowledge on cultivation aspects of important field crops.

THEORY

Unit –I: Cereals
Cereals: Rice, Maize, and Wheat - Origin, geographic distribution, economic importance, soil and climatic requirements, varieties, cultural practices (from land preparation to harvest) and yield.

Unit –II: Major millets
Millets: Sorghum, Pearl millet and Finger millet - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.

Unit –III: Pulses
Pulses: Red gram, Black gram, Green gram and Bengal gram - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.

Unit – IV: Oilseeds and sugar crops
Oil seeds: Groundnut, sesame, sunflower, coconut, Jatropha- Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
Sugar crops: Sugarcane, Sugar beet - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.

Unit – V: Fibres, tuber crops and Tobacco
Fibre crops: Cotton and Jute
Tuber crops: Potato and sweet potato
Narcotics: Tobacco - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.

PRACTICAL
Identification of crops and crop varieties - Rice nursery preparation and transplanting - main field preparation for millets, pulses, oilseeds, sugarcane and Cotton; Seed treatment techniques - Estimation of population - Sowing and manuring- Seeding equipment’s - Study of growth and yield contributing characters, yield calculations, harvesting and yield estimation of above crops; Cost and returns - Study of cropping patterns and important agronomic experiments and farmers’ fields.

THEORY - LECTURE SCHEDULE
1. Introduction-importance of cereals, millets, pulses and oilseeds
2. Introduction-importance of sugar crops, fibres, tuber crops and Narcotics
3. Area, production and productivity of major cereals, millets, pulses and oilseeds of India and Tamil Nadu.
4. Importance and area, production and productivity of sugars, fibres, tubers and tobacco of India and Tamil Nadu.
5. Rice- Origin - geographic distribution - economic importance – varieties - soil and climatic requirement
6. Rice - cultural practices - Deficiency symptoms for major and micronutrients - yield - economic benefits - Special type of Rice cultivation – Rajarajan 1000 (SRI), Transgenic Rice - Hybrid rice.
7. Maize - Origin, geographic distribution, economic importance, soil and climatic requirement.
8. Maize - Varieties, cultural practices and yield.
9. Wheat - Origin, geographic distribution, economic importance, Soil and climatic requirement, varieties, cultural practices and yield.
10. Sorghum - Origin, geographic distribution, economic importance, soil and climatic requirement.
11. Sorghum- varieties, cultural practices and yield.
12. Pearl millet - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield
13. Finger millet - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
14. Blackgram and Greengram - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield - Agronomy of rice fallow pulses
15. Red gram and Bengal gram - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
16. Groundnut - Origin, geographical distribution, economic importance,
17. Mid-semester Examination
18. Groundnut- Soil and climatic requirements - varieties, cultural practices yield and economics
19. Sesame– Origin, geographical distribution, economic importance,)
20. Sesame-Soil and climatic requirements, varieties, cultural practices and yield.
21. Sunflower - Origin, geographical distribution, economic importance,
22. Sunflower- Soil and climatic requirements, varieties, cultural practices and yield.
23. Coconut– Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield
24. Castor and Jatropha – Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield
25. Sugarcane - Origin, geographical distribution, economic importance, soil and climatic requirements.
27. Sugarcane - Crop logging, maturity and ripening sugar and gur manufacture - Value addition and byproduct utilization.
28. Sugar beet - Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices, yield and by product utilization.
29. Cotton - Origin, geographic distribution, economic importance, soil and climatic requirement,
31. Jute - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
32. Potato- Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
33. Sweet potato- Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
34. Tobacco -Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.

PRACTICAL
1. Identification of cereals, millets, pulses and oilseed crops in the crop cafeteria
2. Identification of sugars and fibres crops in the crop cafeteria
3. Practicing various nursery types and main field preparation for rice crop.
4. Nursery and main field preparation for important millets, pulses and oilseeds
5. Nursery and main field preparation for sugarcane and cotton
6. Acquiring skill in different seed treatment techniques in important field crops
7. Estimation of plant population per unit area for important field crops
8. Acquiring skill in field preparation, sowing and manuring of crops under pure and intercropping situations for cereals, millets pulses, oilseeds, sugarcane and cotton
9. Acquiring skill in foliar nutrition for important field crops.
10. Observations on growth parameters of cereals milletsand pulses
12. Study of yield parameters and estimation of yield in cereals, milletsand pulses
13. Study of yield parameters and estimation of yield in oilseeds, sugarcane and cotton
14. Working out cost and returns of important cereals, millets, pulses and oilseeds crops.
15. Working out cost and returns of sugarcane, cotton, Tobacco
16. Visit to farmers field / research stations to study the cultivation techniques of millets, pulses, oilseeds sugarcane and tobacco.

17. Practical Examination

REFERENCES

PAT123 PRINCIPLES OF PLANT PATHOLOGY (2+1)

OBJECTIVES
The subject covers basic aspects of plant pathology including history, taxonomy, general characters of fungi, bacteria, virus, algae and phanerogams and also symptoms of various plant diseases with its causal agent.

THEORY
Unit I: Plant Pathogenic organisms
Unit II: Pathogenesis
Pathogenesis - Mode of infection – Pre-penetration, penetration and post penetration – Spread and survival of pathogens - Role of enzymes and toxins on disease development
Unit III: General characters and molecular phylogeny of fungi
Unit IV: Phylum : Ascomycota and Basidiomycota
Phylum: Ascomycota, Classes: Taphrinomycetes (Taphrinales), Dothideomycetes (Dothidiales, Capnodiales and Pleosporales) Eurotiomycetes (Eurotiatales), Leotiomycetes (Erysiphales and Helotiales),Sordariomycetes (Hypocreales, Phyllochaetales and Diaporthales) and mitosporic ascomycetes; Phylum: Basidiomycota, Classes: Agaricales (Agaricales, Corticiales, Cantharellales and Polyporales), Pucciniomycetes (Pucciniales) and Ustilaginomycetes (Exobasidiales, Ustilaginiales and Tilletiales).
Unit V: Bacteria, Phytoplasma and Viruses
Classification of bacteria - general characters and symptoms of phytopathogenic bacteria – mode of entry and spread -general characters and symptoms of Phytoplasma, Spiroplasma, Fastidious vascular bacteria, viruses, viroids, algae, Panerogamic parasites and Abiotic disorders.

PRACTICAL
Note: Students should submit 50 well-preserved specimens

THEORY SCHEDULE
1. Definition of Plant Pathology – History of Plant Pathology
3. Fastidious vascular bacteria – Spiroplasma – Algal and phanerogamic parasites- abiotic disorders
Pathogenesis - Mode of infection – pre-penetration, penetration and post penetration

Spread and survival of pathogens

Role of toxins on disease development

Role of enzymes on disease development

Role of toxins on disease development

General characters of fungi – types of Mycelia – modification of mycelia, vegetative reproduction

Asexual and sexual reproduction in fungi

Fruiting bodies in fungi – Asexual and sexual

Nutrition / parasitism in fungi - Types of parasitism – parasite, saprophyte, facultative saprophyte, facultative parasite, obligate parasite, Biotrophs, hemibiotrophs, perthotrophs, necrotrophs, and symbiosis

Classification of Kingdom – Protozoa - important taxonomic characters and Symptoms and life cycle of Plasmodiophora brassicaceae and Spongospora subterrenea

Classification of Kingdom – Chromista- General characters - Classification of Oomycetes

Symptoms and life cycle of Pythium, Phytophthora and Albigo.

Symptoms and life cycle of Peronosclerospora, Sclerospora. Perenospora, Pseudoperenospora and Plasmopara

Classification of Kingdom--Chytridiomycota and Zygomycota - important characters, symptoms and life cycles of Rhizopus and Mucor

Mid Semester Examination

Classification of Kingdom--Ascomycota- important characters

Symptoms and life cycles of Erysiphe, Leveillula, Phyllactinia, Uncinula and Podosphaera

Symptoms and life cycles of Taphrina, Capnodium, Eurotium, Talaromyces, Claviceps and Venturia.

Symptoms and important characters of Pyricularia, Sarocladium, Helminthosporium, Alternaria, Cercospora Curvularia, Fusarium and Verticillium

Symptoms and important characters of Colletotrichum, Gloeosporium, Pestalotia, Macrophomina, Botryodiplodia, Septoria and Ascochya

Classification of Kingdom – Basidiomycota- important characters

Symptoms and life cycles of Puccinia, Uromyces, and Ustilago

Symptoms and life cycles of Ganoderma and Exobasidium.

Important taxonomic characters of Agaricus, Pleurotus, Volvariella and Calocybe

Symptoms and important characters of Corticium, Rhizoctonia and Sclerotium

Classification and general characters of phytopathogenic bacteria- Mode of entry and spread

Symptoms and characters of Xanthomonas and Pseudomonas /Ralstonia, Erwinia (Pantoea), Agrobacterium, Corynebacterium (Clavibacter,) and Streptomyces

Virus - definition, nature and properties of plant virus, Single stranded, Double stranded RNA and DNA viruses and Transmission of plant viruses

Common symptoms of virus diseases – bract mosaic, citrus tristeza, tomato Spotted wilt, Sunflower necrosis, papaya ring spot, infectious chlorosis, yellow mosaic, vein clearing, leaf crinkle, leaf curl, bud necrosis, rosette and bunched top

Important characters and symptoms of phytoplasma diseases – Phyllody, witches broom, little leaf, yellow dwarf and sandal spike

Important characters and symptoms of Viroid, Fastidious vascular bacteria, Algal and Phanerogamic parasites

Symptoms and characters of non-parasitic diseases

PRACTICAL SCHEDULE

General characters of fungi – Types of mycelia -Types of vegetative, asexual and sexual spores- asexual and sexual fruiting bodies.

Study of important taxonomic characters and symptoms produced by Plasmodiophora, Pythium and Phytophthora.

Albigo, Sclerospora, Peronospora, Peronosclerospora Pseudoperenospora and Plasmopara

Mucor and Rhizopus.

Taphrina, Capnodium Erysiphe, Phyllactinia, Uncinula, Leveillula and Claviceps.

Puccinia, Uromyces, and Hemileia

Sphacelotheca, Tolyposporium and Ustilago.

Study of important taxonomic characters of Agaricus, Pleurotus, Calocybe, Volvariella and Ganoderma.

Study of important taxonomic characters and symptoms produced by Colletotrichum, Gloeosporium, Pestalotia, Macrophomina and Botryodiplodia

Study of important taxonomic characters and symptoms produced by Pyricularia, Sarocladium Helminthosporium, Alternaria, Cercospora and Curvularia, Rhizoctonia and Sclerotium.

Symptoms of bacterial diseases – leaf blight, leaf streak, canker, scab, crown gall, wilt and soft rot.
12. Symptoms and vectors of viral diseases – infectious chlorosis, mosaic, vein clearing, leaf crinkle, leaf curl, bud necrosis, rosette, bunchy top, bract mosaic, citrus tristeza, tomato spotted wilt, sunflower necrosis, papaya ring spot
14. Study of important characters and symptoms produced by algal parasite and phanerogamic parasites
15. Symptoms of non-parasitic diseases
16. Field visit
17. Final practical examination.

Note: Students should submit 50 well-preserved specimens

REFERENCES

AGM 124: INTRODUCTORY MICROBIOLOGY (2+1)

OBJECTIVES
To study the fundamental principles and applied aspects of microorganisms in food soil and industries.

THEORY
Unit - I: History and scope of Microbiology
Contributions of Anton Van 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 bacterial cell: Invariant and variant components, Structure and organization of microbial cells.

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 and pure culture techniques – Enrichment culturing, dilution – plating, streak plate, spread plate methods; Preservation of microbial cultures.

Unit-III: Food Microbiology
Importance of Food Microbiology, Types of microorganisms in food, Sources of contamination, Factors influencing the microbial growth in food, Microbial spoilage of fruits, vegetables and canned foods, Fermented foods – Beer – Wine – Bread making. Fermented vegetables.

Unit – IV: Soil Microbiology

Unit – V: Industrial Microbiology

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.
Quality analysis 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.

THEORY SCHEDULE
1) Definition and scope of microbiology – Spontaneous generation theory.
3) Position of microorganisms in living world; Prokaryotes Vs Eukaryotes.
4) Bacterial morphology – size, shape and arrangement of cells.
5) Structure and organization of bacterial cells.
6) Functional anatomy and reproduction in bacteria.
7) Morphology of fungi and economic importance.
8) Morphology of algae and their economic importance.
9) Microscopy: principles of optics and light microscope – different types of microscopy.
10) Modified compound microscopes – Dark field, Phase contrast and Fluorescent microscopes.
11) Electron microscopes and types – Transmission electron microscope and Scanning electron microscope
12) Microbial staining – principles, Acidic, Basic and Neutral dyes
13) Simple staining and differential staining.
14) Sterilization principles – physical and chemical methods.
15) Isolation of microorganisms from various sources.
16) Purification of microorganisms by different methods.
17) Preservation of microbial cultures.
18) Mid semester exams
19) Importance of Food Microbiology
20) Types of microorganisms in food
21) Sources of contamination
22) Factors influencing the microbial growth in food
23) Microbial spoilage of fruits, vegetables and canned foods
25) Distribution and importance of soil microorganisms in soil fertility
26) Factors affecting the activities of soil microorganisms
27) Rhizosphere microorganisms and their importance
28) R:S Ratio, Phyllosphere microorganisms
29) Plant – microbe and Microbe – microbe interactions in soil.
30) Types and importance of biofertilizers in Horticulture
31) Mass production and quality control of biofertilizers
32) Fermentor – Design and characteristics, Upstream and Downstream process.
34) Fermented products - Organic acids – Citric acid, Lactic acid and Glutamic acid.

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 and fungi.
7) Wine making.
8) Observation of microorganisms from spoiled vegetables and fruits.
9) Conn’s direct microscopic count and Burried slide technique.
10) Organic matter decomposition - measurement of CO₂ evolution
12) Isolation of symbiotic N\textsubscript{2} fixing microorganisms – \textit{Rhizobium}.
13) Isolation of associative and non-symbiotic N\textsubscript{2} fixer: \textit{Azospirillum} and \textit{Azotobacter}.
14) Isolation of phosphate solubilizing microorganisms and demonstration of Winogradsky column.
15) Assessment of AM fungi colonization in crop plants.
16) Mass production of biofertilizers.
17) Final Practical Examination

REFERENCES

SAC 125: FUNDAMENTALS OF SOIL SCIENCE 2(1+1)

OBJECTIVE

\begin{itemize}
\item 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.
\end{itemize}

THEORY

Unit I
Composition of earth crust, soil as a natural body – major components. Rocks – definition, formation, classification – igneous, sedimentary and metamorphic rocks. Factors influencing parent material. Minerals – definition, occurrence, classification of important soil forming primary minerals - silicate and non silicate minerals, ferro and non-ferro magnesium minerals

Unit II

Unit III

Unit IV
Unit V


PRACTICAL


LECTURE SCHEDULE

2. Rocks – definition, formation, classification – igneous, sedimentary and metamorphic rocks
3. Brief description of important rocks – mineralogical composition
4. Minerals – definition, occurrence, classification of important soil forming primary minerals - silicate and non silicate minerals, ferro and non-ferro magnesium minerals
5. Physical properties-Texture-Soil separates-Textural analysis-International pipette method-Stoke’s law-Assumption and limitations-Textural classes using triangular diagram
6. Bulk density-Particle density-Definition-Textural analysis-Factors affecting bulk density and particle density. Pore space.
7. Definition of macro and micro pore space-Factors affecting pore space- Soil compaction-internal surface area-Factors influencing soil compaction
8. Mid - Semester Examination
10. Soil consistence-Cohesion-Adhesion-Plasticity-Atterberg’s constant-Upper and lower plastic limits, plastic number
15. Role and functions of organic matter in soil - Formation of clay humus complex. Ion exchange reaction – Cation exchange – Anion exchange
17. Irrigation water quality, determination of quality parameters and management. Occurrence, properties and management of acid soils, saline soils and alkali soils

PRACTICAL SCHEDULE

1. Collection of soil samples and estimation of moisture
2. Estimation of EC and pH
3. Estimation of true specific gravity, Apparent specific gravity and pore space
4. Estimation of soil colour and soil texture by Feel method
5. Textural analysis of soils by international pipette method – Soil dispersion
6. Textural analysis of soils by international pipette method – clay and clay + silt
7. Textural analysis of soils by international pipette method – Coarse and fine sand
8. Preparation HCl extract
9. Estimation of Fe₂O₃ and Al₂O₃
10. Estimation of total N
11. Estimation of total P
12. Estimation of total K
13. Estimation of total Ca and Mg
14. Estimation of total micronutrients
15. Estimation of organic carbon
16. Estimation of CEC
17. Practical Examination

REFERENCES

AEX 126: FUNDAMENTALS OF EXTENSION EDUCATION (1+1)

OBJECTIVES
- To learn the concept, principles and philosophy of Extension Education
- To gain knowledge on TOT programmes of ICAR
- To gain knowledge about communication, programme planning and HRD

THEORY
UNIT – I: Introduction to Extension Education
Extension education: meaning, definition, nature, scope, objectives, principles, approaches and history.

UNIT – II: Horticultural Development Programmes

UNIT – III: Rural Development
Rural Development: meaning, definition, objectives and genesis. Transfer of technology programmes like Lab to Land Programme (LLP) National Demonstration (ND), Front Line Demonstration (FLD) Krishi Vigyan Kendras (KVK), Technology Assessment and Refinement Programme (TARP) etc. of ICAR.

UNIT – IV: Communication and Programme Planning

UNIT – V: PRA and HRD

THEORY SCHEDULE
1. Extension education: meaning, definition, nature, scope
2. Objectives, principles, philosophy of extension education, extension educational process and steps in extension teaching.
5. Hill area development programme – Micro Irrigation – TNIAMWORM
6. Rural development : Meaning, Definition, Objectives and Genesis
7. Transfer of technology programmes like lab to land programme (LLP) national demonstration (ND), front line demonstration (FLD)
8. Krishi Vigyan Kendras (KVK), Technology Assessment and Refinement Programme (TARP)

9. Mid semester Examination
10. Communication: meaning, definition, elements and selected models.
12. Programming planning process – meaning, scope, principles and steps.
15. Management and administration: meaning, definition, principles and functions.
16. Concepts of human resource development (HRD)
17. Rural leadership.

PRACTICAL SCHEDULE
1. Visit to study the extension programmes of a voluntary organization
2. Visit to study the extension Programmes of a mahila maudal
3. Visit to study the extension programmes of village Panchayat
4. Visit to study the extension programmes of Horticulture department
5. Visit to All India radio station
6. Exercise on distortion of message
7. Script writing for farm broadcast
8. Script writing for farm telecast
9. Planning preparation and use of posters
10. Planning Preparation and use of charts
11. Planning Preparation and use of flash card
12. Planning Preparation and use of folders
13. Planning Preparation and use of transparencies OHP
14. Preparation of slides with power point
15. Identification of local leaders to study their role in extension work
16. Evaluation of case studies of horticultural extension programmes
17. Preparation of village horticultural production plan

REFERENCES
AHS 127: LIVESTOCK AND POULTRY PRODUCTION (2+1)

OBJECTIVE:
To gain current technical knowledge in the field of livestock and poultry production and thereby enabling them to apply their technical brilliance at field level. To acquire hands on training about livestock and poultry based farming, preparation of dairy products. To gain latest technology of livestock industries so as to acquire entrepreneurial attitude among the students.

THEORY:
UNIT – I Introduction to livestock and Poultry production
Introduction – Significance of livestock in Agriculture and Indian economy – Different Livestock development programs of Government of India - common nomenclatures used in Animal Husbandry practices – various systems of livestock rearing – Record keeping - space requirement for different species of livestock and poultry

UNIT – II Management of Cattle

UNIT – III Management of Sheep, Goat and Pigs
Classification of sheep and goat breeds – Care and Management of Kid and Lamb – steaming up and flushing– Disease control measures in sheep and goats– common breeds of exotic pig – Care and management of piglets – control measures of pig diseases.

UNIT – IV Poultry Management

UNIT – V Livestock Products Technology

PRACTICALS

THEORY LECTURE SCHEDULE
1. Introduction to Livestock and Poultry Industry
2. Different Livestock development programs of Government of India
4. Systems of Livestock rearing – record keeping
5. Space requirement for different species of Livestock and Poultry
6. Introduction and classification of different breeds of white and black cattle
7. Selection of site for dairy farm and systems of housing
8. Introduction to Estrus cycle – Artificial Insemination
9. Care and management of calf
10. Care and management of heifers
11. Care and management of pregnant and lactating cows.
12. Classification of feed – Ration – Balanced ration
13. Importance of Green fodder – Qualities of good fodder
14. Disease control measures in Cattle
15. Introduction and Classification of sheep and goat breeds
16. Care and management of kid and lamb
17. Steaming up and flushing – Disease control measures of sheep and goat.
18. Common breeds of exotic pig
19. Care and management of piglets
20. Disease control measures of pig
21. Introduction to poultry production
22. Classification of breeds of poultry
24. Brooding management in poultry.
25. Litter management in poultry farm
27. Management of layers.
28. Feed conversion ratio and disease control measures in poultry production.
29. Introduction and importance of Livestock and poultry products.
30. Clean milk production.
31. Pasteurization of milk.
32. Composition and nutritive value of milk
33. Nutritive value of meat of sheep, goat and pig.
34. Nutritive value of poultry meat and egg.

PRACTICAL SCHEDULE
1. Study of external parts of livestock and poultry
2. Identification of livestock
3. Common methods of restraining
4. Disbudding
5. Ageing of cattle
6. Design of Cattle shed
7. Selection of dairy cow
8. Determination of specific gravity in milk.
9. Fat percentage and total solids in cows milk.
10. Demonstration of cream separation
11. Ice cream making
12. Identification of feed and fodder
13. Economics of Dairy farming
15. Dressing of chicken
16. Economics of broiler production
17. Visit to Dairy plant, layer and broiler farms.

REFERENCES:

COM 128 INTRODUCTION TO COMPUTER APPLICATIONS (1+1)

OBJECTIVES
To make use of computer basic personal usage and to know how to use MS-office (word, Excel, Access, Power point) to increase personal and academic productivity. To get exposed to aspects of internet usage and to propagate the awareness of research facilities using browsing and searching.

THEORY
Unit – I: Introduction to Computer
Unit – II: WINDOWS
   WINDOWS: GUI, Desktop and its elements, WINDOWS Explorer, working with files and folders, setting time and date, starting and shutting down of WINDOWS. Anatomy of a WINDOW. Title Bar, Minimum, Maximum and Close Buttons, Scroll Bars, Menus and Tool Bars.

Unit – III: MS-Word & Excel

Unit – IV: MS-Power point & Access
   MS Power Point: Features of Power Point Package. MSACCESS: Concept of Database, Units of database, creating database.

Unit – V: Principles of Programming & Internet

THEORY SCHEDULE
1. Introduction to Computers, Anatomy of Computers.
2. Input and Output Devices, Units of Memory, Hardware, Software and Classification of Computers.
4. Operating System-DOS and WINDOWS. Disk Operating System (DOS): Some fundamental DOS commands. FORMAT, DIR, COPY, PATH, LABEL, VOL, MD, CD and DELTREE, Rules for naming files in DOS and Types of files.
5. WINDOWS: GUI, Desktop and its elements, WINDOWS Explorer, working with files and folders, setting time and date, starting and shutting down of WINDOWS.
6. Anatomy of a WINDOW. Title Bar, Minimum, Maximum and Close Buttons, Scroll Bars, Menus and Tool Bars.
7. MSWORD: Word, processing and units of document, features of word-processing packages.
8. Creating, Editing, Formatting and saving a document in MSWORD.
9. Mid-semester examination.
10. MSEXCEL: Electronic Spread sheets, concept, packages, Creating, Editing and Saving a spreadsheet with MSEXCEL.
11. Use of in-built Statistical and other functions and writing expressions.
12. Use of Data Analysis Tools, Correlation and Regression, t-test for two-samples and ANOVA with one-way Classification.
15. MSACCESS: Concept of Database, Units of database, creating database.

PRACTICAL SCHEDULE
2. DOS commands: TIME, DATE, DIR, COPY, FORMAT, VOL, LABEL, PATH.
4. Using Icons, understanding clicks, double clicks.
5. MS-Word – create/edit/print documents.
6. MS-Word – Formatting, inserting, table creation, Alignment.
7. MS-Excel – creating spreadsheet, formatting cells, auto calculation.
8. MS-Excel – Inbuilt functions, chart preparations.
10. MS-Access – Structuring with different types of field.
12. MS-Power point – preparation of slides on power point
13. MS-Power point – Animation Control, Transition Control
14. Transforming the data of WORD,EXCEL and ACCESS to other formats
15. Creating of E-Mail-ID
16. Email- Compose, Attaching, Inbox printing, Browsing a web page.
17. Practical examination.
REFERENCE

AEG 129 FARM POWER AND MACHINERY  (1+1)

OBJECTIVES
This subject will enable the student,
To gain knowledge on the various types of I C engines, types and selection of tractors.
To understand the construction and working of various farm implements like tillage implements, seed drills, transplanters, plant protection and harvesting equipments.

THEORY
Unit I: Farm power
I C Engine – classification - Working principle of two stroke and four stroke I C engine - basic principle and operation of CI and SI engines and comparison.

Unit II: Tractors and its maintenances
Tractors and power tillers – types and uses. Selection of tractor and cost of tractor power -service – repairs, maintenance and lubrication– fuel – oil and miscellaneous cost.

Unit-III: Primary and secondary tillage Implements
Tillage-objectsives-furrow terminology-methods of ploughing -field capacity and working our problems. Primary tillage implements-components and functions of indigenous ploughs-mould board, disc, rotary and chisel ploughs. Secondary tillage implements –components and functions of tillers, harrows, ridger, bund former, puddler, leveler and green manure trampler.

Unit -IV: Sowing and plant protection Equipments.

Unit V: Intercultural, Harvesting equipments.

THEORY LECTURE SCHEDULE
1. Working principles of IC engines and CI engines – farm mechanisms.
2. Tractors and power tillers parts and their working principles – maintenance
4. Various primary tillage implements – working principle and uses.
5. Secondary tillage implements - working principle and uses.
7. Sowing methods and sowing equipments.
9. Other plant protection equipment - working principle and uses.
10. Simple problems – area coverage – cost of operation
11. Intercultural implements – weeders – types and uses.
PRACTICAL SCHEDULE
1. Study of different components of IC engines.
2. Study and working principle of four stroke IC engine.
3. Study and working principle of two stroke IC engine.
4. Study of Tractors and power tillers.
5. Identification of primary tillage implements – indigenous ploughs and mould board ploughs.
6. Identification of disc, rotary and TNAU ploughs.
7. Identification of harrows, ridger and bun former.
8. Identification of puddler leveler and green manure trampler.
9. Seed drill – parts – working principles
10. Identification of paddy harvester and thresher.

REFERENCE BOOKS:
   New Delhi

SEMESTER-III
HOR 211: PRODUCTION TECHNOLOGY OF TROPICAL AND ARID ZONE FRUITS (2+1)

OBJECTIVES
Fruit crops form an important division in Horticulture with high nutrient and yield potential. The tropical fruits like mango, banana, guava and others are predominately cultivated on commercial scale in Tamil Nadu and other states. With this background in view this course has been designed to include the latest technologies such as propagation, training and pruning systems, planting systems and crop regulation in different tropical fruit crops. Besides, it also highlights the important cultivars, varieties and hybrids developed from different Agricultural Universities and other institutes.

THEORY
UNIT-I: Importance and Production Technology of Tropical Fruit Crops

UNIT-II: Production Technologies-I
Guava, grapes and papaya.

UNIT-III: Production Technologies –II
Acid lime, lemon, sweet oranges and sapota

UNIT-IV: Production Technologies –III
Ber, Pomegranate and Anmona

UNIT-V: Production Technologies –IV
Aonla, Jack, Tamarind and minor fruits

PRACTICAL
**LECTURE SCHEDULE**

1) Tropical fruits- Importance – global, national and regional level – area, production and export potential.

2) Past and present status of tropical fruits in India.

3) Study of fruit growing regions / zones in India and Tamil Nadu.

4) Mango – area, production, productivity- varieties- varieties for specific purpose and export.


8) Mango – harvesting techniques – post harvest handling and post harvest treatments, ripening of fruits – storage and processing.

9) Banana varieties- climate and soil requirements.

10) Genome classification – selection of planting material.

11) Banana - planting system – high density planting- inter-cropping.


13) Banana – harvesting – post harvest handling, ripening, storage and processing.


17) Mid-Semester Examination.

18) Grapes – area, production, productivity- classification- varieties.


20) Grapes – training and pruning-nutrition- weed and water management.


PRACTICAL SCHEDULE
1) Study of mango varieties.
2) Practicing propagation methods of mango.
3) Study of banana varieties.
4) Scoring technique, sucker treatment and special practices in banana.
5) Study of guava varieties
6) Practicing propagation methods of guava
7) Study of grapes varieties and propagation techniques.
8) Sapota – Identification of varieties
9) Sapota – Propagation methods
10) Papaya – Varieties and propagation.
12) Acid lime, lemon, sweet orange – varieties, suitable root stock and their propagation.
13) Ber, Pomegranate – varieties-propagation.
16) Assessment of maturity standards for tropical and arid zone fruits.
17) Working out economics of production of tropical and arid zone fruits

REFERENCE BOOKS

HOR 212: PRODUCTION TECHNOLOGY OF TROPICAL VEGETABLES (2+1)

OBJECTIVES
This course aims to educate the students with the current development on various aspects of vegetable cultivation based on the results of research work. It also aims to provide pertinent information on the importance of vegetables, problems and latest agro techniques of vegetable production, post harvest handling and marketing of vegetables.

THEORY
UNIT –I: Vegetable production and its importance
Importance of vegetable growing – Area and production of vegetables in India and Tamil Nadu- Nutritive value of vegetables- classification of vegetables-effect of soil,climate and water on crop production and their management -types of vegetable growing- Kitchen garden-Market garden-Truck garden-Nutrition garden-cropping systems in vegetable crops-Protected cultivation of vegetables.
UNIT –II: Production technology of Solanaceous vegetables

Climate and soil-varieties and hybrids – season – seeds and sowing-nursery management – preparation of field- planting-spacing-planting systems-weed management-irrigation management-Drip and fertigation-nutrient requirement-nutrient deficiencies-physiological disorders-Role of chemicals and plant growth regulators in vegetable production-maturity indices-harvesting and yield-seed production techniques-post harvest handling, storage and marketing of vegetables :Tomato, Brinjal, Chillies, Bhendi,

UNIT –III: Production technology of Leguminous and Cucurbitaceous vegetables

Cluster beans, Cow pea, Vegetable Soybean, Lablab, Pumpkin, Ash gourd, Bitter gourd, Snake gourd, Ridge gourd , Bottle gourd, Cucumber, Gherkin, Water melon and Musk melon

UNIT –IV: Production technology of Tuber crops

Tapioca, Sweet potato, Colocasia, Dioscorea and Amorphophallus

UNIT –V: Production technology of Bulbous and Leafy vegetables

Onion, Amaranthus, Drumstick, Chekurmanis, Coccinia, Curry leaf, Basella and Portulaca.

PRACTICAL

Identification and description of tropical vegetable crops and tuber crops-nursery practices-transplanting-preparation of field and sowing/planting-use of manures and fertilizers-intercultural operation-use of growth regulators-identification of nutrient deficiencies-physiological disorders-Harvest indices and maturity standards-Post harvest handling and storage-seed extraction-working out cost of cultivation- project preparation for commercial cultivation of vegetable crops.

LECTURE SCHEDULE

1) Importance of vegetable growing in India and Tamil Nadu
2) Area, production, world scenario, industrial importance and export potential of vegetable crops.
3) Classification of vegetables
4) Types of vegetable growing
5) Cropping systems in vegetables
6) Vegetable growing in protected structures
7) Vegetable growing in poly houses
8) Production technology-soil, climate, land preparation, seeds and sowing, planting, cropping systems, intercultural operations, manuring, weed control, irrigation, harvesting and post harvest handling of the following vegetable crops:-
   Tomato
9) Brinjal
10) Chillies
11) Bhendi
12) Cluster bean and Field bean
13) Garden bean
14) Cow pea
15) Vegetable soybean
16) Pumpkin and Ash gourd
17) Mid semester examination
18) Bitter gourd and Snake gourd
19) Ridge gourd and Bottle gourd
20) Cucumber and Gherkin
21) Water melon and Musk melon
22) Tapioca
23) Sweet potato
24) Colocasia
25) Dioscorea and Amorphophallus
26) Onion
27) Moringa
28) Amaranthus and Chekurmanis
29) Curry leaf
30) Basella and Portulaca
31) Seed production techniques in vegetable crops
32) Post harvest handling of vegetable crops
33) Storage of vegetable crops
34) Value addition and Marketing of vegetable crops.

PRACTICAL SCHEDULE
1) Nursery management and raising seedlings
2) Preparation of main field for growing vegetables
3) Layout of kitchen garden/Nutrition garden
4) Practices in manuring and fertilizer application for vegetable crops
5) Practices in irrigation of vegetable crops
6) Preparation and use of plant growth regulators in vegetables
7) Identification of physiological disorders in vegetable crops.
8) Identification of varieties / hybrids and description in solanaceous and leguminous vegetables.
9) Identification of varieties / hybrids and description in cucurbits and root and tuber crops.
10) Maturity standards of important vegetable crops.
12) Practices in seed production techniques of cucurbits.
13) Practices in extraction of seeds in vegetable crops.
14) Working out cost of production of solanaceous crops.
15) Working out cost of production of leguminous crops and cucurbitaceous vegetables.
16) Commercial vegetable production in protected structures-visit to green house/poly house units.
17) Practical Examination

REFERENCE BOOKS

HOR 213: PRODUCTION TECHNOLOGY OF PLANTATION CROPS, SPICES AND CONDIMENTS (2+1)

OBJECTIVES:
This course is intended to acquire knowledge on the cultivation aspects of plantation crops, spices and condiments. At the end of the course, the student can able to acquire knowledge about varieties, specialised training and pruning, application of plant growth regulators to improve yield and quality of plantation crops, spices and condiments, and harvesting & processing techniques.

THEORY:
Unit: 1 Plantation crops –I

Unit: 2 plantation crops – II
Coconut, arecanut, palmyrah, oil palm, cinchona

Unit: 3 Major spices: Black pepper, cardamom, turmeric and ginger

Unit: 4 Seed spices& tree spices: coriander, fennel, cumin, fenugreek, clove, nutmeg, cinnamon, all spice.

Unit: 5 Other spices & Condiments: Curry leaf, Asafoetida, Vanilla, Saffron.
PRACTICALS:

LECTURE SCHEDULE:
1. Introduction, importance, scope and export potential of plantation crops in India and Tamil Nadu
2. Area and production trends in India Tamil Nadu
4. Coffee
5. Rubber
6. Cocoa
7. Cashew
8. Cinchona
9. Coconut
10. Areca nut
11. Palmyrah
12. Oil palm
13. Special nursery management practices in plantation crops
14. Value addition in plantation crops and product diversification
15. Introduction – importance and scope and export potential of spices and condiments in India and Tamil Nadu.
16. Area, production and classification of spices and condiments
17. Mid Semester Examination
19. Cardamom
20. Turmeric
21. Ginger
22. Coriander
23. Fennel
24. Cumin
25. Fenugreek
26. Clove
27. Nutmeg
28. Cinnamon
29. All spice
30. Curry leaf
31. Asafoetida
32. Vanilla
33. Saffron
34. Value addition in spices & condiments and product diversification

PRACTICAL SCHEDULE:
1. Identification of plantation crops, spices and condiments
2. Processing in tea & coffee
3. Processing in rubber & cashew
4. Processing in cocoa
5. Product diversification in plantation crops
6. Role of growth regulators in plantation crops
7. Nursery techniques in plantation crops
8. Propagation in pepper & cardamom
9. Propagation in turmeric & ginger
10. Processing of pepper & cardamom
11. Processing of turmeric & ginger
12. Nursery techniques in seed spices
13. Nursery techniques in tree spices
14. Nursery techniques in other spices and condiments
15. Value addition in spices and condiments
16. Role of growth regulators in spices and condiments
17. Visit to the processing industries of plantation crops, spices and condiments.
**REFERENCE BOOKS:**

**HOR 214: BIO-TECHNOLOGY OF HORTICULTURAL CROPS (1+1)**

**OBJECTIVES**

The natural capability of plants to multiply by asexual means is the basis for multiplication *in vitro*. Tissue culture simply directs and assists the natural potential within the plants to put forth new growth and to multiply in a highly efficient and profitable way. New developments in plant research inspire the use of tissue culture techniques in several areas like anther, callus, cell and embryo culture, protoplast fusion, secondary metabolites, genetic engineering. In this course, the importance and scope of biotechnology will be highlighted and the various techniques of tissue culture will be dealt in detail.

**THEORY**

**UNIT-I: Importance, History, Factors affecting tissue culture**

- Plant, cell and tissue culture – History and applications – General techniques – harnessing biotechnology in horticultural crops – factors affecting organogenesis and somatic embryogenesis

**UNIT –II: Techniques of tissue culture - I**


**UNIT-III: Techniques of tissue culture - II**

- Embryo culture – wide hybridization – Embryo rescue – *in vitro* pollination and fertilization – somaclonal variation and its application

**UNIT-IV: Micropropagation and protoplast technology**


**UNIT-V: Genetic engineering and secondary metabolite production**

- Genetic engineering – invitro mutation – induction – secondary metabolite production

**PRACTICAL**

Estimation of photosynthetic potential of Horticultural crops – leaf area index – light intensity measurement in different tier cropping – growth analysis parameters including harvest index – preparation of hormonal solution and induction of rooting in cuttings – ripening of fruits and control of fruit and flower drop. Senescence index in plants – basic principles in identifying the deficiency symptoms of macro and micro elements in fruits, vegetables and flower crops – important physiological disorders and their remedial measures in fruits and vegetables – seed dormancy – tetrazolium test – seed germination and breaking seed dormancy with chemicals and growth regulators

**THEORY LECTURE SCHEDULE**

1. Harnessing bio-technology in horticultural crops
2. Influence of plant materials, physical and chemical factors on *in vitro* growth and development
3. Growth regulators on *in vitro* growth and development
4. Tissue culture, cell division, differentiation and cell organelles
5. Meristem, pollen, anther, suspension, embryo and ovule culture and micropropagation
6. Somaclonal variation and its application
7. Protoplast culture
8. Somatic cell fusion, cybrids
9. Mid Semester Examination
10. Wide hybridization and embryo rescue
11. Artificial seeds and micro grafting
12. Cryo preservation
13. *In vitro* pollination and *in vitro* chimeras
14. *In vitro* mutation, epigenetic variation.
15. Transgenic plants
16. Use of bioreactors in commercial micropropagation

**PRACTICAL**
1. An exposure to tissue culture laboratory
2. Visit to leading Tissue Culture Units like Spic biotech, South India Viscose Coimbatore.
3. Media preparation
4. Inoculation of explants for clonal propagation
5. Inoculation of explants for callus culture
6. Sub-culture for regeneration of plantlets from direct and indirect organogenesis - techniques on anther culture
7. Sub-culture for regeneration of plantlets from direct and indirect organogenesis - techniques on ovule culture
8. Sub-culture for regeneration of plantlets from direct and indirect organogenesis - techniques on embryo culture
9. Induction of somaclonal variation
10. Mutation induction *in vitro*
11. Hardening Techniques
12. Protocol for mass multiplication
13. Rapid clonal propagation
14. Visit to leading Tissue Culture Units like Indo American, Growmore biotech, Manjushree, Harison Malayalam Hosur & Bangalore etc.
15. Cryo preservation
16. Project preparation for establishment of tissue culture laboratory
17. Final Practical Examination.

**REFERENCES**

**AGR 215: WATER MANAGEMENT IN HORTICULTURAL CROPS (1+1)**

**OBJECTIVES**
To study the principles and practices of irrigation in horticultural crops

**THEORY**

**Unit – I: History and development of irrigation**
History and development of water / irrigation management - Role of water in plant growth – Water resources and irrigation potential of India and Tamil Nadu - History and development of irrigation in India – Importance of irrigation – Irrigation systems of India and Tamil Nadu

**Unit – II: Soil-plant-water relationship**

**Unit – III: Water requirement**
Water requirement – Water requirement for important horticultural crops - Factors affecting water requirement-Potential evapotranspiration (PET) and consumptive use – Definition and estimation — Critical stages for irrigation and water requirement of horticultural crops.
Unit – IV: Micro irrigation and water use efficiency


Unit – V: Quality of water and drainage


PRACTICAL

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

THEORY - LECTURE SCHEDULE

1. History and development of water-Role of water in plants – Water resources of India and Tamil Nadu
2. Importance of irrigation and Irrigation systems of India and Tamil Nadu.
4. Soil water movement- soil moisture constants -absorption of water and evapotranspiration.
7. Available soil moisture – definition and importance – moisture extraction pattern - soil physical characteristics (texture, structure, porosity, bulk density and particle density) in influencing irrigation – soil moisture estimation methods
9. Mid-Semester Examination
10. Scheduling of irrigation – criteria based on plant, soil moisture - different approaches - climatological approach, empirical methods, crop co-efficient.
11. Methods of irrigation – surface (flooding, beds and channels, border strip, ridges and furrows, broad bed and furrows, surge irrigation) and sub-surface methods.
12. Micro irrigation system (drip and sprinkler irrigation) – suitability, components, layout, operation, advantage and disadvantage –Fertigation – water soluble fertilizers
13. Water use efficiency – definition and concept – methods to improve WUE – conjunctive use of water- water budgeting
14. Water management for cereals, pulses and oilseeds
15. Water management for commercial crops (cotton, sugarcane, sugar beet, tobacco)
16. Quality of irrigation water – irrigation management under limited water supply- Agronomic practices for use of poor quality water (saline, effluent and sewage water).
17. Tank irrigation, well irrigation - on farm development – command area development and Agricultural drainage – importance of drainage and different methods of drainage.

PRACTICAL SCHEDULE

1. Estimation of soil moisture by gravimetric method and tensiometer
2. Estimation of soil moisture by resistance blocks and neutron probe and other improved devices
3. Measurement of irrigation water with flumes and weirs
4. Calculation of irrigation water based on source, water flow, soil moisture status and depth of irrigation.
5. Land leveling and land shaping - Beds and channels - ridges and furrows.
6. Land leveling and land shaping for border strips - broad bed furrow method of irrigation.
7. Layout, operation and maintenance of drip and sprinkler irrigation systems.
8. Estimation of crop water requirement by direct and indirect methods
9. Scheduling of irrigation based on indicator plants, soil-sand mini plot technique
10. Scheduling of irrigation based on depletion of available soil moisture and IW/CPE ratio.
11. Calculations on irrigation efficiency parameters
13. Observation of irrigation structures in wetlands and irrigated dry lands.
14. Visit to irrigation command area and study of command area development.
15. Observation on drainage structures during on / off campus field visit.
16. Visit to water management and training institute
17. Practical Examination.

REFERENCES

ENT 216: BENEFICIAL INSECTS AND NEMATODE PESTS (2+1)

THEORY

Unit I: Apiculture

Unit II: Sericulture

Unit III: Lac Culture and Minor Productive Insects

Unit IV: Morphology, Taxonomy, Biology and Ecology of Nematodes
Nematology - Introduction – Brief history and development in India - Position of nematodes in animal kingdom- Importance of plant parasitic nematodes and entomophilic nematodes – Economic loss in crop plants. Morphology and anatomy of nematodes – segmentation, cuticle, cephalic region, alimentary, excretory, reproductive and nervous system, sense organs. Classification based on feeding habits and ecology. Taxonomy of important plant parasitic nematodes – Biology and ecology of important plant parasitic nematodes - Meloidogyne, Heterodera, Globodera, Tylenchulus,Pratylenchus, Rotylenchulus, Radopholus and Ditylenchus.
Unit V: Nematode pests on horticultural crops and Integrated nematode Management


PRACTICAL


Assignment: Each student has to submit a report on Economics of bee keeping/ Economics sericulture/entomophilic nematodes/Plant parasitic nematodes

THEORY LECTURE SCHEDULE

1. History of apiculture, species of bees, morphology, anatomy and structural adaptations.
3. Bee pasturage, bee foraging and swarming. Bee enemies and diseases of bees
4. Apiary – selection of site, bee-keeping equipment, seasonal management
5. Bee pollination, bee products and their uses.
7. Voltinism - multivoltine - bivoltine - bivoltine hybrids – double hybrids
10. Mulberry silk worm rearing - rearing house - room and bed disinfectants – grainage
15. Importance and history of Lac culture. Species of Lac insect.
17. Mid Semester Examination
22. Importance of plant parasitic nematodes and entomophilic nematodes – Economic loss in crop plants.
23. Elementary knowledge on morphology of nematode – cuticle, segmentation, cephalic regions.
24. Elementary knowledge on alimentary, excretory, reproductive systems.
25. Elementary knowledge on nervous system and sense organs.
27. Biology and ecology of important plant parasitic nematodes - Meloidogyne, Heterodera, Globodera, Tylenchulus.
28. Biology and ecology of important plant parasitic nematodes - Pratylenchus, Rotylenchulus, Radopholus and Ditylenchus.
29. Important plant parasitic nematodes of vegetables, fruits, spices and plantation crops – list and symptoms of damage.
30. Important plant parasitic nematodes of flower crops, ornamentals, medicinal and aromatic plants – list and symptoms of damage.
31. Interaction with microorganisms (fungi, bacteria and viruses).
32. Principles of nematode management – Legal methods, Physical methods, Cultural methods,
34. Biological control – Entomophilic nematodes, Chemical control – Integrated nematode management.

PRACTICAL SCHEDULE
1. Acquaintance with honey bee species, castes of bees and structural adaptation.
2. Acquaintance with Bee-keeping equipment and bee forage plants.
5. Identification of rearing appliances of mulberry silkworm and acquaintance with methods of disinfection. Handling of silkworm in Chawki rearing and Late age rearing.
6. Identification of lac insect, lac products and other minor productive insects.
7. Soil and root sampling. Extraction of nematodes by Cobb’s sieving method, Baermann funnel technique and modified Baermann funnel technique.
8. Extraction of nematodes by sugar flotation technique.
9. Extraction of cysts by conical flask technique, fenwick can method and Incubation and Blender technique.
10. Extraction of nematodes from roots and staining of roots infested with endoparasitic nematodes.
11. Preservation of nematodes and preparation of temporary and permanent slides.
12. Observing morphology of the order Tylenchida and Dorylaimida.
15. Observing the life stages of Rotylenchulus, Radopholus.
16. Identification of symptoms of nematode damage in major crops.
17. Final Practical examination.

REFERENCE BOOKS
OBJECTIVES:
This course is designed to provide knowledge of soils and plant analysis using different instrumental methods. It is also aimed to inculcate knowledge on principles and methods involved in measurement of soil physical properties, soil fertility evaluation and problem soil and water. Further, the student will gain knowledge on the chemical constituents of horticultural crops.

THEORY
Unit I : Soil and plant analysis
Collection of soil and plant samples and processing for analysis. Instrumental methods – Working principles of pH meter, EC meter, Spectrophotometer, Flame photometer and Spectrophotometer.

Unit II: Soil Physical properties

Unit III : Soil fertility evaluation

Unit IV : Appraisal and management of problem soil and irrigation water
Saline, alkali, acid, waterlogged and sandy soils – their appraisal and management. Irrigation water – water quality appraisal. Effect of poor quality water on soil and plant growth and management.

Unit V : Constituent of horticultural crops
Chemical and mineral composition of horticultural crops. Leaf analysis- standards, index tissue and interpretation of leaf analysis value.

PRACTICALS

THEORY LECTURE SCHEDULE
1. Collection and processing of soil and plant samples – General principles in analytical chemistry.
2. Instrumental method of analysis – Principle and practices of potentiometry, conductometry, colorimetry and spectrophotometry.
3. Principles and practices of absorption and emission spectroscopy.
5. Soil structure – Classification, genesis, factors influencing structural stability – aggregate analysis.
7. Soil air – Composition, renewal and movement of soil air. Oxygen diffusion rate and redox potential
8. Mid Semester Examination
11. Acid soils – Genesis and classification, lime requirement of acid soil and reclamation
12. Saline and sodic soil – characteristics, gypsum requirement and reclamation
13. Water logged and sandy soils – characteristics and their management. Soil micro organism and their importance
15. Chemical composition of vegetables, fruits, spices and condiments.
16. Chemical composition of beverages, essential oils, medicinal plants and narcotics
17. Leaf analysis – index leaves. Critical levels and interpretation of leaf analysis value.

PRACTICALS
1. Collection of soil sample
2. Estimation of moisture and water holding capacity
3. Determination of soil pH and EC
4. Determination of water soluble cations and SAR
5. Determination of water soluble anions
6. Determination of exchangeable sodium and ESP
7. Determination of cations in irrigation water
8. Determination of anions in irrigation water
9. Computation of salts and interpretation of results of water analysis
10. Collection of plant sample
11. Estimation of moisture and preparation of tri acid extract
12. Estimation of nitrogen
13. Estimation of phosphorus
14. Estimation of potassium
15. Estimation of secondary nutrients
16. Estimation of micro nutrients
17. Practical Examination

REFERENCES

GPB 218: GENETICS AND CYTOGENETICS (2+1)

OBJECTIVES
• To impart knowledge on inheritance and variation and to understand the parallelism between the behavior of chromosomes and genes.
• To understand the modern concepts of genetics at molecular level.

THEORY
Unit I: Cytology
Earlier concepts of heredity - Definition of genetics, heredity, inheritance, cytology, cytogenetics; cell and cell organelles – Prokaryotes and Eukaryotes- Cell division – mitosis, meiosis and their significance, cell cycle - Sporogenesis-gametogenesis, Fertilization-Identical and fraternal twins.

Unit II: Mendelian laws and Quantitative inheritance
Mendel’s Work – Laws of heredity- Chromosomal theory of inheritance. Allelic interactions – Dominance vs. recessive, complete dominance, codominance, incomplete dominance, over dominance; Non allelic interaction – gene interactions- Lethal genes, Pleiotrophy, Penetrance and Expressivity, phenocopy: Multiple alleles, Quantitative inheritance – Multiple factor hypothesis modifying genotypes of gene action controlling quantitative traits.
Unit III: Quantitative inheritance, Linkage and Crossing over

Linkage and Crossing over - Estimation of strength of linkage and recombination - cytological proof for crossing over - Two point and three point test cross; Double cross over, interference and coincidence; genetic map, physical map. Cytoplasmic inheritance and Maternal effects.

Unit IV: Chromosomes, Chromosomal variation and Sex determination

Chromosome structure, chemical composition, nucleosome, centromere, telomere, euchromatin, heterochromatin, NOR, satellite chromosome, karyotype, ideogram – chromosome banding; Types of chromosomes- Special chromosomes-Variation in chromosome number and structure – Aneuploidy and Euploidy- its genetic cytological implications and evolutionary significance. Definition of eugenics and eugenics-Nondisjunction-Klinefelter’s syndrome and Turner syndrome-autosomes and allosomes- sex determination - Genic balance theory - Sex linked - sex influenced and sex limited inheritance.

Unit V: Modern concept of genetics and mutation

Experiments showing DNA as genetic material – DNA Structure and function- DNA replication- RNA as genetic material – types of RNA– genetic code-Central dogma of life; gene expression- protein synthesis; Regulation of gene expression – Operon model ; Cistor, muton and recon; Complementation test; exons, introns – split genes – plant genome structure; Mobile genetic elements; Meaning of Developmental genetics, DNA methylation, siRNA, RNAi; Functional genomics, Metagenomics, Transcriptomics, Proteomics, Metabolomics and Phenomics. Mutation – Mutagens-characteristics of mutation – CIB technique - molecular basis of mutation.

PRACTICAL


THEORY SCHEDULE

1. Definition of genetics, heredity, inheritance, cytology, 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.
3. 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.
6. Chromosomal theory of inheritance. Allelic interactions – Dominance vs. recessive, complete dominance, codominance, incomplete dominance, over dominance.
9. Lethal genes, Pleiotrophy, penetrance and expressivity, phenocopy: Multiple alleles, blood group in humans, coat colour in rabbits, self incompatibility in plants; pseudo alleles, isoalleles.
11. Polygenes – transgressive segregation, comparison of quantitatively and qualitatively inherited characters; modifiers; Types of gene action controlling quantitative traits.
12. Linkage - coupling and repulsion; Experiment on Bateson and Punnet – Chromosomal theory of linkage of Morgan – Complete and incomplete linkage, Linkage group.
13. Crossing over – significance of crossing over; cytological proof for crossing over - Stern’s experiment; Factors controlling crossing over.
14. Strength of linkage and recombination; Two point and three point test cross. Double cross over, interference and coincidence; genetic map, physical map.
15. Mid Semester Examination


17. Chromosome structure, chemical composition, nucleosome, centromere, telomere, euchromatin, heterochromatin, NOR, satellite chromosome, karyotype, ideogram – chromosome banding.

18. Types of chromosomes based on position of centromere, based on structure and function.

19. Special chromosomes - polytene, lambrush, based on the role in sex determination: autosomes and allosomes, Other types of chromosomes - B, ring and isochromosomes.


21. Chromosomal aberration: Variation in chromosome number – euploid, aneuploid, types of aneuploids and their origin; Nondisjunction - Klinefelter syndrome and Turner syndrome; Definition of eugenics and euthenics.

22. Polyploid - auto and allopolyploids, their characters; meaning of genome; evolution of wheat, triticale, cotton, tobacco, brassicas,

23. Sex determination: Autosomes and sex chromosomes - chromosomal theory of sex determination - different types – sex determination in human, fowl, butterfly, grasshopper, honey bee, fumea; Genic balance theory of Bridges, quantitative theory, hormonal theory, barr bodies, metabolic differentiation theory; Gynandromorphs – sex reversal in chicken

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

25. Sex determination in plants – Melandrium, papaya, maize.

26. 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.

27. Structure of DNA – Watson and Crick model – Central dogma of life

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

29. RNA types - mRNA, tRNA, rRNA; genetic code, transcription.

30. Translation – protein synthesis; Regulation of gene expression – operon model of Jacob and Monad; Structural genes and regulator genes;

31. Cistron, muton and recon; Complementation test; exons, introns – split genes – plant genome structure; Mobile genetic elements; Meaning of Developmental genetics

32. DNA methylation, siRNA, RNA, Functional genomics, Metagenomics, Transcriptomics, Proteomics, Metabolomics and Phenomics.

33. Mutation – characteristics of mutation – micro and macro mutation – ClB technique.

34. 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/ forest tree.

7. Observation of bivalents, trivalents, quadrivalents and chromosome banding

8. Repetition of meiotic studies in maize/ sorghum/ pearl millet/ forest tree 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 F$_2$ 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. Final Practical examination.
REFERENCES

AEC 219 INTRODUCTORY ECONOMICS (1+1)

OBJECTIVES
The objective of this course is to provide knowledge to the students about basic concepts of economics and their practical importance.

THEORY
Unit 1: Nature and Scope of Economics

Unit 2: Theory of Consumption

Unit 3: Theory of Production

Unit 4: Theory of Distribution

Unit 5: Macroeconomic Concepts

THEORY 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.
7. Engel’s law of family expenditure - Consumer’s surplus: Definition – importance.
9. Mid Semester Examination.

PRACTICAL SCHEDULE
1. Exercise on Law of diminishing marginal utility.
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. Final Practical Examination.

REFERENCES

SEMESTER IV
HOR 220: PRODUCTION TECHNOLOGY OF MEDICINAL AND AROMATIC CROPS (1+1)

OBJECTIVES
The main aim of this course is to provide information about scope and importance of medicinal and aromatic crops in national and state economy. It also highlights the recent development in the production and processing technology of medicinal and aromatic crops.

THEORY
History and background – scope and importance – uses in ayurvedic, siddha and unani system of medicines – Medicinal and aromatic plants wealth of India and Tamil Nadu – Area and production – Classification – annual, biennial and herbaceous perennial – Soil and climate – medicinal plants for temperate, sub tropical and tropical conditions, saline and alkaline, arid and marshy lands. Propagation and planting – manuring – irrigation – weed control, harvesting – post harvest handling – parts used – curing and processing practices – Storage methods – economics of cultivation:

Unit-I : Medicinal Plants-I
Senna, Periwinkle, Isabgol, Gloriosa, Phyllanthus
Unit –II: Medicinal Plants- II
Aloe vera, Ashwagandha, Medicinal coleus, Gymnema, Medicinal solanum, Dioscorea.

Unit-III: Medicinal Plants –III
Ipecac, Rauvolfia, Acorus, Safed musli, Long pepper

Unit-IV: Aromatic Crops-I
Lemon grass, Citronella, Palmarosa, Vettiver, Geranium, Patchouli

Unit-V: Aromatic Crops-II
Origanum, Artimesia, Mint, Ocimum, Lavender, Sandal wood.

PRACTICAL
Identification and description of medicinal and aromatic crops, parts used and their products – Nursery raising and planting of Senna, Periwinkle, Isabgol, Glorisa, Phyllanthus, Aloe vera, Ashwagandha, Medicinal coleus, Gymnema, Medicinal solanum, Dioscorea, Long pepper, Lemongrass, Palmarosa, Vettiver, Geranium, Patchouli, Mint and Ocimum – Study of varieties and propagation techniques in medicinal and aromatic crops – Harvesting curing and processing – Distillation units – Extraction and Identification of alkaloids and essential oils from medicinal and aromatic crops – preparation of project reports and working out economics of cultivation.

LECTURE SCHEDULE
1. History and background – Scope and importance – Uses in Ayurvedic, Siddha and Unani medicinal systems, Medicinal plant wealth of India and Tamil Nadu – area and production – Industrial and pharmaceutical uses.
3. Isabgol, Gloriosa
4. Phyllanthus, Aloe
5. Ashwagandha, Medicinal coleus
6. Gymnema, Medicinal solanum
7. Dioscorea, Ipecac
8. Rauvolfia, Acorus
9. Mid Semester Examination
10. Safed musli and long pepper
11. Scope, importance and uses – Industrial and cosmetic values – area and production – marketing – importance of aromatic plants in national and state economy.
13. Palmarosa, vettiver
14. Geranium, patchouli
15. Origanum, artimesia
16. Mint, ocimum
17. Lavender and sandal wood

PRACTICAL SCHEDULE
1. Identification of medicinal plants – parts used and their products.
2. Identification of aromatic crops – parts used and their products.
3. Collection of medicinal and aromatic plants under local conditions.
4. Study of varieties, propagation techniques and processing methods of following crops-senna, periwinkle.
5. Isabgol, Gloriosa
6. Phyllanthus, Aloe
7. Ashwagandha, Medicinal coleus
8. Gymnema, Medicinal solanum
9. Dioscorea, Ipecac, Rauvolafia
10. Acorus, safed musli long pepper
11. Lemon grass, citronella, palmarosa
12. Vettiver, geranium
13. Patchouli, mint, ocimum
14. Visit to herbal gardens
15. Visit to extraction Units and existing centres of medicinal and aromatic plants.
17. Working out economics of medicinal and aromatic plants cultivation and preparation of projects of commercial medicinal and aromatic plants.

REFERENCE BOOKS

HOR 221: ORNAMENTAL AND LANDSCAPE GARDENING (2+1)

OBJECTIVES
i) To study the basic principles and practices of landscape gardening.
ii) To study the different styles of gardens, living and non-living components and special features in a garden.
iii) To make on–site analysis, designing with garden elements and principles manually and using software’s.

THEORY
Unit-I : History, Garden types and principles of landscaping.

Unit-II: Softscape Elements

Unit –III: Hardscape Elements

Unit-IV: Landscape designing and Execution

Unit-V: Special features in landscaping horticultural crafting and environmental horticulture

PRACTICAL
Identification of ornamental plants and garden components – study of form, size shape, texture, flowering season and flower colour of different living components – Identification and description of trees, shrubs, flowers beds, foliage beds, climbers and creeper, Hedges, edges, cacti, succulents, ferns and palms. Evaluation of different garden sites in the campus based on the basic principles – Study of different styles of garden – Lawn - study of types of grasses - Establishment, care and maintenance of lawn – Art of topiary – Identification, planning and designing of non-living components – Principles and concepts in garden designing – Preparation of landscape design plan for home, institution and industries
LECTURE SCHEDULE
1. Introduction to Ornamental Horticulture and landscaping, Definitions scope and importance.
2. History of gardening.
3. Types of gardens.
5. Principles of gardening.
6. Garden components, basic functions and utility.
7. Trees and shrubs in landscaping
8. Creepers, climbers in landscaping.
9. Herbs, Annuals, Hedges and Edges in landscaping
10. Topiary, Trophy, flower beds and other living components in landscaping.
11. Propagation of ornamental plants.
12. Training, pruning, care and maintenance of ornamental plants.
13. Lawn and lawn grasses.
14. Lawn making, care and maintenance.
15. House plants and indoor gardening
16. Hardscape elements in landscape
17. Basic function, utility and maintenance of non-living components.
18. Mid Semester Examination.
19. Study of ferns, cacti and succulents.
20. Water features, fountains in landscaping.
22. Light, lamp posts and other ornamental structures.
23. Living and non-living components for special situations.
24. Site analysis, cliental preference and principles of landscape drawing.
26. Computer Aided designing in landscape
27. Designing for home institute and industry
28. Oxygenerating plants and xeriscaping.
29. Bog, vertical and roof garden.
30. Horticultural crafting – Bonsai and bonsai culture.
31. Flower arrangements and Terrarium.
32. Horticultural therapy.
33. Environmental Horticulture
34. Psychological and social aspects of ornamental plants.

PRACTICAL SCHEDULE
1. Identification of ornamental plants.
2. Identification of different components – their form, size, shape, texture flowering and other beauty components.
3. Evaluation of different garden sites in campus.
4. Description of trees, shrubs, and annuals.
5. Description of climbers, creepers, flowers and foliage beds.
6. Art of topiary, Trophy and carpet beds
7. Description of other living components
8. Methods of lawn making.
9. Propagation, maintenance, training and pruning of ornamental plants.
10. Identification and description of important non-living components.
11. Study on basic function, utility and maintenance of non living components.
12. Principles and fundamentals of designing garden.
13. Study on beauty components.
15. Preparation of landscape plan for home Institute and Industry.
16. Preparation of landscape plan for public parks.
17. Practices on horticultural crafts – Bonsai, Terrarium and flower arrangements.

REFERENCE BOOKS
OBJECTIVE
Understanding the principles, theoretical aspects and developing skills in protected cultivation and precision farming of horticultural crops.

THEORY
Unit I Importance and basics of protected cultivation
Protected cultivation-overview-importance- scope and current status of protected cultivation of horticultural crops in India- modes of protected cultivation- classification of greenhouses- basic considerations in establishment and operation of green houses- greenhouse construction and covering materials

Unit II Environmental control and nutrient management

Unit III cultural management under protection
crop regulation- special horticultural practices under protected cultivation of rose, chrysanthemum, carnation, orchids, anthurium, gerbera, liliums, cut foliage- technology for raising tomato, sweet pepper, cucumber and other vegetables in protected structures- harvest indices – harvesting

Unit IV Post harvest handling and Marketing
Postharvest handling- precooling, cooling, cold chain and storage- packing and transport - marketing-export- international standards and quarantine measures for various horticultural commodities- principles and guidelines for setting up of hi-tech protected cultivation units- role of corporate sectors in protected cultivation industry

Unit V Precision horticulture

PRACTICAL
Growing structures- basic considerations in establishment and operation of greenhouses- hi-tech nursery- environmental control systems in greenhouse- containers- substrate culture- soil decontamination techniques- scheduling irrigation and fertigation for horticultural crops- crop regulation- special horticultural practices under protected cultivation- Visit to protected cultivation unit, auction centre and cold storage unit- precision equipments- computers and robotics in precision farming-post-harvest process management in floriculture using precision farming.

THEORY SCHEDULE
1. Protected cultivation-introduction- Scope and current status of protected cultivation in India
2. Classification of greenhouses- based on shape, utility, construction materials, covering materials etc.,
3. Environment control- ventilation –heating and cooling systems-lighting- carbon dioxide enrichment
4. Hi-tech nursery management- bed preparation - media and sterilization- planting methods
5. Water and nutrient management- greenhouse irrigation systems – fertigation
6. Hydroponic systems- methods, scope and advantages
7. Special horticultural practices under protected cultivation of flower crops- rose, chrysanthemum, carnation, orchids, anthurium, gerbera, liliums, cut foliage
8. Special horticultural practices under protected cultivation of vegetable crops- tomato, sweet pepper, cucumber
9. Mid semester examination
10. Harvesting - Postharvest handling- Precooling, cooling, cold chain and storage
11. Principles and guidelines for setting up of hi-tech protected cultivation units
12. Role of corporate sectors in protected cultivation industry
13. Precision horticulture- Principles and concepts
15. Variability management in precision farming - mapping - variable rate technology
16. Precision equipments - computers and robotics in precision farming
17. Post-harvest process management in horticulture using precision farming.

PRACTICAL SCHEDULE
1. Study of various modes of protected cultivation
2. Components of polyhouse and structural designs and styles
3. Study & design of greenhouse covering materials
4. Raising hi-tech nursery and its management
5. Selection and sterilization media for hi-tech culture
6. Designing and operating of environmental control systems
7. Bed preparation inside protected structure
8. Scheduling irrigation and fertigation for horticultural crops
9. Special cultural operations in flower crops
10. Special cultural operations in vegetable crops
11. Working out cost of production of flower crop under protected condition
12. Working out cost of production of vegetable crop under protected condition
13. Visit to protected cultivation unit - auction centre - cold storage unit
14. Export documentation and procedure
15. Operating of precision equipments
16. Computers and robotics in precision farming
17. Post-harvest process management in floriculture using precision farming.

REFERENCE BOOKS

HOR 223: CROP PRODUCTION IN VEGETABLE CROPS (0 + 1)

OBJECTIVES
To give hands on experience to the students on crop production aspects Practical training and experience in vegetable production in one transplanted crop (tomato or brinjal or chillies) and one direct sown crop (bhendi or amaranthus or radish or aggregatum onion) - seed treatment - raising nursery - sowing seeds - field preparation - transplanting, manuring, irrigation, fertigation, weed control, after culture - growth regulators - plant protection - maturity indices and harvesting - maintenance of cultivation sheet - working out cost benefit ratio.

PRACTICAL SCHEDULE
1. Practice in raising nursery for transplanted vegetables.
2. Seed treatment, sowing, after care and collection of stubbles.
3. Practice in application of FYM and its incorporation.
5. Formation of raised and flat beds, ridges and furrows.
6. Application of basal dressing of fertilizers.
7. Practice in transplanting and direct sowing of vegetables.
8. Practice in weeding and herbicide application.
10. Practice in gap filling operation.
11. Practice in top dressing and earthing up operation.
12. Practice in PGR preparation and application.
13. Practice in pesticide, fungicide application and other inter cultural operations.
14. Assessing maturity index and harvesting
15. Practice in seed extraction, processing, cleaning and packaging
16. Cost economics of production
17. Practical Examination
REFERENCE BOOKS

HOR 223: CROP PRODUCTION IN FLOWER CROPS (0 + 1)

OBJECTIVES

PRACTICAL SCHEDULE
1) Identification and description of species/varieties
2) Jasmine- propagation under mist–layout and planting
3) Jasmine- pruning, manuring and harvesting
4) Rose- ground layering-root stock raising and budding
5) Rose-layout and planting of Edward and Andhra Red varieties
6) Rose- Practicing disbudding, pinching and pruning
7) Chrysanthemum – preparation of suckers, rooting, layout and planting
8) Tuberose – Preparation of tubers, layout and planting
9) Marigold – raising nursery, seed treatment, sowing and planting
10) Gomphrena – practicing propagation techniques and planting
11) Celosia – practicing propagation techniques and planting
12) Practicing harvesting techniques
13) Practicing post harvest shelf life
14) Grading, sorting and packaging
15) Concrete extraction in rose, jasmine and tuberose
16) Economics of concrete extraction in rose, jasmine and tuberose
17) Practical examination

REFERENCE BOOKS

ENT 224: INSECT PESTS OF FRUIT, PLANTATION, MEDICINAL AND AROMATIC CROPS AND THEIR MANAGEMENT (1+1)

OBJECTIVES
Distribution, bio-ecology, host range, injury, integrated management of important insect pests affecting tropical, sub-tropical and temperate fruits, plantation, medicinal and aromatic crops.

THEORY
Unit I: Insect ecology and Pest categories in horticultural ecosystem

Unit II: Pests of Fruits crops

Pests on mango, sapota, citrus, banana, grapevine, guava, jack, custardapple, pomegranate, pine apple, papaya, ber, date palm, jamun, bael, wood apple, hill banana, grapefruit, avocado, mangosteen, litchi, rambutan, carambola, durian, passion fruit, apple, pear, peach, plum, strawberry, sweet and sour cherry, black and raspberry, currants, apricot, kiwi, and persimmon. Non insect pests on fruit crops – Plant Mites, Plant parasitic nematodes, Rodents, birds and other Vertebrates.

Unit III: Pests of Plantation crops

Coffee, Tea, cardamom, pepper, Rubber, Cashew, Coconut, Areca nut, Oil palm, Cocoa, Palmyrah, All Spice, Kokum, Paprika, Vanilla, Thyme, Celery, Parsley. Non insect pests on plantation crops.

Unit IV: Pests of Medicinal & Aromatic Plants, Mushroom and Locust

Medicinal plants - senna, periwinkle, glory lily, ashwagandha, medicinal coleus, aloe, long pepper, Phyllanthus, amarus, stevia, isabgol, Opium poppy, medicinal solanum, medicinal dioscorea, rauvolfia, vasambu, vallarai and noni. Aromatic crops - ocimum, davana, mint, lemon grass, citronella, palmarosa, vetiver, geranium, patchouli and rosemary. Non insect pests on Medicinal & Aromatic Plants. Pests on mushroom. Locusts and their management.

Unit V: Components of Integrated pest management in horticultural crops

Components of IPM – Cultural, Mechanical, Physical and Legal methods – invasive insect pest. Host plant resistance in IPM, Biological methods In IPM – classical biological control, merits and limitations of biological control, Parasitoids, Predators and Pathogens - Important families of predators and parasitoids, Microbial control, Groups of microbial agents and their actions on insects, Traps in horticultural crop pests management, Semiochemicals in IPM – Phenones, Allomones, Kairomones and Synomones and their role in pest management, Insect growth regulators in IPM – Moul inhibitors and JH mimics, Biotechnology in IPM and Sterile male technique and gamma radiation in IPM.

PRACTICAL


Assignment:
1. Each student has to submit five numbers of insect damaged plant specimens (Herbarium) from Fruit, Plantation, Medicinal and Aromatic Crops.
2. Rearing and submission of five insect pests of fruits, plantation, medicinal and aromatic crops.

THEORY LECTURE SCHEDULE

2. Pest – definition, categories of pests, biotypes, Effect of abiotic and biotic factors on pest population and factors governing pest outbreaks.
3. Concept of economic threshold level and economic injury level. Pest surveillance - Sampling Techniques and forecasting in horticultural crop eco- system
4. Pests of mango, sapota, citrus, banana
5. Pests of grapevine, guava, jack, custard apple, pomegranate, pine apple, papaya
6. Pests of ber, date palm, jamun, bael, wood apple, hill banana, grapefruit, avocado, mangosteen, litchi, rambutan, carambola, durian, passion fruit, apple, pear, peach, plum, strawberry, sweet and sour cherry, black and raspberry, currants, apricot, kiwi, and persimmon.
7. Pests of Coffee, Tea, cardamom, pepper.
8. Pests of Rubber, Cashew, Coconut, Areca nut, Oil palm.
9. Mid semester examination
12. Important species of Plant Mites, Plant parasitic nematodes, Rodents, birds and other Vertebrates on fruits, plantation, medicinal and aromatic crops.
13. Cultural methods, Mechanical methods, Physical methods, Host plant resistance and Traps in horticultural crop pests management.
15. Important predators, parasitoids, pathogens and Entomophilic nematodes in pest management. Microbial control, groups of microbial agents and their actions.
17. Biotechnology in horticultural crop pests management. Sterile male technique and gamma radiation in horticultural crop pests management. Insect antifeedants and repellants in pest management.

PRACTICAL SCHEDULE
1. Sampling techniques for the estimation of insect population and damage in horticultural crops.
2. Identification of life stages of important pests of mango, sapota, citrus, banana,
3. Identification of life stages of important pests of grapevine, guava, jack, custardapple, pomegranate, pine apple, papaya
4. Identification of life stages of important pests of ber, date palm, jamun, bael, wood apple, hill banana, grapefruit, avocado, mangosteen, litchi, rambutan, carambola, durian, passion fruit, apple, pear, peach, plum, strawberry, sweet and sour cherry, black and raspberry, currants, apricot, kiwi, and persimmon.
5. Identification of life stages of important pests of coffee, tea
6. Identification of life stages of important pests of cardamom, pepper, rubber, cashew
7. Identification of life stages of important pests of coconut, arecanut, oil palm
8. Identification of life stages of important pests of Cocoa, Palmyrah, All Spice, Kokum, Paprika, Vanilla, Thyme, Celery, Parsley.
9. Identification of life stages of important pests of medicinal and aromatic plants and mushroom.
10. Practicing Cultural, Mechanical and Physical methods in horticultural pest management.
11. Identification of traps used in horticultural pest management – Pheromone traps, light traps, sticky traps and other traps.
12. Identification of different types of parasitoids, predators and entomopathogens utilized in horticultural crop pests.
13. Mass multiplication of important groups of parasitoids.
14. Mass multiplication of important groups of predators.
15. Mass multiplication of important groups of pathogens.
17. Practical examination

REFERENCE BOOKS
OBJECTIVES
The subject covers cultivation, maintenance, harvesting, Pest and diseases problems their management – nutritional value of edible mushrooms and their preservation.

PRACTICAL

PRACTICAL SCHEDULE
1. Introduction to mushrooms
2. Types of mushrooms
3. Preparation of culture media
4. Pure culture-maintenance of culture
5. Spawn and types of spawn
6. Poly bag method
7. Cultivation techniques
8. Mid – semester examination
9. Cultivation techniques
10. Cropping room
11. Harvest
12. Packing storage of mushroom
13. Problems in cultivation & its management
14. Nutritional value of mushroom
15. Post harvest technology
16. Other uses of mushroom & Cost analysis and project preparation
17. Final Practical Examinations

REFERENCE BOOKS

AEX 226: EXTENSION METHODOLOGIES AND TRANSFER OF HORTICULTURAL TECHNOLOGY (1+1)

OBJECTIVES
- To learn about communication process, models and elements
- To learn about the use of various communication methods
- To learn about modern information technologies

THEORY
UNIT I: Communication

UNIT II: Programme Planning and Training
Programme planning – meaning, definition, principles, steps in programme development process, monitoring and evaluation of extension programmes. Types of training, training to farmers, farm women and rural youth, FTC & KVK.
UNIT III: Extension Teaching Methods


UNIT IV: Modern Communication Gadgets

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

UNIT V: 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.

PRACTICAL


THEORY 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. Training-types, institutions training for farmers, farm women and rural youths and importance
5. Extension teaching methods-definition, meaning, functions, selection and classification.
6. Individual contact methods-farm and home visit, office call, telephone call and personal letter-observation and result demonstration.
7. Group contact methods-method demonstration, meeting, lecture, debate, workshop, seminar, forum and conference
8. Group contact methods-symposium, panel, brainstorming, buzz session, role playing and simulation games.
9. Mid Semester Examination.
10. Mass contact methods-campaign, exhibition, farmers day and field trips - purpose, procedures, advantages and limitations.
12. Audio visual aids-definition, scope and importance, classification-merits and demerits-factors influencing planning and selection.
14. Modern communication sources (e-extension)-multimedia devices-mobile phone, Kisan Call Centre, Village Knowledge Centre/information kiosks, portal, websites.
15. Diffusion-meaning, definition, elements. Innovation-adoption, meaning, definition.
16. Attributes of innovation and stages of adoption
17. Innovation-decision process, functions, adopter categories-factors influencing adoption-impact and constraints in technology transfer programmes.

PRACTICAL SCHEDULE

1. Understanding the communication pattern in State Department of Horticulture.
2. Study on communication pattern in KVK.
4. Preparation and practicing of posters, charts, graphs.
5. Preparation and practicing of circular letter, folders and leaflets.
6. Visit to the department of agricultural engineering to study the transfer of technology efforts in farm mechanization.
7. Visit to village and fixing the priorities and selecting a most important problem for preparation of a project.
8. Visit to ATMA implemented village.
9. Studying the role of print media communication in publishing the activities of horticulture and allied fields.
10. Practicing skill on photo journalism
11. Internet, E-Mail communication Practices
12. Visit to All India Radio, to study it’s role in horticultural development.
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
16. Tabulation
17. Presentation of reports.

REFERENCES

GPB 227: PRINCIPLES AND METHODS OF PLANT BREEDING (2+1)

OBJECTIVES
1. To impart knowledge on emasculation and pollination techniques of various crops
2. To impart knowledge on application of various genetic principles in crop improvement

THEORY
Unit I: Introduction

Unit II: Breeding methods of self pollinated crops

Unit III: Breeding methods of cross pollinated crops and clonally propagated crops

Unit IV: Special breeding methods


Unit V: Maintenance breeding

Types of cultivars – procedure for release of new varieties – stages in seed multiplication – seed certification and TC plants certification. Maintenance Breeding: Breeding for biotic and abiotic stresses; Current trends in Plant Breeding- Marker assisted breeding -Transgenic crops - Varietal protection and geographical indications – DUS. Breeding for pest resistance - mechanisms of resistance; Breeding for disease resistance - mechanisms of resistance; Breeding for Abiotic stress – drought and cold. – mechanisms of resistance; Breeding for Abiotic stress – salinity and alkalinity - mechanisms of resistance; Breeding for quality produce; Ideotype breeding, PPV &FR act, 2001- Plant breeder’s right, Farmer’s right, Biodiversity act, 2002; Germplasm registration.

PRACTICAL


THEORY SCHEDULE

1. Classification of plants, Botanical description, floral biology, emasculation and pollination techniques in cereals, millets, pulses, oilseeds, fibers and plantation crops.
2. Objectives and role of plant breeding - historical perspective – activities in Plant Breeding.
5. Germplasm: evaluation – use of descriptors, documentation, utilization; Agencies – national and international; germplasm exchange – quarantine.
7. Self incompatibility – classifications – mechanisms – application – measures to over come and limitations.
10. Basic biometrics-nature and significance of qualitative and quantitative variation-phenotypic, genotypic and environmental-heritability and genetic advance

17. Mid Semester Examination


26. Wide hybridization-history-importance-barriers and techniques for overcoming barriers-utilization


28. Somaclonal variation - utilization in crop improvement; In vitro selection techniques — Use of doubled haploids in crop improvement.


31. Maintenance Breeding; General seed production techniques – steps in nucleus and breeder seed production – varietal rundown and renovation.

32. Breeding for biotic and abiotic stresses; Current trends in Plant Breeding - Marker assisted breeding -Transgenic crops - Varietal protection and geographical indications – DUS.

33. Breeding for pest resistance - mechanisms of resistance; Breeding for disease resistance - mechanisms of resistance; Breeding for Abiotic stress – drought and cold. – mechanisms of resistance; Breeding for Abiotic stress – salinity and alkalinity

34. Breeding for quality produce; Ideotype breeding, PPV &FR act, 2001- Plant breeders’ right, Farmers right, Biodiversity act, 2002; Germplasm registration.

PRACTICAL SCHEDULE
1. Emasculation and pollination techniques in rice, maize, pulses, castor and cotton.
2. Pollination and reproduction in plants - Alternation of generation and life cycle.
3. Description and drawing different pollination systems - Mechanisms enforcing self and cross pollination in crops; Pollen morphology - Exine structure of different crops. Fertility and sterility in A, B, R and TGMS lines.
4. Breeder kit and its components – uses; Basic steps of selfing and crossing techniques.
5. Emasculation and pollination techniques in field crops.
6. Emasculation and pollination techniques in horticultural crops.
7. Studies on segregating generations and maintenance of records.
8. Maintenance of A, B and R line and TGMS lines - Hybrid seed production techniques
10. Induction of polyploidy using colchicine.
11. Studies on different wild species in crop plants and wide hybridization.
12. Irradiation - dosimetry - half life period - procedure for irradiation of seeds and planting materils.
   Chemical mutagenesis - molar solution preparation - procedure for chemical mutagenesis of seeds and planting materials.
13. Calculation of PCV, GCV, heritability, genetic advance, genetic divergence

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14. Layout of different yield trials - Observing the experimental plots; Visit to nucleus and breeder seed production plots.
15. Screening methods – laboratory and field – for biotic and abiotic stresses.
17. Final Practical Examination.

REFERENCES

AEG 228: SOIL AND WATER CONSERVATION ENGINEERING (1+1)

OBJECTIVES
To expose the students in the area of surveying, principles and practices of Chaining compass surveying, plain table and levelling, concept of dynamic process of a watershed resulting in soil erosion, understand the appropriate conservation measures to be adopted for remediation of watershed, various hydraulic Engineering problems like open channel flow, closed conduit, turbines and pumps, principles of ground water, characteristics of aquifers, construction of wells.

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
requirement - Layout of Sprinkler and Drip systems. Agricultural drainage. Study of different types of wells and its selection. Study of reciprocating pump, centrifugal pump, submersible pumps & jet pumps- Selection of pumps.

THEORY 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
11. Erosion control measures for Agricultural lands – biological measures – contour cultivation – strip cropping
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. Farm ponds – percolation ponds.
18. Irrigation - Measurement of flow in open channels - velocity area method
19. Rectangular weir - Cippoletti weir - V notch
20. Orifices - Parshall flume
21. Duty of water - Irrigation efficiencies
22. Conveyance of irrigation water - canal lining
23. Underground pipe line system
24. Surface irrigation methods - Borders, furrows and check basins
25. Components of Drip and sprinkler irrigation system
26. Agricultural drainage – need - Surface drainage systems
27. Surface drainage systems - Drainage coefficient
28. Groundwater occurrence – aquifers types
29. Types of wells
30. Pump types – Reciprocating pumps – Centrifugal pumps
31. Turbine pumps – Submersible pumps
32. Jet pumps – Airlift pumps
33. Selection of pumps – operation and their maintenance.

PRACTICAL SCHEDULE
1. Study of survey instruments - chains - compass - plane table (only demo) - dumpy level.
2. Chains and cross staff surveying - linear measurement - plotting and finding areas.
4. Compass - Radiation, intersection.
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. Problems on water measurement.
12. Layout of Sprinkler and Drip systems.
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.

REFERENCES
STA 229: STATISTICS (1+1)

OBJECTIVES

1. Statistics plays a major role in all fields of science. When elementary topics like primary data collection, presentation of data, diagrams and graphs etc are taught to the student of agriculture, first they learn the basic concepts of Statistics.

2. By learning sampling methods, test of significance, correlation and regression they come to know practically how to select samples using various methods of sampling and how to test certain hypothesis based on student’s ‘t’ Statistic and, Chi-square Statistic. Using Regression analysis, they may be able to predict the future using the past data.

3. By learning basic principles of design of experiments and basic designs they can conduct practically certain Agricultural experiments with their knowledge of Statistics.

THEORY

Unit I: Data collection diagrams and graphs
Different kinds of data, Primary, Secondary, Quantitative and Qualitative data- Presentation of Data - Purpose and Uses – Bar diagrams, Comparative bar diagram, percentage bar diagram, Pie-diagram and Uses, Histogram frequency curve, frequency polygon O give curves.

Unit II: Measures of Central Tendency and Measures of Dispersion
Mean, Geometric Mean, Median, Mode. Range, Standard deviation, Co-efficient of variation.

Unit III: Sampling methods and Tests of Significance
Kinds of Sampling: SRS (WR) and (WOR), Stratified Random Sampling, Systematic Sampling. Meaning and various steps involved in Tests of Significance, Tests based on ‘t’ and $\chi^2$-Statistics: ‘t’ test for mean, difference of means-Chi-square test for association of attributes – 2x2 contingency only limitations of Chi-square test.

Unit IV: Correlation and Regression
Direct and indirect correlation – scatter diagram -Karl Pearson’s Correlation Co-efficient Meaning and uses of simple linear regression equation – prediction using the equations.

Unit V: Design of experiments and Basic Designs
Basic Principles – randomization replication and local control. Completely Randomized Design (CRD). Randomized complete Block Design (RBD) and Latin Square Design (LSD) and their analyses.

PRACTICALS

Bar diagram – Frequency curve-frequency polygon – Mean, Geometric mean, Median, Mode, Standard deviation and Co-efficient of variation – t test for Mean, difference of means – Chi-square test for independence of attributes in 2x2 table- correlation co-efficient – Regression equation – Field visit – Completely randomized design – Randomized block design – Latin square design – Split Plot design – Factorial experiment $2^2$, $2^3$ factorial design conducted in RBD.

THEORY LECTURE SCHEDULE

1. Different kinds of data, primary and secondary data, qualitative and quantitative data, presentation of data.

2. Bar diagrams, Component Bar diagram, Percentage Bar diagrams, Pie diagram, Picto grams, Uses.

3. Histogram, Frequency curve, Frequency polygon, O give curves, uses.

4. Mean, Median, Mode.

5. Range, Standard deviation, (raw data), Co-efficient of variation.


7. Types of sampling, SRS (WR) and (WOR), stratified random sampling, Systematic sampling.

8. Test of significance, test based on t, mean and difference of means.

9. Mid semester examination.

10. $\chi^2$ – test, test for association of attributes 2x2 contingents only, limitations of chi-square test. Correlation, scatter diagram and karl person’s Co-efficient of correlation.
11. Regression, Simple linear regression, Prediction using the equation.
12. Design of experiments, Basic principles, randomization, replication and local control.
13. Basic designs.
14. Completely randomized design (CRD).
15. Randomized complete block design (RBD).
16. Latin square design (LSD).
17. Analysis of the above design.

PRACTICAL SCHEDULE
1. Bar diagram, frequencies curve, frequencies polygon.
2. Mean, Geometric mean, median and mode.
3. Standard deviation and co-efficient of variation.
4. Test based on t-for-mean and difference of mean.
5. Chi-square test for independence of attributes.
6. Correlation Co-efficient.
7. Regression equation.
8. Completely randomized design.
9. Randomized complete block design.
10. Latin square design.
11. Split plot design.
12. 2² Factorial experiments conducted in RBD.
13. 2³ Factorial experiments conducted in RBD.

REFERENCE BOOKS

SEMESTER- V
HOR 311: BREEDING OF HORTICULTURAL CROPS (2+1)

OBJECTIVES
➢ To import knowledge on the basic concepts of breeding, different methods of breeding of horticultural crops.
➢ To import knowledge on breeding strategies and achievements made in improvement of horticultural crops through breeding.

THEORY:
Unit I : Principles of plant breeding
Unit II : Advanced plant breeding
Unit III: Crop improvement in fruit crops
Objectives, breeding strategies and achievements in crop improvement of mango, banana, acid lime, mandarin orange, sweet orange, grapes, sapota, papaya, guava, pomegranate, jack and aonla.

Unit IV: Crop improvement in vegetable crops
Objectives, breeding strategies and achievements in crop improvement of tomato, brinjal, chillies, bhendi, cucumber, snake guard, ridge guard, bitter guard, pumpkin, watermelon, peas, beans, onion, garlic, potato, tapioca, moringa, cabbage, cauliflower, carrot and amaranthus.

Unit V: Crop improvement in spices and plantation crops, flower crops, medicinal and aromatic crops
Objectives, breeding strategies and achievements in crop improvement of pepper, cardamom, ginger, turmeric, coriander, fennel, vanilla, tea, coffee, cashew, cocoa, coconut, rose, jasmine, tuberose, marigold, chrysanthemum, crossandra, senna, ashwagandha and ocimum.

PRACTICAL

THEORY LECTURE SCHEDULE
1. History and importance of breeding
4. Methods of breeding and hybridization technique
5. Components of variation
6. Estimation of single and poly gene
7. Application of biotechnology to plant breeding
8. Transgenic molecular plant breeding
12. Breeding strategies, merits, demerits and methods of improvement of cross pollinated crops
13. Breeding strategies, merits, demerits and methods of improvement of mango and banana
14. Breeding strategies, merits, demerits and methods of improvement of citrus, grapes and sapota
15. Breeding strategies, merits, demerits and methods of improvement of papaya, guava and pomegranate
16. Breeding strategies, merits, demerits and methods of improvement of tomato and brinjal
17. Breeding strategies, merits, demerits and methods of improvement of chillies and bhendi
18. Breeding strategies, merits, demerits and methods of improvement of bitter guard, cucumber and watermelon
19. Breeding strategies, merits, demerits and methods of improvement of peas and beans
20. Breeding strategies, merits, demerits and methods of improvement of potato
21. Breeding strategies, merits, demerits and methods of improvement of tapioca and sweet potato
22. Breeding strategies, merits, demerits and methods of improvement of onion and moringa and amaranthus
23. Breeding strategies, merits, demerits and methods of improvement of cabbage, cauliflower and carrot
24. Breeding strategies, merits, demerits and methods of improvement of pepper and cardamom
25. Breeding strategies, merits, demerits and methods of improvement of ginger, turmeric, coriander and vanilla
26. Breeding strategies, merits, demerits and methods of improvement of tea and coffee
27. Breeding strategies, merits, demerits and methods of improvement of cashew, cocoa and coconut
28. Breeding strategies, merits, demerits and methods of improvement of rose, jasmine and chrysanthemum
29. Breeding strategies, merits, demerits and methods of improvement of crossandra, tuberose and marigold
30. Breeding strategies, merits, demerits and methods of improvement of senna, ashwagandha and ocimum.
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 and grapes.
3. Study of floral biology and pollination mechanism, practices in selfing and crossing in sapota and papaya.
4. Study of floral biology and pollination mechanism, practices in selfing and crossing in guava and pomegranate.
5. Study of floral biology and pollination mechanism, practices in selfing and crossing in tomato and brinjal.
6. Study of floral biology and pollination mechanism, practices in selfing and crossing in chillies and bhendi.
7. Study of floral biology and pollination mechanism, practices in selfing and crossing in bitter guard, and snake guard.
8. Study of floral biology and pollination mechanism, practices in selfing and crossing in cucumber and watermelon.
9. Study of floral biology and pollination mechanism, practices in selfing and crossing in peas and beans.
10. Study of floral biology and pollination mechanism, practices in selfing and crossing in tapioca and sweet potato.
11. Study of floral biology and pollination mechanism, practices in selfing and crossing in onion, moringa and amaranthus.
12. Study of floral biology and pollination mechanism, practices in selfing and crossing in pepper, cardamom and coriander.
13. Study of floral biology and pollination mechanism, practices in selfing and crossing in cashew, cocoa and coconut.
15. Heterosis breeding and techniques of F₁ hybrid production.
16. Study of mutation and polyploidy breeding.
17. Resistance and tolerance breeding in horticultural crops.

REFERENCE

HOR 312: COMMERCIAL FLORICULTURE (2 + 1)

OBJECTIVES
On completion of this course the students will have knowledge on cultivation techniques of commercial loose flower in open field and Cut flowers in protected structures with hands on training on important cultural practices and flower forcing techniques and value addition in flower crops.

THEORY
UNIT – I: Principles of growing commercial flowers
Scope and importance of commercial floriculture in India – distribution of important flower crops – area and production – export potential – international and national floral industry. Institutions and developmental agencies involved in promotion of floriculture- TANFLORA, NHM, NHB, APEDA
- Cropping systems in flower crops- Flower forcing.
UNIT – II: Loose flowers

UNIT – III: Principles of protected cultivation
Protected structures - controlled environmental conditions –Soil sterilization - factors influencing protected cultivation – cut flower production- flower forcing.

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. Scope and importance of commercial floriculture in India –area and production–export statistics - Cropping systems in flower crops
2. Industrial importance–floriculture industry in India and Tamil Nadu -Institutions and developmental agencies involved in promotion of floriculture- TANFLORA, NHM, NHB, APEDA -
4. Jasmine- importance and uses–origin and history- area and production – botany – species and varieties
12. Field visit – Loose flower growing areas and exporters
13. Economics - loose flower production
15. Flower forcing and factors affecting flower production under controlled atmospheric conditions.
17. Mid semester examination
25. Guest lecture – Automation in 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 and other value addition processes in loose flowers.
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. Working out economics cut flower production under protected structures.
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 to get expertise in loose flowers.
8. Preparation of project – loose flower production – open condition
13. Bird of paradise and heliconia - identification and description of species/varieties – propagation - media preparation – planting material - shade requirement- 
15. Visit to cut flower growing areas, industries and Instititutions– TANFLORA, Auction centre, APEDA.
16. Rose, jasmine and tuberose-extraction of floral concrete – Dry flower making-lecture / Field visit
17. Preparation of project – Cut flower production – controlled condition
18. Practical examination

REFERENCE BOOKS

HOR 313 ORGANIC HORTICULTURE (1+1)

OBJECTIVE
To impart knowledge about specific techniques followed in organic horticulture so as to enable the students to produce horticultural crops organically.

THEORY
Unit-I: Importance of organic horticulture

Unit-II: Soil health in organic horticulture

Unit-III: Bio inputs in organic horticulture

Unit-IV: Bio control in organic horticulture
Weeds pests and disease management under organic horticulture – Non chemical weed management – Non chemical pest management and non chemical disease management.

Unit-V: Certification and Economics in organic horticulture
Certification process – agencies involved – export potential and marketing of organic produce – sustainability indices for evaluating long term and indirect benefits – economic evaluation of organic horticultural technologies

LECTURE SCHEDULE
1) Scope and importance of organic horticulture and its merits and demerits
2) Global and Indian scenario of organic horticulture
3) History and development of organic farming in India and World.
4) Soil problems and its reclamation through organic horticulture
5) Soil physical, chemical and biological properties and conservation of soil resource under organic horticulture.
6) Importance of C:N ratio, its influence on nutrient availability and methodology to improve organic carbon status
7) Bulky and concentrated organic manures
8) Green manures, biofertilizers and bio dynamic farming
9) Mid Semester Examination.
10) Panchakavya and EM technology.
11) Humic acid, Sea weed extract, Mushroom, manchurian tea and vermiwash.
12) Non chemical weed control
13) Non chemical pest control
14) Non chemical disease control
15) Organic certification – standards and agencies – marketing and export avenues for organic produce.
16) Sustainability indices for evaluating indirect benefits of organic farming.

PRACTICAL SCHEDULE
1) Soil physical parameters with relevance to organic horticulture
2) Estimate of soil chemical parameters (pH, EC and ESP)
3) Estimation of soil biological parameters
4) Estimation of farm wastes / agro industrial waste
5) Agrotechniques for composting farm wastes and agro industrial wastes.
6) Recycling of crop wastes through vermiculture
7) Preparation of Panchakavya
8) Preparation of activated EM solution.
9) Nutritive analysis for estimating the potential of organics.
10) Application of various mulch materials to horticultural crops.
11) Nursery bed soil solarization.
12) Study of bio agents for crop protection
13) Preparation of organic formulations for pest control
14) Preparation of organic formulations for disease control
15) Working out indices for organic horticulture
16) Economic evaluation of organic horticulture system
17) Visit to farmers field under organic cultivation.

REFERENCE BOOKS

HOR 314 URBAN AND ENVIRONMENTAL HORTICULTURE (1+1)

OBJECTIVE
To update the knowledge on the recent advances in the field of environmental issues and Urban Horticulture with a spectrum of interests, from a traditional core of activities associated with ecosystem, environmental benefits from horticultural plants, pollution and environmental protection- recreation and leisure; economic vitality and business entrepreneurship, individual health and well-being; community health and well-being; landscape beautification; and environmental restoration and remediation.

THEORY
Unit-I : Ecology of Gardens in an Urban Environment
Concept of ecosystem, Structure and function of an ecosystem, Producers consumers and decomposers, Energy flow in the ecosystem, types, characteristics features, structure and function of the
following ecosystem- Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Invasive ornamental species - Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust,

**Unit-II : Environmental Pollution**


**Unit-III: Social and Therapeutic Horticulture**

Definitions and terms used in social and therapeutic horticulture practice, community gardening, methods and approaches used in therapeutic horticulture, planning, design and construction issues in the design of therapeutic landscapes, tools, equipment and materials – Aroma therapy- definition and applications- aroma garden- social involvements - flower arrangement- different types- vegetable carving-tools and basics.

**Unit-IV : Sustainable Landscapes**

The role of Urban Agriculture in poverty alleviation, Principles and practices in managing environmental factors - temperature, water, light, atmospheric gases and pollutants, and soil and minerals - that influence growth and production of horticultural plants. Xeriscaping - urban planning and planting avenues, schools, villages, beautifying railway stations, dam sites, hydroelectric stations, colonies, river banks, planting material for play grounds.

**Unit-V: Urban Horticulture**


**PRACTICAL**

Eco-system - Carbon use efficiency – Noise pollution determination ; Estimation of respirable and non respirable dust in the air by using portable dust sampler; Total dissolved solids (TDS)- Estimation of species abundance of plants; - effects of nitrate contamination in ground water - Social Service Organization involved in creating environment awareness- Environmental Education Centre; Crop adaptation to environmental variables, soils conditions; Study of transpiration and water balance in plants; Visit to a local polluted site. Observations and remedial measures; Industrial sewage disposal unit. Mine spoil and pond ash reclamation through Horticultural crops - Urban planning and planting avenues, schools, villages, beautifying railway stations, dam sites, hydroelectric stations, colonies, river banks, planting material for play grounds. Description and design of terrace garden, container gardening. Horticultural crafts for social welfare - bonsai culture-Flower arrangements.

**LECTURE SCHEDULE**

1. Eco-system-structure and functions
2. Various Types of eco-system and their impact on atmosphere
3. Climate change and Global warming-its impact on environment
4. Environmental pollution-causes and impact
5. Modes of pollution-air, water, soil, marine, noise and thermal pollution
6. Carbon sequestration - Pollution control measures through Horticulture-trees for pollution control
7. Solid waste management-urban and Industrial waste management
8. Composting, sewage treatment, effluent treatment and microbial examination
9. Environment protection act- air, water, wild life, forest conservation act.
10. Social and therapeutic horticulture-Practices
11. Community gardening-methods and approaches in therapeutic horticulture
12. Planning, designing and construction of therapeutic landscapes
13. Aroma therapy-definitions and applications-aroma gardens
14. Horticultural crafts-social involvements
15. Urban Horticulture—principles and practices in managing environment
16. Urban area beautifications with plants – terrace gardens, container gardens, Vertical gardens
17. Global trends in urban horticulture—roof gardens, hydroponics and bonsai culture.

PRACTICAL SCHEDULE
1. Assessment of various eco-system
2. Determination of Carbon use efficiency
3. Determination of sound level by using sound level meter;
4. Estimation of respirable and non respirable dust in the air by using portable dust sampler;
5. Determination of total dissolved solids (TDS) in effluent samples;
6. Estimation of species abundance of plants;
7. Estimation of nitrate contamination in ground water;
8. Visit to Social Service Organization
9. Visit to Environmental Education Centre;
10. Crop adaptation to environmental variables, soils conditions;
11. Study of transpiration and water balance in plants;
12. Visit to a local polluted site. Observations and remedial measures; Assessment of chlorophyll content of fresh water / sea water ecosystem.
13. Visit to industrial sewage disposal unit.
14. Mine spoil and pond ash reclamation through Horticultural crops
15. Urban planning and planting avenues, schools, villages, beautifying railway stations, dam sites, hydroelectric stations, colonies, river banks, planting material for play grounds.
16. Description and design of terrace garden, container gardening.
17. Horticultural crafts for social welfare - bonsai culture-Flower arrangements.

REFERENCE BOOKS

PAT315 DISEASES OF FRUIT, PLANTATION, MEDICINAL & AROMATIC CROPS (2+1)

OBJECTIVES
The subject covers the classification of plant diseases, various principles of plant diseases management, 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 fruit, medicinal and aromatic crops.

THEORY
Unit I: Principles of plant disease management
Unit II: Biological and chemical control


Unit III: Fruit crops

Mango, banana, citrus, grapes, guava, sapota, pomegranate, anonna, papaya, jack, pineapple, ber, aonla, apple, pear, peach and plum.

Unit IV: Plantation crops

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

Unit V: Medicinal plants, aromatic plants and post harvest diseases

Aloevera, Ashwagandha, Medicinal coleus, Gymnema, medicinal solanum, dioscorea. gloriosa, stevia, coleus, aloe, lemon grass, citronella, palmarosa, vettiver, geranium, patchouli, origanum, artimesia, mint, ocimum, lavender and sandal wood; Post-harvest diseases of fruit crops.

PRACTICAL

Assignment: Students should submit 50 well-preserved diseased specimens.

THEORY SCHEDULE

Etiology, symptoms, mode of spread, survival, epidemiology and management of diseases of the following crops.

1. History of Disease management
2. Classification of plant diseases
3. Principles of Plant Diseases Management
4. Prophylaxis & Immunization
5. Epidemiology of plant diseases
6. Survival and dispersal of plant pathogens
7. Types of resistance.
8. Biological control
9. Biotechnological approach for crop disease management
10. Fungicides – characteristics of an ideal fungicide
11. Classification – group of fungicides
12. Antibiotics – Formulations
13. Methods of application of fungicides and compatibility with other agrochemicals – Phytotoxicity of fungicides – precautions and safety measures in handling of fungicides.
14. Mango and banana
15. Citrus and grapes
16. Guava, pomegranate, anonna, jack & sapota
17. Mid Semester Examinations
18. Papaya, pineapple, ber and aonla.
19. Apple, pear, plum and peach.
20. Tea
21. Coffee and cocoa
22. Rubber, coconut,Areacanut, Aloevera, Ashwagandha and vanilla.
23. Medicinal coleus, Gymnema,Medicinal solanum and Dioscorea
24. Gloriosa, stevia, coleus and aloe.
25. Lemon grass, palmarosa, vettiver and citronella,
26. Geranium, patchouli, origanum, artimesia and mint,
27. Ocimum, lavender and sandal wood
28. Post harvest diseases – Fruits
AGM 316: ENVIRONMENTAL SCIENCE (1+1)

OBJECTIVES
The emphasis of the course will be on the biosphere resource, Sustainable agro ecosystem, pollution and environmental protection.

THEORY
Unit - I: Introduction to Ecology and Environment

Unit – II: Natural resources and Biodiversity
Natural resources – Soil, Water, Air, Mineral, Energy, Forest resource; Biodiversity – importance, hot spots and conservation.

Unit – III: Environmental Pollution
Pollution: problems, types and sources – Soil, Water and Air pollution: Sources, effects and control measures – Noise pollution: Sources, effects and control measures – Radioactive, Heavy metal, thermal and nuclear pollution – Global warming and climate change: Green House Gas (GHG) emission, Green House effect, impact on environment and horticulture – mitigation strategies.
Unit – IV: Solid and Liquid waste management


Unit – V: Environmental protection

Global treaties, conventions – National and State level organizations: Tamil Nadu Pollution Control Board (TNPCB), Central Pollution Control Board (CPCB) – Environmental Laws and Acts – Environmental Education – Clinic Development Mechanism (CDM) – Prevention of land degradation –Afforestation. Role of Information Technology on Environment.

PRACTICAL


THEORY SCHEDULE

1. Introduction to Ecology and Environment, Ecosystem concepts.
2. Species, population, community and succession, Species interactions.
3. Energy efficiencies and Energy flow – Food chain, food web and ecological pyramids.
4. Soil, water and mineral resources.
5. Forest and energy resources.
7. Pollution: Problems, types and sources – Soil pollution: Sources, effects and control measures.
8. Water pollution: Sources, effects and control measures.
9. Mid semester Examination.
10. Air pollution: Sources, effects and control measures.
11. Noise pollution: Sources, effects and control measures.

PRACTICAL SCHEDULE

1. Laboratory safety and handling of chemicals and glass wares.
3. Diversity of flora and fauna in agricultural ecosystem.
5. Estimation of pH, EC and Total solids in waste water samples.
7. Estimation of Chemical oxygen demand in waste water samples.
8. Estimation of acidity, alkalinity and hardness in waste water samples.
10. Visit to common effluent treatment plant.
11. Visit to degraded ecosystem and Environmental impact assessment.
14. Monitoring Air pollution and methods.
15. Solid waste management – Composting of various solid wastes using microorganisms and vermicomposting.
16. Estimation of Heavy metals in contaminated soil and water ecosystem.
17. Final practical Examination.

REFERENCES

AEC 317 FUNDAMENTALS HORTI-BUSINESS MANAGEMENT (1+1)

OBJECTIVES
The objective of this course is to impart skill, training, proficiency in decision making ability, to give direction, to coordinate and control the work at all levels of management for the farm graduates.

THEORY
Unit I: Horti-business

Unit II Planning & Organization
Planning – meaning, steps and methods of planning, types of plan, characteristics of effective plans. Organizations – forms of business organizations, organizational principles, division of labour. Unity of command, scalar pattern, job design, span of control responsibility, power authority and accountability.

Unit III Direction and Control of Business
Direction – guiding, leading, motivating, supervising, coordination – meaning, types and methods of controlling – evaluation, control systems and devices. Budgeting as a tool for planning and control. Record keeping as a tool for control.

Unit IV Operation Management
Functional area of management – operations management – physical facilities, implementing the plan, scheduling the work, controlling production in terms of quantity and quality. Materials management – types of inventories, inventory costs, managing the inventories, economic order quantity (EOQ).

Unit V Personnel & Marketing Management

PRACTICALS
THEORY LECTURE SCHEDULE:

3. Planning – meaning, steps and methods of planning, types of plan, characteristics of effective plans
4. Organizations – forms of business organizations, organizational principles, division of labour
5. Unity of command, scalar pattern, job design, span of control responsibility, power authority and accountability.
6. Direction – guiding, leading, motivating, supervising, coordination
8. Budgeting as a tool for planning and control. Record keeping as a tool for control.
9. Mid-semester examination
10. Functional area of management – operations management
11. Physical facilities, implementing the plan, scheduling the work, controlling production in terms of quantity and quality. Materials management
12. Types of inventories, inventory costs, managing the inventories, economic order quantity (EOQ).
13. Personnel management
14. Recruitment, selection and training, job specialization. Marketing management
15. Definitions, planning the marketing programmes, marketing mix and four P’s. Financial management
16. Financial statements and rations, capital budgeting
17. Project management – project preparation evaluation measures.

PRACTICAL SCHEDULE:

1. Exercise on Operations management in agribusiness firms
2. Logistics management
3. Inventory management - inventory types, costs and Economic Order Quantity (EOQ)
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. Exercise on human resource planning and management
11. Farmers survey – buying behavior 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
17. Final Practical Examination

REFERENCES:

OBJECTIVES

- To impart knowledge on entrepreneurship and its importance in socio-economic development of the nation.
- To gain knowledge and skills in project formulation, project report preparation and evaluation of projects.

THEORY

UNIT – I: Concept of Entrepreneurship

Concept of entrepreneur, entrepreneurship, functions of entrepreneur. Entrepreneurial characteristics - distinction between an entrepreneur and a manager. Agri entrepreneurship - concept, need and scope.

UNIT – II: Entrepreneurship Development Programmes

Assessing overall business environment in Indian economy – globalization – implications of social, political and economic systems on entrepreneurship. Entrepreneurship Development Programmes (EDPs) - objectives, phases, problems of EDPs, criteria for assessment or evaluation of EDPs. Generation, incubation and commercialization of business ideas.

UNIT – III: Management of Enterprises

Role of entrepreneurship in economic development. Motivation and entrepreneurship development. Managing an enterprise - Importance of planning, budgeting, monitoring, evaluation and follow up in running an enterprise. Managing competition - ways to define possible competitors, competitive information. SWOT analysis-concept, meaning and advantages.

UNIT – IV: Marketing and Record Keeping

Venture capital – concept, aims, features, financing steps sources, criteria to provide venture capital. Marketing - market segmentation, market positioning, marketing mix and product mix. Record keeping – purpose, needs and types of records to be maintained in an enterprise. Forms of business – contract farming, joint ventures and public private partnerships. Social responsibility and business ethics.

UNIT – V: Government Schemes of Entrepreneurship


THEORY SCHEDULE

1. Concept of entrepreneur, entrepreneurship and functions of an entrepreneur
2. Entrepreneurial characteristics – distinction between an entrepreneur and a manager – Agri-entrepreneurship- concept need and scope
4. Entrepreneurship Development Programmes (EDPs) – objectives, phases, problems of EDPs, criteria for assessment or evaluation of EDPs
5. Generation, incubation and commercialization of business ideas
6. Role of entrepreneurship in economic development, motivation and entrepreneurship development, managing an enterprise
7. Importance of planning, budgeting, monitoring, evaluation and follow up in running an enterprise
8. Managing competition – ways to define possible competitors, competitive information, SWOT analysis-concept, meaning and advantages
9. Mid-Semester Examination
10. Venture capital – concept, aims, features, financing steps sources, criteria to provide venture capital
11. Marketing - market segmentation, market positioning, marketing mix and product mix
12. Record keeping – purpose, needs and types of records to be maintained in an enterprise
14. Social responsibility and business ethics
15. Project – meaning – importance – components and preparation
16. Government schemes and incentives for promotion of entrepreneurship and government policy on small and medium enterprises
17. Women entrepreneurship-concept, problems and development of women entrepreneurs.

PRACTICAL SCHEDULE
1. Steps in formulating a project proposal
2. Field visit to successful agri-enterprise – study of characteristics of successful agripreneurs – case study
3. Working out Benefit – Cost Ratio for any agro based enterprise
4. Working out Break even analysis
5. Working out various financial ratios
6. Capital budgeting for any agro based enterprise
7. Preparation of balance sheet for an enterprise
8. Practicing tower building
9. Practicing test for achievement planning
10. Visit to agri clinics and agri business centers
11. Case study of successful Women entrepreneurs
12. Preparation of a sample project proposal for an agro based enterprise
13. SWOT analysis of selected enterprise
14. Development of project proposals – formulation of project plan – I
15. Development of project proposals – formulation of project plan – II
16. Presentation of project reports by the students – I
17. Presentation of project reports by the students – II

REFERENCES

ENG 319 COMPREHENSION AND COMMUNICATION SKILLS (1+1)

OBJECTIVES
To enable the learner acquire the major skill -- listening, reading, speaking and writing -- practice integrating all the skills for requires needs specific and general -asses the progress of comprehension and expression

THEORY
Unit – I
Education – employment – unemployment – when is a person unemployed – applications – applying for a job- planning – A good job with prospects – Curriculum Vitae - word building – articles.

Unit – II
Interview – taking part in interviews - role play – word hunt – Look alike words – sound alike words – Rhyming words – Reporting – After the interview –General Knowledge – Quizzes – Review - Stress – Poem reading – No time - reported speech

Unit – III

Unit – IV

Unit - V


THEORY LECTURE SCHEDULE

1. Education – Are you a clean slate – employment – unemployment – when is a person unemployed
2. Applications – applying for a job - A good job with prospects
4. Interview – taking part in interviews - role play
5. Word hunt – Look alike words – sound alike words – Rhyming words
6. Reporting – After the interview –improve your General Knowledge – review – super toys
7. Stress – The rat race - Poem comprehension – on No time - reported speech
8. Killers – Comprehension on cigarettes and sudden death – drugs and Youth – hints developing
9. Mid semester Examination
11. Environment – polluting the world – A dead planet - Is there life on earth - tenses
13. A dilemma lesson – a layman looks at science by Ramond B. Fostick – Comprehension pertaining
14. Computeracy – Computers by Peter Laurie – Review – use your English
15. Entertainment – How to be entertaining – You and your English – A lesson from the text book by G.B.Shaw
16. Usage and abusage
17. War minus showing – A lesson from the text book “The sporting spirit” – fun with language.

PRACTICAL SCHEDULE

1. Effective L istening – Developing Listening Skills – Honing Listening skills
2. Listening to Short talks and Lectures from the cassettes of EFL University
3. Spoken English, Vowels, consonants, monophthongs, diphthongs, triphthongs
4. Stress, intonation, phonetic transcription
5. Seminars, Conferences, preparation and demonstration
6. Oral Presentation by students, Articulation and delivery – Evaluation sheet for oral presentation
7. Communication skills – Verbal communication, written communication
8. Telephonic conversation
9. Reading Skills, Skimming, Scanning, Extensive reading, Intensive reading examples
10. Meeting, purpose, procedure, participation, physical arrangements
11. Presentation of reports by using power point & L.C.D
12. Interviews – Mock interviews
13. Debate and Group discussion
14. Using a dictionary effectively
15. Vocabulary
16. Pronunciation practice
17. Practical examination.

Prescribed Text book


REFERENCES


SEMESTER VII

HOR 321: PRODUCTION TECHNOLOGY OF SUB TROPICAL AND TEMPERATE FRUIT AND NUT CROPS (2 + 1)

OBJECTIVES
To study the cultivation aspects of sub tropical and temperate fruit and nut crops

THEORY
Unit-I : Introduction
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: Sub Tropical Fruits – I
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 and avocado.

Unit –III: Sub Tropical Fruits - II
Pine apple, mangosteen, litchi, loquat, rambutan, carambola, durian, passion fruit and rose apple.

Unit – IV : Temperate Fruits
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 : Nut Crops
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 fruit and nuts – selection, pre-treatment and intercultural operations in hill banana – systems of training, pruning, propagation methods - 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 sub tropical and temperate fruits.
4. –do- Mandarin
5. –do- Grape fruit and Pummelo
6. –do- Avocado
7. –do- Pineapple
8. –do- Mangosteen
9. –do- loquat
10. –do- Litchi
11. –do- Rambutan
12. –do- Carambola
13. –do- Durian and Rose apple
14. –do- Passion fruit
15. Introduction to temperate fruit crops – climatic requirements and growth physiology
16. Bearing habits and training systems of temperate fruit crops
17. 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 of Apple
18. Use of plant growth regulators, physiological disorders and remedies maturity indices and harvest -
   post harvest handling and storage of Apple.
19. Mid semester examination.
20. 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 - use of plant growth regulators, physiological
   disorders and remedies maturity indices and harvest - post harvest handling and storage of Pear.
21. –do- Peach
22. –do- Plum.
23. –do- Strawberry
24. –do- Cherries
25. –do- Raspberry, Black Berry and Currants
26. –do- Apricot
27. –do- Kiwi
28. –do- Persimmon
29. –do- Pistachio nut
30. –do- Macadamia nut
31. –do- Almond
32. –do- Walnut
33. –do- Pecan Nut
34. –do- Chestnut and hazel Nut

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. Identification of physiological disorders and remedies in grapes, mandarin, pummelo and grape fruit
4. Identification and description of varieties of avocado, litchi and passion fruit
5. Study of varieties, propagation in pine apple
6. Planting systems and growth regulation in pine apple
7. Visit to sub-tropical fruit zones and identification of sub-tropical varieties
8. Visit to temperate orchards and identification of temperate fruit varieties
9. Visit to temperate orchard and identification nut crops.
10. Description of varieties and propagation methods of mangosteen, loquat and carambola
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

REFERENCE BOOKS

HOR 322: PRODUCTION TECHNOLOGY OF TEMPERATE AND SUBTROPICAL VEGETABLE (2+1)

OBJECTIVES
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, effort potential of vegetables crops, classification of vegetable crops. Scope and importance of vegetable growing – Seed production techniques and constraints in temperate and sub tropical vegetable crops.

UNIT –II: Cruciferous vegetables
Crops: Cabage, Cauliflower, Knol-khol, sproting broccoli and Chinese cabbage.

UNIT-III : Bulbous and root vegetables
Garlic, onion, potato, sweet potato, dioscorea, carrot, beet root, radish and turnip.

UNIT-IV: Leguminous vegetables
Peas, French beans, butter beans, cluster beans, vegetable soyabean and lab lab.

UNIT-V: Leafy and salad vegetables
Lettuce, palak, celery, asparagus, globe, artichoke, rhubarb, spinach, cherkumanis, basella, and portulaca.

PRACTICAL

LECTURE SCHEDULE
1. Area production, world scenario, industrial importance, export potential of temperate vegetable crops.
Origin, distribution, varieties, climate and soil, nursery management, seed treatment, nutrient requirement, nutrient deficiency and corrective measures. Use of chemical and PGRs. Mulching weed management, irrigation requirement, intercropping, maturity standards, harvesting and grading, seed production of the following crops.

2. Cabbage
3. Cauliflower
4. Knol-khol
5. Sprouting broccoli
6. Brussels sprout
7. Chinese cabbage
8. Garlic, Onion
9. Potato
10. Sweet potato
11. Dioscorea
12. Carrot
13. Beet root
14. Radish
15. Turnip
16. Mid Semester Examination
17. Peas
18. French beans
19. butter beans
20. Cluster beans
21. Vegetable soybean
22. Lab lab
23. Lettuce
24. Palak
25. Celery
26. Asparagus
27. Globe artichoke
28. Rhubarb
29. Spinach
30. Chekurmanis
31. Basella
32. Portulaca

PRACTICAL SCHEDULE
1. Identification and description of temperate subtropical vegetable crops
2. Nursery practices and for transplanted vegetable crops I
3. Preparation of field and sowing / planting for direct sown / transplanted vegetable crops
4. Herbicide use in temperate and sub-tropical vegetable crops .
5. Top dressing of fertilizers and inter-culture.
6. Use of chemicals and growth regulators in vegetable crops.
7. Identification of nutrient deficiencies and adoption correction measures.
8. Physiological disorder and adoption correction measures.
9. Maturity indices and harvesting in temperate and sub-tropical vegetable crops.
10. Protected cultivation of temperate vegetables.
11. Visit to commercial farms in plains.
12. Visit to commercial farms in hills.
13. Visit to cold storage/ market/ processing centres.
14. Working out cost of cultivation of temperate and sub-tropical vegetable crops.

REFERENCE
HOR 323: PROCESSING AND POST HARVEST MANAGEMENT OF HORTICULTURAL CROPS (1+1)

OBJECTIVES
India is considered to be the second largest producer of fruits and vegetables and in the world. Inspite of higher production achieved in the field of horticultural crops, considerable gap exists between gross production and net availability of fruits and vegetables due to huge post harvest loss. These loss are again due to lack of knowledge in the proper post harvest management or handling of fruit and vegetables right from harvesting to marketing. To overcome these bottlenecks, fruits and vegetables could be profitably disposed either by storing them in cold rooms or by processing and preserving them as different products.

Horticultural produces offer tremendous scope for value addition in to different products with commercial feasibility. The content of this course is so designed that it will help the students to become an entrepreneur in this potential area.

THEORY
Unit-I: Post harvest handling and ripening physiology
Importance of post harvest technology and causes of post harvest losses – Maturity indices and time of harvesting – pre and post harvest physiological changes in Horticultural produce – methods to hasten or delay ripening of fruits.

Unit-II: Post harvest treatments and storage

Unit –III: Packaging of Horticultural produce
Packaging of horticultural produce – type of containers and packaging materials – methods of packing – controlled and modified atmospheric packaging – vacuum, edible packaging. Role of NHB, APEDA, Plant Quarantine and other certifying agencies governing internal and foreign trade of harvested produce.

Unit – IV: Methods of preservation
Status and scope of fruit and vegetable processing industries in India – Principles of preservation – Preservation with sugar, salt – heat preservation – chemicals or bio-preservatives, dehydration and fermented beverages.

Unit – V: Value added products and quality control

PRACTICAL
Practice in judging the maturity of various horticultural crops – studies on harvesting or delaying ripening of treated produce. Types of packaging materials and packaging methods – Equipments in food processing unit – preparation of squash, jam, RTS, syrup, candy, ketchup, sauce, pickles, chutney (hot and sweet), dehydrated products, brining – comparative study of ambient and refrigerated storage – visit to food processing units.

THEORY LECTURE SCHEDULE
1) Importance and scope of post harvest technology of horticulture crops.
2) Post harvest losses, maturity indices
3) Pre and post harvest physiological changes during development, maturity and ripening of fruits.
4) Post harvest treatments like pre-cooling, washing, grading waxing, vapourheat treatment.
5) Irradiation of fruits and vegetables and fumigation.
6) Storage methods, controlled atmospheric storage and modified atmospheric storage and storage disorders.
7) Handling of cut flowers and methods to extend the shelf life.
8) Mid Semester Examination.
9) Packaging methods of fruits and vegetables – packaging materials.
10) Controlled and modified atmospheric packaging, vacuum and edible packaging.
11) Role of NHB, APEDA, plant Quarantine and other certifying agencies governing internal and foreign trade of harvested produce.
12) Importance and scope of vegetable preservation industry in India- principles of preservation.
13) Preservation with sugar and salt, chemicals and bio-preservatives.
15) Principles of preservation by fermentation, canning.
16) Value added products from spices and by product utilization from processing industry.
17) Quality control standards – Role of BIS, AGMARK, CodexAlimetarius – Fruits products order (FPO)

PRACTICAL SCHEDULE
1) Practice in Judging the maturity of horticultural produce
2) Use of polyethylene bags in prolonging shelf life of perishables.
3) Wax coating and packaging studies for fruit, vegetables and cut flowers.
4) Identification and study of working of equipments used in processing units.
5) Preparation of squash, RTS and syrup.
6) Preparation of Jam
7) Preparation of Jelly and marmalade
8) Preparation of Sauce and ketchup
9) Preparation of pickles and dehydrated products
10) Visit to food processing units.

REFERENCE

AGR324: WEED MANAGEMENT IN HORTICULTURAL CROPS (1+1)

OBJECTIVES
• To impart knowledge on identification of weeds and on several damages caused by weeds
• To equip the students with the concepts and principles of weed control and management in Horticultural crops

THEORY

Unit I: Weed biology and ecology
Weeds – Definition, classification and characteristics of weeds – Losses caused by weeds-Weed ecology –Critical periods of weed competition-Principles and methods of weed management: preventive, cultural, mechanical, chemical, biological and alternate methods

Unit II: Principles of weed control
Concepts of weed prevention, control and eradication-IWM for horticultural crops –Merits and demerits- Management of problematic, parasitic and aquatic weeds - Chemical, weed management - classification herbicide formulations - adjuvants, herbicide protectants and antidotes -

Unit III: Chemistry of Herbicides
Mode and mechanism of action of herbicides –Introduction to selectivity of herbicides -
Principles of herbicide selectivity - Compatibility of herbicides with other agro chemicals, Herbicide residue management and Herbicide resistance

**Unit IV: Herbicides physiology**
- Principles and concepts - development of transgenic herbicide resistant crops – Success of herbicide resistant crops (HRC) in World and Indian agriculture.

**Unit V: Weed management**
- Weed management in major horticultural crops, aquatic and problematic weeds and their control, invasive alien weeds.

**PRACTICAL**
- Identification of weeds in wet, garden, dry land and hilly ecosystems - Weed control tools and implements - Preparation of herbarium of weeds; 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 - Preparation of list of commonly available herbicides; Study of phytotoxicity symptoms of herbicides in different crops

**LECTURE SCHEDULE**
2. Classification and characteristics of weeds of different agro ecosystems - lowland weeds, irrigated upland rainfed land weeds and hilly weeds -
4. Concepts of weed prevention, control and eradication-IWM in horticultural crops and cropping systems and Non chemical weed management techniques in organic agriculture
5. Management of problematic, parasitic and aquatic weeds - Chemical, weed management –
6. Classification and characteristics of herbicides and herbicide formulations – History and development
7. Herbicide formulations - adjuvants, herbicide protectants and antidotes Herbicide use efficiency - Adjuvants, herbicide protectants and antidotes - Herbicide and herbicide mixtures in India
9. **Mid semester examinations**
10. Mechanism of action of herbicides and their selectivity
11. Introduction to selectivity of herbicides; - Principles of herbicide selectivity -
12. Compatibility of herbicides with other agro chemicals,
13. Herbicide residue management and Herbicide resistance
14. Principles and concepts - development of transgenic herbicide resistant crops
15. 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
16. Weed management in major horticultural crops
17. Aquatic and problematic weeds , Control of problematic weeds and invasive alien weeds

**PRACTICAL SCHEDULE**
1. Identification and classification of wet land weeds
2. Identification and classification of garden land weeds
3. Identification and classification of dry land and hilly weeds
4. Practicing Skill development on cultural and non chemical weed management
5. Identification, classification and characterization of herbicides
6. Practicing Skill development on herbicide application techniques
7. Practicing Skill development on spray equipment’s and spray fluid calibration
8. Practicing Skill development on herbicide weed management in lowland, upland and rainfed ecosystems
9. Calculation of herbicide quantity and recommendation for different eco systems
10. Study on phytotoxicity symptoms of herbicides in different horticrops;
11. Practising Skill development on mechanical weed management
12. Identification and classification of herbicides
13. Practising Skill development on herbicide application techniques
14. Practising Skill development on spray equipments and spray fluid calibration
15. Calculation of herbicide quantity and recommendation
16. Economic evaluation of weed control methods in horticultural crops and cropping systems.

17. Practical Examination

REFERENCES

ENT 325: INSECT PESTS OF VEGETABLE, ORNAMENTAL AND SPICE CROPS AND THEIR MANAGEMENT (1+1)

OBJECTIVES:
Distribution, bio-ecology, host range, injury, integrated management of important insect pests affecting Vegetable, Ornamental and Spice Crops.

THEORY
Unit I: Pests of vegetables
Tomato, brinjal, chilli and bhendi, Bulbous and Cucurbitaceous vegetables - Onion, ash gourd, pumpkin, bitter gourd, snake gourd, ribbed gourd, bottle gourd, watermelon, musk melon, cucumber and gherkin. Fabaceous vegetable crops and greens - Cluster beans, cowpea, lab-lab, peas, beans, moringa, palak, basella and amaranth.

Unit II: Pests of tubers and root vegetables

Unit III: Pests of Flower crops and ornamentals
Flower crops and other ornamentals - rose, jasmine, chrysanthemum and tuberose. crossandra, marigold, nerium, lawn, turf and cut flowers.

Unit IV: Pests of spices crops, Tree crops and dry fruits and nuts
Turmeric, ginger, coriander, fenugreek, fennel, clove, nutmeg, cinnamon, betel vine. Tree crops - neem, teak, tamarind, sandalwood, eucalyptus, and casurina, dry fruits, nuts and other horticultural products.

Unit V: Chemical methods of Pest Management in horticultural crops and its Ecological Perspectives

PRACTICAL
Identification of symptoms of damage and life stages of important pests of different horticultural crops: vegetables, tubers, spices, ornamentals, flower crops, tree crops, dry fruits and nuts. Different groups of pesticide formulations and label information. Precautions in pesticide applications - First aid and antidotes in case of insecticide poisoning. Pesticide application equipments - types and uses.
Preparations of spray fluids for field application. Calculation of dose/concentration of insecticides. Compatibility of pesticides and Phytotoxicity of insecticides. Effective application of insecticides.

Assignment:
1. Each student has to submit five numbers of insect damaged plant specimens (Herbarium) from Vegetable, Ornamental and Spice Crops and five insecticide labels.
2. Rearing and submission of five insect pests of Vegetable, Ornamental and Spice Crops.

THEORY LECTURE SCHEDULE
1. Pests of tomato, brinjal, chilli, bhendi.
2. Pests of onion, ash gourd, pumpkin, bitter gourd, snake gourd, ribbed gourd, bottle gourd, watermelon, musk melon, cucumber and gherkin.
3. Pests of fabaceous vegetable crops and greens - Cluster beans, cowpea, lab-lab, peas, beans, moringa, palak, basella and amaranth.
5. Pests of cruciferous vegetables - cabbage, cauliflower and sprouting broccoli.
6. Pests of Salad vegetables- Kale, cress, celery, rhubarb, asparagus, artichoke, leek, lettuce and spinach
7. Pests of Flower crops and other ornamentals - rose, jasmine, chrysanthemum and tuberose. crossandra, marigold, nerium, lawn, turf and cut flowers.
8. Pests of turmeric, ginger, coriander, fenugreek, fennel, clove, nutmeg, cinnamon, betel vine.
9. Mid semester Examination
10. Pests of trees - neem, teak, tamarind, sandalwood, eucalyptus, and casurina
11. Pests of dry fruits, nuts and other horticultural products.
13. Toxicity ranges, LD$_{50}$, LC$_{50}$ etc., Basic and newer Formulations of insecticides.
15. Insecticide residues, insecticide resistance.
17. Insecticide resistance and residue management.

PRACTICAL SCHEDULE
2. Identification of life stages of important pests of tomato, brinjal
3. Identification of life stages of important pests of chilli, bhendi
4. Identification of life stages of important pests of onion, ash gourd, pumpkin, bitter gourd, snake gourd, ribbed gourd, bottle gourd, watermelon, musk melon, cucumber and gherkin.
5. Identification of life stages of important pests of cluster beans, cowpea, lab-lab, peas, beans
6. Identification of life stages of important pests of moringa, palak, basella and amaranth.
7. Identification of life stages of important pests of potato, cassava, sweet potato, colocasia, vegetable coleus, yam, chow chow, carrot, beet root, radish and turnip.
8. Identification of life stages of important pests of cabbage, cauliflower and sprouting broccoli. Salad vegetables- Kale, cress, celery, rhubarb, asparagus, artichoke, leek, lettuce and spinach
10. Identification of life stages of important pests of turmeric, ginger, coriander, fenugreek, fennel, clove, nutmeg, cinnamon, betel vine.
11. Identification of life stages of important pests of neem, teak, tamarind, sandalwood, eucalyptus, and casurina.
12. Identification of life stages of important pests of dry fruits, nuts and other horticultural products.
13. Identification of different groups of pesticide formulations.
14. Recognizing label information, Precautions in pesticide applications, First aid and antidotes information.
15. Identification of types of Pesticide application equipments and effective application of insecticides.
16. Preparations of spray fluids for field application. Calculation of doses/concentrations of insecticides.
17. Compatibility of pesticides and Phytotoxicity of insecticides.
18. Practical examination

REFERENCE BOOKS

**PAT 326 Diseases of Vegetable, Ornamental and Spice crops (2+1)**

OBJECTIVES
The subject covers the 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 vegetable, ornamental and spice crops.

THEORY
Unit I: Vegetable crops
   - Brinjal, tomato, bhendi, cucurbits, crucifers, beans and peas
Unit II: Tuber crops
   - Potato, sweet potato, beet root, raddish, yam, colocasia and cassava.
Unit III: Spices and condiments
   - Onion, garlic, chillies, cardamom, pepper, betel vine, turmeric, ginger, fenugreek, coriander, clove, nutmeg and cinnamon
Unit IV: Ornamentals
   - Jasmine, rose, crossandra, chrysanthemum, tuberose, marigold, orchid and gladiolus
Unit V: Post-harvest diseases
   - Post-harvest diseases of vegetables.

PRACTICAL
Study of symptoms and host parasite relationships of the following crops: Tomato, brinjal, bhendi, cucurbits, crucifers, bean, peas, potato, cassava, sweet potato, yam, colocasia, onion, garlic, chillies, pepper, betel vine, turmeric, ginger, cardamom, fenugreek, coriander, clove, nutmeg, cinnamon, jasmine, rose, crossandra, chrysanthemum, tuberose, marigold, orchid and gladiolus. Post-harvest diseases of vegetables and ornamentals - Field visits.

THEORY SCHEDULE
Etiology, symptoms, mode of spread, survival, epidemiology and management of diseases of the following crops:
   1. Brinjal
   2. Tomato
   3. Bhendi
   4. Cucurbits
   5. Crucifers
   6. Beans and peas
   7. Potato and sweet potato
   8. Beet root and raddish
   9. Yam and colocasia.
10. Field visit
11. Cassava
12. Onion
13. Garlic
14. Chillies
15. Cardamom
16. Pepper
17. Turmeric
18. Mid Semester Examinations
19. Ginger and fenugreek
20. Coriander
21. Clove
22. Nutmeg
23. Cinnamon
24. Jasmine
25. Rose
26. Crossandra
27. Chrysanthemum
28. Tuberose and marigold
29. Orchid and gladiolus
30. Post harvest diseases of vegetables
31. Post harvest diseases of spices
32. Post harvest diseases of condiments
33. Post harvest diseases of ornamentals
34. Importance of Post harvest disease management

PRACTICAL SCHEDULE
Study of disease symptoms and host parasite relationship of:
1. Tomato
2. Brinjal.
3. Cucurbits
4. Field visit
5. Crucifers.
6. Bean and peas
7. Potato.
8. Field visit
9. Cassava, sweet potato, yam and colocasia.
10. Onion and garlic
11. Chillies
12. Pepper
13. Turmeric and ginger
14. Cardamom and fenugreek
15. Coriander, clove, nutmeg, and cinnamon
16. Post harvest diseases of vegetables, spices and condiments
17. Final Practical Examinations
Assignment: Students should submit 50 well-preserved diseased specimens.

REFERENCES

SAC 327: SOIL FERTILITY AND NUTRIENT MANAGEMENT (1+1)
OBJECTIVES:
To impart knowledge on basic principles of soil fertility, its evaluation and gain knowledge on plant nutrients and its use for sustainable agriculture. Further it aims to gain knowledge on management of problem soil and irrigation water. This course also provides practical knowledge with respect to soil, plant and irrigation water analysis.
THEORY

Unit I: Soil fertility

Unit II: Plant nutrients

Unit III: Problem soils

Unit IV: Irrigation water

Unit V: Nutrients use

PRACTICALS

THEORY SCHEDULE
4. Soil fertility – productivity – soil fertility evaluation – different approaches
5. soil fertility evaluation – methods – chemical methods, soil analysis - soil testings and critical level of nutrients in soil, plant analysis - methods
7. soil as a source of nutrients – plant nutrients – Arnon’s criteria – essential nutrients – beneficial nutrients – sources – forms
8. Nutrient transformations to plant, factors affecting nutrients availability
9. Nutrient deficiencies, toxicities and overcome measures
11. Mid semester examination
13. Mid semester examination
15. Use of saline water for agriculture - Management of poor quality water
16. Effect of fertilizers and pesticides on irrigation water and air
17. Soil test crop response (STCR) fertilizer recommendations for different crops
20. Sources - methods – nutrient schedule for different soils and crops grown under rainfed and irrigated conditions.

PRACTICAL SCHEDULE
1. Determination of soil organic carbon
2. Determination of available nitrogen in soil
3. Determination of available phosphorus in soil
4. Determination of available potassium in soil
5. Determination of available sulphur in soil
6. Preparation of di- acid, tri- acid extract and Estimation the nitrogen in plant
7. Estimation of phosphorus in plant
8. Estimation of potassium in plant
9. Estimation of sulphur in plant
10. Determination of pH and EC in irrigation water
11. Estimation of \( \text{Ca}^{2+} \) and \( \text{Mg}^{2+} \) in irrigation water
12. Estimation of \( \text{Na}^{+} \) and \( \text{K}^{+} \) in irrigation water
13. Estimation \( \text{CO}_3^- \) and \( \text{HCO}_3^- \) in irrigation water
14. Estimation of \( \text{Cl}^- \) in irrigation water
15. Estimation of lime requirement in acid soil
16. Estimation of gypsum requirement in alkaline soil
17. Practical Examination

REFERENCES

AEC 328 PRODUCTION ECONOMICS AND ORCHARD MANAGEMENT (1+1)

OBJECTIVES:
The objective of this course is to provide applied and practical understanding of production economics and farm management techniques with emphasis on its economics analysis

THEORY
Unit I: Nature and Scope

Unit II: Factor-Product Relationship

Unit III: Factor- Factor Relationship

Unit IV: Product-Product Relationship
Unit V: Farm Planning and Budgeting


PRACTICALS

THEORY LECTURE SCHEDULE
1. Production economics: Meaning - definition – nature and scope. Orchard management: Definition - objectives of orchard management - Production economics Vs Orchard management
2. Orchard management decisions - Decision making process - scope of orchard management
4. Factor-Product relationship : Meaning - agricultural 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 – 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 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 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**


**GPB 329: SEED PRODUCTION OF HORTICULTURE CROPS (1+1)**

**OBJECTIVE**

- To understand the quality seed production methods of varieties and hybrids of horticultural crops.
- It impart the importance of seed certification.

**THEORY**

**Unit – I: Seed Morphology and Classification of seed**
- Seed – structure and texture – monocot – dicot seeds and their importance – Characteristics of good quality seeds – seed multiplication systems – different classes Seed

**Unit -II Principles of seed production**
- Influence of agro climatic condition on seed production – selection of seed production area, varietal release – state and central variety releasing committee.

**Unit – III: Seed Production**
- Principles and methods of seed production in self and cross pollinated crops – varieties and hybrids of Tomato, Brinjal, Chillies, Bhendi, Amaranthus, Gourds, Cabbage, Cauliflower, Radish, Carrot, Onion,

**Unit - IV: Post Harvest Technology**
- Harvesting and post harvest technology – methods of harvesting – drying- principles of seed processing – dormancy – methods of seed treatment

**Unit – V : Seed Certification and seed legislation**
- seed standard – seed certification – organization – seed certification procedure, seed Act and seed rules and seed regulation.

**PRACTICAL**
- Seed structure and texture – Monocot – Dicot seeds - Seed identification – identification of improved varieties – seed certification – field inspection – visiting seed production plots –supplementary pollination- planting ratio and planting design-isolation and rogueing- Physiological and harvestable maturity - harvesting and seed extraction -Packaging materials– godown sanitation.

**THEORY LECTURE SCHEDULE**

1. Seed structure and texture – Monocot – Dicot seeds and their importance
2. Characteristics of good quality stdes – seed multiplication system
3. Influence of agro climatic condition of seed production – selection of seed production area.
4. Varietal release – state and central variety releasing committee
5. Different classes of seeds
7. Seed production methods in varieties and hybrids of Tomato and Brinjal
8. Seed production methods in varieties and hybrids of Chillies and Bhendi
9. Seed production methods in varieties and hybrids of Amaranthus
10. Seed production methods in varieties and hybrids of Gourds
11. Seed production methods in varieties and hybrids of Cabbage and Cauliflower
12. Seed production methods in varieties and hybrids of Onion
13. Seed dormancy-Classification - treatment to overcome dormancy
14. Seed treatment
15. Seed certification – organizations involved in certification
16. seed certification procedure
17. seed Act and seed rules
PRACTICAL SCHEDULE
1. Seed structure of monocot & Dicot seeds
2. Seed identification of improved varieties of hybrid of vegetable crops
3. State and central variety release
4. Visit to seed production plots
5. Supplementary pollination
6. Planting ratio and planting design for horticultural crops
7. Isolation and rogueing
8. Physiological and harvestable maturity – indices of maturity
9. Harvesting and seed extraction
10. Visit to seed processing unit
11. Seed certification
12. Visit to state seed certification agency
13. Seed storage of horticultural crops
14. Packaging materials
15. Godown sanitation
16. Practical Examination.

REFERENCE