1. Title and Scope

1.1. These academic regulations shall be called “Annamalai University Faculty of Agriculture B.Sc. Horticulture Academic Regulations 2016” for obtaining B.Sc. (Hort.) Degree in the Faculty of Agriculture.

1.2. The regulations provided herein shall apply to B.Sc. (Hort.) Degree programmes offered by the Faculty of Agriculture, Annamalai University to the students admitted from the academic year 2017-18 onwards.

2. Definitions

2.1. University: University means Annamalai University, Annamalainagar, Tamilnadu.


2.3. Academic session: An academic session is a period during which a cycle of study is completed. It shall commence on or after 1st July of each year. There shall be two semesters in an academic session.

2.4. Semester: A semester shall consist of 105 working days inclusive of the mid-semester and practical examinations.

2.5. Curriculum: It is a series of courses offered to provide learning opportunities to meet the requirements for a degree.

2.6. Course: A course is a unit of instructions, series of classes and work experience extending over a semester. It has a specific number, title and credits. Each course is denoted by a specific number, which has a specific meaning.

   The first three alphabets stand for the Department offering the course. First digit is related to the year; second digit is related to the semester and the third digit is related to course number in a particular semester i.e. “HOR-119 Plant Propagation and Nursery Management”. “HOR” stands for the Department of Horticulture; the first digit (1) stands for the year; second digit (1) stands for the semester and the third digit (9) stands for the serial number of course in a particular semester.

2.7. Credit: It is a measure of quantity of work done in a course. One credit represents one contact hour for theory or two contact hours of laboratory or field work per week. For example, a 1+1 course (2 credits) means 1 hour theory and 2 hours practical per week.

2.8. Credit load: It is the number of credits a student shall undergo in a semester.

2.9. Grade Point: “Grade Point” means the total marks in percentage divided by 10 and shall be expressed on 10-point scale upto second decimal place.

2.10. Credit point: A credit point is a product of grade point obtained by a student and number of credits in a course.

2.11. Grade Point Average (GPA): It is measure of performance of a student in all the courses taken during a semester. The GPA is computed by dividing the total credit points earned by a student in a semester by the total number of credits registered during that semester.

2.12. Overall Grade Point Average (OGPA): It is measure of the cumulative performance of a student on completion of the second and subsequent semesters of the degree programme. It is computed by dividing the total credit points earned by a student up to the end of a particular semester by the total number of credits. It shall be expressed on 10 point scale up to second decimal place.
2.13. The OGPA shall be rounded off to second digit of decimal point on the basis of third digit. If third digit of decimal point is 5 or more than 5, then second digit will be increased by one. If, however, it is less than 5, it will be ignored. This will be done at the end of each semester while calculating the OGPA.

2.14. 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 first semester : 17
ii. Total credit points till the end of first semester : 140.50
iii. Total credit hours in the current (second) semester : 23
iv. Total credit points obtained in the current semester : 156
v. Total credit hours including the current semester : (17+23) = 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

2.15. “Transcript Card” is a consolidated report of grades secured by the student in all the semesters, issued by the University.

3. Admission

3.1. Admission of the student to bachelor degree programme B.Sc. (Hort.) in the Faculty of Agriculture shall be on the basis of merit and in accordance with the policy and guidelines of the State Government and the University. The minimum admission requirement shall be decided by the University and issued from time to time. Decision of the University is final in deciding procedure of admission and finalization of number of seats. Reservation shall be made applicable as per norms of the State Government. The tuition fee and examination fee shall be applicable as decided by the University from time to time.

3.2. 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 organized 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 from 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.

4. Advisory system

4.1. The Dean shall nominate a co-ordinator from amongst the teaching faculty.

4.2. Student ward counselors will be nominated soon after the students’ admission. The counselor shall be nominated from amongst the teaching faculty.

5. Curriculum and programme of study

5.1. The students admitted in the University shall be required to follow the curriculum as prescribed, revised from time to time by the respective Faculty of the University and approved by the Academic Council from time to time.

5.1. The students admitted in the University shall be required to follow the curriculum as prescribed, revised from time to time by the respective Faculty of the University and approved by the Academic Council from time to time.

6. Award of Degree, duration and credit requirements

6.1. A student is required to complete the duration and credit requirements for the award of degree as decided by Academic Council from time to time.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Degree</th>
<th>Duration requirements (Semester)</th>
<th>Credit requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>B.Sc. (Hort.)</td>
<td>8 16</td>
<td>180</td>
</tr>
</tbody>
</table>

7. Medium of instruction

7.1. The medium of instruction in Faculty of Agriculture shall be English.

8. Attendance Requirements

8.1. One hundred per cent attendance is expected from each student. A student who fails to secure 80 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) when offered again.

8.2. For the first year first semester students, for calculating 80 per cent attendance the number of working days will be calculated only from the date of joining of the student.

8.3. If any student is absent for field trips, the student may be marked absent for all the compensating classes on the day of the field trip in addition to the field trip courses.

8.4. The attendance for mid-semester examination will be counted as a theory class.

8.5. 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.
8.6. 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 of Agriculture. The Vice-Chancellor may decide whether or not a condonation fee is required, based on the reason for condonation.

8.7. The student belonging to a batch will attend classes and earn attendance in the particular batch only as per the time table. No student shall be permitted to attend along with another batch to gain attendance either in theory or in practical.

9. Examinations

Each course shall carry a maximum of 100 marks for the purpose of grading. The distribution of marks shall be as follows.

9.1. Course with both theory and practical

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Particulars</th>
<th>Mid-semester examination</th>
<th>Final Practical examination</th>
<th>Final Theory examination</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Written test/Practical</td>
<td>20</td>
<td>25*</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Assignment</td>
<td>-</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Record</td>
<td>-</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Viva voce</td>
<td>-</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>20</td>
<td>40</td>
<td>40</td>
<td>100</td>
</tr>
</tbody>
</table>

9.2. Course with only Theory / Practical**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Particulars</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mid-semester examination</td>
<td>40</td>
</tr>
<tr>
<td>2</td>
<td>Final Theory / Practical examination**</td>
<td>60</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

**The modality of evaluation of various courses with only practical is given in Regulation 9.4

9.3. Evaluation of course work

The results of the course shall be indicated by grade points ranging from 0 to 10. The minimum grade point to be secured for the successful completion of a course will be 6.00. Securing a grade point less than 6.00 in a course will be treated as 'RA' and the grade point will be 0 for calculating the GPA/OGPA. In case of course with theory and practical, minimum of 50% marks separately in theory and practical with an aggregate of 60 per cent is essential.

The following symbols shall be used in the mark sheets.

- E  - Incomplete (due to attendance deficiency)
- AB - Absent
- RR - Re-registration
- RA - Re-appearance
- IE - Improvement Examination
- EE - Incomplete for reasons other than attendance
9.4. Evaluation pattern for courses with only practical

The evaluation pattern of courses with only practicals are grouped and mark distribution is furnished below.

A. PED 116 Physical Education (0+1)

The students will be evaluated for 100 marks. The course teacher will evaluate the performance and behavior of students in the classes and marks will be awarded at the end of the first semester as detailed below.

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Max marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance &amp; routine activities</td>
<td>60</td>
</tr>
<tr>
<td>Behaviour</td>
<td>15</td>
</tr>
<tr>
<td>Participation in tournaments</td>
<td>25</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

B. PED 117 Principles and practices of yoga (0+1)

Each student has to undergo 60 hours of face to face course work in a year.

<table>
<thead>
<tr>
<th>Paper</th>
<th>Title of the paper</th>
<th>Mode</th>
<th>Hours of instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Principles and Practices of Yoga</td>
<td>Regular</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>Yoga Practical</td>
<td></td>
<td>40</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>60</strong></td>
</tr>
</tbody>
</table>

Each student enrolled in PED 117 should attend two semesters (I & II). The final practical examination will be conducted in the last practical class of the second semester. Marks will be awarded as follows.

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

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Particulars</th>
<th>Max marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Written Examination</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>PART – A Two Marks Questions 10 out of 12 (10 x 2 =20)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PART – B Five Marks Questions 2 out of 3 (2 x 5 = 10)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PART – C Ten Marks Questions 1 out of 2 (1 x 10 = 10)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Yoga Practical Examination</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>Viva – Voce Examination</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>Record</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

C. NSS / NCC 118 (0+1)

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

NCC/NSS courses shall be registered during first semester and evaluated at the end of fourth semester.

NSS

Each student enrolled in NSS should also attend at least one special camp not exceeding 10 days duration. 80% attendance is mandatory for attending special camp. Marks will be awarded as follows.
At the end of 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, thus 40 parades in four semesters. Marks will be awarded at the rate of two and half marks per parade (2.5 x 40 = 100).

D. ENG 115 / TAM 114 / ENG 114 / ENG 228 (0+1)

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Particulars</th>
<th>Mid-semester examination</th>
<th>Final examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Written test</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>2</td>
<td>Continuous evaluation</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Assignment</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Record</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Viva voce</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>40</td>
<td>60</td>
</tr>
</tbody>
</table>

E. Crop Production HOR 328

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Particulars</th>
<th>Mid-semester examination</th>
<th>Final examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Field evaluation</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>Written examination</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>Assignment</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Record</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Viva voce</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>40</td>
<td>60</td>
</tr>
</tbody>
</table>

F. Rural Awareness Work Experience (RAWE)

RAWE AEX 410 Rural Awareness Work Experience (0+5)

Course on Rural Awareness Work Experience will be offered in the VII Semester for eight weeks.

The village attachment will be organized by the Department of Agricultural Extension. Orientation programme will be organized in the first week of the semester. The final examination will be conducted separately at the end of the semester by the University. The marks will be awarded as detailed below.

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Max marks</th>
<th>Evaluation by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation Note book</td>
<td>20</td>
<td>By Teacher in-charge</td>
</tr>
<tr>
<td>Skills learned</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Final examination</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commendable activities</td>
<td>10</td>
<td>By the Examiners</td>
</tr>
<tr>
<td>Detailed project report presentation &amp; Record</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Viva-voce</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>
RAWE AGR 411, RAWE HOR 412 and RAWE CPT 413

The marks will be awarded as detailed below.

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Max marks</th>
<th>Evaluation by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation Note book</td>
<td>20</td>
<td>By Teacher in-charge</td>
</tr>
<tr>
<td>Skills learned</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Final examination</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commendable activities</td>
<td>10</td>
<td>By the Examiners</td>
</tr>
<tr>
<td>Detailed project report presentation &amp; Record</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Viva-voce</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

G. Educational tours: HOR 221 (0+1) and AEX 414 (0+1)

Educational tour for courses HOR 221 Study tour and AEX 414 All India Study Tour are compulsory. The tours will be undertaken during IV and VII semester, respectively. The duration of HOR 221 shall not exceed 7 days and that of AEX 414 shall not exceed 14 days. The tours will be arranged by the respective Department in consultation with the Dean, Faculty of Agriculture. The final examination will be conducted separately at the end of the semester by the university. Marks for the tours are to be awarded as follows.

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Max marks</th>
<th>Evaluation by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance</td>
<td>20</td>
<td>Accompanying staff</td>
</tr>
<tr>
<td>Behaviour</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Tour Diary</td>
<td>20</td>
<td>By the organising staff/Examiners</td>
</tr>
<tr>
<td>Tour record</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Viva-voce</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

H. HIA 415 Horticultural Industrial attachment (0+6)

Course on Industrial attachment will be offered in the VII Semester for eight weeks by Department of Horticulture. Orientation programme will be organized in the 11th week of the semester. Students shall be attached with Agri. Clinic / Input Industry / Horticulture based industries like Coffee Board, Tea Board, fruit and vegetable processing industries, Floriculture units, landscape companies, Horticultural nursery units, etc. The final examination will be conducted separately at the end of the semester by the University.

The evaluation shall be done as detailed below.

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Max marks</th>
<th>Evaluation by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation Note book</td>
<td>20</td>
<td>By Teacher in-charge</td>
</tr>
<tr>
<td>Skills learned</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Commendable activities</td>
<td>20</td>
<td>By the Examiners</td>
</tr>
<tr>
<td>CD Preparation/Project Report</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Viva-voce</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>
I. Experiential learning EXP 329 (0+6) and EXP 424 (0+6):

These courses will be offered in the VI (0+6) and VIII (0+6) semester respectively.

A student can choose an experiential learning programme of his/her choice. The maximum number of students allowed to register for a module will be decided by the Dean depending on enrolment. If more number of students opt for a same module, the particular subject mark is considered for selecting a student.

Periodical evaluation of the above course will be done by the course teacher during different stages of work. Final evaluation of the above course will be done by the teacher in charge and another examiner. The final 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.

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Max marks</th>
<th>Evaluation by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation Note book</td>
<td>20</td>
<td>By Teacher in-charge</td>
</tr>
<tr>
<td>Proficiency in skill learning</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Skills learned</td>
<td>20</td>
<td>By the Examiners</td>
</tr>
<tr>
<td>Record</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Viva-voce</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

J. HPW 425 Project work (0+2)

Course in Project work will be offered in the eighth semester. A student can choose a research project of his/her choice in line with experiential learning course chosen during sixth semester (EXP 329). Periodical evaluation of course will be done by the course teacher during different stages of work. Final evaluation of the above course will be done by the course teacher and another examiner. The final semester examination will be conducted by the University before the commencement of regular final semester examinations. The evaluation shall be done as follows.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Particulars</th>
<th>Periodical evaluation</th>
<th>Final examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Research area identification and collection of literature</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Work done</td>
<td>30</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Report</td>
<td>-</td>
<td>40</td>
</tr>
<tr>
<td>4</td>
<td>Viva voce</td>
<td>-</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>40</td>
<td>60</td>
</tr>
</tbody>
</table>

10. Mid-Semester Examination (MSE)

10.1. Writing the mid-semester examination is a pre-requisite for writing the final theory and practical examinations. If a student does not appear for MSE he/she is not eligible to appear for the final examinations. Such a 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 on payment of fee prescribed by the University. MSE will be conducted by the Dean, Faculty of Agriculture. The answer scripts will be shown to the student after valuation, 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.

10.2. 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.

10.3. The MSE marks will be furnished to the Dean, Faculty of Agriculture through the Head of the Department 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 Head of the Department himself is the course teacher, one senior member of the Department concerned shall be nominated by the Dean.

10.4 The MSE theory will be of one hour duration.

For courses with both theory and practical, 20 marks will be apportioned as shown below.

<table>
<thead>
<tr>
<th>Marks</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>i) Fill up the blanks @ ½ mark for 10 questions out of 12</td>
<td>5</td>
</tr>
<tr>
<td>ii) Definition @ 1 mark for 5 questions out of 7</td>
<td>5</td>
</tr>
<tr>
<td>iii) Short notes @ 2½ marks for 2 questions out of three</td>
<td>5</td>
</tr>
<tr>
<td>iv) Essay type @ 5 marks for 1 question out of two</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20</strong></td>
</tr>
</tbody>
</table>

For courses with only Theory, 40 marks will be apportioned as shown below.

<table>
<thead>
<tr>
<th>Marks</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>i) Fill up the blanks @ 1 mark for 10 questions out of 12</td>
<td>10</td>
</tr>
<tr>
<td>ii) Definition @ 2 marks for 5 questions out of 7</td>
<td>10</td>
</tr>
<tr>
<td>iii) Short notes @ 3 marks for 5 questions out of three</td>
<td>15</td>
</tr>
<tr>
<td>iv) Essay type @ 5 marks for 1 question out of two</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
</tr>
</tbody>
</table>

10.5. If the student is not able to write the MSE due to deputation by the University, he/she may be permitted to take up a make-up missing examination. Such examination should be completed ordinarily within 15 working days after the respective MSE.

10.6. A student who fails to attend a mid-semester examination due to unavoidable circumstances shall be permitted with prior approval of the Dean to take up missing examination of the particular course, on payment of fee prescribed by the University. Such examinations should be completed ordinarily within 15 working days after the respective MSE.

11. Final Examinations

11.1. The final theory and practical examinations will be of three hours duration each.

11.2. Theory examinations will be conducted after practical examinations.

11.3. The question papers for the final theory examinations will be set by the external examiners.

<table>
<thead>
<tr>
<th>Question pattern for theory papers with maximum 40 marks</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>i) Fill up the blanks @ ½ mark for 10 questions out of 12</td>
<td>5</td>
</tr>
<tr>
<td>ii) Definition @ 1 mark for 5 questions out of 7</td>
<td>5</td>
</tr>
<tr>
<td>iii) Short notes @ 2½ marks for 2 questions out of 3</td>
<td>5</td>
</tr>
<tr>
<td>iv) Essay type @ 5 marks for 5 questions (either or pattern from each unit)</td>
<td>25</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
</tr>
</tbody>
</table>
Question pattern for theory papers with maximum 60 marks

<table>
<thead>
<tr>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>i) Fill up the blanks @ 1 mark for 10 questions out of 12</td>
</tr>
<tr>
<td>ii) Define / Explain @ 2 marks for 5 questions out of 7</td>
</tr>
<tr>
<td>iii) Short notes @ 3 marks for 5 questions out of 7</td>
</tr>
<tr>
<td>iv) Essay type @ 5 marks for 5 questions (either or pattern from each unit)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

11.4. Central valuation of answer books will be done by examiners on the advice of the Chairman, Board of Examiners.

11.5. Practical Examination

Practical examinations will be conducted separately towards the end of each semester. 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.

11.6. Two examiners appointed by the University, nominated by the Head of the Department and recommended by the Dean will conduct the practical examination.

12. Re-appearance and Improvement Examination

12.1. Re-appearance and Improvement Examinations are permitted only for the final theory and practical examinations (retaining marks obtained in mid-semester examination) at the time of regular semester examination only, after the payment of fee prescribed by the university. A student is permitted to write reappearance examination for the failed subjects only three times during n+4 years duration excluding the regular final examination. In the event of a student failing to secure a pass in the three re-examinations permitted, he/she has to reregister the course along with juniors.

12.2. A student who failed in a course (subject) or awarded EE can take up re-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.

12.3. A student having an OGPA of less than 6.50 only is eligible to improve the grade point only once in courses completed earlier in which he/she had obtained grade point of less than 8.00. In case a student fails to secure higher grade point in the subsequent attempts, the higher grade point secured by the student either in regular or improvement examination will be accounted. Improvement and re-examination will not be allowed in courses with only practical. Those who fail in these subjects shall have to repeat the course in the subsequent year/years.

12.4. The camp requirement in NSS and NCC may be allowed along with juniors if the student has secured more than 80% attendance in the regular courses.

12.5. Those who miss the study tours for any valid reason must undertake the tour along with juniors to complete the degree programme.

12.6. A continuing candidate cannot appear for more than six subjects in the reappearance examination at a time. The candidate who has completed the tenure of four years in the B.Sc. (Hort.) Degree Programme (private candidate) cannot appear for more than 16 subjects in the reappearance examination at a time.
12.7. The candidates for the reappearance examinations will submit their applications through the Dean, Faculty of Agriculture who will scrutinize the applications to ensure compliance of regulation 12.1 and 12.3. The attested copy of all grade sheets pertaining to the reappearance examinations should be enclosed along with the applications.

13. Malpractices in Examinations

13.1. The Dean, Faculty of Agriculture shall be responsible for dealing all cases of unfair means by students in writing records, assignments and examinations.

13.2. The invigilator or the course teacher concerned shall report each case of unfair means with full details of the evidence and written explanation of the student concerned to the Dean immediately.

13.3. The Dean shall take appropriate steps on receipt of the report and the report will be sent to the Controller of Examinations for appropriate action as prescribed by the University.

14. Regulations of student conduct and discipline

14.1. Ragging Rules: Students found involved in ragging or in any other misconduct, or if a complaint is received from the affected student(s) to that effect, will be immediately expelled from the current semester and the Dean shall further constitute a committee to probe and conduct enquiry into the matter and based on the report of the committee, the Dean shall forward the same to the Registrar to pass the final orders on merit of case within three working days.

14.2. Unlawful Activities: In case of students found involved in any unlawful activities either within or outside the Hostel/College Campus, besides expulsion both from the Hostel and College, at the discretion of the Dean with the knowledge of the Registrar, the matter will be reported to the Police of the jurisdiction to be dealt with, in accordance with the appropriate law in force.

14.3. Ragging – An offence

Extract of Tamil Nadu Government Gazette – Extra ordinary dt. 29.01.1997 (Tamil Nadu Prohibition of Ragging Act, 1997).

In this Act, unless the context otherwise requires, “Ragging” means display of noisy, disorderly conduct, doing any act which causes or is likely to cause physical or psychological harm or raises apprehension or fear or shame or embarrassment to a student in any educational institution and includes: teasing, abusing or playing practical jokes on or causing hurt to such student or asking the student to do any act or perform something which such student will not, in the ordinary course willingly act or perform. Ragging within or outside any educational institution is prohibited.

Who ever directly or indirectly commits, participates in, abets or propagates “Ragging” within or outside any educational institution, shall be punished with imprisonment for a term which may extend to two years and shall also be liable to fine which may extend to ten thousand rupees.

Any student convicted of an offence under section 4 shall also be dismissed from the educational institution and such student shall not be admitted in any other educational institution.

Without prejudice to the foregoing provision, whenever any student complains of ragging to the head of an educational institution, or to any other person responsible for the management of the educational institution, such head of the educational institution or person responsible for the management of the educational institution shall inquire into the same immediately and if found true
shall suspend the student who has committed the offence from the educational institution.

On the recommendation of the Dean, Faculty of Agriculture, The Registrar will have full powers to punish any student who violates the rules by imposing a fine, suspension or expulsion. His decision is final and he need not assign any reason or explanation for the punishment awarded.

These rules will be altered or amended, and further rules may be added if necessary. All the rules for the time being in force should be observed by the students.

15. Award of Degree

The degree namely B.Sc. (Hort.) shall be awarded during convocation under the seal of the University to the students who have successfully completed all the graduation requirements as detailed below.

The candidates should have undergone successfully the prescribed course of study in the University. They shall further be required to have completed and passed 180 course credits and shall have earned an overall grade point average (OGPA) of 6.50 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.

The University shall issue Provisional Certificate (PC) to the candidates after having passed all provisional examinations.

15.1. Class ranking

In calculation of class equivalent for OGPA the following classification shall be adopted

<table>
<thead>
<tr>
<th>OGPA</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.00 and above</td>
<td>Distinction</td>
</tr>
<tr>
<td>8.00 to 8.99</td>
<td>I Class</td>
</tr>
<tr>
<td>7.00 to 7.99</td>
<td>II Class</td>
</tr>
<tr>
<td>6.50 to 6.99</td>
<td>Pass</td>
</tr>
</tbody>
</table>

16. Transitory Regulations

Separate time table of course work under old semester system will be arranged by the HOD 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 the academic year 2017 – 2018.

The candidates under old semester system will, however, complete all the examinations within a period of eight academic years from the year of admission.

17. Removal of difficulties

If any difficulty arises in giving effect to the provisions of these regulations, based on the recommendations of the Dean, the Vice-Chancellor may issue necessary orders, which appear to him to be necessary or expedient for removing the difficulty.
### Semester I

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Course No.</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.</td>
<td>HOR 110</td>
<td>Fundamentals of Horticulture</td>
<td>2+1</td>
</tr>
<tr>
<td>02.</td>
<td>AGR 111*</td>
<td>Fundamentals of Agricultural Meteorology</td>
<td>1+1</td>
</tr>
<tr>
<td>03.</td>
<td>SAC 112*</td>
<td>Principles of Analytical Chemistry</td>
<td>1+1</td>
</tr>
<tr>
<td>04.</td>
<td>GBP 113*</td>
<td>Fundamentals of Plant Physiology</td>
<td>2+1</td>
</tr>
<tr>
<td>05.</td>
<td>TAM 114* or ENG 114</td>
<td>தமிழ் இலகியகளின் வளா மற்றும் இவ்வாழ்வியத்தின் வளா [Or] Development Education</td>
<td>0+1</td>
</tr>
<tr>
<td>06.</td>
<td>ENG 115*</td>
<td>English for Effective Communication</td>
<td>0+1</td>
</tr>
<tr>
<td>07.</td>
<td>PED 116*</td>
<td>Physical Education</td>
<td>0+1</td>
</tr>
<tr>
<td>08.</td>
<td>PED 117*</td>
<td>Principles and practices of yoga</td>
<td>0+1</td>
</tr>
<tr>
<td>09.</td>
<td>NSS/NCC 118*</td>
<td>National Service Scheme/National Cadet Corps</td>
<td>0+1</td>
</tr>
<tr>
<td>10.</td>
<td>HOR 119</td>
<td>Plant Propagation and Nursery Management</td>
<td>1+1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>7+10 =17</td>
</tr>
</tbody>
</table>

### Semester II

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Course No.</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.</td>
<td>HOR 120</td>
<td>Production Technology of Tropical and Arid Zone Fruits</td>
<td>2+1</td>
</tr>
<tr>
<td>02.</td>
<td>HOR 121</td>
<td>Growth and Development of Horticultural Crops</td>
<td>1+1</td>
</tr>
<tr>
<td>03.</td>
<td>ENT 122*</td>
<td>Fundamentals of Entomology</td>
<td>2+1</td>
</tr>
<tr>
<td>04.</td>
<td>AGM 123*</td>
<td>Fundamentals of Microbiology</td>
<td>2+1</td>
</tr>
<tr>
<td>05.</td>
<td>SAC 124 *</td>
<td>Fundamentals of Biochemistry</td>
<td>2+1</td>
</tr>
<tr>
<td>06.</td>
<td>GPB 125</td>
<td>Botany of Horticultural Crops</td>
<td>1+1</td>
</tr>
<tr>
<td>07.</td>
<td>AEC 126*</td>
<td>Principles of Economics</td>
<td>1+1</td>
</tr>
<tr>
<td>08.</td>
<td>AHS 127</td>
<td>Livestock and Poultry Management</td>
<td>2+1</td>
</tr>
<tr>
<td>09.</td>
<td>COM 128*</td>
<td>Fundamentals of Information Technology</td>
<td>1+1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>14+9=23</td>
</tr>
</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>01.</td>
<td>HOR 210</td>
<td>Production Technology of Tropical Vegetables</td>
<td>2+1</td>
</tr>
<tr>
<td>02.</td>
<td>HOR 211</td>
<td>Production Technology of Plantation Crops, Spices and Condiments</td>
<td>2+1</td>
</tr>
<tr>
<td>03.</td>
<td>PAT 212</td>
<td>Principles of Plant Pathology</td>
<td>2+1</td>
</tr>
<tr>
<td>04.</td>
<td>SAC 213*</td>
<td>Fundamentals of Soil Science</td>
<td>2+1</td>
</tr>
<tr>
<td>05.</td>
<td>GPB 214*</td>
<td>Principles of Genetics and Cytogenetics</td>
<td>2+1</td>
</tr>
<tr>
<td>06.</td>
<td>AGR 215</td>
<td>Irrigation and Weed Management</td>
<td>1+1</td>
</tr>
<tr>
<td>07.</td>
<td>AEC 216*</td>
<td>Production Economics and Farm Management</td>
<td>1+1</td>
</tr>
<tr>
<td>08.</td>
<td>ENT 217</td>
<td>Economic Entomology and Nematology</td>
<td>1+1</td>
</tr>
<tr>
<td>09.</td>
<td>AEX 218</td>
<td>Rural Sociology, Educational Psychology and Dimensions of Extension Education</td>
<td>2+1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>15+9=24</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>01.</td>
<td>HOR 220</td>
<td>Commercial Floriculture</td>
<td>2+1</td>
</tr>
<tr>
<td>02.</td>
<td>HOR 221</td>
<td>Study Tour</td>
<td>0+1</td>
</tr>
<tr>
<td>03.</td>
<td>ENT 222</td>
<td>Principles of Pest Management</td>
<td>1+1</td>
</tr>
<tr>
<td>04.</td>
<td>AGM 223*</td>
<td>Soil and Applied Microbiology</td>
<td>2+1</td>
</tr>
<tr>
<td>05.</td>
<td>PAT 224</td>
<td>Mushroom Culture</td>
<td>0+1</td>
</tr>
<tr>
<td>06.</td>
<td>GPB 225*</td>
<td>Principles and Methods of Plant Breeding</td>
<td>2+1</td>
</tr>
<tr>
<td>07.</td>
<td>AEC 226*</td>
<td>Agricultural Marketing, Trade and Prices</td>
<td>1+1</td>
</tr>
<tr>
<td>08.</td>
<td>STA 227*</td>
<td>Agricultural Statistics</td>
<td>1+1</td>
</tr>
<tr>
<td>09.</td>
<td>ENG 228*</td>
<td>Soft Skills of Employability</td>
<td>0+1</td>
</tr>
<tr>
<td>10.</td>
<td>AEG 229*</td>
<td>Farm Power, Machinery and Renewable Energy</td>
<td>2+1</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>11+10=21</strong></td>
<td></td>
</tr>
</tbody>
</table>

### Semester V

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Course No.</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.</td>
<td>AGR 310*</td>
<td>Climate Change and Disaster Management</td>
<td>1+0</td>
</tr>
<tr>
<td>02.</td>
<td>HOR 311</td>
<td>Breeding of Horticultural Crops</td>
<td>2+1</td>
</tr>
<tr>
<td>03.</td>
<td>HOR 312</td>
<td>Biotechnology of Horticultural Crops</td>
<td>1+1</td>
</tr>
<tr>
<td>04.</td>
<td>HOR 313</td>
<td>Urban and Environmental Horticulture</td>
<td>1+1</td>
</tr>
<tr>
<td>05.</td>
<td>AGM 314*</td>
<td>Environmental Science</td>
<td>2+1</td>
</tr>
<tr>
<td>06.</td>
<td>SAC 315*</td>
<td>Soil Fertility, Fertilizers and Manures</td>
<td>2+1</td>
</tr>
<tr>
<td>07.</td>
<td>AGR 316</td>
<td>Production Technology of Field Crops</td>
<td>2+1</td>
</tr>
<tr>
<td>08.</td>
<td>ENT 317</td>
<td>Insects, Mites and Nematode Pests of Horticultural Crops and Their Management</td>
<td>2+1</td>
</tr>
<tr>
<td>09.</td>
<td>AEC 318*</td>
<td>Agri Business Management and Entrepreneurship</td>
<td>1+1</td>
</tr>
<tr>
<td>10.</td>
<td>AEG 319*</td>
<td>Fundamentals of Soil and Water Conservation Engineering</td>
<td>2+1</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>16+9=25</strong></td>
<td></td>
</tr>
</tbody>
</table>

### Semester VI

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Course No.</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.</td>
<td>HOR 320</td>
<td>Syli Horticulture</td>
<td>1+1</td>
</tr>
<tr>
<td>02.</td>
<td>HOR 321</td>
<td>Production Technology of Temperate and Subtropical Fruits</td>
<td>2+1</td>
</tr>
<tr>
<td>03.</td>
<td>HOR 322</td>
<td>Production Technology of Temperate and Subtropical Vegetables</td>
<td>2+1</td>
</tr>
<tr>
<td>04.</td>
<td>HOR 323</td>
<td>Ornamental and Landscape Gardening</td>
<td>2+1</td>
</tr>
<tr>
<td>05.</td>
<td>PAT 324</td>
<td>Diseases of Fruits, Plantation, Medicinal, Aromatic Crops and their Management</td>
<td>2+1</td>
</tr>
<tr>
<td>06.</td>
<td>HOR 325</td>
<td>Protected Cultivation and Precision Horticulture</td>
<td>2+1</td>
</tr>
<tr>
<td>07.</td>
<td>AEC 326*</td>
<td>Agricultural Finance, Banking and Cooperation</td>
<td>1+1</td>
</tr>
<tr>
<td>08.</td>
<td>AEX 327*</td>
<td>Extension Methodologies and Transfer of Agricultural Technology</td>
<td>1+1</td>
</tr>
<tr>
<td>09.</td>
<td>HOR 328</td>
<td>Crop Production - Vegetable Crops</td>
<td>0+1</td>
</tr>
<tr>
<td>10.</td>
<td>EXP 329</td>
<td>Experiential Learning -I</td>
<td>0+6</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>13+15=28</strong></td>
<td></td>
</tr>
</tbody>
</table>
# B.Sc. (Horticulture) Regulations and Syllabus 2017-18

## Semester VII

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Course No.</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.</td>
<td>RAWE AEX 410</td>
<td>Rural Awareness Work Experience</td>
<td>0+5</td>
</tr>
<tr>
<td>02.</td>
<td>RAWE AGR 411</td>
<td>Field Crop Production</td>
<td>0+2</td>
</tr>
<tr>
<td>03.</td>
<td>RAWE HOR 412</td>
<td>Horticultural Crop Production</td>
<td>0+3</td>
</tr>
<tr>
<td>04.</td>
<td>RAWE CPT 413</td>
<td>Crop Protection (Entomology and Plant Pathology)</td>
<td>0+4</td>
</tr>
<tr>
<td>05.</td>
<td>AEX 414</td>
<td>All India Study Tour</td>
<td>0+1</td>
</tr>
<tr>
<td>06.</td>
<td>HIA 415</td>
<td>Horticultural Industrial Attachment</td>
<td>0+6</td>
</tr>
</tbody>
</table>

**Total** 0+21 = 21

## Semester VIII

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Course No.</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.</td>
<td>HOR 420</td>
<td>Processing and Post Harvest Management of Horticultural Crops</td>
<td>2+1</td>
</tr>
<tr>
<td>02.</td>
<td>HOR 421</td>
<td>Organic Horticulture</td>
<td>1+1</td>
</tr>
<tr>
<td>03.</td>
<td>HOR 422</td>
<td>Production Technology of Medicinal and Aromatic Crops</td>
<td>1+1</td>
</tr>
<tr>
<td>04.</td>
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<td>Seed Production - Principles and Technologies in Horticultural Crops</td>
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<td>Project Work</td>
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<td>Diseases of Vegetable, Ornamental, Spice Crops and their Management</td>
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**Total** 8+13 = 21

* Common courses for B.Sc. (Ag.) and B.Sc. (Hort.)*

RAWE – Rural Awareness Work Experience; HIA-Horticultural Industrial Attachment

EXP – Experiential Learning; HPW – Horticultural Project Work

## Abstract

**Semester wise credits**

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**Total** 68 84 96 180
## Department wise Course Distribution

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Total: 29+29=58
### Agronomy

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<td>Production Technology of Field Crops</td>
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<td>RAWE AGR 411</td>
<td>Field Crop Production</td>
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**Total**: 5+5=10

### Genetics and Plant Breeding

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<th>Credits</th>
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<td>Principles and Methods of Plant Breeding</td>
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<td>Seed Production- Principles and Technologies in Horticultural Crops</td>
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**Total**: 9+5=14

### Soil Science and Agricultural Chemistry

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<td>Principles of Analytical Chemistry</td>
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<td>SAC 315*</td>
<td>Soil Fertility, Fertilizers and Manures</td>
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**Total**: 7+4=11

### Agricultural Entomology

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<td>Fundamentals of Entomology</td>
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<td>ENT 217</td>
<td>Economic Entomology and Nematology</td>
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<td>ENT 222</td>
<td>Principles of Pest Management</td>
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<td>ENT 317</td>
<td>Insects, Mites and Nematode Pests of Horticultural Crops and their Management</td>
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<td>RAWE CPT 413</td>
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**Total**: 6+6=12

### Plant Pathology

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<td>PAT 224</td>
<td>Mushroom Culture</td>
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<td>VI</td>
<td>PAT 324</td>
<td>Disease of Fruits, Plantation, Medicinal, Aromatic Crops and their management</td>
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<td>RAWE CPT 413</td>
<td>Crop Protection</td>
<td>0+2</td>
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**Total**: 6+6=12
### Agricultural Microbiology

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### Courses offered by other departments

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## Languages

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<td>TAM 114 (Or) ENG 114</td>
<td>தமிழ் இலகியகளி அறிவிய பயணம் (0 + 1) (Or) Development Education</td>
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### Common Courses

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Total 0+17=17

## Department wise Credit distribution

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<td>03.</td>
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<td>05.</td>
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<td>06.</td>
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<td>Agricultural Extension</td>
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<td>12.</td>
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Total 180
HOR 110 FUNDAMENTALS OF HORTICULTURE (2+1)

Objectives
To 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

Unit–II: Establishment of Orchard and Production Techniques, Factors Influencing Crop Production

Unit–III: Nursery Management and Cropping System

Unit–IV: Growth and Development

Unit–V: Protected Cultivation and Post-Harvest Technology

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.
6. Different climate zones of India and Tamil Nadu in relation to horticulture crops.
8. Different planting systems.
9. Nutrition garden, kitchen garden and other types of garden.
10. Soil and climate factors in relation to horticulture crop production.
11. Factors limiting horticulture crop production.
12. Fertility management in orchards.
15. Study of cropping systems.
17. Mid Semester Examination
19. Principles of organic farming
20. Bearing habits of horticulture crops.
21. Study of flowering, pollination and fruit set in horticulture crops.
22. Unfruitfulness – causes and prevention in horticulture crops.
23. Fruit drop – causes and prevention in horticulture crops.
27. Role of growth regulators in horticultural crops.
28. Principles and practices of protected cultivation.
29. Study of different types of media and protected structures for propagation.
30. Study of green house components
31. Environmental control for crop production.
32. Post-harvest technology – importance and causes for post-harvest losses.
33. Maturity indices – climacteric and non climacteric fruits.
34. Harvesting methods.

Practical Schedule
1. Study of different features of orchard.
2. Planning, layout and planting of 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 mixtures 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. Practice in judging the maturity indices of fruits and vegetables.
15. Study of harvesting methods.
16. Visit to green houses.
17. Orientation for final practical examination.

References
AGR 111 – FUNDAMENTALS OF AGRICULTURAL METEOROLOGY (1+1)

OBJECTIVES
This course is scheduled to study the problems of plant growth and yield in relation to environmental factors. Agricultural 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 – List of extreme points with the 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
Atmospheric pressure - cyclones, anticyclones, tornado, hurricane and storms – swinging of pressure belt - EL Nino and La Nino - definition and causes. Wind and its effect on crops.

Unit -IV: Clouds and Precipitation

Unit -V: Agro climatic zones and weather forecasting
Agroclimatic Zones of India and Tamil Nadu – Agroclimatic normals – Basics of weather forecasting –importance, synoptic chart - crop weather calendar - Remote sensing - Impact of climate and weather on crop production - pest and diseases.

PRACTICAL
Agromet Observatory - Site selection and layout. Acquiring skill in the use of different instruments and recording data on rainfall / precipitation 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.
2. Extreme points / Coordinates of India and Tamil Nadu. Atmosphere - Composition of atmosphere - Vertical layers of atmosphere based on temperature difference / lapse rate.
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 / references crop ET₀ - Definition and their importance in agricultural production.
12. Weather forecasting / Warming - Types, importance, Agro Advisory Services, Agromet services for India
13. Agro climatic zones of Tamil Nadu - Agro climatic normals for field crops.
14. Synoptic chart
15. Crop weather calendar.
17. Effect of weather and climate on crop production, soil fertility and incidence of pest and diseases.

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 - AWS
3. Measurement of air, soil temperature and grass minimum temperature and study of thermo hygrograph
4. Measurement of solar radiation and sunshine hours
5. Humidity measurements – use of wet and dry bulb, Assmann psychrometer
6. Measurement of wind direction and wind speed
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-
11. Study of Automatic weather station
12. Data analysis for rainfall chart and thermo hygrograph chart data
13. Analysis of weather data – Mean, monthly, annual and diurnal variation of weather variables.
14. Preparation of crop weather calendars and forecast based agro advisories
15. Preparation of Synoptic charts
17. Orientation for final examination

REFERENCE BOOKS

e-resource
OBJECTIVES: This course aims to familiarize students with the basic principles of Analytical Chemistry and instrumentation techniques. The principles and applications of sampling and separation techniques, titrimetric analysis, UV-visible and spectrophotometry, gravimetric analysis and electrochemical methods are emphasized.

THEORY

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

Unit II: Standards and Indicators

Unit III: Gravimetric Analysis

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

Unit V: Radiation Chemistry

PRACTICAL

THEORY SCHEDULE
1. General principles in analytical chemistry – common analytical methods – quantitative and qualitative analysis – Accuracy and precision of analytical results.
2. Preparation of laboratory reagents – digestion and distillation techniques.
9. Mid Semester Examination.
11. Instrumental methods of analysis- Principles and practices of potentiometry, conductometry, colorimetry and spectrophotometry.
12. Principles and practices of absorption and emission spectroscopy-ICPA
13. Principles and practices of chromatography – Paper chromatography, Gas Chromatography, TLC, HPLC and HPTLC.
17. Use of radioactive and stable isotopes in analytical applications.
PRACTICAL SCHEDULE

1. Study of common laboratory glassware and apparatus – General Guidelines in the laboratory. Part - I
2. Volumetric analysis – Preparation of primary, secondary standards and indicators
3. Acidimetry – Standardization of bases
4. Alkalimetry – Standardization of acids
5. Permanganimetry – Standardization of KMnO4
6. Dichrometry – Standardization of Ferrous Sulphate
7. Iodimetry – Estimation of Copper
8. Complexometry – Estimation of Calcium and Magnesium
11. Spectrophotometry – Determination of phosphorus
12. Turbidimetry – Estimation of Sulphur
13. Flame Photometry – Estimation of Potassium
14. Absorption spectrophotometry – Estimation of Fe, Zn, Mn, Cu
15. Identification of sub atomic particles, calculation of Half life and Activity Constant
16. Identification of types of radioactive decay
17. Orientation for final examination

REFERENCE BOOKS


E-references

GPB 113 FUNDAMENTALS OF PLANT PHYSIOLOGY (2+1)

OBJECTIVES
To impart basic knowledge on various functions and processes related to crop production, mineral nutrition, plant growth regulators and environmental stresses.

THEORY
Unit I: Plant Water Relations

Unit II: Plant Mineral Nutrition
Unit III: Photosynthesis and Respiration

Light reaction – Photosystems- red drop and Emerson enhancement effect-
Photolysis of water and photophosphorylation - Photosynthetic pathways – C₃ and C₄,
CAM – difference between three pathways - Factors affecting photosynthesis-
Photorespiration – pathway and its significance - Phloem transport – Munch hypothesis
- Phloem loading and unloading - Source and sink strength and their manipulations - Glycolysis – TCA cycle - Oxidative phosphorylation – difference between photo and oxidative phosphorylation – energy budgeting - respiratory quotient.

Unit IV: Growth and Development

Growth – phases of growth - Factors affecting growth – Hormones-
classifications - Biosynthetic pathway and role of auxins - Biosynthetic pathway and role of gibberellins and cytokinins- Biosynthetic pathway and role of ethylene and ABA-
Novel and new generation PGR’s – Brassinosteroids and salicylic acid - Growth retardants – Commercial uses of PGR’s- Photoperiodism - short, long and day neutral plants – Chailakhyan’s theory of flowering- Forms of phytochrome - Pr and Pfr - regulation of flowering – Vernalisation - Theories of vernalisation - Seed germination - physiological and biochemical changes - seed dormancy and breaking methods - Senescence and abscission – physiological and biochemical changes -Physiology of fruit ripening- climacteric and non-climacteric fruits - factors affecting ripening-
Manipulations

Unit V: Stress Physiology

Classification of stresses - Physiological changes and adaptations to drought, flooding, high and low temperature, salinity and UV radiation – compatible osmolytes – membrane properties — compartmentalization – stress alleviation - Global warming – green house gases – physiological effects on crops - Carbon Sequestration

PRACTICALS


THEORY LECTURE SCHEDULE

1. Importance of Crop Physiology in Agriculture – Structure of plasma membrane, chloroplast, mitochondria, peroxisome and vacuole
4. Translocation of water – ascent of sap – mechanisms of xylem transport
5. Transpiration – significance – structure of stomata - mechanisms of stomatal opening and closing - guttation - antitranspirants
7. Physiological functions and disorders of macro nutrients – Hidden hunger
8. Physiological functions and disorders of micro nutrients
9. Foliar nutrition- root feeding and fertigation – sand culture, hydroponics and aeroponics
10. Light reaction – photolysis of water and photophosphorylation
11. Photosynthetic pathways – C₃ and C₄ cycles
12. CAM pathway – difference between three pathways - Factors affecting photosynthesis.
13. Photorespiration – pathway and its significance
14. Phloem transport – Munch hypothesis - Phloem loading and unloading - Source and sink strength and their manipulations
15. Glycolysis – TCA cycle
16. Oxidative phosphorylation – difference between photo and oxidative phosphorylation – energy budgeting - respiratory quotient
18. Mid Semester Examination
19. Biosynthetic pathway and role of auxins
20. Biosynthetic pathway and role of gibberellins and cytokinin
21. Biosynthetic pathway and role of ethylene and ABA
22. Novel growth regulators – Brassinosteroids and salicylic acid – New Generation PGR's
23. Growth retardants and inhibitors -commercial uses of PGR's
24. Photoperiodism - short, long and day neutral plants – Chailakhyan’s theory of flowering
25. Forms of phytochrome - Pr and Pfr - regulation of flowering
26. Vernalisation - theories of vernalisation – Lysenko and Chailakhyan’s theories
27. Seed germination - physiological and biochemical changes - seed dormancy and breaking methods
28. Senescence and abscission – physiological and biochemical changes
29. Physiology of fruit ripening- climacteric and non climacteric fruits - factors affecting ripening and manipulations
30. Drought - physiological changes - adaptation – compatible osmolytes - alleviation
31. High and low temperature stress – physiological changes - membrane properties - adaptation
32. Salt stress - physiological changes - adaptation – compartmentalization - alleviation
33. Flooding and UV radiation stresses – physiological changes - adaptation
34. Global warming – green house gases —physiological effects on crop productivity- Carbon Sequestration

PRACTICAL SCHEDULE
1. Preparation of different types solutions
2. Measurement of plant water potential by different methods
3. Estimation of photosynthetic pigments- chlorophylls and Carotenoids
4. Determination of stomatal index and stomatal frequency
5. Measurement of leaf area by different methods
6. Physiological and Nutritional disorders in crops plants
7. Estimation of chlorophyll Stability Index
8. Estimation of Relative Water Content
9. Determination of photosynthetic efficiency in crop plants – soluble protein
10. Estimation of Nitrate Reductase activity
11. Growth Analysis - LAI, LAD, SLA, SLW, LAR, NAR, RGR, CGR and HI
12. Bioassay of Cytokinin
13. Bioassay of GA
14. Estimation of proline
15. Demonstration of Practical applications of PGRs.
16. Field visit for foliar diagnosis
17. Orientation for final examination

REFERENCE BOOKS

E-books and e-references
3. http://4e.plantphys.net
4. www.plantphysiol.org
ENG. 114 DEVELOPMENT EDUCATION (0+1)
(Alternate courses for non-Tamil students)

OBJECTIVES

- Basic principles of learning
- Taxonomy of educational
- Career development and entrepreneurship
- Communication skills

LECTURE SCHEDULE
2. Occupation and profession, training and education, lateral thinking and convergent thinking, teaching and learning – discussion.
3. Bloom’s classification of educational objectives – Cognitive, Affective, Psychomotor domain(s)
4. Career development – opportunity for graduates of agriculture and allied sciences – discussion
5. Success story of a farmer / entrepreneur – factors involved – role – play
6. Brainstorming – Demonstration
7. Simulation – Educational Simulation-Interactive Teaching - Business Simulation – Company’s annual report for analysis
8. Interpersonal communication – Transactional communication – ice breaker
9. Mid semester examination
10. The conduct of a symposium
11. Conferencing – the concept and presentation of a paper
12. Scientific Article Writing and Editing
13. Popular Article Writing, Editing and Blogging
14. Project proposal
15. Project Report – writing
17. Orientation for final examination

REFERENCE BOOKS

ENG 115 ENGLISH FOR EFFECTIVE COMMUNICATION  (0+1)
OBJECTIVES
To make the students competent in Listening – Receptive skill, Speaking – Productive skill, Reading - Receptive skill and Writing - Productive skill
Unit I - Listening
  Introduction - Listening vs Hearing - Basic listening modes - Types of listening - Intensive and Extensive Listening - Process of Listening - Methods of enhancing listening- Barriers of listening.
Unit II - Speaking
Unit III - Reading

Introduction to Reading - Types of reading - Skimming and Scanning - Idea reading (Reading for information) - Exploratory reading - Study reading (Text reading) - Critical reading - Analytical reading - Note-making - Précis Writing.

Unit IV - Writing

Word formation (prefix, suffix and word coining) - Word expansion (root word and etymology) - Compound words - Single word substitutes - Abbreviations and acronyms - Sentence agreement - Sentence completion - Sentence correction - Writing definitions - Coherence and cohesion in writing - Mind mapping in writing - Paragraph writing techniques - Thesis sentence writing - Inferential sentence writing - Logical arrangement of sentences - Letter Writing - Text conversion - Interpreting charts, graphs, diagrams into text - Poster making - Essay writing (types of essays).

Unit V

Integrated skills - Group Discussion - Presentation (Seminar) - Forum discussion - Brain Storming - Debate - Writing Fan-mail - e-mail.

The Practical Class Schedule for the revised English course is as follows:

1. Introduction - Listening vs Hearing - listening modes - Types of listening - Intensive and Extensive Listening
2. Process of Listening - methods of enhancing listening
3. Barriers of listening - Note-taking
4. English Phonology - Influence of Language 1 on Language 2
5. English Stress and Intonation
6. Principles of speech preparation
7. Presentation skills
8. Techniques of speaking
9. Mid semester examination
10. Introduction to reading - Types - Scanning and Skimming - Idea reading (Reading for information) - Exploratory reading - Study reading (Text reading) - Critical reading - Analytical reading - Note-making - Précis writing.
11. Word formation (prefix, suffix and word coining) - Word expansion (root word and etymology) - Compound words - Single word substitute - Abbreviations and Acronyms
12. Sentence agreement - Sentence completion - Sentence correction - Writing definitions
13. Writing Practice - Mind mapping - sentence writing - Logical arrangement of sentences
14. Paragraph writing - techniques - Thesis sentence writing - Inferential sentence writing - Coherence and cohesion in writing
15. Letter Writing - Types of letters
16. Text conversion - Interpreting charts, graphs, diagrams into text - Poster making - Essay writing (types of essays)
17. Orientation for final examination

REFERENCE BOOKS

5. Helgesen, Mark et al., Active listening, 1997, Cambridge University
10. Robert, A. Day How to Publish a Scientific Article 2001, Oxford University
Exercises for strength, agility, co-ordination, flexibility, co-operation, vital capacity, endurance, speed and for various systems of our body and team spirit.

Exercise for Good Posture – Conditioning and calisthenics for various Athletic activities, i.e. (a) Before start – Arm stretch, hand stretch and cat stretch (b) Loosening up jogging, bending and twisting (c) Standing – Lateral Arc, triangle and hands to feet pose (d) Sitting – camel kneel, spinal twist and supine knee bend (e) Relaxation – The corpse pose, quick and deep relaxation. Basic gymnastic exercises – participation of athletic events – running, throwing and jumping events.

SKILL DEVELOPMENT IN ANYONE OF THE FOLLOWING GAMES

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

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

Volley Ball: Fingering, under arm pass, over head pass, setting, spiking, back pass, jump pass, stunts, elementary dive, diving dive, roll, blacking and various types of services.

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

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

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

Kho-Kho: Quadra ped, bi-ped, how to given kho, taking a direction, recede, parallel toe method, bullet tow method, distal method, foot out, dive, ring game, chains and pursue and defence skills.

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

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

Cricket: Grip, bowling, spin, leg spin, off spin, medium, batting, dive, sweep, mode of delivery, fielding, rolling etc.
Tennis: Grip, forehand drive, back hand drive, stroke, backhand ground stroke, service, volley, smash, wall practice, foot work, defence and offence tactics.
Table Tennis: Grip, tossing and serving, spin serve, rally, smash, flick, defence and offence tactics.
Shuttle Badminton: Grip, foot work, service, setting, smash, volley, forehand and back hand stroke, back hand serve and defence.
Gymnastics: Balanced walk, execution, floor exercise, tumbling/acrobatics, grip, release, swinging, parallel bar exercise, horizontal bar exercise, flic-flac-walk and pyramids.

ATHLETICS
(a) Sprint: Medium start, long start, bunch start, set, pick up, finish, upsweep, downsweep, placement, receiving and exchanging.
(b) Jumps : Western roll, belly roll, eastern cut off, fass ferry flop, approach, take off, straddle, hitch-kick, handgging, clearance, landing, strides etc.
(c) Throws : Grip, momentum, pre shift, sub phase, the wind up, foot work, entry to the turn, shift, angle of release, follow throw, delivery, front cross step, rear cross step, hop step, fuck method pary obraine, discoput, rotation, carry and glide.
(d) Hurdles: Finding lead leg, use of lead leg and trial leg, flight, clearing, finish.
   Lead up games, advance skills and game for any one of the above games.

PED 117 PRINCIPLES AND PRACTICES OF YOGA (0 + 1)

PRINCIPLES (20 hrs)
UNIT I
Introduction to yoga : The origins of yoga – Definitions – concepts – Aims and objectives of yoga – Five principles of yoga – yoga Diet – Classification of Diet
UNIT II
Streams of yoga: Karma yoga – Bhakti yoga – Jnana yoga – Raja yoga (Astanga yoga)
UNIT III
UNIT IV
Scientific effects: Physiological, Psychological, Biochemical effects on various systems of human body: Asana – Pranayama – Mudra - Bandha and Shat Kriya
UNIT V
Meditation and relaxation techniques: Meditation: Introduction – Meaning – Definition - Techniques –Obstacles – Benefits; Relaxation techniques: IRT – QRT – DRT – Psychic sleep

PRACTICAL (40 hrs)
1. Prayer - Starting and closing
2. Breathing practices for awareness : Hands in and out breathing,-Hand stretch breathing- Ankle breathing
3. Preparatory practices: Loosening practices- Forward and backward bending – Lateral bending-Alternate toe touching-spinal twisting; Jogging-Forward-Backward and Sideward
4. Suryanamaskar – Start with prayer/mantra – 12 poses
5. Asana: Standing –Periyaasana, Padhastasana, Trikonasana; Siting – Vajrasana,Paschimotanas, Ushtrasana, Vakrasana; Prone – Makrasana; Bhujangasana, Shalabasana, Dhanurasana; Supine – Uttanapadasana, Sarvangasana, Matyasana, Halasana, Chakrasana, Savasana
7. Mudra – Chin mudra, Chinmaya mudra, Adhi mudra, Brahma mudra, Namaskara mudra, Maha mudra, Vishnu mudra/Nasiga mudra, Yoga mudra
8. Bandha - Jalandra Bandha, Uddiyana Bandha, Moola Bandha
9. Kriya - Kapala pathi, Trataka-Jothi trataka, Jatru trataka; Neti-Jala neti, Sutra neti; Dhouti –Vamana dhouti
10. Dhayana practice – Meditation
11. Relaxation – Instant relaxation technique (IRT); Quick relaxation technique (QRT); Deep relaxation technique (DRT)
12. Practical record preparation

References
2. Shivananda Saraswati, Yoga Therapy, Bihar School of Yoga, Munger, 1998
3. Swami Satyananda Saraswati, Asana, Pranayama, Mudra and Bandha, Bihar School of Yoga, Munger, 2002
5. Hatha yoga Pradipika, Swami Satyananda Saraswati, Bihar School of Yoga, Munger, 2004

NSS/NCC 118 NATIONAL SERVICE SCHEME/NATIONAL CADET CORPS

NSS

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

NCC

PRACTICAL SCHEDULE
1. NCC song – Aims and Motto of NCC – Motivation of cadets
2. History of NCC and organization of NCC
3. Food drill – General and word of Command
5. National Integration – Indian History and Culture
6. Health and Hygiene – Structure and Function of a human body, hygiene and Sanitation
7. Social Service – weaker sections of our society and their needs
8. Self Defence – Theory and practice, prevention of untoward incidence
9. Map reading – introduction to map, and lay out of map
10. Disaster Management Civil defence organization and its duties
11. Communication – Different types – media
12. Signals – introduction to radio, telephony procedures
13. Field Engineering – principles and applications, camouflage and concealment
14. Adventure training introduction, different types
15. First Aid – methods and practices
17. Besides the above schedule, NCC cadets will be involved during important occasions during convocation, Independence day, Republic day, etc.

HOR 119 PLANT PROPAGATION AND NURSERY MANAGEMENT (1+1)

Objectives
Plant propagation is one of the fundamental agricultural operations which involves multiplication and perpetuation of seeds and planting material 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 carry out all scientific horticultural operations and also nursery management practices.

Theory
Unit–I: Methods of propagation
Scope and importance – propagation – overview – methods of sexual and asexual propagation – advantages and disadvantages of sexual and vegetative propagation.

Unit–II: Principles and methods of seed propagation

Unit–III: Propagation structures

Unit–IV: Asexual propagation techniques

Unit–V: Micro propagation
Micro propagation - culture media- culture conditions - meristem culture - callus culture – micro grafting- hardening of plants in nurseries - clonal orchards- nursery registration act.

Practical

Lecture Schedule
1. Scope and importance of plant propagation, study of sexual and asexual methods of propagation.
2. Advantages and disadvantages of sexual and vegetative propagation.
3. Seed dormancy – Internal and external factors.
4. Nursery techniques, protray culture, apomixes, monoembryony and polyembryony.
5. Propagation structures - mistchambers, cold frames, hot beds, humidifiers.
6. Construction of green houses and glass houses and its controlling system.
7. 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. Types of layering and techniques of preparation.
15. Propagation by specialized plant parts – bulbs and tubers.
16. Propagation by specialized plant parts – runners, suckers and other organs.
17. Micro propagation techniques

Practical Schedule
1. Preparation of nursery beds, seed treatment and sowing.
2. Identification of various tools and implements.
3. Preparation of pot mixture and study of various containers.
4. Practice in potting, repotting and liquid manures.
5. Study of special structures for propagation viz., mist chamber, cold frames, hot beds, poly house, shade net house.
7. Mist propagation techniques.
8. Practice in propagation by cuttings.
10. Practice in budding methods.
11. Practice in 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 and project preparation for commercial nurseries and visit to private nurseries.
17. Orientation for final practical examination.

References

Web resource
1. www.fruits.com

HOR 120 PRODUCTION TECHNOLOGIES OF TROPICAL AND
Objectives
This course has been designed to impart knowledge on the latest technologies such as propagation, planting systems, training and pruning systems, and crop regulation in different tropical and arid zone fruit crops.

Theory
Unit–I: Importance of tropical and arid zone fruit crops
Scope and importance of tropical and arid zone fruits – overview – area, production and export potential – classification of fruits – agro climatic zones of India and Tamil Nadu with emphasis on tropical fruits – research institutes.

Unit–II: Production Technology – I
Importance – nutritive value – climate and soil requirements – varieties – propagation techniques – planting systems and planting densities – after care – training and pruning – nutrient, water and weed management – specialized horticultural techniques including PGR’s – physiological disorders – production problems – pre and post-harvest technologies of the following crops:
Mango, Banana, Guava and Papaya.

Unit–III: Production Technology – II
Sapota, Acid lime, Lemon and Sweet orange.

Unit–IV: Production Technology – III
Grapes, Pomegranate, Jackfruit and Annona.

Unit–V: Production Technology – IV
Aonla, Ber and Minor fruits (wood apple, karonda, phalsa, west Indian cherry, bael).

Practical
Description and identification of varieties – propagation techniques – application of manures and fertilizers – special practices in fruit crops – application of PGR’s – diagnosis of maladies – working out production economics – visit to commercial orchards.

Lecture Schedule
1. Tropical and arid zone fruits – scope and importance.
2. Overview – area, production and export potential of tropical and arid zone fruits.
3. Classification of fruits.
4. Agro climatic zones of India and Tamil Nadu with emphasis on tropical fruits – research institutes.
5. Production technology for Mango
6. Production technology for Mango
7. Production technology for Mango
8. Production technology for Mango
9. Production technology for Banana
10. Production technology for Banana
11. Production technology for Banana
12. Production technology for Banana
13. Production technology for Guava
14. Production technology for Guava
15. Production technology for Papaya
16. Production technology for Papaya
17. Mid Semester Examination
18. Package of practices for Sapota
19. Package of practices for Sapota
20. Package of practices for Acid lime
21. Package of practices for Acid lime
22. Package of practices for Lemon
23. Cultivation aspects of Sweet orange
24. Cultivation aspects of Grapes
25. Cultivation aspects of Grapes
26. Cultivation aspects of Grapes
27. Production techniques of Pomegranate
28. Production techniques of Pomegranate
29. Production techniques of Jackfruit
30. Production techniques of Annona
31. Production techniques of Aonla
32. Production techniques of Ber
33. Production technology for Wood apple, Karonda
34. Production technology for Phalsa, West Indian cherry and Bael.

Practical Schedule
1. Study of mango varieties.
2. Propagation methods of mango.
3. Study of banana varieties.
4. Scoring technique, sucker treatment and special practices in banana.
5. Study of guava varieties and propagation methods of guava.
6. Special practices in guava.
7. Study of papaya varieties and propagation.
8. Study of sapota varieties and propagation methods.
9. Diagnosis of maladies and methods of application of manures and fertilizers in fruit crops.
10. Study of acid lime, lemon, sweet orange varieties, citrus root stocks and propagation.
11. Study of grape varieties and propagation methods.
12. Study of varieties of Ber, Pomegranate and their propagation.
15. Working out economics of production of tropical and arid zone fruits.
16. Visit to commercial orchards.
17. Orientation for final practical examination

References

References
2. http://agritech.tnau.ac.in/horticulture
3. http://nhb.gov.in/fruit

HOR 121 GROWTH AND DEVELOPMENT OF HORTICULTURAL CROPS (1+1)
Objectives
It is aimed to inculcate knowledge among under graduate students regarding physiology of growth and development, analysis of growth, role of essential nutrients in plant growth and development, role played by plant growth regulators in the growth and development process of horticultural crops.

Theory
Unit–I: Growth and Growth Analysis

Unit–II: Role of Essential Nutrients on Plant Growth
Plant nutrients - essential plant nutrients - beneficial nutrients - their functions, mobility in plants and deficiency and toxicity symptoms-uptake of nutrients from the soil solution-nutrient uptake by leaves- leaf sampling for tissue analysis – nutrient deficiency symptoms in horticultural crops- correction measures – physiological disorders of fruits, vegetables and flower crops – identification and management.

Unit–III: Plant Growth Regulators
Plant growth regulators- definitions-auxins, cytokinin, abscisic acid, gibberellic acid, ethylene, brassinosteroids, inhibitors and retardants- biosynthesis-basic functions-role in crop growth and development, propagation, flowering, fruit setting, fruit thinning, fruit development, fruit drop and fruit ripening.

Unit–IV: Physiology of Flowering
Flowering- factors affecting flowering- physiology of flowering- photoperiodism-long day, short day and day neutral plants-vernalisation and its application in horticulture-training and pruning-physiological basis of training and pruning-source and sink relationship-translocation of assimilates.

Unit–V: Physiology of Fruit and Seed Development
Fruiting- factors affecting fruit set and development-physiology of fruit, bulb and tuber growth and development-physiology of ripening of fruits-climacteric and non-climacteric fruits - seed development- factors affecting seed development and maturation- physiology of seed development and maturation- seed dormancy -types, causes and breaking methods in horticultural crops.

Practical

Lecture Schedule
1. Factors affecting growth and development
2. Bud dormancy
3. Growth analysis
4. Essential plant nutrients
5. Deficiency symptoms of essential plant nutrients
6. Physiological disorders of horticultural crops
7. Role of plant growth regulators
8. Application of plant growth regulators
9. Mid Semester Examination
10. Factors affecting flowering
11. Physiology of flowering
12. Photoperiodism
13. Vernalization
14. Physiology of pruning and training
15. Physiology of fruit, tuber and bulb development
16. Physiology of ripening of fruits
17. Seed dormancy - types, causes and breaking methods.

Practical Schedule
1. Observation of different types of seed germination
2. Methods of breaking seed dormancy
3. Methods of breaking bud dormancy
4. Seed viability test using Tetrazolium
5. Measurement of leaf area by different methods
6. Estimation of chlorophyll content
8. Identification of nutrient deficiencies and physiological disorders in vegetable crops
9. Identification of nutrient deficiencies and physiological disorders in flower crops
10. Identification of plant growth regulators
11. Use of PGRs in the propagation of horticultural crops
12. Use of PGRs in the induction of flowering, fruit setting and prevention of fruit drop.
13. Visit to orchard to study different pruning and training practices in horticultural plants.
14. Use of PGR in ripening of fruits.
15. Estimation of ascorbic acid in fruit crops.
16. Estimation of TSS and total sugars in fruit crops.
17. Orientation for final practical examination.

References

References

ENT 122: FUNDAMENTALS OF ENTOMOLOGY (2+1)

OBJECTIVES
- To study the external morphology, anatomy, physiology and behaviour of insects and their position in animal kingdom by studying their taxonomic characters up to family level.

THEORY
Unit–I : History and Importance
Unit–II : Morphology and Behaviour
   Body segmentation, Structure and functions of insect cuticle – cuticular appendages and moulting. Basic Structures of head, thorax, abdomen and their appendages. Modifications of insect antennae, mouth parts, legs, wings, wing venation, wing coupling apparatus and abdomen and its appendages; Metamorphosis and their
types; Insect behaviour – tropisms, biocommunication, rhythm, diapause, migration, defense and offence.

Unit–III : Anatomy and Physiology
Anatomy and functions of digestive, excretory, respiratory, circulatory, nervous and reproductive systems in insects. Types of reproduction and mating. Functions of exocrine and endocrine glands. Sensory organs and their functions.

Unit–IV : Taxonomy of Entognatha and Ectognatha (Insecta) (Apterygota and Pterygota)

Unit V : Taxonomy of Endopterygota
Distinguishing characters of agriculturally important orders of Endopterygota - Neuroptera (Chrysopidae, Myrmeleontidae, Mantispidae, Ascalaphidae), Megaloptera, Rhaphidioptera, Coleoptera (Cicindelidae, Carabidae, Dytiscidae, Curculionidae, Apionidae, Staphylinidae, Coccinellidae, Lampyridae, Hydrophilidae, Scarabaeidae, Dynastidae, Cerambycidae, Melolonthidae, Anobiidae, Tenebrionidae, Bruchidae, Meloidae, Cetonidae, Buprestidae, Elateridae and Bostrichidae), Strepsiptera, Diptera (Cecidomyiidae, Agromyzidae, Tephritidae, Asilidae, Tabanidae, Tachinidae, Pipunculidae, Hippoboscidae, Culicidae, Syrphidae and Muscidae, Drosophilidae), Mecoptera, Siphonaptera, Trichoptera, Lepidoptera (Nymphalidae, Lycaenidae, Pieridae, Papilionidae, Crambidae, Pyraustidae, Noctuidae, Arctiidae, Bombycidae, Coccoidea, Geometridae, Gelechiidae, Pterophoridae, Saturniidae, Sphinxidae, Lymantriidae, Meteoridae and Hesperiidae) and Hymenoptera (Tenthredinidae, Apidae, Xylocopidae, Megachilidae, Bombidae, Sphecidae, Vespidae, Formicidae, Ichneumonidae, Braconidae, Platygastridae, Bethylidae, Evanidae, Chalcididae Encyrtidae, Eulophidae and Trichogrammatidae).

PRACTICAL

Assignment:
Each student has to submit 25 insects covering at least ten orders

THEORY LECTURE SCHEDULE
1. Definition and branches of Entomology, Its history and scope in Agriculture and Horticulture. Origin of insects, Position of insects in the animal kingdom
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
5. Moulting process in insects
6. Basic structures of head and its appendages, modifications of insect antennae
7. Modifications of insect mouth parts
8. Basic structures of thorax and its appendages, modifications of legs, wings, wing venation and wing coupling apparatus
9. Basic structures of abdomen and its appendages
10. Metamorphosis and types of eggs, larvae and pupa
11. Tropism, biocommunication in insects - Sound and light production, diapause, rhythm, migration, defense and offence in insects
12. Elementary knowledge on digestive system, structure of alimentary canal and its modifications in certain groups
13. Elementary knowledge on digestive enzymes, digestion and absorption of nutrients
14. Elementary knowledge on excretory system in insects – malpighian tubules – accessory excretory organs and physiology of excretion
15. Elementary knowledge on respiratory system in insects – structure of trachea – tracheoles
16. Types of respiratory system – spiracles – respiration in aquatic and endoparasitic insects
17. Mid Semester Examination
20. Elementary knowledge on nerve impulse conduction – axonic and synaptic transmissions
22. Types of reproduction – oviparous, viviparous, paedogenesis, polyembryony, ovoviviparous and parthenogenesis
23. Elementary knowledge on structure and functions of Exocrine and Endocrine glands
24. Structure of sense organs – types of sensilla – photoreceptors, chemoreceptors and mechanoreceptors
25. Taxonomy and systematics – Definition, importance and binomial nomenclature. Classification of insects – Apterygota, Pterygota, Endopterygota with examples
28. Distinguishing characters of Neoptera orders – Polyneoptera – Plecoptera, Dermaptera, Embioptera, Zoraptera, Orthoptera,
29. Distinguishing characters of orders Phasmatodea, Grylloblattodea and Mantophasmatodea, (Mantodea, Blattodea (Cockroach), Blattodea (Termites)
30. Distinguishing characters of Paraneoptera orders – Psocidea (free living), Psocidea (parasitic), Thysanoptera and Hemiptera
31. Distinguishing characters of order Endopterygotes – Neuroptera, Megaloptera, Rhaphidiptera, Coleoptera and families of agricultural importance
32. Distinguishing characters of order Strepsiptera, Mecoptera, Siphonaptera, Trichoptera and Diptera and their families of agricultural importance
33. Distinguishing characters of order Lepidoptera and families of agricultural importance
34. Distinguishing characters of order Hymenoptera and families of agricultural importance.

PRACTICAL SCHEDULE
1. Observations on segmentation and external features of grasshopper/cockroach/blister beetle
2. Practicing the methods of collection, killing, pinning, labelling, display and preservation of insects including immature stages. Preparation of riker mount.
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, house fly 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
7. Studies on the types of metamorphosis. Observations on immature stages of insects – Eggs, larvae and pupae
8. Demonstration of digestive system and male and female reproductive systems (grasshopper/cockroach)
10. Observation on distinguishing characters of Phasmatodea, Grylloblattodea, Mantophasmatodea, Mantodea, Blattodea (Cockroach), Blattodea (Termites) Psocodea – free living, Psocodea (parasitic) and Thysanoptera.
12. Observation on distinguishing characters of Neuroptera, Megaloptera and Raphidiopera.
15. Observation on distinguishing characters of Lepidoptera (Families: Nymphalidae, Lycaenidae, Pieridae, Papilionidae, Crambidae, Pyraustidae, Noctuidae, Arctiidae, Bombycidae, Coccinellidae, Geometridae, Gelechiidae, Pterophoridae, Saturniidae, Sphinxidae, Lymentridiidae, Metarbelidae and Hesperiidae).
17. Orientation for final examination

REFERENCE BOOKS
AGM 123 - FUNDAMENTALS OF MICROBIOLOGY (2+1)

OBJECTIVES
1. To enable better understanding of students about the microscopic world around them
2. To acquaint students with the basic laboratory techniques and tools of microbiology
3. To introduce the fundamental characteristics of various microorganisms
4. To develop experimental skills, including the collection and analysis of data, the ability to draw valid conclusions and apply these conclusions within a larger framework

THEORY
Unit I. History of Microbiology

Unit II. Microbiological Techniques
General principles of light microscopy magnification, resolving power and numerical aperture. Different types of light and electron microscopes. Staining techniques - principle and types of stains; simple, negative, differential and structural staining. Sterilization and disinfection techniques; principles and methods of sterilization physical methods – heat, filters and radiation; chemical methods. Isolation, enrichment and purification techniques of bacteria, yeast, moulds and actinobacteria. Preservation of microbial cultures.

Unit III. Position of Microbes in the living World and their Structure

Unit IV. Growth, Nutrition and Metabolism
Bacterial growth- population growth- growth cycles of population - measurement of growth ; environment on growth – temperature, oxygen, pH and salts; energetics in bacteria; oxidation – reduction , electron carrier – overview of aerobic and anaerobic respiration and fermentation in bacteria.

Unit V. Viruses, Bacterial Genetics and Immunology

PRACTICAL

THEORY SCHEDULE

1. Definition and scope of microbiology – Development of microbiology as science
2. Biogenesis and a biogenesis theory. Contributions by Antonie Van Leeuwenhoek, Louis Pasteur
4. Microscopy; principles – resolving power and magnification. Light microscopy
5. Different types of microscopes - UV, Dark Field, Phase Contrast, Fluorescence and Electron Microscopes; Atomic and Confocal Scanning Laser Microscopy
6. Staining techniques - principle and types of stains staining techniques- simple, negative, differential and structural staining methods
7. Sterilization – principle – physical agents and chemical methods
8. Isolation and enrichment culture techniques; preservation techniques
9. Evolutionary relationship - Position of microbes in living world – concepts and developments in classification of microorganisms
10. Groups of microorganisms prokaryotes and eukaryotes
11 Archaea – ecology; differences among archaea, eubacteria and eukaryotes
12. Systematic bacteriology Bergey’s manual of systematic bacteriology – outline only
13. Cell biology; size, shape, structure and arrangement of cells
14. External structures in bacteria and their functionality
15. Functional anatomy and reproduction in bacteria
16. Morphology of fungi – economic importance
17. Morphology of algae – economic importance
18. Mid Semester Examination
21. Nutritional types of bacteria; energetic in bacteria. Metabolic diversity/ pathways specific to bacteria
22. Microbial metabolism- Energy generation by substrate level phosphorylation, oxidative and Photo phosphorylation
23. Aerobic respiration and anaerobic respiration
24. Fermentative mode of respiration
25. Viruses and their properties; types of viruses
26. Bacteriophages – lytic and lysogenic and temperate phages
27. Mutation in bacteria – principles and types
28. Mutagens – physical, chemical and biological
29. Genetic recombination – competency transformation
30. Genetic recombination by Conjugation – concept of Hfr
31. Genetic recombination by Transduction – generalized and specialized
32. Basic concepts of Immunology
33. Immunology – principles – specific and non specific defense
34. Antigen – antibody reactions – vaccines applications

PRACTICAL SCHEDULE

1. Laboratory safety and handling of chemical and glasswares
2. Study of compound microscope
3. Micrometry
4. Methods of sterilization
5. Preparation of culture media and agar slants
6. Isolation and identification of bacteria, fungi and actinobacteria
7. Purification of bacteria
8. Purification of fungi
9. Gram staining
10. Bacterial spore staining
11. Capsule staining
12. Negative staining
13. Morphology of fungi – somatic structures
14. Morphology of fungi – Asexual and Sexual reproductive structures
15. Morphology of actinobacteria
16. Growth of microorganisms on solid and liquid media
17. Orientation for final examination

TEXT BOOKS

REFERENCE BOOKS

Web pages
1. http://www.microbes.info

SAC 124 - FUNDAMENTALS OF BIOCHEMISTRY (2+1)

OBJECTIVES
- To gain basic knowledge of the biomolecules viz., Carbohydrates, Proteins and Lipids - properties, structure and metabolism.
- To learn basics of enzymes, vitamins and hormones.
- To study qualitative tests for carbohydrates and quantitative determination of carbohydrates, proteins, chemical constants of lipids and assay of Vitamins.

THEORY
Unit I - Carbohydrates:

Unit II – Proteins and Enzymes


Unit III- Lipids:
Unit IV - Metabolism


Unit V – Secondary Metabolites


PRACTICAL


Lecture Schedule

1. Introduction to Biochemistry, Carbohydrates - occurrence and classification.
2. Structure of monosaccharide, oligosaccharides and polysaccharides.
5. Amino acids - Classification and structure.
7. Classification of proteins based on function and solubility.
8. Structure of protein - Primary, secondary, tertiary and quaternary structure.
9. Protein folding, physical and chemical properties of proteins.
10. Enzymes - Properties, classification and nomenclature.
12. Enzyme inhibition - competitive, non-competitive, uncompetitive and allosteric enzymes.
13. Coenzymes, cofactors and isoenzyme.
15. Storage lipids – Structural lipids - types and importance.
16. Sterols - basic structure and their importance.
17. MIDSEMESTER EXAMINATION
19. Carbohydrate metabolism - breakdown of starch by amylases
20. Glycolysis - Reactions and bioenergetics.
21. TCA cycle - Reactions and bioenergetics.
23. Respiration - electron transport chain and oxidative phosphorylation.
24. Lipid metabolism - lipases and phospholipases.
26. Biosynthesis of fattyacids and triacylglycerol.
27. Transamination, deamination and decarboxylation of amino acids.
28. Ammonia assimilating enzymes - GS, GOGAT and GDH.
29. Metabolic inter-relationship.
31. Occurrence, classification and functions of terpenes and alkaloids.
32. Vitamins – Definition – general characteristics and classification.
34. Cytokinins and other natural growth hormones and inhibitors in plants.

Practical Schedule

I. Qualitative tests for carbohydrates
   1. Identification of glucose and fructose
   2. Identification of sucrose and maltose
   3. Identification of lactose
4. Identification of dextrin
5. Identification of starch
6. Scheme for identification of unknown carbohydrates

II. Quantitative analysis of carbohydrates
7. Estimation of glucose (By copper reduction method)
8. Estimation of sucrose (By Inversion method)
9. Estimation of starch

III. Analysis of proteins
10. Estimation of amino acid (by Sorenson method)
11. Colour reactions of protein

IV. Analysis of lipids
12. Determination of acid value of an oil
13. Determination of iodine value of an oil
14. Determination of saponification value of an oil
15. Determination of peroxide value of an oil

V. Vitamins
16. Determination of ascorbic acid (vitamin C)
17. Record certification

References

e-references

GPB 125 BOTANY OF HORTICULTURAL CROPS (1+1)

OBJECTIVES
1. To teach basic and fundamental aspects on botany of the horticultural crops.
2. This course will help students to understand the course on morphology and diagnostic characters of plants/families and in turn, it will help to undertake the breeding of the horticultural crops.

THEORY

Unit–I:

Unit–II:
Botany, floral biology, pollination, fruit set and economic part in the families Anacardiaceae (mango, cashew), Rutaceae (acid lime, sweet orange and mandarin), Musaceae, Moraceae, Vitaceae, Caricaceae, Euphorbiaceae (aonla, cassava, rubber), Myrtaceae (guava, clove), Sapotaceae, Bromeliaceae, Punicaceae, Annonaceae (custard apple), Rhamnaceae and Rosaceae (apple, pear, plum, rose).
Unit–III

Botany, floral biology, pollination, fruit set and economic part in the families
Solanaceae (tomato, brinjal, chilli, potato), Malvaceae, Cucurbitaceae (pumpkin, watermelon, muskmelon, ridge gourd, bitter gourd, cucumber), Moringaceae, Fabaceae (peas, French beans), Alliaceae (onion, garlic), Brassicaceae (cabbage, cauliflower, radish), Chenopodiaceae, Amaranthaceae, Convolvulaceae (sweetpotato), Araceae (elephant foot yam, colocasia), Dioscoreaceae (yam, medicinal dioscorea).

Unit–IV

Botany, floral biology, pollination, fruit set and economic part in the families
Piperaceae (pepper, betelvine) Zingiberaceae (cardamom, turmeric, ginger), Orchidaceae (Vanilla, Dendrobium orchid), Apiaceae (Umbelliferae) (coriander), Myristicaceae, Lauraceae, Leguminosae, Caesalpiniaeae, Camelliaceae, Rubiaeae, Arecaceaee(Palmae) (coconut, arecanut, palmyrah, oil palm), Sterculiaeaceae(Cocoa).

Unit–V

Botany, floral biology, pollination, fruit set and economic part in the families
Oleaceae (mulligai, nullai, jathimalli), Asteraceae (chrysanthemum, marigold, marikolundu, gerbera, golden rod, aster, pyrethrum), Amaryllidaceae, Acanthaceae, Caryophyllaceae, Iridaceae, Apocynaceae, Poaceae (Graminae), (lemongrass, citrononella, palmarosa, vetiver), Geraniaceae, Lamiaceae (Labiatae) (coleus, patchouli, mint, maruvu), Scrophulariaceae.

PRACTICAL

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

Lecture Schedule

1. Systematic botany-principles involved in nomenclature.
2. Terminology, morphological description and classification based on root, stem, leaf, inflorescence, flower and fruit.
4. Anacardiaceae (mango, cashew), Rutaceae (acid lime, sweet orange and mandarin) and Musaceaee.
5. Moraceae, Vitaceae, Caricacea, Euphorbiaceae (aonla, cassava, rubber), Myrtaceaee (guava, clove) and Sapotaceaee.
7. Solanaceaee (tomato, brinjal, chilli, potato) and Malvaceaee.
8. Cucurbitaceae (pumpkin, watermelon, muskmelon, ridge gourd, bitter gourd, (cucumber).
9. Mid-Semester Examination
10. Moringaceae and Fabaceae (peas, French beans) and Alliaceae (onion, garlic).
11. Brassicaceae (cabbage, cauliflower, radish), Chenopodiaceae and Amaranthaceae.
12. Convolvulaceae, Umbelliferae, Araceae (elephant foot yam, colocasia) and Dioscoreaceae (yam, medicinal dioscorea).
13. Piperaceae (pepper, betelvine) Zingiberaceae (cardamom, turmeric, ginger), Orchidaceae (vanilla, dendraobium orchid) and Apiaceae (coriander).
15. Camelliaceae, Rubiaeae, Palmae (coconut, arecanut, palmyrah, oil palm), Sterculiaeae.
16. Oleaceae (malligai, mullai, jathimalli), Asteraceae (chrysanthemum, marigold, marikolundu, gerbera, golden rod, aster, pyrethrum), Amaryllidaceae and Acanthaceae.
17. Caryophyllaceae, Iradiaceae, Apocynaceae, Graminae, (lemongrass, citronella, palmarosa, vetiver), Geraniaceae, Labiatae (coleus, patchouli, mint, maruvu) and Scrophulariaceae.

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

References
AEC 126 - PRINCIPLES OF ECONOMICS (1+1)

OBJECTIVE

The objective of this course is to provide knowledge to students about basic concepts of economics and their relevance and importance in Agricultural Science.

THEORY

Unit I: Nature and Scope of Economics


Unit II: Theory of Consumption


Unit III: Theory of Production


Unit IV: Theory of Exchange and Distribution


Unit V: Macroeconomic Concepts


PRACTICAL

THEORY SCHEDULE
1. Economics: Nature and scope of economics: Agricultural Economics: Definition and scope, importance, subject matter: Science Vs. art, positive science Vs. normative science, deductive method Vs. inductive method
5. Law of Equi-Marginal Utility: Definition, assumptions, limitations and applications - Indifference curve analysis: Definition and properties of indifference curves and budget line.
7. Demand: Definition, Kinds of demand, Demand schedule, Demand curve, Law of Demand, Determinants of demand - Extension and contraction of demand Vs. Increase and decrease in demand.
8. Elasticity of Demand: Own price, cross price and income elasticities of demand, Degrees of price elasticity of demand - Factors influencing elasticity of demand and Importance of Elasticity of demand.
9. Mid Semester Examination.
15. Wages: Real wage and money wage – Wage theories - Interest: Pure interest and gross interest - Theories of interest - Profit: Meaning of economic profit - Profit theories.

PRACTICAL SCHEDULE
3. Indifference curve analysis and consumer equilibrium.
4. Law of Demand, demand schedule - Graphical derivation of individual and market demand.
5. Estimation of own price, income and cross price elasticities of demand.
10. Types and functions of money.
11. Inflation: Analysis of causes of inflation and control measures.
12. Approaches to computation of national income.
13. Study of structural changes in the economy.
14. Food grain production in India - Growth rate analysis.
15. Study of demographic changes in India.
16. Measures of human development: Welfare indicators - Human Development Index (HDI) and Physical Quality of Life Index (PQLI).
17. Orientation for final examination

REFERENCE BOOKS

AHS 127 LIVESTOCK AND POULTRY MANAGEMENT (2+1)

OBJECTIVES
1. The course aims to provide the students with holistic knowledge about the livestock and poultry management so that it can be applied at field level.
2. To provide hands on training about livestock, poultry-based farming and preparation of dairy products.
3. To impart knowledge and latest technologies adopted in livestock industries to infuse entrepreneurial attitude among the students.

THEORY

Unit I: Introduction to Livestock and Poultry Management

Unit II: Dairy Cattle Management

Unit III: Sheep and Goat Management
Breeds - Classification - Economic traits - Systems of rearing - Housing management - Floor space requirement – Care and management of young and adult stock – Nutrition – Feed and fodder – Flushing – Steaming up - Prophylactic and control measures of diseases.

Unit IV: Swine Management

Unit V: Poultry Management
Breeds – Classification - Commercial strains of broiler and layer – Housing – deep litter and cage system – Brooding – Litter management – Care and management of broiler and layer - Nutrition of chick, grower, layer and broiler – Feed conversion ratio - Prophylactic and control measures of diseases.

PRACTICALS
Study of external parts of cattle – Common methods of restraining - Identification methods of livestock – Disbudding and deworming in cattle –

Theory Lecture schedule

1. Significance of livestock and poultry in Indian economy - livestock and poultry census.
2. Different livestock development programmes of Government of India and Tamil Nadu.
3. Zoological classification of livestock - common nomenclatures used in Animal Husbandry practices
5. Definition of breed - classification of cattle breeds - breed characteristics of Indian cattle - Sindhi, Gir, Sahiwal, Tharparkar and Kangayam.
8. Estrous cycle – signs of estrous - Artificial Insemination - merits and demerits
9. Housing management - selection of site and floor space requirement for calves, heifer and milch animals.
10. Systems of housing – loose housing – conventional barns - single row system - double row system - head to head and tail to tail arrangement - merits and demerits.
11. Care and management of new born calf, heifers, pregnant and lactating cows.
13. Classification of feed stuff – Importance of green fodder.
15. Factors affecting composition of milk - Pasteurization of milk.
16. Prophylactic and control measures of diseases.
17. Mid Semester Examination.
18. Sheep and goat farming - classification of breeds of Indian and exotic origin – economic traits.
19. Systems of rearing - housing management - floor space requirement for adult and young stock.
20. Care and management of young and adult sheep and goat.
22. Prophylactic and control measures of diseases.
24. Economic traits - housing of swine.
25. Care and management of sow, boar and piglets – nutrition - creep feeding.
26. Prophylactic and control measures of diseases.
27. Classification of chicken breeds - commercial strains of broiler and layer.
28. Systems of housing- deep litter and cage system- merits and demerits - floor space requirement.
30. Care and management of grower and layer.
32. Feed conversion ratio /dozen egg or kg of meat production.
33. Prophylactic and control measures of diseases.
34. Vaccination schedule for broiler and layer.
Practical schedule
1. Study of external parts of cattle
2. Common methods of restraining in cattle
3. Identification methods of livestock
4. Disbudding and deworming in cattle
5. Determination of age in cattle
6. Study and design of cattle shed
7. Selection of dairy cow by score card method
8. Determination of weight in cattle
9. Determination of specific gravity in milk
10. Demonstration of fat percentage and total solids estimation in milk
11. Demonstration of cream separation
12. Demonstration of ice cream making
13. Identification of feed and fodder
14. Identification of poultry farm equipments
15. Measures of performance efficiency in broiler and layer
16. Visit to dairy plant, layer and broiler farms
17. Orientation for final examination

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

E- references
1. www.sciencecentral.com
2. www.ansci.umn.edu/poultry/resources/layermgmt.htm
3. www.armsd.com/
4. www.animalwebsites.co.uk
6. www.britishangoragoats.org.uk/management.htm
7. www.indiagoatfarm.com
8. www.indiadairy.com
9. www.indiagronet.com
10. www.foodsci.uoguelph.ca
11. www.fil-idf.org

COM 128 FUNDAMENTALS OF INFORMATION TECHNOLOGY  (1+1)

THEORY
UNIT I: COMPUTER BASICS
Representation - Memory and Storage - Input Output Media - Current Trends in Computer.

UNIT II: OPERATING SYSTEM AND SOFTWARE

UNIT III: COMPUTER NETWORKS AND INTERNET

UNIT IV: COMPUTER PROGRAMMING AND LANGUAGES

UNIT V: DATABASE MANAGEMENT SYSTEMS

THEORY
Lecture Schedule
7. Introduction to Computer Networks, Network Topologies, Communication Protocol, Network Devices
8. Introduction to Internet, Internet Applications, Internet Tools, Web Browser and Email client
9. Mid-semester examination
11. Introduction to Computer Programming, Algorithm, Flowchart, Decision Tables, Pseudo code and Program Control Structures
12. Programming paradigms, Introduction to Programming Languages
15. Normalization Techniques, Types of Databases, Introduction to Structured Query Language
16. Data Definition Language, Data Manipulation Language

PRACTICAL SCHEDULE
1 Working with basic Computer Hardware
2 Number System conversion: Decimal, Binary, Octal, Hexa Decimal, Binary addition and subtraction
3 Conversion between bits, bytes, kilobits, kilobytes, megabits, megabytes, gigabits, gigabytes
4 Working with MS DOS commands
5 Working with Windows Operating system
6 Working with Linux Operating System
7 Working with Word Processing Software
8 Working with Presentation Software
9 Working with Spreadsheet Software
10 Working with Image Editing Software
11 Working with basic networking commands
12 Working with Web Browsers and Search Engines
13 Working with Emails
14 Working with Programming basics: Algorithm, Flowchart, Pseudo Code and Coding
15 Working with DBMS softwares
16 Working with SQL commands
17 Orientation for final examination

Text book

REFERENCE BOOK

e-reference:
1. http://pearsoned.co.in/ITLEducationSolutionsLimited/

HOR 210 PRODUCTION TECHNOLOGY OF TROPICAL VEGETABLES (2 + 1)

OBJECTIVES
To impart knowledge on the scenario of advanced production techniques and production constraints in tropical vegetables.

THEORY
Unit–I: Scope and importance of tropical vegetables
Scope and importance- area and production, global and national scenario, institutions involved in vegetable crops research – export potential – constraints in vegetable production- classification of vegetable crops – types of vegetable nutrition garden, kitchen garden, truck garden, market garden, roof garden, floating garden – vegetable forcing- contract farming- rice fallow cultivation, river bed cultivation, rain fed cultivation,– GAP in vegetable production – export standards of vegetables.
Unit–II: Solanaceous and Malvaceous vegetable crops
Tomato, brinjal, chilli, capsicum and bhendi
Unit–III: Cucurbitaceous and Malvaceous vegetable crops
Ash gourd, pumpkin, bottle gourd bitter gourd, snake gourd, ribbed gourd, watermelon, musk melon, coccinia, cucumber and gherkin.
Unit–IV: Legumes and greens
Cluster bean, vegetable cowpea, lab-lab, moringa, amaranthus and Indian palak
Unit–V: Bulbous and Tuber crops
Onion, cassava, sweet potato, colocasia, vegetable coleus, elephant foot yam and edible Dioscorea.
Practical


Lecture Schedule
1. Area, production, world scenario and industrial importance.
2. Export potential of vegetables and institutions involved in vegetable crops research.
3. Constraints in vegetable production.
4. Classification of vegetable crops.
5. Effect of climate, soil, water and nutrients on vegetable crop production.
6. Cropping systems in vegetable crops.
7. Types of vegetable farming.
9. Rice fallow cultivation, river bed cultivation and rainfed cultivation.
10. GAP in vegetable production.

12. Tomato
13. Brinjal
14. Chilli
15. Capsicum
16. Bhendi
17. Mid-Semester Examination
18. Pumpkin
19. Ash gourd and Bottle gourd
20. Water melon and Musk melon
21. Snake gourd and Ribbed gourd
22. Bitter gourd and Coccinea
23. Cluster bean
24. Vegetable cowpea
25. Lab lab
26. Moringa
27. Amaranthus and Indian palak
28. Onion
29. Cassava
30. Sweet potato
31. Colocasia
32. Vegetable coleus
33. Elephant foot yam
34. Edible dioscorea

Practical Schedule
1. Preparation of nursery bed, containerized transplant production and sowing of vegetable seeds.
2. Preparation of field- raising of a transplanted vegetable crop.
3. Preparation of field, sowing of cucurbitaceous, perennial and leafy vegetable and tuber crops.
4. Identification and description of varieties and hybrids of solanaceous and leguminous vegetables.
5. Identification and description of varieties and hybrids of bhendi, cucurbits, root and tuber crops.
6. Planning and lay out of kitchen/nutrition garden.
7. Study of rain fed and padugai land cultivation practices in vegetable crops
8. Practices in manuring and fertilizer application in vegetable crops
9. Practices in irrigation practices of vegetable crops
10. Preparation of plant growth regulator spray solution- their usage in tropical vegetable crops
11. Identification of nutrient deficiencies, physiological disorders and corrective measures in vegetable crops.
12. Maturity indices, harvesting and post-harvest handling of vegetable crops
13. Practices in seed production techniques in vegetable crops
14. Commercial vegetable production in protected structures
15. Project preparation for commercial cultivation of tropical vegetable crops.
16. Visit to commercial vegetable production units
17. Orientation for final practical examination.

References

e resources
1. http://www.informaworld.com/smpp/title~db=all~content=g904622674
OBJECTIVES
This course is intended to impart knowledge on the cultivation aspects of plantation crops, spices and condiments. At the end of the course, the student will be able to acquire knowledge on various aspects of plantation crops, spices and condiments.

THEORY
Unit-I: Production technology of Plantation Crops I
Tea, coffee, cocoa, rubber, cashew.

Unit-II: Production technology of Plantation Crops II
Cocount, arecanut, palmyrah, oil palm, cinchona, wattle.

Unit–III: Production technology of Spices and Condiments I
Scope and importance of spices and condiments constraints in production –Area and production, export potential in spices and condiments in India and Tamil Nadu- classification of species and condiments–origin and distribution – climate and soil – botany of spices, varieties and hybrids – propagation – spacing- planting and support – Irrigation, nutrient and weed management – mulching – intercropping – shade regulation – training and pruning–harvesting processing –Value added products –extraction of essential oils, oleorsins and active principles – grading – packing and storage of the following crops:
Pepper, cardamom, turmeric and ginger.

Unit–IV: Production technology of Spices and Condiments II
Coriander, fenugreek, fennel, cumin clove, nutmeg, cinnamon, curryleaf and tamarind.

Unit–V: Production technology of Spices and Condiments III
Vanilla, saffron, garlic and asafoetida and herbal spices.

Practical
Description and identification of plantation crops, spices and condiments – nursery management practices- planting – training and pruning – manures and fertilizer application –latex extraction in rubber - harvesting and processing, grading and packing -study of value added products – visit to fields and processing industries.

Lecture Schedule
1. Scope and Importance and export potential of plantation crops in India and Tamil Nadu
2. Area, production and constraints of plantation crops in India and Tamil Nadu
3. Classification of plantation crops
4. & 5. Cultivation aspects and processing of tea
6. & 7. Coffee
8. Cocoa
9. Rubber
10. Cashew
11. Cinchona and wattle
12. Coconut
13. Arecanut
14. Palmyrah
15. Oil palm
16. Introduction -importance, scope and constraints in spices and condiments in India and Tamil Nadu
17. Mid Semester Examination
18. Area, production and export potential of spices and condiments in India and Tamil Nadu
19. Classification of spices and condiments
20 & 21. Production technology and processing of pepper
22. Cardamom
23. Turmeric
24. Ginger
25. Coriander
26. Fenugreek
27. Fennel and cumin
28. Clove
29. Nutmeg
30. Cinnamon
31. Curry leaf and Tamarind
32. Vanilla and Saffron
33. Garlic and Asafoetida
34. Herbal spices

Practical Schedule
1. Identification of plantation crops, spices and condiments
2. Nursery techniques in plantation crops
3. Processing of tea and coffee
4. Tapping and processing of rubber
5. Processing of cocoa and cashew
6. Edible and non edible products in coconut, cashew nut and palmyrah
7. Propagation techniques in pepper and cardamom
8. Propagation techniques of ginger and turmeric
9. Propagation techniques of seed spices
10. Propagation techniques of tree spices
11. Propagation techniques of herbal spices
12. Processing of major spices
13. Processing of seed and tree spices
14. Special techniques in tree spices
15. Value added products in spice crops
16. Visit to commercial farms of plantation and spice crops
17. Orientation for final practical examination.

References

PAT 212 Principles of Plant Pathology (2+1)

OBJECTIVES
The subject covers the knowledge on basic concepts of Plant Pathology and principles of plant disease management.

THEORY
Unit-I: Plant Pathogenic organisms


Unit-II: Fungal taxonomy based on Kirk et al., (2008)

Classification of Kingdom – Protozoa - important taxonomic characters, symptoms and life cycle of Plasmodiophora brassicae - Classification of Kingdom – Chromista- General characters - Classification of Oomycetes. Symptoms and life cycle of Pythium, Phytophthora, Perenospora, Plasmopara and Albugo - Classification of
Kingdom- Chytridiomycota - important characters, symptoms and life cycles of Synchytrium and Zygomycota - important characters, symptoms and life cycle of Rhizopus - Classification of Kingdom- Ascomycota- Important characters, symptoms and life cycles of Taphrina, Aspergillus, Erysiphe and Venturia and important taxonomic characters and symptoms of Penicillium, Leveillula, Phylactinia, Uncinula, Helminthosporium, Alternaria, Cercospora, Curvularia, Fusarium, Verticillium, Colletotrichum, Pestalotia, Macrophomina, and Botryodiplodia. Classification of Kingdom - Basidiomycota- Symptoms and life cycles of Puccinia, Uromyces, Hemileia and Ustilago. Important taxonomic characters of Ganoderma, Agaricus, Pleurotus and Calocybe. Symptoms and important characters of Athelium (Sclerotium), Rhizoctonia and Exobasidium

Unit-III: Bacteria, Candidatus Phytoplasma, Virus, Viroid, Algal and Phanerogamic parasites

Classification, general characteristics and symptoms of bacterial diseases, mode of entry and spread - General characteristics and symptoms of viral, viroid and phytoplasma diseases - General characters of algal parasite Cephalaleuros, Phanerogamic parasites and Non-parasitic diseases.

Unit- IV: Epidemiology and Plant Disease Management


Unit- V: Biological control and biotechnological approaches


Practical


Lecture Schedule

1. Definition of plant pathology – history of plant pathology
4. Classification of Kingdom – Protozoa - important taxonomic characters and Symptoms and life cycle of Plasmodiophora brassicae
5. Classification of Kingdom –Chromista- General characters - Classification of Oomycetes. Symptoms and life cycle of Pythium and Phytophthora
6. Symptoms and life cycle of Plasmodiata, Perenospora and Albugo
7. Classification of Kingdom– Chytridiomycota and Zygomycota - important characters, symptoms and life cycles of Synchytriunm and Rhizopus
8. Classification of Kingdom– Ascomycota- important characters
9. Symptoms and life cycles of Taphrina, Aspergillus, Venturia and Erysiphe
10. Symptoms and important characters of Pencillium, Leveillula, Phyllactinia and Uncinula, Helminthosporium, Alternaria, Cercospora and Curvularia, Fusarium and Verticillium
11. Symptoms and important characters of Colletotrichum, Pestalotia, Macrophomina, and Botryodiplodia,
12. Classification of Kingdom - Basidiomycota- important characters
13. Symptoms and life cycles of Puccinina, Uromyces, Hemileia and Ustilago
14. Important taxonomic characters of Ganoderma, Agaricus, Pleurotus and Calocybe
15. Symptoms and important characters of Athelium, Rhizoctonia and Exobasidium
17. Mid semester examination
18. General characters - Common symptoms of virus and viroid diseases – Chlorosis, mosaic, stripe, vein clearing, vein banding, crinkle, enation, necrosis, dwarfing, rossette, bunchy top, bract mosaic and twisting, cadang-cadang of coconut and potato spindle tuber
19. General characters - Symptoms of phytoplasma diseases – phyllody, witches broom, little leaf, dwarf, yellows and sandal spike and algal parasite – Cephaleuros
20. Phanerogamic parasites – Cuscuta, Orobanche, Loranthus and Striga
21. Epidemiology of crop diseases - weather factors and their role in disease development – temperature, rainfall, relative humidity, dew, sunlight, soil types, soil moisture, soil temperature, soil pH and inoculum potential.
22. Survival and spread of fungal, bacterial and viral pathogen
23. Disease surveillance, assessment and forecasting
25. Eradication – physical, chemical and cultural methods.
27. Fungicides formulations and adjuvants - characteristics of an ideal fungicide
28. Fungicides – definition, protectant, eradicant, therapeutant, fungistat. Groups of fungicides – Copper fungicide and Sulphur fungicide,
29. Heterocyclic nitrogen compound, Quinones and miscellaneous fungicides.
30. Systemic fungicides and Antibiotics
31. Methods of application of fungicides – Seed treatment, dry and wet, soil drenching, foliar spray, post harvest treatment, corm injection, root feeding, capsule application and acid delinting and precautions while handling fungicides.
33. Biological control -fungi, bacteria, bacteriophages – methods of application of biocontrol agents – plant products and antiviral principles.
34. Biotechnological approaches of crop disease management – genetic engineering and tissue culture.

Practical Schedule

1. General characters of fungi – Types of mycelium, asexual, sexual and vegetative spores – types of sexual and asexual fruiting bodies.
2. Study of symptoms, fungal characters and host parasite relationships of *Plasmodiophora brassicae* (club root), *Pythium* (damping-off), *Phytophthora* (late blight)
3. Study of symptoms, fungal characters and host parasite relationships of *Plasmodara, Peronospora* (Downy mildew), *Albugo* (White rust) and *Rhizopus* (Jack fruit rot)
4. Study of symptoms, fungal characters and host parasite relationships of *Taphrina* (leaf curl), *Capnodium* (sooty mould), *Venturia* (Scab), *Curvularia* and *Botryodiplodia*
5. Study of symptoms, fungal characters and host parasite relationships of *Helminthosporium, Cercospora* (Leaf spot), *Alternaria* (Leaf blight), and *Colletotrichum* (Anthracnose)
6. Study of symptoms, fungal characters and host parasite relationships of *Erysiphe, Leveillula, Phyllactinia* and *Uncinula* (Powdery mildew)
7. Study of symptoms, fungal characters and host parasite relationships of *Fusarium, Verticillium* (Wilt) and *Macrophomina* (Root rot)
8. Study of symptoms, fungal characters and host parasite relationships of *Puccinia, Uromyces, Hemileia* (Rust), *Ustilago* (Smut), *Rhizoctonia* (Root rot), *Exobasidium* (Tea Blister blight), *Athelium* (Sclerotium rot), *Ganoderma*, *Agaricus*, *Pleurotus* and *Calocybe* (Mushroom)
10. Symptoms and vectors of viral diseases – Chlorosis, mosaic, vein clearing, vein banding, leaf crinkle and leaf curl, enation, necrosis, dwarfing, rosette, bunchy top and bract mosaic
11. Field visit to expose the students on different fungal, bacterial and viral diseases of horticultural crops
12. Symptoms of *Candidatus Phytoplasma* (little leaf, phyllody and spike), algal diseases – *Cephalæuros*, Panerogamic parasites and Non-parasitic diseases
13. Study of various groups of fungicides and preparation of Bordeaux mixture and Bordeaux paste.
15. Cross protection – demonstration of production of immunized seedling against citrus *Tristeza* and Preparation of leaf extracts, oil emulsion of neem and other botanicals and antiviral principles
16. Bio-control agents – mass production of *Trichoderma viride* and *Pseudomonas fluorescens* and Survey and assessment of crop diseases
17. Orientation for final practical examination

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

References

E-resources
1. www.ucmp.berkeley.edu/fungi
2. www.ictv.org
3. www.vivo.library.cornell.edu
4. www.plantdisease.org
OBJECTIVES: Demonstrate basic knowledge of terms and concepts in soil science and apply this knowledge to new problems and situations Learn the key physical, chemical, and biological aspects of soils. Form a basic understanding of formative processes for different soil types. The recognition soil as a natural body

THEORY
Earth origin and Weathering of rocks
Unit I:
Unit II:
Physical properties - 1
Unit III-
Physical properties - 1 II
Unit IV-
Soil Colloids and Chemical Properties
Unit V-
Soil Chemical properties - Soil colloids - Properties, types and significance - Layer silicate clays - their genesis and sources of charges - Ion exchange - CEC, AEC and Base saturation - Factors influencing Ion exchange - significance. Soil reaction, Buffering capacity and EC Soil Organic matter - sources - chemical composition-decomposition-humus formation-role and functions of organic matter in soil. Soil organisms - Beneficial and harmful effects
Practical
Identification of rocks and minerals. soil profile, collection and processing of soil samples, soil moisture, soil bulk density, particle density, pore space, particle size analysis - feel, international pipette method, Bouyoucos Hydrometer, soil colour, soil pH, soil EC, cation exchange capacity of soil, anion exchange capacity, exchangeable cations in soil, buffering capacity of soil

Theory Schedule:
1. History and development of Soil Science and its branches – Origin of the Earth – Composition of Earth’s crust
2. Rocks – definition, formation, classification – igneous, sedimentary and metamorphic rocks. Brief description of important rocks – mineralogical composition
3. Minerals – definition, occurrence, classification of important soil forming primary minerals - silicate and non-silicate minerals, ferro and non-ferro magnesium minerals Formation of secondary minerals – clay minerals and amorphous minerals
4. Weathering – types of weathering – physical weathering of rocks – agents of physical weathering and their role
5. Chemical weathering – solution, hydration, hydrolysis, carbonation, oxidation and reduction; Biological weathering – role of flora and fauna in weathering process


7. Fundamental soil forming process – Elluviation, Illuviation and humification. Specific Soil forming processes – podzolization, Laterization, salinization, alkalinization, calcification, decalcification, Pedoturbation, melanization

8. Soil profile description – master horizons – pedon and poly pedon

9. Soil and Phases of soils – solid, liquid and gaseous phase-mineral matter, organic matter, water and air – definition and functions of soil and various concepts of soil-Pedological and edaphological concepts

10. Soil physical properties- soil texture – definition – various inorganic components in soil and their properties – particle size analysis – methods – various textural classes in soil and their properties


13. Genesis of soil structure- importance of soil structure and its management


16. Soil consistence – cohesion, adhesion, plasticity, Atterberg’s constants – upper and lower plastic limits, plasticity number- significance of soil consistence

17. Mid Semester examination


19. Determining soil moisture constants – pressure plate apparatus – soil moisture content- methods Gravimetric, gypsum block, Tensiometer, TDR and neutron probe


22. Measurement of soil temperature – importance of soil temperature on crop growth – management of soil temperature

23. Soil air – compositions of atmospheric air and soil air – gaseous exchange – Fick’s law-

24. Influence of soil air on plant growth, soil properties and nutrient availability – measurement of oxygen diffusion rate – measures to improve soil aeration


26. Layer silicate clays – genesis and classification – 1:1, 2:1 expanding and non expanding, 2:2 clay minerals, amorphous minerals and iron and aluminum oxides

27. Origin of charge in organic and inorganic colloids – negative and positive charges – organic colloids - differences between organic and inorganic soil colloids
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28. Adsorption of ions – types of ion exchange – cation and anion exchange – cation and anion exchange capacities of soil
29. Base saturation – factors affecting ion exchange capacity of soils – importance of Cation Exchange Capacity (CEC) and Anion exchange capacity (AEC) of soils
32. Importance of soil organic matter and humus – fractionation of soil humus – carbon cycle – biomass carbon and nitrogen
34. Soil organisms – soil flora and fauna –beneficial and harmful roles – earth worms – microorganisms and their influence on soil properties

PRACTICAL SCHEDULE
1. Identification of rocks and minerals
2. Collection and Preparation of soil samples for laboratory analysis
3. Study of soil profile
4. Estimation of moisture in soil by gravimetric method
5. Determination of bulk density, particle density and pore space by measuring cylinder method
6. Determination of bulk density by clod and core sampler methods and particle density by pycnometer method
7. Determination of particle size analysis – feel method and international pipette methods-1
8. International pipette methods-1I
9. Determination of particle size analysis- Bouyoucos Hydrometer
10. Determination of soil colour using Munsell color chart
11. Estimation of pH and EC in soil
12. Estimation of soil organic carbon
13. Estimation of CEC in soil
14. Estimation of exchangeable cations in soil- calcium and magnesium
15. Estimation of exchangeable cations- Potassium and Sodium
16. Determination of base saturation and interpretation
17. Record certification

Reference books

E-reference:
GPB 214 PRINCIPLES OF GENETICS AND CYTOGENETICS (2+1)

OBJECTIVES
The fundamental concepts of Genetics and Cytogenetics will be exposed to the students quoting classical examples

THEORY

Unit I: Cytology

Brief history of developments in genetics and cytogenetics; Physical basis of heredity: Structure and function of cell and cell organelles – Differences between Prokaryotes and Eukaryotes. Cell division – mitosis, meiosis and their significance, cell cycle - zygote formation and embryo development - identical and fraternal twins. Chromosome structure, chemical composition, nucleosome, euchromatin, heterochromatin, NOR, satellite chromosome, karyotype, ideogram – chromosome banding; Types of chromosomes based on position of centromere, based on structure and function: based on the role in sex determination, normal and special chromosomes - B, ring and isochromosomes; Chromosomal aberration: Variation in chromosome structure – genetic and cytological implications; Variation in chromosome number – euploid, aneuploid, Nondisjunction - Klinefelter syndrome and Turner syndrome; Definition of eugenics and euthenics; evolution of wheat, Triticale, cotton, tobacco, Brassicas.

Unit II: Mendelian laws and modifications of Mendelian laws


Unit III: Modern concept of genetics and mutation

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. Chemical structure of DNA – Watson and Crick model – Central dogma of life. Proof for semi conservative method of DNA replication; Models of DNA replication; RNA types - mRNA, tRNA, rRNA; Genetic code, protein synthesis; Regulation of gene expression – operon model of Jacob and Monad; Cistrion, muton and recon; Complementation test; exons, introns – split genes –Transposable genetic elements- Ac - Ds system in maize. Functional genomics, Metagenomics, Transcriptomics, Proteomics, Metabolomics and Phenomics. Mutation – characteristics of mutation – micro and macro mutation – CIB technique - molecular basis of mutation- Transition and transversion; major physical and chemical mutagens.

Unit IV: Quantitative inheritance, Linkage and Crossing over

Quantitative inheritance – Multiple factor hypothesis – Nilsson Ehle experiment on wheat kernel colour. Polygenes – transgressive segregation, comparison of quantitatively and qualitatively inherited characters; modifiers; Types of gene action controlling quantitative traits. Linkage - coupling and repulsion; Experiment on Bateson and Punnet – Chromosomal theory of linkage of Morgan – Complete and incomplete linkage, Linkage group. Crossing over – significance cytological proof - Stern's experiment; Factors controlling crossing over. Strength of linkage and recombination; Two point and three point test cross. Double cross over, interference and coincidence; genetic map and physical map.

Unit V: Sex determination, sex linkage and cytoplasmic inheritance

Sex determination: Autosomes and sex chromosomes - chromosomal theory of sex determination - different types – sex determination in human, fowl, butterfly, grasshopper, honey bee, fumea; Sex determination in plants – Melandrium, papaya, maize. Genic balance theory of Bridges, quantitative theory, hormonal theory, barr

**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.
5. Types of chromosomes based on position of centromere, based on structure and function: normal and special chromosomes - polytene, lampbrush, based on the role in sex determination: autosomes and allosomes, Other types of chromosomes - B, ring and isochromosomes.
7. 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.
8. Polyploid - auto and allopolyploids, their characters; meaning of genome; evolution of wheat, Triticale, cotton, tobacco, *Brassica*
9. Pre-Mendelian ideas about heredity – Vapour and fluid theory, Magnetic power theory, Preformation theory, Lamarck’s theory, Darwin’s theory, Germplasm theory and Mutation theory.
10. Mendel’s experiments and laws of inheritance. Rediscovery of Mendel’s work
12. Chromosomal theory of inheritance. Allelic interactions – Dominance vs recessive, complete dominance, codominance, incomplete dominance, over dominance.
13. Deviation from Mendelian inheritance – Non allelic interaction without modification in Mendelian ratio – Bateson and Punnett’s experiment on fowl comb shape. Non allelic interaction with modification in Mendelian ratio – i.) Dominant epistasis (12:3:1)
   ii.) Recessive epistasis (9:3:4) iii.) Duplicate and additive epistasis (9:6:1).
   iv.) Duplicate dominant epistasis (15:1)
   v) Duplicate recessive epistasis (9:7) vi.) Dominant and recessive epistasis (13:3);
   Summary of epistatic ratios (i) to (vi).
14. Lethal genes, Pleiotrophy, penetrance and expressivity, phenocopy: Multiple alleles, blood group in humans, coat colour in rabbits, self incompatibility in plants; pseudo alleles, isoalleles.
15. Mid Semester Examination
19. **Polygenes – transgressive segregation**, comparison of quantitatively and qualitatively inherited characters; modifiers; Types of gene action controlling quantitative traits.

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

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

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

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

24. **Sex determination**: Autosomes and sex chromosomes - chromosomal theory of sex determination- different types – sex determination in human, fowl, butterfly, grasshopper, honey bee, fumea; Sex determination in plants – *Melandrium*, papaya, maize.

25. **Genic balance theory of Bridges**, quantitative theory, hormonal theory, barr bodies, metabolic differentiation theory; Gynandromorphs – sex reversal in chicken

26. **Sex linked inheritance – criss cross inheritance – reciprocal difference**; holandric genes; sex influenced and sex limited inheritance.


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

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

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

31. **RNA types** - mRNA, tRNA, rRNA; genetic code, protein synthesis - transcription. Translation

32. **Regulation of gene expression** – operon model of Jacob and Monad; Structural genes and regulator genes. Cistron, muton and recon;

33. **Complementation test**; exons, introns – split genes – Transposable genetic elements - Ac - Ds system in maize - Functional genomics, Metagenomics, Transcriptomics, Proteomics, Metabolomics and Phenomics

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

**PRACTICAL SCHEDULE**

1. Use of microscopes
2. Principles of killing and fixing; preparation of stains and preservatives.
4. 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 rice/maize.
6. Procedure for fixing and observing different meiotic phases in the inflorescence in pearl millet/ sorghum / horticultural crop/forest tree.
7. Repetition of meiotic studies in maize/ sorghum/ pearl millet/ forest tree and making temporary and permanent slides.
8. Observation of bivalents, trivalents, quadrivalents and chromosome banding.
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. Orientation for final examination

REFERENCE BOOKS

Further reading

e resources :
1. www.nmsu.edu,
2. www.biology200.gsu.edu

AGR 215 – IRRIGATION AND WEED MANAGEMENT FOR HORTICULTURAL CROPS (1+1)

OBJECTIVES
To study the basic principles and practices of water management in horticultural crops. To impart scientific knowledge on water management to economise water, utilization of poor quality water and to get higher yields. Exposure to different weeds, herbicides and their application to achieve higher yields.

THEORY
Unit–I : Importance, sources and soil – water – plant – relationship
Role of water for growth and development of crops - Need for scientific water management in India. Irrigation systems of India and Tamil Nadu - Soil – plant – water relationship - Soil moisture constant.

Unit–II : Water Requirement, Management and Scheduling of irrigation

Unit–III : Irrigation methods and quality of water

Unit–IV Biology, Ecology and principles of weed management

Unit–V : Herbicides and Weed Management
Herbicides – classification - formulation - methods of application; Introduction to Adjuvants and their use in herbicides - Weed management in major vegetable, flower and fruit crops - lawns and plantation crops. Aquatic and problematic weeds and their management.

Practical

Lecture Schedule
1. Role of water for growth and development of crops - Need for scientific water management in India –
2. Water resources of India and Tamil Nadu - Irrigation systems of India and Tamil Nadu.
5. Soil moisture extraction pattern - Crop water requirement - Consumptive use (CU)– PET. Water requirement for different horticultural crops – factors affecting crop water requirement - Critical stages for irrigation for fruits and vegetables.
7. Methods of irrigation – surface (flooding, beds and channels, border strip, ridges and furrows, broad bed and furrows, surge irrigation) and sub – surface method.
8. Micro irrigation system (drip and sprinkler irrigation) – suitability, components, layout, operation, advantage and disadvantage.
9. Mid Semester Examination.
10. Quality of irrigation water – Utilization of poor quality water for irrigation
11. Weeds - Definition, classification and characteristics, harmful and beneficial effect of weeds - weed seed dissemination - Seed dormancy
13. Principles and methods of weed management: Preventive, cultural, mechanical, chemical, biological and IWM.
14. Classification and characteristics of herbicides and herbicide formulations – Methods of herbicide application.
15. Adjuvants – Uses – Weed management in major vegetable and fruit and flower crops
16. Weed management in lawns and plantation crops
17. Problematic, parasitic weeds and their control

Practical Schedule
1. Determination of soil moisture content by gravimetric method and other improved devices.
2. Determination of field capacity and wilting point
3. Measurement of irrigation water with weirs, flumes and units.
4. Moisture extraction pattern of vegetable and fruit crops
5. Water use efficiency and methods to improve it.
6. Acquiring skill in different land shaping methods for surface irrigation
7. Layout, operation and maintenance of drip and sprinkler irrigation systems.
9. Identification of wet, dry and garden land weeds
10. Agronomic method of weed control
11. Identification of herbicides and its requirement calculations
12. Herbicides application equipments
13. Management of aquatic, problematic and parasitic weeds
14. WCE and economics of different weed control options.
15. Weed survey and its uses
16. Visit to orchard and nearby farmers field
17. Orientation for final practical examination

References
AEC 216 - PRODUCTION ECONOMICS AND FARM MANAGEMENT (1+1)

OBJECTIVES

The objective of this course is to provide knowledge to the students of B.Sc. (Ag.) about the principles of farm management. It would help the students in using different methods and tools for decision making in farm management, which would facilitate profit maximization through optimizing resource use.

THEORY

Unit I: Production Economics and Farm Management - Nature and Scope

Production Economics - Definition, nature and scope. Farm Management - Definition, objectives, scope of farm management and Farm management decisions - Production economics Vs farm management. Basic terms and concepts: Resources - Fixed, variable, flow and stock resources, choice indicator. Factors of production. Production function - Types/forms - Linear, quadratic and cobb-douglas.

Unit II: Factor - Product Relationship / Principle of Variable Proportions


Unit III: Factor – Factor Relationship / Principle of Factor Substitution


Units-IV: Product - Product Relationship / Principle of Product Substitution


Unit V: Farm Planning and Budgeting

Farm planning: Meaning - Types - Elements - Farm planning procedure - Characteristics of good farm plan. Farm budgeting: Definition and types – Partial budgeting, complete budgeting and cash flow budgeting - Limitations. Types and systems of farming: Types - Specialized, diversified, and mixed farming - Systems of farming: Co-operative, collective, capitalist, state and peasant farming. Risk and uncertainty: Definition - Types of risk and uncertainty - Safeguards against risk and uncertainty.

PRACTICAL
Problems on factor - product relationship - Determination of least cost combination - Determination of optimum product combination - Computation of cost concepts - Cost of cultivation and cost of production of agricultural crops, horticultural and livestock products - Methods of calculation of depreciation - Farm records and accounts: Analysis of farm records and accounts - Farm inventory analysis: Valuation of farm assets - Net worth statement - Profit and loss statement - Cash flow statement - Preparation of complete and partial budgets - Preparation of farm plan - Graphical solution to linear programming problem.

THEORY SCHEDULE
1. Production Economics: Definition and nature and scope - Farm Management: Definition - Objectives - Scope of farm management - Farm management decisions.
2. Production Economics Vs Farm Management - Basic terms and concepts: Resources - Fixed, variable, flow and stock resources - Choice indicator.
3. Factors of production - Types/Forms of production function - Linear, quadratic and cobb-douglas.
5. Law of Diminishing Marginal Returns - Relationship between total, average and marginal products - Three stages of production function.
6. Elasticity of production - Determination of optimum input and output - Physical and economic optimum.
7. Cost principles and cost curves.
9. Mid-Semester Examination
10. Isoquant map - characteristics / properties - Factor intensity.
11. Marginal rate of technical substitution - Elasticity of factor substitution - Iso-cost line - Principles of cost minimization / Least cost combination of inputs.
12. Isocones, ridgelines and expansion path - Effect of input price changes on the least cost combination - Returns to scale.
15. Farm planning: Meaning - Types - Elements - Farm planning procedure - Characteristics of good farm plan - Farm budgeting: Definition and types - Partial budgeting - Complete budgeting and cash flow budgeting - Limitations.
17. Risk and Uncertainty: Definition - Types of risk and uncertainty - safeguards against risk and uncertainty.

PRACTICAL SCHEDULE
1. Estimation of optimum input and output combination.
2. Computation of cost concepts
3. Determination of least cost combination.
4. Determination of optimum product combination
5. Cost of cultivation and cost of production of agricultural crops
6. Cost of cultivation and cost of production of horticultural crops
7. Cost of production of livestock products.
8. Depreciation: Methods of calculating depreciation.
9. Visit to private agricultural farm to collect data/ information on farm business.
10. Farm records and accounts: Analysis of farm records and accounts - types.
11. Farm inventory analysis – Methods of valuation of assets
12. Net worth statement - Profit and loss statement
14. Preparation of complete and partial budgets
15. Preparation of farm plan.
17. Orientation for final examination

REFERENCES

ENT 217 ECONOMIC ENTOMOLOGY AND NEMATOLOGY (1+1)

Objectives
1. To study the techniques in rearing honey bees, silkworm and lac insects.
2. To know about rearing of silkworm; lac insects and their importance.
3. To study the basic morphology and biology of important plant parasitic nematodes of horticultural crops.

Theory
Unit–I: Apiculture

Unit–II: Sericulture

Unit–III: Lac Culture and Minor Productive Insects

Unit–IV: Morphology, Taxonomy and Biology of Nematodes
Nematology Introduction. – Importance of plant parasitic and entomophilic nematodes. Elementary knowledge on morphology and anatomy of nematodes – Economic losses in Horticultural crop plants

Unit–V: Nematode pests on horticultural crops
Taxonomy of important plant parasitic nematodes – Biology and ecology of important plant parasitic nematodes – Meloidogyne, Heterodera, Globodera, Tylenchulus, Pratylenchus, Rotylenchulus, Radopholus and Ditylenchus. Plant parasitic nematodes of horticultural crops – vegetables, fruits, spices and plantation crops, flower crops, ornamentals, medicinal and aromatic plants.

Practical
Acquaintance with honey bee species, structural adaptation, castes, Bee-keeping equipment, bee forage plants, enemies of bees and Handling of bee colonies.

Survey and sampling for plant parasitic nematodes. Extraction of plant parasitic nematodes and cysts from soil and roots (Cobb’s sieving technique, Baermann funnel technique, conical flask technique, Sugar floatation technique, Fenwick can method, Incubation and Blender technique). Mounting of plant parasitic nematodes—Diagnostic characters of Orders Tylenchida and Dorylaimida. Identification of important plant parasitic nematodes of major horticultural crops—Meloidogyne, Heterodera, Globodera, Tylenchulus, Radopholus Rotylenchulus, Ditylenchus, Hirschmanniella, Aphelenchoides and Pratylenchus.

Assignment: Each student has to submit an assignment on preparation of crop calendar/Economics of beekeeping/Economics of sericulture/helpful insects/productive insects/Entomophilic nematodes/Plant parasitic nematodes of horticultural crops.

Lecture Schedule

1. Introduction—Species of bees, morphology, anatomy and structural adaptations.
2. Colony organization and life history—bee castes—duties—social behaviour.
3. Bee pasturage, Apiary, bee foraging and swarming. Bee enemies and diseases of bees
4. Bee pollination, seasonal management, bee products and their uses.
5. Types of silkworm—Non—mulberry, Eri, Tasar and Muga silkworms. Voltinism—Morphology and biology of mulberry silkworm
7. Mulberry silk worm rearing—Chawki rearing and Rearing of late age worms—rearing house—grainage
9. Mid Semester Examination
10. Lac culture—Species of Lac insect—Morphology, biology and secretion of lac.
12. Minor Productive Insects—Cochineal insect, Gall insect, Aesthetic and Scientific value of insects
14. Elementary knowledge on morphology of nematode—Classification based on feeding habits and ecology.
15. Taxonomy of important plant parasitic nematodes.
17. Biology and ecology of important plant parasitic nematodes of horticultural crops—Pratylenchus, Rotylenchulus, Radopholus and Ditylenchus.

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, fernick 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. Orientation for final practical examination

References

AEX 218 RURAL SOCIOLOGY, EDUCATIONAL PSYCHOLOGY AND DIMENSIONS OF EXTENSION EDUCATION (2+1)

OBJECTIVES
The course intends to expose students to the fundamentals of extension education, extension systems in India, programme planning and rural development efforts and to acquire knowledge on basics concepts related to rural sociology and educational psychology. The course will also provide an opportunity to students to visit different organizations involved in extension activities and rural development work and to learn the practical applications of important sociological and psychological concepts.

THEORY
Unit–I:Introduction to Extension Education and Extension Programme Planning
Extension Education – meaning, definition, scope, objectives, philosophy, principles; Extension Educational Process; Differences among formal, informal and non-formal education. Extension Programme Planning – definition, principles; meaning of project, plan, calendar of work, plan of work; steps in programme planning.

Unit–II:Introduction to Rural Sociology
Sociology, Rural Sociology and rural society – definitions; rural and urban differences, importance of rural sociology in extension education. Rural society – important characteristics of Indian rural society; Social groups – definition, classification, role of social groups in extension; Culture – concept, cultural traits, characteristics, functions, Ethnocentrism. Structure of Rural Society – patterns of rural settlement, social institutions, social organizations, Social Stratification – concept, functions, types. Social Control – definition; Customs – conventions, folkways, mores, rituals, taboos; Social Interaction Process – definition, basic social processes; Social Change – concept, factors influencing social change; Leadership – definition of leader and leadership, types, functions, characteristics of a good leader, methods of selecting leaders.

Unit–III: Introduction to Educational Psychology

Education – Psychology – Educational Psychology – Social Psychology – definitions, importance of psychology in extension; Basic principles of Human behaviour – Attention, Perception – meaning, characteristics; Intelligence – concept, types, measurement, factors affecting intelligence. Personality – concept, types, measurement, factors influencing personality; Teaching–Learning Process – Teaching – definition, meaning, principles of teaching, steps in extension teaching; Learning – definition, meaning, principles, learning situation. Motivation – concept, Maslow’s hierarchy of needs, techniques of motivation, importance of motivation in extension; Attitude – concept, factors influencing the development of attitudes.

Unit–IV: Early Rural Development attempts and Major Rural Development Programmes

Historical development of extension in India – Economic Conference of Mysore, Gurgaon Experiment, Sriniketan, Sevagram, Marthandam project, Firka development scheme, Etawah pilot project, Nilokkeri Experiment; Extension programmes of Ministry of Agriculture – Training and Visit (T&V) System, Broad Based Extension System (BBES), Farming System Research Extension (FSRE), Agricultural Technology Management Agency (ATMA); First line Extension System – KVK, ATIC, Frontline demonstrations. Rural Development – meaning, definition, concept, importance; Democratic Decentralization – Meaning, Panchayat Raj – Three tiers of Panchayat Raj system – Powers, Functions and Organizational setup – CDP, NES, IADF, IAAP, HYVP, IVLP, IRDP, NATP, ITDP, SFDA, MFAL, NREP, RLEG, DPAP, CADP, FFW, JRY, EAS, IAY, SGSY, SJSRY, PMGSY, SGRY, MGNREGA, PURA, NAIP, NADP (RKVY).

Unit–V: Women and Youth Development Programmes

Women Development Programmes – DWCRA, MSY, TANWA; Youth Development Programmes – TRYSEM, Nehru Yuva Kendra (NYK), ARYA.

Practical

Visit to District Rural Development Agency (DRDA) to study the organizational set up and rural development programmes; Visit to Panchayat Union office to learn their functions; Exposure to Gram Panchayat activities; Study of the functions of DDH and to learn about ATMA and other schemes; Interaction with a Self-Help Group to study its activities; Exposure to a Non-Governmental Organization (NGO) to study its role in rural development; Study of the activities of State Department of Horticulture to learn their extension activities; Visit to KrishVigyan Kendra (KVK) to learn their roles and activities; Visit to Social Welfare Department to study the women development programmes; Exercise to assess the awareness and participation of village people in rural development programmes in a rural setting. Visit to a village to study the sociological characteristics of a rural society – patterns of settlement, culture, social stratification, social values, social control, customs, social interaction processes, social change, and social problems; Study of basic social institutions and social organizations and their functions in a village setting; Exercise on selection of leaders in a village; Practice on Personality and Intelligence measurement techniques.

Lecture Schedule

1. Extension Education – meaning, definition, scope, objectives, philosophy, principles.
2. Extension Educational Process, Differences among formal, informal and non-formal education.
3. Extension Programme Planning – definition, principles; meaning of project, plan, calendar of work, plan of work; steps in programme planning.


5. Rural society – rural and urban, important characteristics of Indian rural society, differences and relationship, important characteristics of Indian rural society; Social Groups – definitions, classification, role of social groups in extension.

6. Culture – concept, cultural traits, characteristics, functions, Ethnocentrism.

7. Structure of Rural Society – patterns of rural settlement, social institutions, social organizations.

8. Social Stratification – concept, functions, types. Social Control – definition; Customs – conventions, folkways, mores, rituals, taboos;


10. Leadership – definition of leader and leadership, types, functions, characteristics of a good leader, methods of selecting leaders.

11. Education – Psychology – Educational Psychology – Social Psychology – definitions, importance of psychology in agricultural extension.


13. Intelligence – concept, types, measurement, factors affecting intelligence; Personality – concept, types, measurement, factors influencing personality.


15. Learning – definition, meaning, principles, types of learning, learning situation.

16. Motivation – concept, Maslow’s hierarchy of needs, techniques of motivation, importance of motivation in agricultural extension.

17. Attitude – concept, factors influencing the development of attitudes.

18. Mid Semester Examination

19. Historical development of extension in India – Famine Commission, Royal Commission, Scheme of Rural Reconstruction, Economic Conference of Mysore, Gurgaon experiment, Sriniketan.

20. Sevagram attempt, Marthandam Project, Firka Development Scheme, Etawah Pilot project, Nilokheri Experiment.


22. First line Extension System – KrishiVigyan Kendra (KVK), Institution Village Linkage Programme (IVLP), Agricultural Technology Information Centre (ATIC), Frontline demonstrations.


24. Community Development Programme (CDP), National Extension Service (NES).

25. Intensive Agricultural District Programme (IADP), Intensive Agricultural Area Programme (IAAP).

26. High Yielding Variety Programme (HYVP), Institution Village Linkage Programme (IVLP), Integrated Rural Development Programme (IRDP), National Agricultural Technology Project (NATP).

27. Integrated Tribal Development Agency (ITDA), Small Farmers Development Agency (SFDA), Marginal Farmers and Agricultural Labourers Development Agency (MFAL).

28. National Rural Employment Programme (NREP), Rural landless Employment Guarantee Programme (RLEGP), Drought Prone Area Programme (DPAP), Command Area Development Programme (CADP).

29. Food for Work Programme (FFW), Jawahar Rozgar Yojana (JRY), Employment Assurance Scheme (EAS), Indira Awaas Yojana (IAY), Swarna Jayanthi Gram Swarojgar Yojana (SGSY).
30. Prime Minister Employment Yojana (PMEY), Swarna Jayanti Shahari Rozgar Yojana (SJSRY), Pradhan Mantri Gram Sadak Yojana (PMGSY), Sampoorna Gramin Rozgar Yojana (SGRY).


32. Women Development Programmes – Development of Women and Children in Rural Areas (DWCRA), Rashtriya Mahila Kosh (RMK), Integrated Child Development Scheme (ICDS), Mahila Samridhi Yojana (MSY), Tamil Nadu Women in Agriculture (TANWA).

33. Women Development Programmes – Development of Women and Children in Rural Areas (DWCRA), Mahila Samridhi Yojana (MSY), Tamil Nadu Women in Agriculture (TANWA).

34. Youth Development Programmes – TRYSEM, Nehru Yuva Kendra (NYK), Attracting Rural Youth towards Agriculture (ARYA).

Practical Schedule

1. Visit to District Rural Development Agency (DRDA) to study the organizational set up and rural development programmes.
2. Visit to a Panchayat Union Office to learn about its functions.
3. Visit to the Office of the Deputy Director of Horticulture to study the extension activities of the State Department of Horticulture and to understand the reorganized extension system, organizational setup, functions.
4. Exposure to an NGO to study their role in rural development activities.
5. Visit to a nearby KVK to study its role and activities.
6. Visit to the Social Welfare Department to study the social welfare and women development programmes.
7. Understanding the sociological characteristics of a rural society – (Brainstorming).
9. Preparation of interview schedule to study the social characteristics of rural society – pattern of settlement, culture, social stratification, social values, social control, customs, social interaction process, social change and social problems (Group exercise).
10. Visit to a village for data collection (Group exercise).
11. Processing of data and presentation of Reports.
12. Preparation of interview schedule to study the basic social institutions and social organizations and their functions in a village setting (Group exercise).
13. Preparatory work for selection of leaders in a village (Group exercise).
14. Visit to a village for data collection (Group exercise).
15. Processing of data and presentation of reports.
16. Practicing Personality measurement techniques (Group exercise) and intelligence measurement techniques (Group exercise).
17. Orientation for final practical examination

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3. www.princeton.edu
4. rural.nic.in
5. www.panchayat.gov.inwed.nic.in
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HOR 220 COMMERCIAL FLORICULTURE (2 + 1)

Objectives
On completion of this course, the students will gain knowledge on cultivation techniques of commercial loose flowers in open field and cut flowers in protected structures.

THEORY
Unit–I: Principles of Growing Commercial Flowers

Unit–II: Production Technology of Loose Flowers
Crossandra, Marigold, Nerium, Gomphrena, Celosia and China aster.

Unit–III: Production Technology of cut flowers I

Unit–IV: Production Technology of cut flowers II
Orchids, anthurium, china aster, bird of paradise, Asiatic lily.

Unit–V: Production Technology of cut flowers III
Heliconias, alstromeria and flowering fillers viz., limonium, asparagus, ivy, gypsophila and cut foliages- constraints in flower production – future thrust.

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.


7. & 8. Chrysanthemum.

9. Tuberose

10. Crossandra

11. Marigold

12. Nerium and Gomphrena

13. Celosia and China aster.

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


17. Mid Semester Examination

18. & 19. Carnation


22. & 23. Chrysanthemum

24. & 25. Gladiolus

26. & 27. Orchids

28. Anthurium

29. Bird of paradise and heliconia

30. Asiatic lily, alstroemeria,

31. Foliage and flowering fillers - limonium, asparagus ivy, gypsopals, baby eucalyptus

32. Methods of floral concrete extraction from rose, jasmine and tuberose and other value addition processes in loose flowers.

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

34. Constraints in flower production and future thrust.

Practical Schedule


7. Preparation of project for loose flower production under open conditions.


12. Bird of paradise and heliconia – identification and description of species and
14. Visit to flower growing areas, industries and Institutions – TANFLORA, Auction centre, APEDA.
15. Rose, jasmine and tuberose – extraction of floral concrete.
16. Preparation of project for cut flower production under controlled conditions.
17. Orientation for final practical examination.

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2. www.Hitech horticulture.com
3. www.icar.org.in
4. www.wikihow.com
5. www.theflowerexpert.com
6. www.keralagriculture.gov.in

HOR 221 STUDY TOUR (0 + 1)
Objectives
To give exposure on state level scenario of Horticulture industry through visiting state organizations, institutions of higher learning, field units, progressive farmers fields, industries etc.
Details of Tour Programme
The students will visit various state level institutions related to agriculture, horticulture, forestry and other allied fields in South India. During the tour programme, the students will gain first-hand information on different agro-climatic zones, crops grown, cultivation practices, socio-cultural and economic status of the farming communities. The institutes shall be fixed based on the convenience and ground reality existing during conduct of the tour programme.
Duration: 7 days.

ENT 222 PRINCIPLES OF PEST MANAGEMENT (1+1)
OBJECTIVES
1. To study the influence of environment on insect populations
2. To know about various pest damage and
3. To study the principles and methods of pest management

THEORY
Unit–I: Insect Ecology
Unit–II: Components of IPM
Integrated Pest Management – Definition; Advantages and limitations of IPM.
Components of IPM – Cultural, Mechanical, Physical and Legal methods, Host plant resistance in IPM, Botanical insecticides in IPM – antifeedants and repellants. Formulation techniques of botanicals. Traditional methods in IPM, Biotechnology in IPM.

Unit–III: Biological and Behavioural pest management Strategies

Biological methods in IPM – classical biological control, merits and limitations of biological control, Parasitoids, Predators and Pathogens – Mass multiplication and application techniques of important groups of parasitoids, predators, pathogens.
Conservation, augmentation and release of bio control agents-Semiochemicals – Allomones, Kairomones and Synomones and their role in pest management, Sterile male technique – Insect growth regulators – Moult inhibitors and JH mimics in IPM

Unit–IV: Chemicals in Pest Management


Unit–V: IPM Strategies in Horticultural Crops

Integrated Pest Management in different ecosystems – Vegetables, Fruits, Plantation crops and Flower crops – Present status of IPM in Horticultural Crops in India. Plant clinic centres – Farmers field school and their role in IPM.

Practical


Assignment: Each student has to submit 15 numbers of insect damaged plant specimens (Herbarium) and five insecticide labels.

Lecture Schedule

1. Definition and importance of Insect ecology.
3. Effect of biotic and abiotic factors on insect population
4. Definition and categories of pests, biotypes and causes for pest outbreak.
5. Definition of IPM. Concepts, Scope and limitations of IPM. Concepts of Economic Injury Level (EIL) and Economic Threshold Level (ETL)
6. Definition and examples of Cultural, Physical and Mechanical methods of pest management, Host plant resistance in IPM.
7. Botanical insecticides in IPM – Formulation techniques of Botanicals – Legal methods of pest control -Traditional methods in IPM,
8. Biotechnology in IPM – genetic engineering – transgenic crops
9. Mid Semester Examination
11. Microbial control – definition, Important groups of microbial agents, Mode of action. Their role in pest management
12. Pheromones in IPM – Allelochemicals in IPM – Allomones, Kairomones and Synomones. Insect growth regulators in IPM – Moult inhibitors and JH mimics
13. Chemical control – importance and history. Classification of pesticides
14. Toxicity ranges. Basic and newer Formulations of insecticides – Hazards of insecticides, bio accumulation and bio magnification. Compatibility and Phytotoxicity
15. Integrated pest management strategies for Important Vegetables and Fruits
17. Plant clinic centres – Farmers field school and their role in IPM.

Practical Schedule
1. Identification of types of damage and major symptoms caused by crop pests
2. Assessment of insect population and their damage in horticultural crops
3. Practicing common Cultural, Mechanical and Physical methods in pest management
4. Observation on models of traps in pest management
5. Identification of different types of parasitoids, predators and entomopathogens
6. Practicing Mass culturing techniques of Trichogramma and Chrysopa
7. Practicing Mass culturing techniques of Chrysopa
8. Practicing Mass production of NPV and Fungal pathogens
9. Practicing Mass production of Fungal pathogens
11. Identification of different groups of pesticide formulations
12. Recognizing label information, Precautions in pesticide applications, First aid and antidotes informations.
13. Identification of types of Pesticide application equipments and Preparations of spray fluids for field application.
15. IPM Practices for vegetable and fruit pests
17. Orientation for final practical examination.

References

AGM 223 SOIL AND APPLIED MICROBIOLOGY (2+1)

OBJECTIVES
1. To enlighten the students with the knowledge of microbial diversity in soils and their interaction with plants.
2. To high lighten the role of soil microorganisms in soil fertility and plant growth promotion
3. To develop experimental skills in soil microbiology which includes isolation of beneficial microorganisms from soil and plant and their mass production
4. To make students gain expertise in practical aspects of production of industrial products

THEORY
Unit I Introduction to Soil Microbiology
Soil Microbiology- definition and scope. Contribution of Beijerinck, Winogradsky, waksman. Diversity of soil microorganisms - culturable (bacteria, actinobacteria, yeasts, moulds and algae) and unculturable microorganisms - metagenomic approach - factors influencing the microbial diversity
Unit II Microbial Processes in soil


Unit III Soil Microorganisms and plants

Rhizosphere, spermosphere, phyllosphere, epiphytic and endophytic microorganisms and their significance. Plant growth promoting rhizobacteria. Soil microorganisms and their interactions – positive and negative interactions

Unit IV Microbial inoculants


Unit V Industrial Microbiology

Industrial utilization of microorganisms - Alcohol fermentation – wine and beer. Antibiotics (Penicillin, Streptomycin) and vitamin (B12) production. Microbes in food industry – single cell protein, baker’s and brewer’s yeast and dairy products – cheese and yoghurt. Biofuels- ethanol and biodiesel. Probiotic Microorganisms

PRACTICAL


THEORY SCHEDULE

1. Introduction and historical developments in soil microbiology. Contributions of Beijerinck, Winogradsky, Fleming and Waksman
2. Diversity of soil microorganisms - culturable and unculturable microbial diversity
   Metagenomic approach
3. Factors influencing the activities of soil microorganisms
4. Carbon cycle – C:N ratio. Role of soil microorganisms in the decomposition of organic matter and humus formation
5. Nitrogen cycle – Mineralization, Ammonification, Nitrification and Denitrification
7. Endophytic and symbiotic microorganisms
10. Phosphorus cycle
11. Microbial transformation of phosphorus - phosphate solubilizer and mycorrhizae
12. Sulphur cycle - sulphur oxidizers;
13. Microbial transformation of K, Zn and Si.
14. Role of soil enzymes in nutrient transformation- Soil fertility and plant growth
15. Role of soil enzymes in degradation of xenobiotics
16. Importance of soil and plant associated microorganisms – rhizosphere, spermosphere, phyllosphere, epiphytic and endophytes
17. Mid Semester Examination
18. Soil microorganisms and their interactions – positive and negative interactions.
19. Plant growth promoting Rhizo bacteria (PGPR)
20. Bioinoculants – types carrier based and liquid based - bacterial, fungal (AMF) and algal Bioinoculants
21. Mass production of bacterial biofertilizer
22. Mass production of AMF
23. Mass production of algal biofertilizer and Azolla
24. Quality control of bacterial and fungal biofertilizers
25. Methods of application of bioinoculants and crops recommended
26. Industrial utilization of microorganisms – alcohol fermentation – alcoholic beverages
27. Antibiotics production (Penicillin and Streptomycin)
28. Vitamin production (Vitamin B2 and Vitamin B12).
29. Microbial production of organic acids and their uses in industry
30. Microbial production of industrial enzymes
31. Microbes in food industry – Single Cell Protein, Baker’s and Brewer’s yeast,
32. Dairy products – cheese and yoghurt
33. Biofuels – alcohol and biodiesel production
34. Probiotic microorganisms – role and their importance in human and animal health

PRACTICAL SCHEDULE
1. Enumeration of soil microorganisms - quantitative Conn’s direct microscopic method
2. Buried slide technique
3. Standard plate count technique
4. Enumeration of rhizosphere microorganisms and determination of R:S ratio
5. Study on soil enzyme activity - soil dehydrogenase activity
6. Isolation of Rhizobium from root nodules
7. Isolation of Azospirillum
8. Isolation of Gluconoacetobacter from sugarcane
9. Isolation of phosphobacteria
10. Isolation of PPFM
11. Examination of AM infection in roots and recovery of spores from soil
12. Mass production of bacterial bioinoculants
13. Mass production of AM fungi
14. Mass multiplication of blue green algae and Azolla
15. Methods of application of different bioinoculants
16. Wine fermentation
17. Orientation for final Examination

Text Books

REFERENCE BOOKS

Web Pages
1. fire.biol.wwu.edu/hooper/416_05Ncycle1.ppt
2. www.fao.org/docrep/009/a0100e/a0100e05.htm

PAT 224 MUSHROOM CULTURE (0+1)

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

PRACTICAL
Introduction to mushrooms – edible and poisonous type – edible mushrooms – Pleurotus, Agaricus, Volvariella and Calocybe – preparation of culture media – pure

Practical Schedule
1. Introduction to mushrooms
2. Types of mushrooms
3. Morphology and life cycle of important edible mushrooms
4. Preparation of culture media
5. Pure culture-maintenance of culture
6. Spawn and types of spawn
7. Cultivation techniques
8. Mid – semester examination
9. Cultivation of oyster mushroom
10. Cultivation of milky mushroom
11. Cultivation of button mushroom
12. Cultivation of paddy straw mushroom
13. Problems in cultivation & its management
14. Post harvest technology
15. Nutritional & medicinal value of mushroom
16. Other uses of mushroom & Cost analysis and project preparation
17. Final Practical Examinations

References

E-resources
1. www.nrcmushroom.org
2. www.un.csam.org>tm.mushroom

GPB 225 PRINCIPLES AND METHODS OF PLANT BREEDING (2+1)

OBJECTIVES To expose the students to basic and applied principles of plant breeding

THEORY

Unit I: Reproductive systems in plant breeding

Male sterility and applications. Apomixis – introduction – classification - applications; Parthenocarpy and its types.

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


PRACTICAL

Observation on pollination and reproduction in plants - Alternation of generation and life cycle. Description and drawing different pollination systems - Mechanisms enforcing self and cross pollination in crops; Pollen morphology - Exine structure of different crops. Assessment of pollen fertility and sterility in A, B, R and

THEORY SCHEDULE
1. Objectives and role of plant breeding - historical perspective – activities in Plant Breeding.
8. TGMS, PGMS, Gametocides, Transgenic Male sterility and applications.
10. Basic biometrics-nature and significance of qualitative and quantitative variation-phenotypic, genotypic and environmental-heritability and genetic advance
17. Backcross breeding – genetic principles – prerequisites – procedures for transferring dominant and recessive genes
18. Mid Semester examination
21. Breeding methods of cross pollinated crops without involving artificial hybridization:
   - Mass selection in cross pollinated crops
   - Modified mass selection
   - Unit selection
   - Mass selection with progeny testing
   - Half sib family selection
   - Full sib family selection.

22. Breeding methods of cross pollinated crops involving artificial hybridization:
   - Recurrent selection
   - Types
   - Merits and demerits.

23. Heterosis breeding:
   - Theories
   - Genetic basis
   - Hybrid vigour
   - Estimation of heterosis
   - Inbreeding depression
   - Development of inbreds.

24. Heterosis breeding:
   - Procedure
   - Use of male-sterility systems and manual emasculation in hybrid seed production
   - Maintenance of parental lines
   - Types of hybrids
   - Achievements
   - Merits and demerits
   - Hybrid variety
   - Merits and demerits.

25. Synthetics and composites:
   - Steps in development of synthetics and composites
   - Achievements
   - Merits and demerits.

26. Genetic characters of asexual reproduction:
   - Breeding methods
   - Clonal selection
   - Hybridization and clonal selection
   - Merits and demerits
   - Achievements
   - Chimeras and its types
   - Tree breeding
   - Clonal orchards.

27. Polyplody breeding:
   - Classification
   - Induction of polyplody
   - Diploid x tetraploid and diploid x hexaploid crosses
   - Achievements
   - Limitations.

28. Wide hybridization:
   - History
   - Importance
   - Barriers and techniques for overcoming barriers
   - Utilization

29. Mutation breeding:
   - Mutation
   - Types
   - Mutagens
   - Breeding procedure
   - Applications
   - Achievements
   - Limitations.
   - Ideotype concept

30. Somaclonal variation:
   - Utilization in crop improvement
   - In vitro selection techniques
   - Use of doubled haploids in crop improvement.
   - Concept of biotic and abiotic stress resistance.

31. Types of cultivars:
   - Procedure for release of new varieties
   - Stages in seed multiplication
   - Concept of seed certification
   - TC plants certification.

32. Maintenance breeding:
   - General seed production techniques
   - Steps in nucleus and breeder seed production
   - Varietal rundown and renovation.

33. Current trends in Plant Breeding:
   - Marker assisted breeding

34. Transgenic crops:
   - Concept of Plant Varietal protection
   - Geographical indications and DUS

PRACTICAL SCHEDULE
1. Pollination and reproduction in plants - Alternation of generation and life cycle.
2. Description and drawing different pollination systems - Mechanisms enforcing self and cross pollination in crops; Pollen morphology - Exine structure of different crops. Fertility and sterility in A, B, R and TGMS lines.
3. Breeder kit and its components - Uses; Basic steps of selfing and crossing techniques.
4. Emasculation and pollination techniques in field crops.
5. Emasculation and pollination techniques in horticultural crops.
6. Studies on segregating generation and maintenance of records.
7. Maintenance of A, B and R line and TGMS lines - Hybrid seed production techniques.
10. Studies on different wild species in crop plants and wide hybridization.
14. Layout of different yield trials - Observing the experimental plots - Nucleus and breeder seed production plots.
15. Screening methods - Laboratory and field - For biotic and abiotic stresses.
17. Orientation for final examination.
References

AEC 226 - AGRICULTURAL MARKETING, TRADE AND PRICES (1+1)

OBJECTIVE
The aim of the course is to give exposure to the Under Graduate students on market concepts, marketing of agricultural commodities, intermediaries involved, domestic and export trade, risk in agricultural marketing, marketing institutions involved, price dynamics and the role of government in regulation of markets.

THEORY
Unit I: Agricultural Marketing – Nature and Scope

Units II: Marketing Functions and Marketing Efficiency

Units III: Marketing Institutions

Units IV: Trade in Agricultural Products

Units V: Agricultural Prices

PRACTICAL

THEORY SCHEDULE
4. Producers’ surplus of agricultural commodities. Marketable and marketed surplus - Definition, importance, relationship and factors affecting marketable surplus.
5. Marketing functions - Definition and classification. Buying and selling, Assembling and distribution, Storage and warehousing Processing and value addition
9. Mid Semester Examination
10. Role of government in promoting agricultural marketing - DMI, Regulated market, cooperative marketing, State Agricultural Marketing Board, NAFED, TANFED, State trading, FCI, PDS
13. Barriers to trade - Tariff and non tariff measures. Role of institutions like UNCTAD and WTO in promoting trade. Free trade agreements - Implications of AoA, market access, domestic support and export subsidies.
15. Agricultural prices - Meaning, functions and importance. Characteristics of agricultural product prices. Important terms and concepts - Farm harvest price, Wholesale price, Retail price, FOB price, Border price, CIF price, MSP. Procurement price, Remunerative price, Parity price, Fair price and SAP.
17. Government intervention in pricing of agricultural commodities - Objectives, forms of intervention, agricultural price policy in India, Role of CACP.

PRACTICAL SCHEDULE
1. Market survey
2. Estimation of marketable and marketed surplus
3. Identification of marketing channels and estimation of price spread for agricultural products.
4. Identification of marketing channels and estimation of price spread for horticultural products.
5. Visit to Regulated market.
6. Visit to Cooperative marketing society
7. Visit to Farmers’ market and shandy.
8. Visit to FCI, CWC and TNCSC
9. Visit to Agmark laboratory
10. Visit to agricultural processing units
11. Farm input marketing
12. Visit to cashew export unit
13. Commodity boards
14. Time series analysis
15. Construction of index numbers
17. Orientation for final examination

References:

STA 227  AGRICULTURAL STATISTICS (1+1)

OBJECTIVE
To understand and apply fundamental concept of statistical applications in biology and to acquire about theoretical concept of descriptive statistics, testing of hypothesis, correlation, regression and basic design of experiments.

THEORY
Unit I: Descriptive Statistics
Introduction – Measures of central tendency: arithmetic mean, geometric mean, harmonic mean, median and mode – Merits and demerits. Measures of dispersion: Range, Quartile deviation, Mean deviation, standard deviation, and coefficient of variation - Skewness and kurtosis – Merits and demerits.

Unit II: Sampling Theory and Probability Distributions

Unit III: Testing of hypothesis
Null and alternative hypothesis – types of errors - critical region and tests of significance. Large sample test – single mean and difference between two means – single proportion and difference between two proportions.
Small sample tests – F-test - t-test for testing the significance of single mean – independent and paired t test – chi square test for testing the association of r x c contingency table.

Unit IV: Correlation and Regression
Correlation – Scatter diagram - Karl Pearson’s correlation coefficient – Spearman’s rank correlation - computation and properties.

Unit V: Analysis of Variance and Experimental Designs
Analysis of Variance (ANOVA) – assumptions – one way and two way classifications. Basic principles of experimental designs – Completely Randomized Design (CRD) – Randomized Block Design (RBD) – Latin Square Design (LSD).

**THEORY SCHEDULE**

1. Introduction – Measures of central tendency: arithmetic mean, geometric mean, harmonic mean, median and mode – Merits and demerits. TBI 1-5, TBI 25 – 35.
9. Mid Semester Examination
10 Small sample tests – F-test - t-test for testing the significance of single mean TBII 26-28
11. Independent and paired t test TBII 29-38
12. Chi square test for testing the association of r x c contingency table. TBII 43-45
13. Correlation – Scatter diagram - Karl Pearson’s correlation coefficient – Spearman’s rank correlation - computation and properties. TBI 142 – 145
15. Analysis of Variance (ANOVA) – assumptions – one way and two way classifications. Basic principles of experimental designs. TBI 227 - 231
16. Completely Randomized Design (CRD) – Randomized Block Design (RBD). TBI 269 - 284
17. Latin Square Design (LSD). TBI 315 - 320

**PRACTICAL SCHEDULE**

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

**Text Books**


REFERENCE BOOKS

Web resources
2. www.statsoft.com
4. www.stats.gla.ac.uk/steps/glossary/index.html

ENG 228 SOFT SKILLS OF EMPLOYABILITY (0+1)

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

UNIT I – Introduction to Soft Skills
Soft skills – an introduction – career skills and corporate skills - definitions.

UNIT II – Life Skills
1. Attitude
   Attitude - Psychological and sociological definitions – types of attitude - consequences – suggestions to keep good attitude.
2. Emotional Intelligence
   Introduction to Emotional Intelligence – four branch model of EQ - five point scale to measure EI – suggestions to improve EI.
3. Interpersonal skills
   Interpersonal Skills - Study of character traits - formal interpersonal skills - greeting, enquiring, answering, complimenting and acknowledging.
4. Self Development/Empowerment

UNIT III Communication Skills
5. Types of Communication
   Communication - Basic Communication Model - Verbal and Non-verbal Communication.
   Business Communication
   Writing memo - short notes – short reports, Agenda , minutes, Business proposals, newspaper advertisement.
6. Group Dynamics
   Study of affiliation, participation, goal consciousness – Forming, Storming, Norming –Performing.
7. **Kinesics**
   Definition - personal appearance, posture, gestures, facial expressions, eye contact and movements.

8. **MID SEMESTER**

UNIT IV – Employability Skills

9. **Interview Skills – I**

10. **Interview Skills – II**
    Telephone interview – Skype interview - Panel Interview - Five stages of interview –how to answer the questions

11. **Group Discussion**
    Definition – contexts – why and how? – techniques and skills.

UNIT V – Corporate Skills

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

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

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

16. **Stress management**

17. **Final practical Examination**

Practical Schedule

1. Administration of 25 item questionnaire on Emotional Intelligence and introduction to Soft Skills.

2. Attitude, its types and seven steps to overcome challenged attention.

3. Interpersonal Skills, character traits, formal interpersonal skills and demonstration.

4. Self Development, empowerment and goal setting based on the principle of SMART SWOC analysis.

5. Types of communication viz., verbal and non verbal communication and basic communication model.

6. Writing - writing memo, short notes, short reports, agenda, minutes, business proposals, newspaper advertisement.

7. Group dynamics – the study of affiliation, participation, goal consciousness, forming, storming, norming and performing.

8. Definition of kinesics - personal appearance, posture, gestures, facial expressions, eye contact and movements, observation and explanation of the body language of a public speaker.

9. Mid semester examination.

10. Mock interview, group interview, telephone interview, skype interview and panel interview - simulation.

11. The techniques and skills of group discussion – group discussion on select topics.

12. Leadership qualities and the basic requirements of being a leader (responsibility, rapport with subordinates, knowledge of the assignment, goal setting, decision making and team work).


14. Negotiation skills, functions of negotiation, kinds of negotiation and the phases of the process, rules and steps to improve negotiation skills.
15. Stress management and time management – brainstorming.
16. Teacher student interaction on causes of stress in students life.
17. Orientation for final examination

REFERENCE:

Text book:

E-books:

Websites:
1. www.softskills.com
2. www.reportingskills.com
3. www.writing-skills.com
4. www.negotiation.com
5. www.businessballs.com
6. www.study-habits.com
7. www.timethoughts.com

AEG 229 FARM POWER, MACHINERY AND RENEWABLE ENERGY (2+1)

OBJECTIVES
This subject will enable the student
1. To gain knowledge on the various types of IC engines, types and selection of tractors.
2. To understand the construction and working of various farm implements like tillage implements, seed drills, transplanters, plant protection and harvesting equipments.
3. To gain knowledge on the various renewable energy sources like solar, wind, biogas and biomass energy.
4. To understand the construction and working of various solar energy gadgets, wind mill, bio gas plants and production of bio diesel and ethanol from agricultural produce.
THEORY
UNIT I – Tillage and Tillage Machinery, Sowing, Planting, Intercultural Equipment
Farm power in India - Human, animal, mechanical and electrical energy sources. Tillage – Ploughing Methods - Primary Tillage Implements - Types of plough - Secondary tillage implements - Cultivators, Harrows and rotavators - Wetland equipment - Puddlers, Tramplers and Cage Wheel. Sowing Methods - Seed Drills, Seed cum fertilizer drills - Paddy transplanters.
UNIT II – Plant Protection Gadgets, Harvesting Machinery and Equipment for Land Development
UNIT III – Agriculture Diesel Engine and Tractors
IC engines- Working principles, Two stroke and four stroke engines, IC engine terminology, modern agriculture diesel engine, Electronic fuel injection, dual fuel operation engine, Tractors- Types and Utilities.
UNIT IV: Energy scenario and biomass energy conversion systems
UNIT V: Solar energy, Wind energy and bio – fuels and its applications

PRACTICAL
Study of constructional details of KVIC and JANATHA type and Deen Bandu type bio gas plants and different types of gasifier and briquette preparation from biomass – Study and find the Performance of a solar still, solar dryer and solar cooker – Study about the working of solar photovoltaic pumping system and solar street light. Study of different types of wind mills- Study the processing of Bio diesel production from Jatropha.

Lecture Schedule:

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<td>energy sources</td>
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<td>Objectives of Primary tillage, mould board, disc plough,</td>
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<td>chisel plough and subsoiler, components and functions, types,</td>
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<td>advantages and disadvantages</td>
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<td>Secondary tillage equipment – harrows, land forming equipment</td>
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<td>– rotavator</td>
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<td>4</td>
<td>Wet land equipment – puddlers, Green manure tramplers and</td>
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<td>cage Wheels</td>
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5 Seed Sowing methods and Equipments
6 Seed drills, seed cum fertilizer drills – components and functions, requirements
7 Paddy transplanters, types, working principle, and nursery requirements
8 Sprayers and their functions, classification, manually operated sprayers, power sprayers – dusters, types and uses
9 Harvesting tools and equipment – sickles, paddy harvester
10 Combine – Harvesting machinery for groundnut, tuber crops, and sugarcane
11 Equipment for land development and soil conservation – dozers
12 Equipment for intercultural tools, levelers, chisel plough, sub soil plough, blade harrow and bund former
13 Implements for intercultural operations – cultivators, sweep, junior hoe, manual weeder
14 Power operated weeder for wet land and garden land
15 IC engines- working principles, two stroke and four stroke engines, different systems of IC engine
16 Electronic fuel injection system, dual fuel operation engine, tractors – types and utilities
17 Introduction – Energy crisis – Classification – Availability – Renewable energy sources – significance
18 Mid-Semester Examination
19 Potential of Solar, Wind, Biogas, Biomass, and other Renewable Energy sources achievements in India
20 Methods of energy conversion – Thermo chemical conversion methods – Principles of combustion, Pyrolysis
21 Gasification – Types of gasifiers – Producer gas and its utilization
22 Briquettes – Types of briquetting machines – Uses of briquettes – Shredders
23 Biochemical conversion methods – Biogas and Ethanol Production – Applications
24 Biogas technology – Feed stocks – Factor influences biogas yield – Biogas Plants Types – Construction and Working – Applications
25 Solar energy – Solar energy applications
26 Solar collectors – Types – Solar energy gadgets
27 Solar air heaters – Solar cookers – Solar water heating systems – Solar grain dryers
28 Solar photo voltaic systems and application
29 Solar lights – Solar pumping systems – Solar refrigeration system – Solar ponds
30 Solar space heating and cooling systems
31 Wind energy – Types of wind mills – Constructional details and applications
32 Energy from agricultural wastes – Liquid Biofuels
33 Bio diesel and ethanol from agricultural produce
34 Bio diesel and ethanol production and Uses.

PRACTICAL SCHEDULE:
1 Study of working of two and four stroke IC engines
2 Study of MB plough and disc plough, measurement of plough size, different parts, horizontal and vertical suction
3 Study of disc harrows, bund former, leveller, and rotavator, chisel plough, blade harrow
4 Study of seed-cum-fertiliser drills – furrow opener, metering mechanism and calibration
5 Study of different inter-cultivation equipments.
6 Study of plant protection equipment – power sprayers, knapsack sprayers and dusters – minor repairs and adjustment of sprayers
7 Study of power tiller their operation and maintenance.
8 Study of tractors and Harvesting Machinery - operation and maintenance
9 Study and constructional details of different bio gas plant types
10 Study and constructional details of different types Gasifiers and biomass Briquetting
11 Study of different types of solar collector.
12 Study of working principle of solar water heater and solar air heater.
13 Study the Performance of a solar still, solar dryer and solar cooker
14 Study the working of solar photovoltaic pumping system and solar street light
15 Study the different types of wind mills
16 Study the processing of Bio diesel production from Jatropha
17 Orientation for final examination

Text Books:

Reference Books:

WEB RESOURCES:
1. www.agricoop.nic.in/dacdivision/Machinery1/directory.htm
2. www.farmmachineryshow.org
3. www.freesolaronline.com
4. www.rsnz.org
5. www.finwea.org
6. www.mnre.gov.in

AGR 310 – CLIMATE CHANGE AND DISASTER MANAGEMENT (1+0)

OBJECTIVES

Acquiring knowledge on ecological principles, concepts, basic understanding of climate change and its impact key concepts of disasters and practices of mitigation, assessment of hazards and their management.
B.Sc. (Horticulture) Regulations and Syllabus 2017-18

THEORY
Unit – I : Climate change and its impact
Climate change – Causes – Impact on Agriculture – Mitigation strategies – Global warming – Sea level rise – Ozone layer depletion – Acid rains – Pollution – Pollutants – Types.

Unit – II : Resource conservation

Unit – III : Natural disasters

Unit – IV : Disaster management

Unit – V : Disaster Rehabilitation

THEORY LECTURE SCHEDULE
2. Impact of climate change on Agriculture and mitigation strategies
3. Climate change – global warming, sea level rise, ozone layer depletion and acid rain
4. Environmental pollution causes, effects and control
5. Conservation of resources and remediation measures from different pollutants
6. Basic concepts and principles of Agricultural ecology and environment
7. Manmade disasters and Nuclear disasters
8. Natural disasters – definition – types and effects
9. Mid – semester examination
10. Floods, drought, cyclone, earth quakes and Tsunami
11. Landslides, avalanches, volcanic eruptions, Heat and cold waves
12. Disaster management – efforts to mitigate disasters at national and global levels
13. Disaster response mechanism in India
14. Disaster warning, India’s key hazards, risk and mitigation
15. Financial arrangements – role of NGO’s and other organizations.
16. Rehabilitation – Bio shields livelihood options – insurance and compensation
17. Preparedness - EOCs

REFERENCE BOOKS

e-resources
OBJECTIVES
To impart knowledge on the basic concepts of breeding, different methods of breeding, breeding strategies and achievements made in the improvement of horticultural crops.

THEORY

Unit I: Principles of plant breeding

Unit II: Advanced plant breeding
- Self-pollinated crops and cross-pollinated crops- components of variation– segregation – breeding values – applications of biotechnology to plant breeding – transgenic molecular plant breeding.

Unit III: Crop improvement in fruit crops
- Objectives, breeding strategies and achievements in crop improvement of mango, banana, acid lime, sweet orange, grapes, sapota, papaya, guava and pomegranate..

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

Unit V: Crop improvement in spices, plantation crops and flower crops
- Objectives, breeding strategies and achievements in crop improvement of pepper, cardamom, turmeric, coriander, tea, coffee, cashew, coconut, rose, jasmine, tuberose, chrysanthemum and crossandra.

Practical

Lecture Schedule
1. History and importance of breeding.
4. Methods of breeding and hybridization techniques.
5. Components of variation.
6. Segregation – breeding values
7. Application of biotechnology to plant breeding.
8. Transgenic molecular plant breeding.
9. Centres of origin – germplasm – plant genetic resources, conservation, evaluation and utilization- National and international agencies engaged in conservation, gene sanctuaries, exploration etc.,
13. Breeding strategies, and methods of improvement of the following crops:
   - Mango and banana.
   - Citrus and grapes
   - Guava and pomegranate.
   - Papaya and sapota
   - Mid Semester Examination
   - Tomato and brinjal.
   - Chillies and bhendi.
21. Pumpkin, ridge gourd and snake gourd
22. Peas and beans.
23. Potato.
24. Tapioca
25. Onion, moringa and amaranthus.
27. Pepper and cardamom.
28. Turmeric and coriander
29. Tea and coffee.
30. Cashew
31. Coconut.
32. Rose.
33. Jasmine and chrysanthemum.
34. Crossandra and tuberose.

Practical Schedule
1. Study of floral biology and pollination mechanism, practices in selfing and crossing in the following crops: Mango and banana.
2. Citrus and grapes.
3. Sapota and papaya.
5. Tomato and brinjal.
6. Chilies and bhendi.
8. Cucumber and watermelon.
10. Tapioca and sweet potato.
11. Onion, moringa and amaranthus.
12. Pepper, cardamom and coriander.
13. Cashew, cocoa and coconut.
14. Chrysanthemum and marigold.
15. Heterosis breeding and techniques of F1 hybrid production.
16. Study of mutation and polyploidy breeding.
17. Orientation for final practical examination.

References
1. Anil Kumar Shukla and B.B. Vashishtha. 2014. Fruit breeding – approaches and achievements. IBDC, Lucknow,
8. e-resources

HOR 312 BIOTECHNOLOGY OF HORTICULTURAL CROPS (1+1)
OBJECTIVES
The natural capability of plants to multiply by asexual means is the basis for multiplication in vitro. In this course, the importance and scope of biotechnology will be highlighted and various techniques of tissue culture will be dealt in detail.
THEORY
Unit–I: Importance, history, factors affecting tissue culture
Unit–II: Techniques of tissue culture – I
Unit–III: Techniques of tissue culture – II
Unit–IV: Techniques of tissue culture- III
   Protoplast culture – somatic hybridization -- synthetic seed production -- cryopreservation- secondary metabolite production.
Unit–V: Genetic engineering and secondary metabolite production
Practical
Lecture Schedule
1. History of plant tissue culture - concepts and applications of biotechnology.
2. Influence of plant materials, physical and chemical factors on in vitro growth and development.
3. Effect of growth regulators on in vitro growth and development.
5. Callus culture – initiation and maintenance of callus culture – initiation of cell suspension cultures.
8. Anther culture – isolation procedure for anthers and microspores and pathways leading to haploid plants.
9. Mid Semester Examination
10. Ovary and embryo culture – methods of isolation and culture- embryo rescue technique its applications.
12. Protoplast culture – techniques for isolation, culture, fusion and production of somatic hybrids.
13. Techniques of cryopreservation.
17. Uses of various molecular tools and achievements.
Practical Schedule
1. Study of components of tissue culture laboratory and requirements.
2. Various tissue culture laboratories – layout/design.
5. Sterilization techniques – methods of sterilizing glasswares and media.
8. Inoculation of explants – techniques involved.
9. Sub-culturing techniques.
11. Micropropagation - media, culture of explants.
13. Demonstration of protoplast culture
15. Extraction and quantification of DNA.
16. PCR and electrophoresis from leaf DNA.
17. Orientation for final practical examination.

References
10. Virtual lab https://www.amrita.edu

HOR 313 URBAN AND ENVIRONMENTAL HORTICULTURE (1+1)

OBJECTIVES
To update the knowledge on environmental issues related to horticultural production and urban environment, to impart knowledge on horticultural techniques/activities/concepts associated with ecosystem management, environmental protection, health and well-being of an individual and a community, landscape beautification and urban planning.

THEORY
Unit–I: Ecology and Global warming: Relationship to Environment and Horticulture


Unit–II: Environmental Pollution and Mitigation

   Air, water, soil, noise, thermal and nuclear pollutions: causes, effects and control measures- pollution control through horticultural practices- carbon sequestration: concept, methods and carbon credit – plants in pollution control- solid waste management: causes, effects and control measures of urban and industrial wastes, composting, and modern land fill- sewage and effluent treatment methods and utilization of waste water-Environmental Protection Acts.
Unit–III: Urban Planning and Sustainable Landscapes

Urban Planning: town planning concepts: Geddisian Triad concept, garden city concept, satellite town principles – importance of plants in urban planning – role of plants in managing urban environmental factors and vice-versa – sustainable landscape concepts for urban: xeriscaping, green belt/green buffers, avenue planting, landscaping schools, villages, gated communities/colonies, railway stations, dam sites, industrial sites, river/lake banks and play grounds.

Unit–IV: Horticultural concepts for urban well being

Global trends in urban horticultural concepts- home gardens, container gardening, vertical gardens, herbal garden, roof garden and hydroponics: basics, techniques and layout – social horticulture- physiological and social aspects of ornamental plants-public gardens, theme parks and botanical gardens – horticultural crafts: bonsai, vegetable carving and flower arrangements.

Unit–V: Therapeutic Horticulture for Health Benefits

Therapeutic horticulture: definitions and terms – therapeutic horticulture programmes- methods and approaches used in therapeutic programmes – planning, design and construction issues in the design of therapeutic landscapes/gardens, tools, equipment and materials – aroma therapy – definition and applications – aroma garden.

Practical


Lecture Schedule

1. Eco-system concept: Its structure and functions
2. Classification of ecosystems system and their features with special reference to urban and horticultural ecosystem
3. Climate change: causes, consequences and implications in urban environment and horticulture
4. Biodiversity conservation and role of invasive aliens in climate change
5. Environmental pollution: causes, effects and control measures of air, water, soil, noise, thermal and nuclear pollutions
6. Carbon sequestration: concept, methods, carbon credit and highlight on trees for pollution control.
7. Solid waste management: causes, effects and control measures of urban and industrial wastes, composting with special reference to modern land fill
8. Sewage and effluent water treatment: concept, technology and treatment methods and utilization of waste water in urban areas.
9. Mid Semester Examination
10. Environment protection, wild life and biodiversity protection acts.
11. Urban Planning: Town planning concepts with a special reference to importance of plants in urban environment
12. Sustainable landscape concepts for urban environment: xeriscaping, green belt/green buffers and avenue planting
13. Sustainable features for landscaping in schools, villages, gated communities/colonies, railway stations, dam sites, industrial sites, river/lake banks and play grounds.
14. Trends and developments in urban horticultural concepts: home gardens, herbal gardens, container gardening and hydroponics
15. Trends and developments in urban horticultural concepts: green walls and roof gardens
16. Gardens for society – psychological and social aspects of ornamental plants. concepts and features of public gardens, theme parks and botanical gardens
17. Therapeutic horticulture: horticultural ways to cure (planning, design and construction issues in the therapeutic gardens) Aroma therapy - definition, approaches and applications.

Practical Schedule
1. Assessment of various eco-systems.
2. Determination of carbon use efficiency
4. Determination of sound level by using sound level meter.
5. Estimation of air pollution by using portable dust sampler: CO₂, PM₁₀, Methane
6. Determination of total dissolved solids (TDS) in effluent samples.
7. Estimation of species abundance of plants.
8. Visit to Social Service Organization/Corporate companies: To study the role of CSR in pollution control
9. Visit to Environmental Education Centre: To study the recent developments in pollution control practices
10. Visit to a local polluted site: To assess the level of different pollutants and remedial measures
11. Sewage or effluent water treatment plant: To study the technology
12. Reclamation of problem soils for planting (Mine spoil, concrete dump, heavy clay/sandy soils, etc..).
13. Practicing tree transplanting: balling and bur-lapping
14. Description and design of terrace garden
15. Description and design of grow walls
17. Orientation for final practical examination.

References

e-resources
OBJECTIVES

- Imparting basic knowledge about the environment and ecology.
- Developing an attitude of concern for the environment.
- Motivating the students to participate in environment protection and environment improvement.

Unit I - Ecology and Ecosystems

Ecology - Relevance to man - Ecosystem - Components - Terrestrial - Biomes - Forest - Desert - Aquatic - Pond - River - Estuaries - Ocean - Energy flow - Food Chain, Food Web and Ecological pyramids - Species interactions - Succession

Unit II - Natural Resources and Biodiversity


Unit III - Environmental pollution

Pollution - pollutants - contaminants - sources and types of pollution - sources, impacts and control measures of soil, water and air pollution - noise pollution - impacts and control measures - Radioactive - Heavy metal and thermal pollution - Green house gases - Global warming and climate change - impact on environmental and agriculture.

Unit IV Unit - Solid and Liquid waste management

Types of wastes - Industrial wastes - Agricultural waste and Domestic wastes - characteristics and environmental impact - solid waste management techniques - physical, chemical and biological methods - standards for waste water disposal

Unit V - Environmental Protection

Global treaties - conventions - national and state level organization - Tamilnadu Pollution Control Board (TNPCB) - Central Pollution Control Board (CPCB) - Environmental Impact Assessment (EIA) Environmental Laws and Acts - Environmental Education - afforestation - role of information technology on environment.

Practical

Environmental Sampling and Preservation - Biodiversity Assessment in natural and agro ecosystems - Water and Effluent quality analysis: Colour, Temperature, Turbidity, pH, EC, TDS, Acidity, Alkalinity, Hardness, DO, BOD, COD and E.coli. - Impact of wastewater irrigation: germination test - Biogas production from wastes - Suspended Particulate Matter (SPM) assessment in the ambient air - Field Visit to sewage water treatment plant and Pollution Control Boards

LECTURE SCHEDULE

1. Ecology, Environment, Ecosystem and its components
2. Terrestrial biomes (Forest, Desert, etc.)
3. Aquatic biomes (Pond, River, Estuaries and Ocean)
4. Energy flow, Food Chain, Food Web and Ecological pyramids
5. Species interactions
6. Succession and adaptations
7. Natural and Energy resources: Land, Water, Air, Forest, Minerals
8. Energy resources - Renewable and Non-renewable
9. Sustainable Management and Conservation of natural resources
10. Biodiversity: Types, National and Global Status, importance, Hotspots and Threats
11. Conservation of Biodiversity: In-situ and Ex-situ - Biosphere Reserves - National parks, Wildlife Sanctuaries, Botanical Garden, etc.
12. Environmental pollution - types and sources
13. Soil pollution sources, effects
14. Fate of soil pollutants - management - bio and phyto remediation of soil pollutants
15. Water pollution sources and types of waste water
16. Waste water – impact on ecosystems- eutrophication, bio magnification, water borne diseases
17. Air pollution sources effects and control measures
18. Mid-semester examination
19. Air pollution indicators, episodes and monitoring
20. Noise pollution sources effects and control measures
21. Radioactive, heavy metal and thermal pollution sources effects and control measures
22. Green House Gases-Global warming- Climate change-Impact on agriculture and other natural resources
23. Types of wastes – industrial waste, agricultural wastes, domestic waste-characteristic and environmental impact
24. Solid waste management techniques- physical methods
25. Solid waste management techniques- composting and Vermicomposting
27. Waste water recycling and Standards for waste water disposal
28. Global treaties and Conventions for Environmental Protection
29. National and state level organizations: CPCB, TNPCB, etc..
31. Environmental Education
32. Environmental Laws and Acts
33. Afforestation
34. Role of information technology on environment.

PRACTICAL SCHEDULE
1. Sample collection and preservation from contaminated sites.
2. Estimation of microbial communities in Irrigation and polluted water samples
3. Estimation of oligotrophic bacteria
4. Characterization of waste water
5. Assessment of Suspended Particulate Matter (SPM)
6. Estimation of dissolved oxygen in water (DO)
7. Estimation of biological oxygen demand (BOD)
8. Estimation of chemical oxygen demand (COD)
9. Detection of E.coli in water samples
10. Assessment of Microorganisms in air
11. Impact of air pollution on phyllosphere Microflora
12. Solid waste management – Decomposition of cellulose
13. Solid waste management – Vermicomposting
14. Maturity indices of compost
15. Biogas production from organic wastes
16. Visit to water treatment plant
17. Orientation for final examination

REFERENCE BOOKS

REFERENCES
1. Tyler Miller and Scot Spoolman. 2009. Living in the Environment (Concepts,
OBJECTIVES
To impart knowledge on essential nutrients, soil fertility, nutrient transformations in soil, manures fertilizers and soil fertility management through various approaches.

THEORY
Unit-I-Essential Nutrients

Unit-II-Nutrient Dynamics
Nutrients - sources, forms, mobility, transformations, fixation, losses and availability of nitrogen, phosphorus, potassium, calcium, magnesium, sulphur, iron, manganese, zinc, copper, boron, molybdenum, nickel, chloride in soils - Beneficial elements - Nutrient interactions

Unit-III-Classification of Fertilizers

Unit-IV-Application Methods
Methods of fertilizer application - Seed coating, pelletization, seedling dipping - Nutriseed pack - Soil Application - Foliar spray - Fertigation - water soluble fertilizers, fertigation scheduling (Fertilizer-water interaction, fertilizer solubility, comparison of fertilizer application methods)

Unit-V-Nutrient Management
Nutrient management concepts - INM, STCR, IPNS, SSNM and RTNM. Nutrient use efficiencies of major and micronutrients and enhancement techniques (Soil, Cultural and Fertilizer strategies). Soil health - Quality indices and their management - Organic farming and Precision Farming - Long term effect of fertilization on soil

Practical Syllabus

THEORY
Lecture schedule
1. Soil fertility and productivity - essential nutrients- criteria of essentiality - N, P and K nutrients - functions, deficiency and toxicity symptoms
2. Secondary nutrients, micro nutrients and beneficial elements - functions,
deficiency and toxicity symptoms

3. Concepts and approaches of soil fertility evaluation - Liebig's Law, Mitscherlich's law and Bray's nutrient mobility concept. Approaches - Deficiency symptoms, tissue analysis, biological tests and chemical tests

4. Techniques/methods of soil fertility evaluation - Inductive, deductive, 'A' value technique, crop logging, critical level, DRIS and agronomic approach

5. Sources, forms, mobility, transformation, fixation, losses and availability of nitrogen in soil

6. Sources, forms, mobility, transformation, fixation, losses and availability of phosphorus in soil

7. Sources, forms, mobility, transformation, fixation, losses and availability of potassium in soil

8. Sources, forms, mobility, transformation, fixation, losses and availability of calcium magnesium and sulphur in soil

9. Sources, forms, mobility, transformation, fixation, losses and availability of micronutrients in soil

10. Nutrient interactions in soil

11. Fertilizers - Definition, classification of N, P and K fertilizers

12. N fertilizers - Urea, ammonium sulphate, ammonium nitrate, CAN, properties and their reactions in soil

13. Manufacture of urea and ammonium sulphate

14. P fertilizers - Rock phosphate, bone meal, basic slag, single super phosphate, diammonium phosphate, triple super phosphate, properties and their reactions in soil

15. Manufacturing of SSP and DAP

16. K fertilizers - MOP and SOP - properties and reactions in soil

17. Mid Semester Examination

18. Synthesis of MOP and SOP


20. Mixed fertilizers - definition, preparation and compatibility

21. Preparation and characteristics and compatibility - Specialty/ Customized fertilizers, Water soluble fertilizers, liquid fertilizers, Micro nutrient mixtures and chelated micronutrients

22. Fertilizer Control Order

23. Organic manures - Definition, classification and sources - Fortified organics

24. Composting techniques - Aerobic and anaerobic (Bangalore and Coimbatore method) enriched FYM and vermicompost. Composting of organic waste - Sugarcane trash and coir waste

25. Methods of fertilizer application for different soil types - Fertigation - Definition - water soluble fertilizers

26. Types of fertigation - Fertilizer schedule

27. Fertilizer application methods - Seed coating, pelletization, seedling dipping - Nutriseed pack - Soil Application - Foliar spray

28. Nutrient management concepts - INM, STCR, IPNS, SSNM and RTNM - Tools - DSSIFER and VDK

29. Nitrogen use efficiency - Slow release N fertilizers - Significance and enhancement techniques

30. Nutrient use efficiency of P, K and micronutrients and their enhancement techniques

31. Soil health - Definition - Soil Quality Indices - Physical, chemical and Biological indicators - Soil enzymes

32. SOM maintenance - Role of SOM in sustaining soil health

33. Precision farming and organic farming - Concepts and applications

34. Long term effect of fertilization on soil

Practical schedule
1. Estimation of alkaline KMnO\textsubscript{4} N in soil
2. Estimation of Olsen P and Bray P in soil
3. Estimation of Neutral Normal NH₄OAc K in soil
4. Estimation of Ca, Mg by versenate method
5. Estimation of sulphur in soil by turbidimetry
6. Estimation of DTPA extractable micronutrients in soil
7. Fertilizer sampling techniques and Estimation of N in urea
8. Estimation of ammoniacal and nitrate N in ammonium nitrate
9. Estimation of water soluble P in SSP
10. Estimation of citric acid soluble P in rock phosphate - Pemberton's method
11. Estimation of K in KCl and K₂SO₄
12. Estimation of N in FYM / Compost by Macro Kjeldahl method
13. Preparation of triple acid extract - Estimation of P in FYM / Compost by Vanado molybdate yellow colour method
15. Colloquium on establishment of soil testing laboratories - Fertilizer calculations - Soil test based fertilizer prescription
16. Visit to STL and FTL, Visit to fertilizer manufacturing / mixing unit
17. Orientation for final examination.

References

e-references
1. www.fspublishers.org/ijab/past-issues/IJAB Vol_5_No_3/47.pdf
2. www.springerlink.com/index/IQ11256h8t325054.pdf

AGR 316 – PRODUCTION TECHNOLOGY OF 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: Agronomy of cereals
Rice, Wheat and Maize- Origin, geographic distribution, economic importance, soil and climatic requirements, varieties, cultural practices (from land preparation to harvest) and yield.

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

Unit–III: Agronomy of pulses
Blackgram, Greengram, Redgram and Bengalgram – Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.

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Unit-IV: Agronomy of oilseeds and sugar crops

**Oil seeds** – Groundnut, sesame, sunflower and Rapeseed and mustard – Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.

**Sugar crops:** Sugarcane, Sugar beet and sweet sorghum – Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.

Unit-V: Fibres, tuber and Narcotics crops

**Fibre crops** – Cotton and Jute – Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.

**Tuber crops** – Potato and sweet potato – Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.

**Narcotics** – Tobacco and betel vine – Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.

Practical


**Theory Lecture Schedule**

1. Introduction – importance of cereals, millets, pulses and oilseeds.
2. Introduction – importance of sugar crops, fibres
4. Area, production and productivity of major cereals, millets, pulses and oilseeds of India and Tamil Nadu.
5. Importance and area, production and productivity of sugars, fibres, tubers and tobacco of India and Tamil Nadu.
8. Maize – Origin, geographic distribution, economic importance, soil and climatic requirement.
10. Wheat – Origin, geographic distribution, economic importance, Soil and climatic requirement, varieties, cultural practices and yield.
11. Sorghum – Origin, geographic distribution, economic importance, soil and climatic requirement.
13. Pearl millet – Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
14. Finger millet – Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
15. Blackgram and Greengram – Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield – Agronomy of rice fallow pulses.
16. Red gram – Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
17. Groundnut – Origin, geographies distribution, economic importance.
18. Mid Semester Examination
21. Sesame – Soil and climatic requirements, varieties, cultural practices and yield
23. Sunflower – Soil and climatic requirements, varieties, cultural practices and yield.
24. Coconut – Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield.
27. Sugar beet – Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices, yield
28. Cotton – Origin, geographic distribution, economic importance, soil and climatic requirement.
30. Jute – Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices – harvesting and retting
31. Potato – Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
32. Sweet potato – Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
33. Tobacco – Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield – curing of tobacco
34. Betel vine – Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural and after cultivation practices and yield.

Practical Schedule
1. Identification of cereals, millets, pulses, oilseeds, sugar crops, fibres, tubers and narcotics
2. Nursery and main field preparation for rice
3. Nursery and main field preparation for important millets and red gram
4. Nursery preparation and methods of planting for coconut
5. Nursery preparation and methods of planting for sugarcane and tobacco
6. Acquiring skill in different seed treatment techniques for major field crops.
7. Field preparation and sowing of major field crops
8. Estimation of plant population and seed rate requirement for major field crops.
9. Working out fertilizer requirement and fertilizer management for major field crops
10. Observations on growth and yield parameters of major field crops
11. After cultivation practices for major field crops
12. Estimation of yield components and yield of major field crops
13. Assessment of sugarcane maturity
14. Economic analysis of crops
15. Visit to farmer’s field
16. Visit to research stations to study the cultivation techniques of major field crops
17. Orientation for final examination.

References
ENT 317 INSECTS, MITES AND NEMATODE PESTS OF HORTICULTURAL CROPS AND THEIR MANAGEMENT (2+1)

OBJECTIVES
To impart knowledge on distribution, bionomics, symptoms of damage and management strategies of Insects, Mites and Nematode pests of horticultural crops.

THEORY
Bionomics, symptoms of damage and management strategies for Insects, Mites and Nematode pests of following crops.

Unit–I: Pests of Vegetable and Tuber Crops
Brinjal, Bhendi, Tomato, Crucifers, Cucurbits, Chow chow, Carrot, Beet root, Radish, Turnip, Beans, Palak, Chillies, Onion, Garlic, Moringa, Amaranthus, Potato, Sweet potato, Tapioca, Yam and Colocasia.

Unit–II: Pests of tropical fruit Crops
Mango, Citrus, Guava, Banana, Grapevine, Ber, Sapota, Papaya, Avocado, Mangosteen Durian,, Fig, Hill banana; Pomegranate, Aonla, Pine apple, Custard apple, Wood apple, Jamun, Jack, Bread fruit, Passion fruit and Litchi.

Unit–III: Pests of temperate fruit Crops
Apple, Pear, Peach, Plum, Strawberry, Kiwi, Sweet and Sour cherry, Apricot, Raspberry, Persimmon and Currants.

Unit–IV: Pests of Plantation and Spice Crops
Coconut, Areca nut, Palmyrah, Tea, Coffee, Cashew, Cocoa, Rubber, Ginger, Turmeric, Cardamom, Pepper, Fennel, Cumin, Fenugreek, Clove, Nutmeg, Cinnamon Coriander, Curry leaf, Asafoetida, Vanilla, Betel vine and Tamarind.

Unit–V: Pests of Flower Crops, Medicinal Plants, Lawn and Stored products
Rose, Jasmine, Crossandra, Chrysanthemum, Tuberose, Cut flowers, Gloriosa, Coleus, Phyllanthus, Aswagantha, Vasaka, Senna, Periwinkle, Ocimum, Mint, Lemon grass, Citronella, Vetiver, Lawn and Stored products.

Practical
Identification of symptoms of damage and life stages of important Insects, Mites and Nematode pests of different horticultural crops: vegetables, tubers, tropical fruits, temperate fruits, plantations, spices, flower crops, medicinal plants, lawn and stored products.

Lecture Schedule
1. Pests of Brinjal, Bhendi and Tomato
2. Pests of Crucifers
3. Pests of Cucurbits
4. Pests of Chow Chow, Carrot and Beet root
5. Pests of Radish, Turnip, Beans and Palak
6. Pests of Chillies, Onion and Garlic
7. Pests of Moringa and Amaranthus
8. Pests of Potato, Sweet potato, Tapioca, Yam and Colocasia.
9. Pests of Mango, Citrus and Banana
10. Pests of Guava, Grapevine and Ber
11. Pests of Sapota, Papaya and Avocado
12. Pests of Mangosteen, durian, Fig and Hill banana
13. Pests of Pomegranate, Aonla and Pine apple
14. Pests of Custard apple, Wood apple and Jamun
15. Pests of Jack, Bread fruit, Passion fruit and Litchi
16. Pests of Apple, Pear, Peach, Plum, Strawberry and Kiwi
17. Mid Semester Examination
18. Pests of Sweet and Sour cherry and Apricot
20. Pests of Coconut, Areca nut and Palmyrah
21. Pests of Tea, Coffee and Cashew
22. Pests of Cocoa and Rubber
23. Pests of Ginger and Turmeric
24. Pests of Cardamom, Pepper and Fennel
25. Pests of Cumin, Fenugreek, Clove, Nutmeg and Cinnamon
26. Pests of Coriander, Curry leaf and Asafoetida,
27. Pests of Vanilla, Betelvined and Tamarind
28. Pests of Rose, Jasmine and Crossandra,
29. Pests of Chrysanthemum, Tuberose and Cut flowers
30. Pests of Gloriosa, Coleus and Phyllanthus
31. Pests of Aswagantha, Vasaka and Senna
32. Pests of Periwinkle, Ocimum and Mint
33. Pests of Lemon grass, Citronella, Vetiver and Lawn
34. Pests of Stored products.

Practical Schedule
1. Identification of Pests of Brinjal, Bhendi and Tomato
2. Identification of Pests of Crucifers, Cucurbits, Chow chow, Carrot, Beet root, Radish, Turnip, Beans and Palak
3. Identification of Pests of Chillies, Onion, Garlic, Moringa and Amaranthus
4. Identification of Pests of Potato, Sweet potato, Tapioca, Yam and Colocasia
5. Identification of Pests of Mango, Citrus, Guava and Banana
6. Identification of Pests of Grapevine, Ber, Sapota and Papaya
7. Identification of Pests of Avocado, Mangosteen, Durian, fig, Hill banana, Pomegranate, Aonla, Pine apple, Custard apple and Wood apple
8. Identification of Pests of Jamun, Jack, Bread fruit, Passion fruit, Litchi, Apple, Pear, Peach, Plum and Strawberry
9. Identification of Pests of Kiwi, Sweet and Sour cherry, Apricot, Raspberry, Persimmon and Currants
10. Identification of Pests of Coconut, Areca nut and Palmyrah
11. Identification of Pests of Tea, Coffee, Cashew, Cocoa and Rubber
12. Identification of Pests of Ginger, Turmeric, Cardamom, Pepper, Fennel, Cumin and Fenugreek
13. Identification of Pests of Clove, Nutmeg, Cinnamon, Coriander, Curry leaf, Asafoetida, Vanilla, Betelvine and Tamarind
15. Identification of Pests of Gloriosa, Coleus, Phyllanthus, Aswagantha, Vasaka, Senna, Periwinkle, Ocimum, Mint, Lemon grass, Citronella and Vetiver
16. Identification of Pests of Lawn and Stored products
17. Orientation for final practical examination.

Assignment:
- Collection and submission of 25 pests of horticultural crops
- Rearing of 10 insect pests

References
AEC 318 – AGRI BUSINESS MANAGEMENT AND ENTREPRENEURSHIP (1+1)

OBJECTIVE
The objective of this course is to impart skill, training, proficiency in decision making and enhance ability, to direct, to coordinate and control the work at all levels of management for the farm graduates. The course is designed so that the student would use the knowledge and skill gained for starting new agribusiness and managing the business.

THEORY
Unit I: Agri Business Management

Unit II: Management Functions I
Management Functions: Planning, organizing, staffing, directing, controlling.

Unit III: Management Functions II

Unit IV: Functional Arcas of Management

Unit V: Entrepreneurship

PRACTICAL
Mapping opportunities in Agribusiness sectors and selecting an agribusiness – Identification of the forms of agribusiness organization - Guest lecture by entrepreneur - Visit - Understanding functional areas of agribusiness firm - Identifying information needs for business plan preparation - Documenting the procedure for establishing agribusiness firms - guest lecture / visit to District Industries Centre - Exercise on forecasting demand for agricultural products - Preparation of production plans for agribusiness firm - Exercise on Inventory Management - types, cost and basic EOQ model - Purchase management and Vendor rating methods - Market survey for understanding customer needs and satisfaction - Pricing of products of small agribusiness - Working out cost of production and cost analysis - Preparation of advertisement and sales promotion programs for an agribusiness firm – Financial performance of firm - Balance sheet and Income Statement of agribusiness and Ratio analysis - Assessment of entrepreneurial skill and competency - Presentation of business plan and discussion - Model project discussion.

THEORY SCHEDULE
1. Management - Definition and concepts - Approaches.
3. Agri Business Management - Meaning and definition - Scope characteristics.
9. Mid Semester Examination.
14. Marketing mix, market promotion - Promotion mix – Consumer buying behavior.
15. Entrepreneur - Agripreneurs - Agripreneurship - Types, characteristics and process. Innovation, business incubation.
16. EDP - Programmes government schemes and incentives - Government Policy.

PRACTICAL SCHEDULE
1. Mapping opportunities in Agribusiness sectors and selecting an agribusiness (The classes that follow could be based on building up this into a business).
2. Identification of the forms of agri business organization.
3. Guest lecture by entrepreneur.
4. Visit - understanding functional areas of agribusiness firm.
5. Identifying information needs for business plan preparation.
6. Documenting the procedure for establishing agribusiness firms - guest lecture / visit to District Industries Centre.
7. Exercise on forecasting demand for agricultural products.
8. Preparation of production plans for agribusiness firm.
9. Exercise on Inventory Management - types, cost and basic EOQ model.
10. Market survey for understanding customer needs and satisfaction.
12. Preparation of advertisement and sales promotion programs for an agribusiness firm.
14. Assessment of entrepreneurial skill and competency
15. Presentation of business plan and discussion.
16. Model project discussion.
17. Orientation for final examination

REFERENCE BOOKS
OBJECTIVE
To impart the basics of soil and water conservation engineering to the undergraduate students

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 and watershed management

Unit IV Irrigation and drainage

Unit V Wells and Pumps

Practical

Lecture Schedule
1. Introduction - land surveying - uses in agriculture.
2. Chain cross staff and compass surveying - computation of angles.
3. Radiation, intersection and traversing.
4. Dumpy level - setting, observation and tabulation of readings - computation of land slope - difference in elevation.
5. Computation of area and volume – Simpson’s rule and Trapezoidal rule.
7. Water erosion - causes - erosivity and erodibility - mechanics of water erosion
8. Splash, sheet, rill and gully erosion - ravines - land slides
10. Effects of water and wind erosion
12. Mechanical measures – contour bund – graded bund - Broad beds and furrows – basin listing – random tie ridging
15. Farm ponds and percolation ponds - storage and its use for domestic and ground water recharge
16. Gully control structures - Check dams – Temporary and permanent
17. Watershed concept – Integrated approach and management
18. Mid semester examination.
19. Irrigation - measurement of flow in open channels - velocity area method
20. Rectangular weir - Cippoletti weir - V notch
21. Orifices - Parshall flume
22. Duty of water - irrigation efficiencies
23. Conveyance of irrigation water - canal lining
24. Underground pipe line system
25. Surface irrigation methods - borders, furrows and check basins
26. Components of drip and sprinkler irrigation system
27. Agricultural drainage – need - surface drainage systems
28. Surface drainage systems - drainage coefficient
29. Groundwater occurrence – aquifers types
30. Types of wells and sizes
31. Pump types – reciprocating pumps – centrifugal pumps
32. Turbine pumps – submersible pumps
33. Jet pumps – Airlift pumps
34. Selection of pumps – operation and their maintenance.

PRACTICAL SCHEDULE
2. Chains and cross staff surveying - linear measurement - plotting and finding areas.
5. Levelling – fly levels – determination of difference in elevation.
6. Computation of area
7. Computation of volume
8. Contouring – Block contouring
10. Drip Irrigation systems.
11. Sprinkler irrigation system
12. Problems on water measurement.
13. Problems on duty of water, irrigation efficiencies.
15. Study of different types of wells and its selection.
16. Study of pumps and Selection of pumps.
17. Orientation for final examination.

REFERENCE BOOKS

Web resource
1. http://nptel.ac.in/courses/105107122/13
2. http://soilwater.okstate.edu/courses/lectures-powerpoint

HOR 320 SILVI HORTICULTURE (1+1)

Objectives
To impart knowledge about importance of growing tree species as livelihood for village communities, establishing tree nurseries, care and growing of tree species.

Theory
Unit–I: Forest and its importance

Unit–II: Social forestry and its concepts

Unit–III: Agro forestry and their classification

Unit–IV: Management of tree species
Silviculture of important agroforestry species viz., cashew, casuarina, eucalyptus, tamarind, pungam, neem, jamun, ber, silk cotton and palmyrah

Unit–V: Waste Land and Aforestation

PRACTICAL

Lecture Schedule
1. Role of forest – Global and Indian forest status – National forest policy
2. Social forestry – definition – objectives – components
3. Social forestry projects – Phase I & II – targets and achievements
4. Joint forest management – Tamilnadu afforestation programme
5. Agroforestry – definition – components – different terminologies – distinction between agroforestry and social forestry
9. Mid Semester Examination
10. Subsystem – home garden, multitier cropping – wind break and shelter belts – differences, importance – design of shelter belts and species composition
11. Role of agroforestry in soil, water and ecological conservation – industrial agroforestry – constraints in agroforestry
12. Silvi culture practices for casuarina – eucalyptus, cashew, ber
13. Silvi culture practices for tamarind – neem – Jamun
14. Silvi culture practices for pungam, silkcotton, palmyrah
15. Wasteland – definition-classifications-suitable tree species
16. Suitable agroforestry systems for different problem soils and wastelands
17. Planting techniques and afforestation for wastelands

Practical Schedule
1. Identification and description of seeds and seedlings of tree species cashew –ber-casuarina, eucalyptus – neem -silkcotton
2. Identification and description of tamarind, pungam, neem. Jamun, palmyrah
3. Production of presprouted seeds in tamarind, cashew, palmyrah by different seed treatment methods
4. Production of presprouted seeds in neem and silk cotton by different seed treatment methods
5. Identification and description of fuel, fodder, and green manure trees in the locality
6. Nursery methods for eucalyptus and casuarina
7. Production of seedlings for avenue planting in polybags
9. Visit to woodlots of casurina, eucalyptus, neem, tamarind, observing, spacing, height, girth and calculating tree volume using the formula
10. Visit to agroforestry systems in farmers holding and recording the spacing and assessing the growth and yield
11. Working out economics of cultivation of tree species like casuarina, eucalyptus
12. Visit to social forestry plantation and identification of tree species- recording espacement and purpose
13. Assessing the problem soils- identifying suitable tree species recording espacement and purpose
14. Visit to afforestation in difficult sites
15. Visit to avenue plantation- identification of tree species- description of the tree and spacing adopted
16. Visit to near by village and assessing the needs of fodder, fuel and green manure.
17. Orientation for final practical examination.

References

E- resources
www. Uky.edu/jmlhjt2/courses/for350

HOR 321 PRODUCTION TECHNOLOGY OF TEMPERATE AND SUB TROPICAL FRUITS (2 + 1)

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

Unit I: Importance of temperate and sub tropical fruit crops
Subtropical, temperate and humid zones of India and Tamil Nadu –
classification of temperate and subtropical fruits – area, production, scope and
importance, role of temperate and subtropical fruit crops on national economy.

Unit II: Production technology of Temperate Fruits - I
Composition and uses – origin and distribution – varieties, soil and climatic
requirements – propagation – planting density and cropping systems – 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 — production constraints of the following
crops: Apple, pear, peach, plum and strawberry.

Unit III: Production technology of Temperate Fruits - II
Sweet and sour cherry, black and raspberry, currants, apricot, kiwi and
persimmon.

Unit IV: Production technology of Sub Tropical Fruits – I
Hill banana, mandarin, grapefruit, pummelo and avocado.

Unit V: Production technology of Sub Tropical Fruits – II
Pineapple, mangosteen, litchi, loquat, rambutan, carambola, durian, passion
fruit and rose apple.

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 and 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 crops – study of maturity
indices in major sub tropical and temperate fruit crops – visit to sub tropical and
temperate zones to study sub tropical and temperate fruit crops.

Lecture Schedule
1. Temperate, subtropical and humid zones of India and Tamil Nadu.
2. Classification of temperate and subtropical fruits.
3. Area, production, scope and importance, role of temperate and sub tropical fruits
on national economy.
4, 5 & 6. Composition and uses – origin and distribution – species and cultivars – soil
and climate requirements – propagation – main field preparation – planting density –
cropping systems – nutrient, water and weed management, training and pruning – use
of plant growth regulators – physiological disorders and remedies – maturity indices –
harvest – post-harvest handling of the following crops: Apple.
7 & 8. Package of practices for Pear.
9 & 10. Package of practices for Peach.
11. Production technology for Plum.
13. Production technology for Cherries.
15. Cultivation aspects of Apricot.
17. Mid Semester Examination
18. Cultivation aspects of Kiwi.
19 & 20. Package of practices for Hill Banana.
21 & 22. Production technology for Mandarin.
25. Production technology for Avocado.
26 & 27. Production technology for Pineapple.
28. Cultivation aspects of Mangosteen.
29. Cultivation aspects of Loquat.
30. Cultivation aspects of Litchi.
HOR 322 PRODUCTION TECHNOLOGY OF TEMPERATE AND SUBTROPICAL VEGETABLES (2+1)

OBJECTIVES
This course is intended to acquire knowledge on the cultivation aspects of temperate and sub tropical vegetables. At the end of the course the students will gain knowledge on the scenario of vegetable cultivation, advanced production technologies, special
techniques, post-harvest handling and production constraints of temperate and sub tropical vegetables.

THEORY

Unit–I: Overview

Area, production, world scenario, economic and industrial importance, export potential -Scope and importance of vegetable growing – classification– seed production techniques and constraints in temperate and sub tropical vegetable crops.

Unit–II: Cruciferous vegetables


Cabbage, Cauliflower, Sprouting broccoli, Brussels sprouts, Chinese cabbage, Knol – khol and Chow-chow

Unit–III: Bulbous and root vegetables

Garlic, Leek, Onion, Potato, Carrot, Beet root, Radish and Turnip.

Unit–IV: Leguminous vegetables

Peas, French bean, Butter bean, Cluster bean, Dolichos bean and vegetable soya bean

Unit–V: Leafy and salad vegetables

Lettuce, Palak, Celery, Asparagus, Globe artichoke, Rhubarb, Spinach, Basella and Portulaca

Practical


Lecture Schedule

1. Area, production, world scenario, economic and industrial importance and export potential.
2. Scope and importance.
3. Constraints in vegetable production
4. Composition, origin, distribution, types, varieties, climate and soil, nursery management, seed treatment, use of chemicals and PGRs. mulching, weed management, nutrient requirement, nutrient deficiency, physiological disorders and corrective measures. Irrigation methods, inter culture, maturity standards, harvesting, Post-harvest handling and storage methods, grading and marketing of the following crops, Cabbage.
5. Cauliflower
6. Knol – khol
7. Sprouting broccoli
8. Brussels sprouts
9. Chinese cabbage
10. Chow-chow
11. Garlic
12. Leek
13. Onion
14. Potato
15. Carrot
16. Beet root
17. Mid Semester Examination
18. Radish
19. Turnip
20. Peas
21. French beans
22. Butter beans
23. Cluster beans
24. Dolichos bean
25. Vegetable soybean
26. Lettuce
27. Palak
28. Celery
29. Asparagus
30. Globe artichoke
31. Rhubarb
32. Spinach
33. Basella
34. Portulaca

Practical Schedule
1. Identification and description of temperate vegetable crops
2. Identification and description of subtropical vegetable crops
3. Nursery practices for transplanted vegetable crops
4. Preparation of field and sowing/planting for direct sown/transplanted vegetable crops.
5. Application of herbicides in temperate and sub-tropical vegetable crops.
6. Top dressing of fertilizers, fertigation and inter-cultural operations
7. Use of chemicals and plant growth regulators in vegetable crops
8. Identification of nutrient deficiencies and corrective measures
9. Physiological disorders and their management
10. Harvest indices, maturity standards and harvesting practices
11. Post-harvest handling of temperate and sub-tropical vegetables
12. Protected cultivation of temperate vegetables
13. Visit to commercial farms
14. Visit to cold storage/market/processing centers.
15. Project preparation for commercial cultivation of important temperate vegetable crops
16. Project preparation for commercial cultivation of important sub-tropical vegetable crops.
17. Orientation for final practical examination.

References

e-resources
HOR 323 ORNAMENTAL AND LANDSCAPE GARDENING (2+1)

OBJECTIVES

- To study the basic principles and practices of landscape gardening.
- To study the different styles of gardens, living and non-living components and special features in a garden.
- To make on-site analysis, designing with garden elements and principles manually and using softwares.

THEORY

Unit–I: History of Gardening and Principles of Landscaping

Unit–II: Softscape Elements

Unit–III: Hardscape Elements

Unit–IV: Landscape Designing and Executions.

Unit–V: Conceptual Gardening and Horticultural Crafts

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 – study on special types of garden – preparation of landscape project – study on horticultural crafts – bonsai, terrarium and flower arrangement visit to various gardens.

Lecture Schedule
1. Garden components, basic functions and utility.
2. Trees and shrubs in landscaping.
3. Creepers, climbers in landscaping.
4. Herbs, annuals, hedges and edges in landscaping.
5. House plants and indoor gardening.
6. Study of ferns, cacti and succulents.
7. Topiary, trophy, flower beds and other living components in landscaping.
8. Propagation of ornamental plants.
9. Training, pruning, care and maintenance of ornamental plants.
10. Lawn – establishment and maintenance.
11. Psychological and social aspects of ornamental plants
12. Hardscape elements in landscape.
13. Basic function, utility, fabrication and maintenance of non-living components.
15. Light, lamp posts and other ornamental structures.
16. Living and non-living components for special situations.
17. Mid Semester Examination
18. Site analysis, cliental preference and principles of landscape drawing.
19. Elements of beauty
21. Computer Aided Designing in landscape
22. Landscape designing for Residence.
23. Landscape designing for educational institutes
24. Landscape designing for industry
25. Landscape designing for public park/theme park
26. Landscape designing for traffic island
27. Oxygenating plants and xeriscaping
29. Studies on modern day special types of garden.
31. Flower arrangements
32. Terrarium
33. Cut foliages-importance of cut foliages
34. Vegetable and fruit carving, plant jewels

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, herbs and annuals.
5. Description of climbers, creepers, flowers and foliage beds.
6. Art of topiary, trophy and carpet beds.
7. Identification of lawn grasses.
8. Methods of establishment of lawn grasses.
10. Description of non-living components.
11. Study on beauty components.
12. Principles and fundamentals of designing garden.
13. Practices on manual and computer aided landscape designing
15. Preparation of landscape plan for public parks
17. Orientation for final practical examination.

References

e-resources
1. www.bestgarden.net
2. www.toptropicals.com
3. www.garden adornments.com
4. www.gardentools.com
5. Software -Auto CAD – 2010 Edition

PAT 324 DISEASES OF FRUIT, PLANTATION, MEDICINAL, AROMATIC CROPS AND THEIR MANAGEMENT (2+1)

OBJECTIVES
• The subject covers the etiology, epidemiology, symptoms, mode of spread, survival and integrated management of important diseases due to fungi, bacteria, viruses, Candidatus Phytoplasma, phanerogamic parasites and non-parasitic causes of the fruit, medicinal and aromatic crops.

THEORY
Unit I:
Definition for plant diseases – Causes of plant diseases - Classification of plant diseases – etiology and symptoms of plant diseases.

Unit II: Fruit crops
Mango, banana, citrus, grapevine, guava, sapota, pomegranate, annona, papaya, jack, pineapple, ber, aonla, apple, pear, peach, litchi, cashew, fig and plum.

Unit III: Plantation crops
Tea, coffee, cocoa, rubber, coconut, arecanut and vanilla.

Unit IV: Medicinal and aromatic plants.
Aloe vera, Ashwagandha, Medicinal coeleus, gymnema, medicinal solanum, dioscorea. gloriosa, stevia, lemon grass, citronella, palmarosa, vetiver, geranium, patchouli, origanum, artimesia, mint, ocimum, lavender and sandal wood

Unit V: Post-harvest diseases.
Post-harvest diseases of fruit crops.

Practicals
Definition for plant diseases, Causes of plant diseases, Classification of plant diseases, Etiology and symptoms of plant diseases, Study of symptoms and host parasite relationship of the following crops : Fruits – mango, banana, citrus, grapes, guava, sapota, pomegranate, annona, jack, papaya, pineapple, ber, aonla, apple, pear, plum, peach, fig and litchi. Plantation crops - Tea, coffee, cocoa, rubber, coconut, arecanut and vanilla. Medicinal plants – Aloe vera, Ashwagandha, Medicinal coeleus, gymnema, medicinal solanum, dioscorea, gloriosa and stevia. Aromatic plants - Lemon grass, citronella, palmarosa, vetiver, geranium, patchouli, origanum, artimesia, mint,
ocimum, lavender, sandal wood. Post-harvest diseases- fruits and plantation crops.

Field visit

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

Lecture Schedule

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

1. Definition for plant diseases
2. Causes of plant diseases
3. Classification of plant diseases
4. Etiology and symptoms of plant diseases
5. Mango
6. Banana
7. Citrus
8. Grapes
9. Guava and pomegranate
10. Annona, jack and sapota
11. Papaya and pineapple
12. Ber and Aonla
13. Apple, fig and litchi
14. Pear, Peach and Plum
15. Tea
16. Coffee
17. Mid Semester Examinations
18. Cocoa
19. Rubber
20. Coconut
21. Areca nut
22. Aloe vera, ashwagandha and vanilla.
23. Medicinal coleus, Gymnema, medicinal solanum and dioscorea
24. Gloriosa and stevia
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
29. Post harvest diseases – Plantation crops
30. Post harvest diseases – Medicinal plants
31. Post harvest diseases – Aromatic plants
32. Physiological disorders of fruits
33. Phanerogamic parasites
34. Post harvest technology

Practical schedule

1. Identification of diseases specimen
2. Classification of plant diseases
3. Mango
4. Banana
5. Citrus
6. Grapevine
7. Guava and sapota
8. Pomegranate and annona,
10. Apple, pear, plum and peach.
11. Tea, coffee and cocoa
12. Field visit
13. Rubber, coconut, areca nut and vanilla
14. Diseases of medicinal plants
15. Gloriosa, stevia, coleus and aloe vera.
16. Diseases of aromatic plants
17. Final Practical Examinations
Assignment: Students should submit 50 well preserved diseased specimens.

References

E-Book

E-resources
1. www.ucmp.berkeley.edu/fungi
2. www.ictv.org
3. www.vivo.library.cornell.edu

HOR 325 PROTECTED CULTIVATION AND PRECISION HORTICULTURE (2+1)

OBJECTIVES
To impart knowledge on the protected cultivation of horticultural crops and to sensitize the students on precision farming technology of horticultural crops.

THEORY
Unit–I: Importance and basics of protected cultivation

Unit–II: Environmental control

Unit–III: Water and nutrient management

Unit–IV: Concept and introduction of precision horticulture
Importance of precision horticulture – definition, principles and concepts – role of geographic information systems (GIS) – global positioning systems (GPS) – mobile mapping system and its application in precision farming — role of computers in developing comprehensive systems needed in site specific management (SSM) – georeferencing and photometric correction.

Unit–V: Precision farming techniques for horticultural crops
Precision farming techniques for grapes, banana, tomato, capsicum, cucumber, cut roses, cut chrysanthemum, carnation and gerbera.

Practical
canopy management in precision farming – water use efficiency in annuals, perennials and landscape horticulture – visit to commercial units.

Lecture Schedule
1. Prospects and constraints of protected cultivation in India
2. Types of protected structures – green house, poly house, net house, poly tunnels, protected nursery house etc.
3. Study of environmental factors influencing protected cultivation
4. Classification of greenhouses – based on shape, utility, construction materials, covering materials etc.,
5. Designing and erection of protected structures – cladding/glazing/covering materials
7. Environment control – heating and cooling systems
8. Environment control – light regulation and CO2 enrichment
9. Containers and growing media – soil/media decontamination.
11. Hydroponics – nutrient film techniques, aeroponic culture
12. Protected cultivation techniques for tomato
13. Protected cultivation techniques for capsicum
15. Protected cultivation techniques for roses and gerbera
16. Protected cultivation techniques for chrysanthemum and carnation.
17. Mid Semester Examination
18. Protected cultivation techniques for anthurium and orchids.
20. Precision horticulture – definition, principles and concepts.
21. Geographic information system (GIS) and its application in precision farming.
22. Global positioning system (GPS) and its application in precision farming.
24. Precision equipments for seeding and chemical application
25. Role of computers in developing comprehensive system needed in site specific management (SSM) system and postharvest process management (PPM)
27. Georeferencing and photometric correction
28. Sensors for information gathering, geostatistics and robotics in horticulture
29. Design, layout and installation of drip and fertigation in precision farming
30. Information and data management, crop growth models and GIS based modeling.
31. Precision farming techniques for grapes and banana.
32. Precision farming techniques for tomato and Capsicum
33. Precision farming techniques for rose and Carnation
34. Precision farming techniques Gerbera and chrysanthemum.

Practical Schedule
1. Study of different protected structures – designs, components, orientation and construction of greenhouse.
2. Types and structures of auto control system in green house.
3. Study of heating and cooling systems in green house.
4. Study of different growing media.
5. Solarization and fumigation in green house.
6. Study of special cultural practices for production of vegetable crops under protected cultivation.
7. Study of special cultural practices for flower crops under protected cultivation.
8. Visit to protected culture units.
9. Project preparation for protected cultivation of important horticultural crops.
11. Study of soil salinity, soil compaction, soil test crop response (STCR) and grid soil sampling.
12. Practicing design and layout of precision farming system
13. Canopy management in precision farming
14. Water use efficiency in annuals, perennials and landscape horticulture
15. Visit to commercial computerized irrigation control unit.
16. Project preparation for precision cultivation in important horticultural crops
17. Orientation for final practical examination.

References

e-resources
1. www.icar.org.in/ciphet.html
2. www.jains.com
3. www.gisdevelopment.net
5. www.agritech.tnau.in
6. www.ncpahindia.com
7. www.iasri.res.in

AEC 326 - AGRICULTURAL FINANCE, BANKING AND CO-OPERATION (1+1)

OBJECTIVES
This course aims at imparting knowledge on principles of finance, banking and cooperation, and farm financial analyses. This course will also help the Under Graduate students in understanding the functions of various institutions involved in farm financing and different crop insurance products implemented in India.

THEORY
Unit 1: Agricultural Finance – Nature and Scope
Agricultural Finance: Definition - Importance - Nature and scope. Agricultural credit: Meaning – Definition - Need and classification - Sources of credit. Role of institutional and non - institutional agencies: Types - Roles - Advantages and disadvantages. Rural indebtedness: Consequences and control measures of rural indebtedness - History and development of rural credit in India.
Unit 2: Farm Financial Analysis

Principles of credit - 5C's, 3R's and 7 P's of credit, Project cycle and management. Preparation of bankable projects / Farm credit proposals - Feasibility - Time value of money: Compounding and discounting - Appraisal of farm credit proposals - Undiscounted and discounted measures - Repayment plans. Farm financial statements: Balance sheet - Income statement - Cash flow statement - Financial ratio analysis.

Unit 3: Financial Institutions

Institutional lending agencies - Commercial banks: Nationalization - Agricultural development branches - Area approach - Priority sector lending - Regional Rural Banks. Lead bank: Role and functions - Preparation of District annual credit plan and scale of finance - Kisan Credit Card (KCC) Scheme and Know Your Customer (KYC). Rural credit policies followed by State and Central Government - Subsidized farm credit, Differential Interest Rate (DIR) Scheme - Relief measures and Loan Waiver Scheme. Higher financial institutions: RBI, NABARD, AFC, ADB, World Bank and Deposit Insurance and Credit Guarantee Corporation of India - Role and their functions in rural credit. Microfinance: Definition and its role in poverty alleviation - Self-Help Groups: Characteristics, role, functions, growth and development in India - Role of Non-Governmental Organizations in promoting SHGs.

Unit 4: Banking and Insurance


Unit 5: Cooperation

Cooperation: Philosophy and Principles - History of Indian co-operative credit movement: Pre and Post - Independence periods and co-operation in different plan periods. Co-operative credit institutions: Two tier and three tier structure - Functions: provision of short term and long term credit - Strength and weakness of cooperative credit system - Policies for revitalizing cooperative credit: Salient features of Vaithiyathan Committee - Report on revival of rural co-operative credit institutions - Reorganization of co-operative credit structure in India and single window system. Special Co-operatives: LAMPS, FSS, National Cooperative Development Corporation (NCDC) and National Federation of State Cooperative Banks Ltd. (NAFSCOB): Objectives, role and functions.

PRACTICAL

Visit to a farm to study the credit needs, problems and suggestions in the use of farm credit - Preparation of Bankable Projects / Farm Credit Proposals - Project preparation and appraisal - Undiscounted methods - Discounted methods - Preparation of Balance Sheet and Income Statement - Preparation of Cash flow Statement and Exercise on preparation of Repayment plans - Exercise on Financial Ratio Analysis - Appraisal of farm credit proposals - Visit to Commercial Bank / Lead Bank to study its role and functions - Visit to NABARD to study its role and functions - Visit to Regional Rural Bank to study its role and functions - Visit to Primary Agricultural Cooperative Bank (PACB) to study its role, functions and procedures for availing loan - Visit to District Central Co-operative Bank (DCCB) to study its role, functions and procedures for availing loan - Fixation of Scale of Finance - Visit to Cooperative Agricultural and Rural Development Bank (Land Development Bank) to study procedures for availing long term credit - Visit to Self-Help Group to study its characteristics, roles and functions - Analysis of Different Crop Insurance Products / Visit to crop insurance implementing agency.
THEORY SCHEDULE

1. Agricultural Finance: Definition - Importance - Nature and scope. Agricultural credit:
   Meaning - Definition - Need and classification.
2. Sources of credit. Role of institutional and non-institutional agencies: Types - Roles - Advantages and disadvantages. Rural indebtedness: Consequences and control measures of rural indebtedness - History and development of rural credit in India.
3. Principles of credit - 5C's, 3R's and 7 P's of credit, Project cycle and management. Preparation of bankable projects / Farm credit proposals - Feasibility.
4. Time value of money: Compounding and discounting - Appraisal of farm credit proposals - Undiscounted and discounted measures.
7. Lead bank: Role and functions - Preparation of district annual credit plan and scale of finance - Kisan Credit Card (KCC) Scheme and Know Your Customer (KYC). Rural credit policies followed by State and Central Government - Subsidized farm credit, Differential Interest Rate (DIR) Scheme - Relief measures and Loan Waiver Scheme.
8. Higher financial institutions: RBI, NABARD, AFC, ADB, World Bank and Deposit Insurance and Credit Guarantee Corporation of India - Role and their functions in rural credit.
9. Mid Semester Examination
10. Microfinance: Definition and its role in poverty alleviation - Self-Help Groups: Characteristics, role, functions, growth and development in India - Role of Non-Governmental Organizations in promoting SHGs.
11. Negotiable Instruments: Meaning - Importance and Types - Central bank: RBI - functions - Credit control - Objectives - CRR, SLR and Repo rate - Credit rationing - Dear money and cheap money.
15. Cooperative credit institutions: Two tier and three tier structure - Functions: provision of short term and long term credit - Strength and weakness of cooperative credit system.
16. Policies for revitalizing co-operative credit: Salient features of Vaithiyanathan Committee - Report on revival of rural cooperative credit institutions - Reorganization of cooperative credit structure in India and single window system.
17. Special Co-operatives: LAMPS, FSS, National Cooperative Development Corporation (NCDC) and National Federation of State Cooperative Banks Ltd. (NAFSCOB): Objectives, role and functions.

PRACTICAL SCHEDULE

1. Visit to a farm to study the credit needs, problems and suggestions in the use of farm credit.
2. Preparation of Bankable Projects / Farm Credit Proposals.
3. Project preparation and appraisal - Undiscounted methods.
4. Project preparation and appraisal - Discounted methods.
5. Preparation of Balance Sheet and Income Statement.
7. Exercise on financial ratio analysis.
8. Appraisal of farm credit proposals.
9. Visit to Commercial Bank / Lead Bank to study its role and functions.
10. Visit to NABARD to study its role and functions.
11. Visit to Regional Rural Bank to study its role and functions.
12. Visit to Primary Agricultural Co-operative Bank (PACB) to study its role, functions and procedures for availing loan.
13. Visit to District Central Cooperative Bank (DCCB) to study its role, functions and procedures for availing loan - Fixation of Scale of Finance.
14. Visit to Cooperative Agricultural and Rural Development Bank (Land Development Bank) to study procedures for availing long term credit.
15. Visit to Self-Help Group to study its characteristics, roles and functions.
16. Analysis of Different Crop Insurance Products / Visit to crop insurance implementing agency.
17. Orientation for final examination

REFERENCES

AEX 327-EXTENSION METHODOLOGIES AND TRANSFER OF AGRICULTURAL TECHNOLOGY (1+1)

OBJECTIVE
To impart knowledge to the students on different extension methods and approaches used for transfer of agricultural technology. The course will also enable to develop practical skills on preparation of different extension teaching methods.

THEORY
Unit I Extension Education and Transfer of Technology
Unit II Communication
   Communication – Meaning, definition and types, Communication models (Aristotle, Shannon-Weaver, Berlo, Schramm, Leagans, Rogers and Shoemaker) – elements and their characteristics - Barriers in communication
Unit III Extension Teaching Methods
   Extension teaching methods – meaning, definition, functions, classification (Individual, Group, Mass contact methods), Merits and Demerits; Audio aids, Visual aids and Audio-Visual aids – definition, classification – Factors influencing selection and use of audio visual aids Participatory Extension Approaches – RRA, PRA and PTD.
Unit IV e-Extension and Agricultural journalism
   e-Extension - Internet, video and teleconferencing, Interactive Multimedia Compact Disc (IMCD), Agri portals, Information Kiosks, Kisan Call Centre (KCC), Mobile phone, Expert System Village Knowledge Centre (VKC) and DEMIC. Agricultural
journalism (Print media) – Definition, principles, importance, ABC of news, types of news.

Unit V Diffusion of Innovations
   Diffusion of Innovations – definition, elements; Innovation – definition, attributes; Adoption – meaning, steps in adoption process, innovation decision process, adopter categories, factors influencing adoption of innovations; Consequences of innovations.

Practical
   Study of communication methods followed by State Department of Agriculture; Planning and writing script for radio, television and print media; Planning and preparation of visual aids – posters, charts and graphs, flash cards, flannel graph and extension literature; Planning and practice in conduct of method demonstration and brainstorming. Practicing PRA techniques in a village setting; Practice in handling of digital camera. Study of spread and acceptance of Agricultural technologies.

THEORY SCHEDULE
1. Extension Education - Meaning, definition and importance, Agricultural Extension – Meaning, definition. Linkage between Research, Extension and Clientele systems
2. TOT- Meaning and definition, components of TOT, models and approaches of TOT – Importance of TOT in Agricultural Extension
3. Communication – meaning, definition, types and modules communication (Aristotle Shanon and Weaver, Berlo, Schramm, Leagans, Rogers and Shoemaker)
4. Elements of communication and their characteristics - Barriers of communication.
6. Group contact methods – Method demonstration, group meeting, small group training, field day or farmers’ day, study tour, lecture, debate, workshop, seminar, forum, conference, symposium, panel discussion brainstorming, buzz session.
9. Mid semester Examination.
10. e-Extension-Internet, video and teleconferencing, Interactive Multimedia Compact disc (IMCD)
11. Agri portals, Information kiosks, Kisan Call Centre (KCC)
12. Mobile phone, Expert System, Village Knowledge Centre (VKC), DEMIC
13. Agricultural journalism (Print media) – Definition, principles, importance, ABC of news, types of news.
15. Participatory Technology Development – Meaning and steps
17. Adopter categories - Factors influencing adoption of innovations - Consequences of innovations.

PRACTICAL SCHEDULE
1. Understanding the communication methods followed by the State Department of Agriculture for TOT.
2. Planning and preparation of posters and charts.
3. Planning and preparation of flash cards and flannel graph.
4. Planning and preparation of extension literature- leaflet, folder and pamphlet
5. Practice on conduct of method demonstration in a village.
6. Exercise on conducting brain storming.
7. Practice on script writing for Radio.
8. Practice on script writing for television.
9. Practice on script writing for newspapers.
10. Visit to local press (newspaper agency) to study their media activities
11. Practice on handling of digital camera.
13. Practicing PRA techniques in a village setting.
14. Preparation of interview schedule to study the spread and acceptance of Agricultural technologies
15. Visit to village to study the spread and acceptance of Agricultural technologies
16. Processing of data, preparation and presentation of reports.
17. Orientation for final examination

Reference Books

E-Resources
1. www.i4d.com
2. www.panasia.org
3. www.joe.org

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, application of FYM and its incorporation
3. Field preparation – ploughing, formation of irrigation channels.
4. Formation of raised and flat beds, ridges and furrows.
5. Application of basal dressing of fertilizers.
7. Practice in weeding and herbicide application.
8. Practice in scheduling of irrigation and fertigation.
9. Mid Semester Examination
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.
15. Practice in seed extraction, processing, cleaning and packaging.
17. Orientation for final practical examination

References

EXP 329 EXPERIENTIAL LEARNING –I (0+6)

For experiential learning the student can choose any one course from the professional packages indicated below. The Head of the Department in consultation with the Dean shall restrict the number of professional packages in a module according to the practical feasibility and climatic conditions.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course No.</th>
<th>Title</th>
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<tr>
<td>1</td>
<td>EXP 329</td>
<td>Experiential learning –I (Professional package)</td>
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<tr>
<td>2</td>
<td>EXP 329</td>
<td>Commercial nursery establishment</td>
<td>0+6</td>
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<tr>
<td>3</td>
<td>EXP 329</td>
<td>Protected cultivation of cut flower crops</td>
<td>0+6</td>
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<tr>
<td>4</td>
<td>EXP 329</td>
<td>Protected cultivation of vegetable crops</td>
<td>0+6</td>
</tr>
<tr>
<td>5</td>
<td>EXP 329</td>
<td>Container gardening and hydroponics</td>
<td>0+6</td>
</tr>
</tbody>
</table>

EXP 329 COMMERCIAL NURSERY ESTABLISHMENT (0+6)

**OBJECTIVES**

To provide hands on training on establishment and management of a commercial nursery and to develop skills in various propagation methods and care of nursery plants.

**Activities**

Students shall prepare a plan to start a commercial nursery and analyse its technical and financial viability. Undertake end to end approach to achieve the objectives of the approved project. Hands on training will be given right from procurement of raw materials, production, care and marketing.

**References**


**e Resources**

1. [http://www.horticulture/propagation.com](http://www.horticulture/propagation.com)
EXP 329 PROTECTED CULTIVATION OF CUT FLOWERS (0+6)

OBJECTIVES
Understanding the principles, theoretical aspects and developing skills in protected cultivation of cut flowers.

ACTIVITIES
Students shall prepare a plan to start a commercial cut flower unit and analyse its technical and financial viability. Undertake end to end approach to achieve the objectives of the approved project. Hands on training will be given right from procurement of raw materials, production, care and marketing.

References

Resources
1. www.icar.org.in/ciphet.html
2. www.jains.com
3. www.gisdevelopment.net
4. www.lasercladding.com
5. www.epa.gov

EXP 329 PROTECTED CULTIVATION OF VEGETABLE CROPS (0+6)

OBJECTIVES
Understanding the principles, theoretical aspects and developing skills in protected cultivation of high value vegetable crops.

ACTIVITIES
Students shall prepare a plan to start a commercial vegetable unit under a polyhouse and analyse its technical and financial viability. Undertake end to end approach to achieve the objectives of the approved project. Hands on training will be given right from procurement of raw materials, production, care and marketing.

References

Resources
1. www.icar.org.in/ciphet.html
2. www.jains.com
3. www.gisdevelopment.net
4. www.lasercladding.com
5. www.epa.gov

EXP 329 CONTAINER GARDENING AND HYDROPONICS (0+6)

OBJECTIVES
To impart practical training in container growing of vegetables in terrace, windows and balconies and to provide training on hydroponic leafy vegetable production.

ACTIVITIES
The student shall undertake practical training on growing herbs, vegetables and fruits in containers and develop automated irrigation and fertigation methods for crop management and harvest. Hands on training shall be given in selection of containers,
media, automation of irrigation, sensors, valves, hydroponic solutions, training and pruning.

References

VII SEMESTER
Rural Awareness Work Experience (RAWE)/ Horticultural Industrial Attachment (HIA)

A. Village Stay - Attachment
Guidance to students
For each batch of students, there will be a designated RAWE teacher from the Department of Agricultural Extension, who will continuously guide, supervise and monitor the work of students during their placements in rural areas. The designated Teachers from the courses related to the subject matter areas will also visit and guide the students on technological aspects and to solve the problems, which are beyond the competence of students as well as to evaluate the performance of the students on the concerned subject. They will also support the students during the extension educational activities.

It will consist of general orientation by different faculties for one week followed by village attachment. The students would be required to record their observations in field on daily basis and will prepare their project report based on these observations. The detailed outline of the work to be carried in each subject during Village stay period is as follows:

RAWE AEX 410 (Extension programme): 0 + 5 credits
- Study of rural situation – village settlement pattern, demography, climate, land utilization pattern, resources inventory, infrastructural facilities, rural institutions, organizations, groups, customs, beliefs and value systems.
- Study of cropping pattern, extent of adoption of latest technologies and identify the constraints.
- Conducting need based method demonstrations in the village.
- Organization of field visits and group discussion with farmers.
- Organization of farmers/ rural youth training programme.
- Participation in village social service work.
- Identification of communication media in the transfer of technologies.
- Study on-going central/state sponsored rural development and extension programmes.
- Visit to village institutions to study their role in development programmes and extension work.
- Exposure visit to block and district level Agricultural / Horticultural research and extension institutions.

RAWE AGR 411 (Field Crop Production): 0 + 2 credits
- The student will involve themselves in actual day-to-day Agricultural operations along with their adopted farmers.
- A calendar of operations for the entire semester will be prepared in consultation with the host farmer, course teacher and Programme Officer.
- The course teacher will provide the recommendations for major crops grown in the village and in turn the students will compare these with farmer’s practice and get opinion about improved technology.
- The students will maintain a record of daily work done in the prescribed proforma.
• Each student shall cover a minimum of three crops, preferably from among cereals, oilseeds and pulse crops.
• If such crop diversification is not available, the student shall collect information on any three crops either with the host farmer or other farmer in or near by village.
• Observations on crop growth and yield attributes shall be recorded as per the proforma.

RAWE HOR-412 (Horticultural Crop Production): 0 + 3 credits
• The student will involve themselves in actual day-to-day horticultural operations along with their adopted farmers.
• For this purpose, a calendar of operations for the entire semester will be prepared in consultation with the adopted farmer and the member of the advisory committee.
• The advisory committee will provide the recommendations for major horticultural crops grown in the village and in turn the students will compare these with farmer's practice and get opinion about improved horticultural technology.
• The students shall maintain a record of daily work done in the proforma given to them by the Department of Horticulture.
• Each student shall cultivate/plant a minimum of three corps, preferably one from fruits like Mango, Papaya, Lime, Guava and two from vegetables like Cabbage / Cauliflower / Tomato / Brinjal / Chilli or any other seasonal vegetables.

RAWE CPT-413 (Crop Protection-Entomology and Plant Pathology): 0 + 4 credits
• The students will get an opportunity to work with the farmers in the field and acquainted with various plant protection problems of the standing crops.
• They have to collect data on pest damage every week.
• They shall maintain record of plant protection work undertaken in the prescribed Proforma given to them by the Department of Entomology and Plant Pathology for this purpose.
• The student will also conduct a survey on adoption of recommended plant protection measures and the incidence/occurrence of different diseases and insect pests on different crops in the village.
• Students shall submit 15 herbarium specimens each of insect damage and plant disease symptoms for any of the crops grown in the village.
• Information on other plant disorders, nematode problems, bird and rodent damage if any, shall also be mentioned in the plant protection record separately.
• The students will also demonstrate preparation of fungicidal / insecticide spray fluids for important plant protection measures.

AEX 414 ALL INDIA STUDY TOUR

OBJECTIVES
The course will provide an opportunity to the students to study the functioning of important National Institutes related to Agriculture/Horticulture and allied fields.

SYLLABUS
Visit to important National institutes related to agriculture, horticulture, forestry and allied fields in various regions of the country. Exposure to various agro-climatic zones, crops grown, cultivation practices, socio-economic and cultural features of the farming community in different parts of the country.
HIA 415 HORTICULTURAL INDUSTRIAL ATTACHMENTS (0+6)

OBJECTIVES
1. To make the students understand the commercial scale industrial operations of the horticultural industries and constraints faced by the industry.
2. To understand agricultural technologies being practiced in commercial scale and to impart skills needed for running an industry.

The students will be attached to any one of the horticultural industries like Coffee Processing, Tea Processing, Cashew Processing, Fruit and vegetable processing industries, Floriculture units, landscape companies, nursery units, etc. for a period of eight weeks inclusive of orientation and report preparation. The activities are only indicative. The course teacher in consultation with the HOD and the Dean shall make necessary changes based on the prevailing situations. Weekly activities are given below:

1. Orientation
2. Acquaintance with industry and staff
3. Study of structure, function, objectives, issues / procedures in starting a unit
4. Study of various processing units and hands on training under supervision of industry staff
5. Skill development in all crucial tasks of the industry
6. Export – Import guidelines- financial support and regulations
7. Documentation of the activities, and tasks performed
8. Preparation of a business proposal

HOR 420 PROCESSING AND POST-HARVEST MANAGEMENT OF HORTICULTURAL CROPS (2+1)

OBJECTIVES
To highlight the importance of post-harvest technology in sustainable horticulture, to impart knowledge on various pre-harvest and post-harvest factors, various types of losses and value addition techniques.

THEORY

Unit–I: Principles of Post-Harvest Technology
Importance and scope 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 – pre harvest factors influencing post-harvest life – pre harvest and post-harvest treatments to enhance shelf life

Unit–II: Post-Harvest Treatments and Storage

Unit–III: Packaging and Export of Horticultural Produce

Unit–IV: Methods of Preservation
Status and scope of fruit and vegetable processing industries in India – Principles of preservation – Preservation with sugar, salt- chemicals or bio – preservatives-drying and dehydration-types of driers-canning-preparation of canned products and fermented beverages.
Unit–V: Recent Technologies in Fruit and Vegetable Processing

Minimal processing of fruits and vegetables-techniques involved-Recent trends in processing-processing by irradiation- principles, methods,suitability-application of irradiation in food processing-waste and by- product utilization from processing industry.

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.

Lecture Schedule

1. Importance and scope of post-harvest technology of fruits and vegetables.
2. Post-harvest technology of spices, plantation crops and cutflowers
3. Causes for post-harvest loses and maturity indices for fruits and vegetables.
4. Pre and post-harvest physiological changes during development, maturity and ripening of fruits.
5. Pre harvest factors influencing post-harvest life.
6. Methods to hasten or delay ripening of fruits.
7. Post-harvest treatments like pre-cooling, washing, grading, vapourheat treatment and fumigation.
8. Waxing of fruits and vegetables
9. Role of ethylene in post-harvest technology.
10. Storage methods-Low temperature storage, refrigerated storage
11. Controlled Atmospheric Storage, Modified Atmospheric Storage and hypobaric storage
12. Low cost storage technology
13. Methods of storage for local and distant market.
14. Handling of cut flowers and methods to extend the shelf life.
15. Packaging technology for export by road, air and sea for fruits
16. Packaging technology for export by road, air and sea for vegetables.
17. Mid Semester Examination
18. Packaging technology for export by road, air and sea for cut flowers.
19. Packaging technology for export by road, air and sea for spices and plantation crops.
20. Controlled and modified atmospheric packaging, vacuum and edible packaging.
21. WTO guidelines for export of horticultural produce.
22. CODEX standards and export standards for fruits, vegetables and cutflowers.
23. Food safety standards.
24. & 25. Importance and scope of vegetable preservation industry in India – principles of preservation.
26. Preservation with sugar.
27. Preservation with salts, chemicals and bio preservatives.
30. Principles of preservation by fermentation.
31. Processing of dehydrated spice products.
32. Minimal processing of fruits and vegetables.
33. Irradiation in food processing.
34. Utilization of wastes from fruit and vegetable processing industries.

Practical Schedule

1. Practice in judging the maturity of horticultural produce.
2. Pre harvest treatments to enhance the post-harvest life
3. Assessment of physical, physiological and biochemical changes during ripening
4. Determination of physiological loss in weight and quality
5. Preharvest treatments to enhance the post-harvest lifestorage studies
6. Packaging studies for fruits and vegetables
7. Packaging studies for cut flowers and dry flowers.
8. Waxing
9. Identification and study of working of equipments used in processing units.
10. Preparation of squash, RTS and syrup.
11. Preparation of Jam.
13. Preparation of sauce and ketch-up.
15. Preparation of dehydrated products.
16. Visit to food processing units.
17. Orientation for final practical examination

References

e- resources
1. www.postharvest.ucdavis.edu
2. www.postharvest.ifsa.ufi.edu
3. www.fao.org

OBJECTIVES
To study the specific techniques followed in organic horticulture and to impart knowledge on organic production of horticulture crops.

THEORY
Unit –I: Importance of organic horticulture

HOR 421 ORGANIC HORTICULTURE (1+1)}
Unit–II: Soil health in organic horticulture
   reclamation under organic horticulture – soil physical, chemical and biological
   improvement – organic carbon status and improvement strategies – C:N ratio and its
   significance.
   Unit–III: Bio inputs in organic horticulture
   Organic manures – FYM, coirpith- compost, vermicompost, pressmud compost,
   oil cakes, green manures – bio fertilizers – biodynamic farming – foliar supplements –
   panchakavya, EM technology, humic acid, sea weed extract, mushroom manchuiiran
   tea, vermiwash, -dasagavya – amirthakaraisal
   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.

PRACTICAL
   Estimation of soil physical, chemical and biological parameters- estimation of
   nutrient content of farm wastes – recycling of crop wastes – preparation of
   panchakavya, dasagavya,amirtha karausal and EM solution – application of various
   mulch materials – nursery beds solarization – bioagents of crop protection –
   preparation of organic formulations for pest, disease control – economic evaluation of
   organic horticulture.

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, principles and
   concepts of organic farming
4. Soil problems and its reclamation through organic horticulture
5. Soil physical, chemical and biological properties and conservation of soil resource
   underorganic 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,EM technology andhumic acid
11. Sea weed extract, mushroom, Manchurian tea and vermiwash
12. Nonchemical methods of weed control
13. Nonchemical methods ofpest control
14. Nonchemical methods ofdisease control
15. Organic certification – standards and agencies – marketing and export avenues for
   organic produce
16. Sustainability indices for evaluating indirect benefits of organic farming
17. Economic evaluation of organic horticultural technologies – net returns and B:C
   ratio.

Practical Schedule
1. Soil physical parameters with relevance to organic horticulture.
2. Estimation of soil chemical parameters (pH, EC and ESP).
4. Estimation of nutrient content of farm wastes/agro industrial wastes
5. Agrotechniques for composting farm wastes and agro industrial wastes.
7. Preparation of panchakavya, dasagavya andamirthakaraisal
10. Application of various mulch materials to horticultural crops.
11. Nursery bed soil solarization.
13. Preparation of organic formulations for pest control.
15. Working out indices for organic horticulture.
17. Orientation for final practical examination.

References


HOR 422 PRODUCTION TECHNOLOGY OF MEDICINAL AND AROMATIC CROPS (1+1)

OBJECTIVES
This course mainly provides pertinent knowledge about scope and importance of medicinal and aromatic crops. Besides, it also highlights the recent developments in the production and processing technology of medicinal and aromatic crops.

THEORY

Unit–I: Medicinal Plants – I
Senna, Periwinkle, Glory lily, Gymnema, Medicinal coleus, Aloe vera

Unit–II: Medicinal Plants – II
Ashwagandha, Sarpagandha, Isabgol. Medicinal yam, Opium poppy

Unit–III: Medicinal Plants – III
Medicinal solanum, Phyllanthus, Noni, Stevia

Unit–IV: Aromatic Crops – I
Lemon grass, Citronella, Palmarosa, Vetiver, Geranium, Patchouli
Unit–V: Aromatic Crops – II

**PRACTICAL**

Identification and description of medicinal and aromatic crops, parts used and their products - Nursery raising and planting of Senna, Periwinkle, Glory lily, Gymnema, Medicinal coleus, Aloe vera, Ashwagandha, Medicinal yam, Medicinal solanum, Phyllanthus, Long pepper, Noni, Stevia, Lemon grass, Citronella, Palmarosa, Vetiver, Geranium, Patchouli, Ocimum, Mint. – 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 and demands of phytochemicals and AYUSH – Medicinal and aromatic plants wealth of India and Tamil Nadu - Area and production – Export and imports
2. Conservation strategies- *ex situ and in situ* - Classification – based on family, habit, climate, soil and ecological factors – Organized production- GAP, GMP guidelines and contract farming-constraints and challenges in production and maintenance – Institutions for promotion of medicinal and aromatic crops –
4. Glory lily and Gymnema
5. Medicinal coleus and Aloe vera
6. Ashwagandha and Sarpagandha
7. Isabgol and Opium poppy
8. Medicinal yam
9. Mid Semester Examination
10. Medicinal solanum and Phyllanthus
11. Noni and Stevia
12. Lemon grass, Citronella and Palmarosa,
13. Vetiver and Geranium
14. Patchouli and Ocimum
15. Mint and Lavender
16. Rosemary
17. Davana

**Practical Schedule**

1. Identification and description of medicinal crops – parts used and their products
2. Identification and description of aromatic crops, parts used and their products
3. Collection of medicinal and aromatic crops under local conditions
4. Study of varieties, propagation techniques and processing methods of following crops- Senna and Periwinkle
5. Glory lily and Gymnema
6. Medicinal coleus and Aloe vera
7. Ashwagandha and Medicinal yam
8. Medicinal solanum and Phyllanthus
9. Noni and Stevia
10. Lemon grass, Citronella and Palmarosa
11. Vetiver, Geranium and Patchouli
12. Ocimum and Mint
13. Visit to herbal gardens
14. Visit to extraction units and existing centers of medicinal and aromatic crops
15. Extraction of essential oil in selected aromatic crops
16. Working out economics of medicinal and aromatic crops cultivation and preparation of projects of commercial medicinal and aromatic crops.
17. Orientation for final practical examination.
References

Web resources
1. www.herbs.org
2. www.nmpb.nic.in
3. www.frlht.india.org

GPB 423 SEED PRODUCTION- PRINCIPLES AND TECHNOLOGIES IN HORTICULTURAL CROPS (2+1)

OBJECTIVES
To make the students understand the importance of quality seed, principles involved in quality seed production, the techniques involved in quality seed production of varieties and hybrids in horticultural crops and make them seed entrepreneurs.

THEORY
Unit–I: Importance of quality seed

Unit–II: Principles and Techniques of seed production

Unit–III: Post-harvest Technology

Unit–IV: Seed certification and seed legislation
Seed certification – phases – general and specific seed crop standards for horticultural crops – Field standards – Seed standards – field inspection – Grow Out Test - The Seeds Act and Rules – Composition and role of Central Seed Committee and its Sub-Committee, i.e., Central Sub – Committee on Crop Standards, Release and Notification of varieties of horticultural Crops – State Seed Sub – Committee – Central Seed Certification Board, State Seed Certification Agency – Central Seed Testing

Unit–V: Seed testing

Seed testing – importance – seed lot – assignment of lot number – seed sample – sampling methods – purity analysis – moisture estimation – Germination tests – viability test – seed vigour tests – seed health test

Practical


Lecture Schedule

1. Seed – definition – importance -characteristics of good quality seed– seed production and crop production
4. Principles and factors influencing seed production
5. Methods and tools of seed production in variety and hybrid
6. Seed production in tomato, brinjal and chillies
7. Seed production in bhendi, cowpea, French bean and cluster bean
8. Seed production in pumpkin, ashgourd, bittergourd.
9. Seed production in ribbedgourd, snakegourd and bottlegourd
10. Seed production in onion and amaranthus
11. Seed production in cabbage and cauliflower
12. Seed production in carrot and beetroot.
13. Seed production in marigold and petunia.
14. Seed production in ashwagandha andperiwinkle,
15. Seed production in coriander and fenugreek
16. Seed handling techniques in cocoa, coffee and coconut.
17. Mid Semester Examination
19. Seed extraction methods.
22. Storage –Types-factors influencing seed storage
23. Seed certification – phases – general and specific standards
24. Field Standard – Seed standards – Field inspection – Grow Out Test
25. TheSeeds Act and Rules – Composition and role of Central Seed Committee and its Sub-Committee, i.e., Central Sub – Committee on Crop Standards.
26. Release and Notification of varieties of horticultural Crops
27. State Seed Sub – Committee Central Seed Certification Board, State Seed Certification Agency – Central Seed Testing Laboratory cum Referral Laboratory and Notified Seed Testing Laboratories.
28. Seed Inspector – duties and responsibilities – offences and penalties
31. Seed testing – importance – seed lot – assignment of lot number – seed sample – sampling methods
32. Purity analysis – moisture estimation
33. Germination tests – viability test
34. Seed vigour tests – seed health test
Practical Schedule
1. Seed structure in Horticultural crops
2. Seed production planning
3. Seed extraction techniques.
4. Practicing emasculation and dusting techniques (tomato/brinjal/okra)
5. Supplementary pollination in horticultural crops.
6. Seed sampling
7. Mixing and dividing the submitted sample.
8. Analysis of physical purity
9. Estimation of seed moisture
10. Conducting of germination tests
11. Seedling evaluation
12. Quick viability test
13. Seed health test
14. Grow out test
15. Vigour test
16. Seed Blending.
17. Orientation for final practical examination

References

e resources
1. www.dare.gov.in
2. http:sfci.nic.in
3. www.iar.org.in/Directorate1.htm
4. www.apsa.org
5. www.seedassociationofindia.com
6. www.apaseed.com
7. www.apaseed.org

EXP 424 EXPERIENTIAL LEARNING –II (0+6)

For experiential learning the student can choose any one course from the professional packages indicated below. The Head of the Department in consultation with the Dean shall restrict the number of professional packages in a module according to the practical feasibility and climatic conditions.
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<th>Course No.</th>
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<td>1</td>
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<td>Experiential learning –II (Professional package)</td>
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<tr>
<td>2</td>
<td>EXP 424</td>
<td>Commercial landscaping</td>
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<td>3</td>
<td>EXP 424</td>
<td>Commercial tissue culture unit</td>
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<td>4</td>
<td>EXP 424</td>
<td>Processing and value addition</td>
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<tr>
<td>5</td>
<td>EXP 424</td>
<td>Organic vegetable production</td>
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</tbody>
</table>

**EXP 424 COMMERCIAL LANDSCAPING (0+6)**

**OBJECTIVES**
To enable students to gain hands experience in landscape designing and execution and to develop entrepreneurial skills and confidence among students to develop their own landscape company.

**ACTIVITIES**
Planning and designing different types of location specific gardens, e.g., home garden, institutional garden, public garden, corporate-and factory garden including preparation of cost estimates and execution.

**References**

**e Resources**
1. www.bestgarden.net
2. www.centralfloridagarden.blogspot.com
3. www.intuxford.tripod.com
4. www.lawngrasses.com
5. www.spiefsonahpsu.edu
6. .www.sunny.crk.umn.edu/courses

**EXP 424 COMMERCIAL TISSUE CULTURE UNIT (0+6)**

**OBJECTIVES**
To enable students to gain hands-on-experience in commercial micro-propagation and to train the students in establishing a commercial plant tissue culture unit

**ACTIVITIES**
Design for a commercial tissue culture laboratory – Stock solutions and medium preparation-liquid and semi solid – Surface sterilization of different explants- Stage 1- Aseptic culture establishment – Stage 2-Multiple shoot induction and sub culturing for further multiplication Stage 3-Shoot elongation and rooting of micro-shoots –in vivo and in vitro- Stage 4- Hardening and field establishment of micropropagated plants – Visit to commercial Units – Project preparation – Banana /Bamboo / Rose/ Chrysanthemum/Gerbera/Orchids/medicinal plants.

**References**
EXP 424 PROCESSING AND VALUE ADDITION (0+6)

OBJECTIVES
To enable students to gain hands on experience in commercial production of value added products and to train the students in establishing a commercial processing unit.

ACTIVITIES
Students shall identify the crop and value addition technique and prepare a process flow chart along with the technical and economical feasibility. Hands on training will be provided in licencing, procurement of raw materials, handling, processing, packing, labeling and marketing. Visit to commercial processing units – Project preparation and working out cost economics.

References

E resources:

EXP 424 ORGANIC VEGETABLE PRODUCTION (0+6)

OBJECTIVES
To study the techniques followed in organic vegetable production and to impart practical knowledge on organic farming.

ACTIVITIES
Students shall undertake production of organic vegetables and analyse the cost and certification procedures and agencies. Hands on training shall be provided in preparation of value added compost, solid waste management - Organic bio fortification. Hands on training on various botanical preparations and biostimulants used in organic foliar supplements – panchakavya, EM technology, humic acid, sea weed extract, mushroom manchurian tea, vermiwash, dasagavya – amirthakaraisal.

References

**HPW 425 PROJECT WORK (0+2)**

**Practical**

The students will work on a specified topic suggested by the course teachers appointed for that purpose on various aspects of Agri-Hortibusiness, economics of precision farming, feasibility of establishing a small and cottage industry related to agriculture and allied sciences and cooperative firms engaged in dealing with agricultural input or outputs. The group of students is expected to submit the project report in the prescribed format given in the annexure and the same should be submitted within a period of two semesters.

**Detailed program of project work**

- Identification of thrust area in agriculture and allied sciences
- Selection of topic and delineation of objectives to fulfill the core area of the subject
- Mobilization of resources needed for accomplishing the research project
- Review of literature in the subject area selected and finalizing the project proposal
- Finalization of research methods/methodology/design of experiments to be initiated by the group of student researchers
- Design and layout finalization – laying of experiments at field – preparation of questionnaire for the survey – testing the questionnaire and conduct of field survey
- Analysis of data – tabulation and finalization of research data
- Report writing and submission of draft report to the course teacher/guide concerned
- Identifying the user groups and dissemination of the findings emanated
- Conducting final evaluation and assessment of performance of students in various aspects of research project implementation

**Format of Research Project to be executed by the Student Researcher**

- Cover page
- Certificate page duly signed by the student and the guide/course Teacher
- Acknowledgement to be given by the student
- Contents highlighting the name of the Chapters
- Contents highlighting the list of tables
- Contents highlighting the list of plates/figures
- Abstract along with key words to be annexed in a single page
- Interleaf pages for Chapters
- Chapter – I Introduction – Dedicated to highlight the national, regional and societal importance, Scope of the study and limitations of the study along with the objectives
- Chapter – II Review of Literature – It should focus on the concepts used, concepts derived and literature reviewed towards each and every objective chosen in the study and a summary of literature to orient towards the subject chosen
- Chapter – III Methodology/Design of the study – It should focus on the methods of conduct of study, tools used for analysis and Statistical Significance related are to be discussed
- Chapter – IV Description of the Study – It should address on the place in which the research was conducted, its topographical, climatic and geographical and socio economic features
- Chapter – V Results/Results and Discussion – Presentation of the findings with tabular, diagrammatic evidence to prove the data and discussion in liaison with the literature reviewed towards each and every objective of the study
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- Chapter – VI Summary and conclusions – This chapter can present the summary of data and its important findings and if need be related policies for alleviating the constraints in the farm and the firm.
- References – Books; Journals; Periodicals; Theses/Dissertations; Web References.

**PAT 426 DISEASES OF VEGETABLE, ORNAMENTAL AND SPICE CROPS AND THEIR MANAGEMENT (2+1)**

**OBJECTIVES**
- The subject covers the etiology, epidemiology, symptoms, mode of spread, survival and integrated management of important diseases due to fungi, bacteria, viruses, *Candidatus 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, lettuce, amaranthus and peas.

**Unit–II : Tuber crops**
- Potato, sweet potato, beet root, radish, yam, colacasia and cassava.

**Unit–III : Spices and condiments**
- Onion, garlic, chillies, nutmeg, cardamom, pepper, betel vine, turmeric, ginger, fenugreek, coriander, clove and cinnamon.

**Unit–IV : Ornamentals**
- Jasmine, rose, crossandra, chrysanthemum, tuberose, marigold, orchid and gladiolus.

**Unit–V : Post – harvest diseases**
- Post – harvest diseases of vegetables, tubers, spices and condiments.

**Practicals**
- Study of symptoms and host parasite relationships of the following crops: Tomato, brinjal, bhendi, cucurbits, crucifers, bean, lettuce, amaranthus, peas, potato, cassava, sweet potato, yam, colacasia, 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, tubers, spices, condiments 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, lettuce, amaranthus and peas
  7. Potato and sweet potato
  8. Beet root and radish
  9. Yam and colacasia
  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

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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, amaranthus and peas
7 Potato
8 Field visit
9 Cassava, sweet potato, yam and colacasia
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, condiments and ornamentals
17 Final Practical Examinations

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

Reference books

E-Book

Web references
1. www.ucmp.berkeley.edu/fungi
2. www.ictv.org
3. www.vivo.library.cornell.edu

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