Academic regulations and Syllabus

BACHELOR OF SCIENCE (HONOURS) IN AGRICULTURE (Semesters 1-8)

Under Choice based credit system (CBCS) with Outcome based Education

2018-19 Onwards (Revised)
ANNAMALAI UNIVERSITY
FACULTY OF AGRICULTURE
ACADEMIC REGULATIONS AND SYLLABUS
B.Sc. (Hons.) (AGRICULTURE)
(2018-19 ONWARDS)

1. Title and Scope
   1.1. These academic Regulations shall be called “Annamalai University Faculty of Agriculture B.Sc. (Hons.) Agriculture Academic Regulations 2018” for obtaining Bachelor Degree in the Faculty of Agriculture.
   1.2. The regulations provided herein shall apply to the students admitted from the academic year 2018-19 onwards.

2. Definitions
   2.1. University: University means Annamalai University, Annamalainagar, Tamil Nadu.
   2.3. Academic year: An academic year 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 year.
   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 prefix, code number, title and credits. Each course is denoted by specific code number, which has 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. “SAC-112 Principles of Analytical Chemistry”. “SAC” stands for the Department of Soil Science and Agricultural chemistry; the first digit (1) stands for the year; second digit (1) stands for the semester and the third digit (2) 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 undergoes 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 up to 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 a 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 taken during that semester.
   2.12. Overall Grade Point Average (OGPA)/ “Cumulative Grade Point Average” (CGPA): It is a 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

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Total credit hours till the end of last semester</td>
</tr>
<tr>
<td>2.</td>
<td>Total credit points till the end of last semester</td>
</tr>
<tr>
<td>3.</td>
<td>Total credit hours in the current semester</td>
</tr>
<tr>
<td>4.</td>
<td>Total credit points obtained in the current semester</td>
</tr>
<tr>
<td>5.</td>
<td>Total credit hours including the current semester</td>
</tr>
<tr>
<td>6.</td>
<td>Total credit points including the current semester</td>
</tr>
<tr>
<td>7.</td>
<td>Overall Grade Point Average</td>
</tr>
<tr>
<td>8.</td>
<td>Corrected to two decimals</td>
</tr>
</tbody>
</table>

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 B.Sc. (Hons.) Agriculture programme 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 rules shall be made applicable as per norms of the state government.

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 organised by the University or the Faculty at the commencement of the
semester may, however, pay their semester tuition fees and other fees within the third working day after they return 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. Dean shall nominate a co-ordinator from amongst the teaching faculty.

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

5. Curriculum and programme of study

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

6. Award of Degree, duration and credit requirements

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. (Hons.) Agriculture</td>
<td>8</td>
<td>16</td>
</tr>
</tbody>
</table>

7. Medium of Instruction

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.

<table>
<thead>
<tr>
<th>9.1. Course with both theory and practical</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Mid Semester Examination</td>
<td>20</td>
</tr>
<tr>
<td>II. Practical Examination (Written = 25, Record = 5 Specimen collection/Assignment = 5 and Viva-Voce = 5) (The question pattern in written part should be uniform in each department)</td>
<td>40</td>
</tr>
<tr>
<td>III. Final Theory Examination</td>
<td>40</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>9.2. Course with only Theory/Practical*</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Mid Semester Examination</td>
<td>40</td>
</tr>
<tr>
<td>II. Final Semester Examination</td>
<td>60</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></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 10.0. 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% mark separately in theory and practical with an aggregate of 60 per cent is essential. An OGPA of 6.50 shall be the minimum requirement for the award of Degree. The following symbols shall be used in the grade sheets.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>Incomplete (due to attendance deficiency)</td>
</tr>
<tr>
<td>AB</td>
<td>Absent</td>
</tr>
<tr>
<td>RR</td>
<td>Re-registration</td>
</tr>
<tr>
<td>RA</td>
<td>Re-appearance</td>
</tr>
<tr>
<td>IE</td>
<td>Improvement Examination</td>
</tr>
<tr>
<td>EE</td>
<td>Incomplete for reasons other than attendance</td>
</tr>
</tbody>
</table>

9.4. Evaluation pattern for courses with only practical: The evaluation pattern of courses with only practical is 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 and 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 and 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.
<table>
<thead>
<tr>
<th>S. No.</th>
<th>Particulars</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NSS Regular Programme (15 +15 +15 +15)</td>
<td>60</td>
</tr>
<tr>
<td>2</td>
<td>NSS Special camp not exceeding 10 days duration (Attendance-30 and Activity -10)</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

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><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>60</strong></td>
</tr>
</tbody>
</table>

**E. Crop Production AGR 311/ AGR 321**

<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>Record</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Assignment</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><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>60</strong></td>
</tr>
</tbody>
</table>

**F. Rural Agricultural Work Experience (RAWE)**

**RAWE AEX 410 Village Attachment and Technology Transfer (0+5), RAWE AGR 411 (0+3), RAWE HOR 412 (0+2) and RAWE CPT 413 (0+4)**

Course on Rural Agricultural Work Experience will be offered in the VII Semester for eleven weeks. The village attachment will be organized by the Department of Agricultural Extension.

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.
Orientation programme will be organized by different departments during the first week of the semester 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 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><strong>Final examination</strong></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</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Presentation and Record</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Viva Voce</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

G. Educational Tours: AGR 221 (0+1) and AEX 414 (0+1)

Educational tour courses AGR 221 Study tour-I and AEX 414 All India Tour (0+1) are compulsory. The tours will be under taken during fourth and seventh semester, respectively. The duration of AGR 221 shall not exceed 7 days and that of AEX 414 shall not exceed 14 days. The tours will be arranged by the respective departments of the study in consultation with the Dean, Faculty of Agriculture. The final examination will be conducted separately at the end of the semester by the University. The 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><strong>Final examination</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tour Diary</td>
<td>20</td>
<td>By the organising staff/Examiner</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><strong>Total</strong></td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

H. AIA AEC 415 Agroindustrial Attachment (0 + 6)

Course on Agro Industrial attachment will be offered in the VII Semester for five weeks. The attachment of students to Agro based industries will be organized by Department of Agricultural Economics. Orientation programme for a week will be organized at the 1st 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>Project report</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td><strong>Final examination</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Record</td>
<td>20</td>
<td>By the Examiners</td>
</tr>
<tr>
<td>Power point presentation</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Viva Voce</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>
I. Experiential learning

These courses will be offered in the VIII semester. A student can choose any two experiential learning programme of his/her choice. The maximum number of students allowed to register in a department will be decided by the Dean depending on enrolment. If more number of students opt for a same department 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 staff member appointed as examiner by the Head of the Department. The final examination will be conducted by the University before the commencement of regular final semester examinations.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Parameters</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Project Planning and Writing</td>
<td>10</td>
</tr>
<tr>
<td>2.</td>
<td>Presentation</td>
<td>10</td>
</tr>
<tr>
<td>3.</td>
<td>Regularity</td>
<td>10</td>
</tr>
<tr>
<td>4.</td>
<td>Monthly Assessment</td>
<td>10</td>
</tr>
<tr>
<td>5.</td>
<td>Output delivery</td>
<td>10</td>
</tr>
<tr>
<td>6.</td>
<td>Entrepreneurship Skills</td>
<td>10</td>
</tr>
<tr>
<td>7.</td>
<td>Technical Skill Development/ Business networking</td>
<td>20</td>
</tr>
<tr>
<td>8.</td>
<td>Report Writing Skills</td>
<td>10</td>
</tr>
<tr>
<td>9.</td>
<td>Final Presentation</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>100</strong></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 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 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 of theory will be one hour duration. For courses with both theory and practical, 20 marks will be apportioned as shown below.
<table>
<thead>
<tr>
<th>Model</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Objective type @ ½ mark for 10 questions out of 12</td>
<td>5</td>
</tr>
<tr>
<td>2. Definition/description @ 1 mark for 5 questions out of 7</td>
<td>5</td>
</tr>
<tr>
<td>3. Short answers @ 2½ marks for 2 questions out of 3</td>
<td>5</td>
</tr>
<tr>
<td>4. Essay type @ 5 marks for 1 question out of 2</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>Model</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Objective @ 1 mark for 10 questions out of 12</td>
<td>10</td>
</tr>
<tr>
<td>2. Definition/description @ 2 marks for 5 questions out of 7</td>
<td>10</td>
</tr>
<tr>
<td>3. Short answers @ 3 marks for 5 questions out of 7</td>
<td>15</td>
</tr>
<tr>
<td>4. Essay type @ 5 marks for 1 question out of 2</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 missing MSE. 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 tests 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. The 40 marks will be apportioned as shown below.

<table>
<thead>
<tr>
<th>Model</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Objective type @ ½ mark for 10 questions out of 12</td>
<td>5</td>
</tr>
<tr>
<td>2. Definition/description @ 1 mark for 5 questions out of 7</td>
<td>5</td>
</tr>
<tr>
<td>3. Short answers @ 2½ marks for 2 questions out of 3</td>
<td>5</td>
</tr>
<tr>
<td>4. Essay type @ 5 marks for 5 questions (either or pattern from each Unit)</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
</tr>
</tbody>
</table>

For courses with only Theory, 60 marks will be apportioned as shown below.

<table>
<thead>
<tr>
<th>Model</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Objective type @ 1 mark for 10 questions out of 12</td>
<td>10</td>
</tr>
<tr>
<td>2. Definition/description @ 2 marks for 5 questions out of 7</td>
<td>10</td>
</tr>
<tr>
<td>3. Short answers @ 3 marks for 5 questions out of 7</td>
<td>15</td>
</tr>
<tr>
<td>4. Essay type @ 5 marks for 5 questions (either or pattern from each Unit)</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>60</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 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. The 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 and 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. (Hons.) Agriculture 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 so 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. Whoever 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 students 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.(Hons.)Agriculture shall be awarded during convocation under the seal of the University to the students who have successfully completed the entire graduation requirement 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. (Hons.) Agriculture
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 H.D. for students with attendance deficiency in a course/courses provided such course/courses are not currently offered due to the introduction of the revised syllabi with effect from 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.

* * * * *
PROGRAMME OUTCOMES

GGEN42 B.Sc. (Hons) Agriculture

1. Graduate will acquire detailed basic and applied knowledge on crop cultivation, crop improvement, seed production, management of abiotic-stress, soil reclamation, plant protection, farm machinery, renewable energy, livestock production and allied socioeconomic aspects concerned with field and horticultural crops and necessary skills and hands on experience for entrepreneurship venture, higher studies and research in all frontier areas of agriculture.

2. Graduate will be able to develop expertise in the various techniques and illustrate efficiency in identifying soil types, weeds, crops and varieties, seeds, fertilizers, pesticides, disease symptoms and insect pests and proposing farm budgeting, and irrigation and nutrient schedules.

3. Graduates will be the successful professionals in agro-industries with problem solving skills, critical thinking, market intelligence and decision-making and will be able to organize, facilitate and participate effectively and demonstrate innovativeness and creativity.

4. Graduates will function as an effective member or leader in diverse teams of knowledge dissemination regarding various farming techniques and commercial aspects of agriculture.

5. Graduates will learn appropriate traditional/Indigenous and modern techniques and understand the current problems which are necessary for future goals in agriculture. Further, they will have absolute idea about energy flow, waste management, environment related enforcements and eco system management.

6. Graduate will gain accurate and relevant analytical skills of problems and will have capacity to interpret information, analyze data and draw appropriate statistical conclusions, respond and adapt to changing situations and to understand the ethical standards.

PO and Co Mapping Matrix

<table>
<thead>
<tr>
<th>AFFINITY LEVELS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Low</td>
</tr>
<tr>
<td>2 Moderate/Medium</td>
</tr>
<tr>
<td>3 Substantial/High</td>
</tr>
</tbody>
</table>

Abstract of Distribution Pattern of Courses and Credit

<table>
<thead>
<tr>
<th>Semester</th>
<th>Number of Courses</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>9</td>
<td>6+9</td>
</tr>
<tr>
<td>II</td>
<td>9</td>
<td>12+9</td>
</tr>
<tr>
<td>III</td>
<td>9</td>
<td>16+9</td>
</tr>
<tr>
<td>IV</td>
<td>10</td>
<td>14+10</td>
</tr>
<tr>
<td>V</td>
<td>10</td>
<td>17+10</td>
</tr>
<tr>
<td>VI</td>
<td>11</td>
<td>18+9</td>
</tr>
<tr>
<td>VII</td>
<td>6</td>
<td>0+21</td>
</tr>
<tr>
<td>VIII</td>
<td>2</td>
<td>0+20</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>83+97</strong></td>
<td><strong>180</strong></td>
</tr>
</tbody>
</table>

14
### Semester-wise Distribution of Courses and Credit

#### I Semester

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course code</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>AGR 110</td>
<td>Principles of Agronomy and Agricultural Heritage</td>
<td>2+1</td>
</tr>
<tr>
<td>2.</td>
<td>AGR 111</td>
<td>Fundamentals of Agricultural Meteorology</td>
<td>1+1</td>
</tr>
<tr>
<td>3.</td>
<td>SAC 112</td>
<td>Principles of Analytical Chemistry</td>
<td>1+1</td>
</tr>
<tr>
<td>4.</td>
<td>GPB 113</td>
<td>Fundamentals of Plant Physiology</td>
<td>2+1</td>
</tr>
<tr>
<td>5.</td>
<td>TAM 114 (or) ENG 114</td>
<td>jkpH;zsfpa';fspy; nshz;ika[k; mwtpay; jkpH;g; gad;ghLk; (OR) Development Education</td>
<td>0+1</td>
</tr>
<tr>
<td>6.</td>
<td>ENG 115</td>
<td>English for Effective Communication</td>
<td>0+1</td>
</tr>
<tr>
<td>7.</td>
<td>PED 116</td>
<td>Physical Education</td>
<td>0+1</td>
</tr>
<tr>
<td>8.</td>
<td>PED 117</td>
<td>Principles and Practices of Yoga</td>
<td>0+1</td>
</tr>
<tr>
<td>9.</td>
<td>NSS (or) NCC 118</td>
<td>National Service Scheme (OR) National Cadet Corps</td>
<td>0+1</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td><strong>6+9=15</strong></td>
</tr>
</tbody>
</table>

#### II Semester

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course code</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>AGR 120</td>
<td>Weed Management</td>
<td>1+1</td>
</tr>
<tr>
<td>2.</td>
<td>AGR 121</td>
<td>Irrigation Management</td>
<td>1+1</td>
</tr>
<tr>
<td>3.</td>
<td>ENT 122</td>
<td>Fundamentals of Entomology</td>
<td>2+1</td>
</tr>
<tr>
<td>4.</td>
<td>AGM 123</td>
<td>Fundamentals of Microbiology</td>
<td>2+1</td>
</tr>
<tr>
<td>5.</td>
<td>SAC 124</td>
<td>Fundamentals of Biochemistry</td>
<td>2+1</td>
</tr>
<tr>
<td>6.</td>
<td>GPB 125</td>
<td>Introduction to Agricultural Botany</td>
<td>1+1</td>
</tr>
<tr>
<td>7.</td>
<td>AEC 126</td>
<td>Principles of Economics</td>
<td>1+1</td>
</tr>
<tr>
<td>8.</td>
<td>AEX 127</td>
<td>Fundamentals of Rural Sociology and Educational Psychology</td>
<td>1+1</td>
</tr>
<tr>
<td>9.</td>
<td>COM 128</td>
<td>Fundamentals of Information Technology</td>
<td>1+1</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td><strong>12+9=21</strong></td>
</tr>
</tbody>
</table>

#### III Semester

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course code</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>AGR 210</td>
<td>Agronomy of Field Crops – I</td>
<td>2+1</td>
</tr>
<tr>
<td>2.</td>
<td>ENT 211</td>
<td>Economic Entomology and Introductory Nematology</td>
<td>2+1</td>
</tr>
<tr>
<td>3.</td>
<td>PAT 212</td>
<td>Fundamentals of Plant Pathology</td>
<td>2+1</td>
</tr>
<tr>
<td>4.</td>
<td>SAC 213</td>
<td>Fundamentals of Soil Science</td>
<td>2+1</td>
</tr>
<tr>
<td>5.</td>
<td>GPB 214</td>
<td>Principles of Genetics and Cytogenetics</td>
<td>2+1</td>
</tr>
<tr>
<td>6.</td>
<td>HOR 215</td>
<td>Basic Horticulture and Plant Propagation</td>
<td>2+1</td>
</tr>
<tr>
<td>7.</td>
<td>AEC 216</td>
<td>Production Economics and Farm Management</td>
<td>1+1</td>
</tr>
<tr>
<td>8.</td>
<td>AEX 217</td>
<td>Dimensions of Agricultural Extension</td>
<td>1+1</td>
</tr>
<tr>
<td>9.</td>
<td>AHS 218</td>
<td>Livestock and Poultry Management</td>
<td>2+1</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td><strong>16+9=25</strong></td>
</tr>
</tbody>
</table>

#### IV Semester

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course code</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>AGR 220</td>
<td>Agronomy of Field Crops – II</td>
<td>2+1</td>
</tr>
<tr>
<td>2.</td>
<td>AGR 221</td>
<td>Study Tour -I</td>
<td>0+1</td>
</tr>
<tr>
<td>3.</td>
<td>ENT 222</td>
<td>Insect Ecology and Principles of Pest Management</td>
<td>2+1</td>
</tr>
<tr>
<td>4.</td>
<td>AGM 223</td>
<td>Soil and Applied Microbiology</td>
<td>2+1</td>
</tr>
<tr>
<td>S. No.</td>
<td>Course code</td>
<td>Title</td>
<td>Credit</td>
</tr>
<tr>
<td>--------</td>
<td>-------------</td>
<td>----------------------------------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>5.</td>
<td>SAC 224</td>
<td>Soil Resource Inventory and Problem Soils</td>
<td>2+1</td>
</tr>
<tr>
<td>6.</td>
<td>GPB 225</td>
<td>Principles and Methods of Plant Breeding</td>
<td>2+1</td>
</tr>
<tr>
<td>7.</td>
<td>AEC 226</td>
<td>Agricultural Marketing, Trade and Prices</td>
<td>1+1</td>
</tr>
<tr>
<td>8.</td>
<td>STA 227</td>
<td>Agricultural Statistics</td>
<td>1+1</td>
</tr>
<tr>
<td>9.</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></td>
<td><strong>Total</strong></td>
<td>14+10=24</td>
</tr>
</tbody>
</table>

### V Semester

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course code</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>AGR 310</td>
<td>Farming System, Organic Agriculture, Agroforestry and Dry Farming</td>
<td>3+1</td>
</tr>
<tr>
<td>2.</td>
<td>AGR 311</td>
<td>Crop Production-I</td>
<td>0+1</td>
</tr>
<tr>
<td>3.</td>
<td>ENT 312</td>
<td>Pests of Crops, Stored products and their Management</td>
<td>2+1</td>
</tr>
<tr>
<td>4.</td>
<td>PAT 313</td>
<td>Principles of Plant Disease Management</td>
<td>1+1</td>
</tr>
<tr>
<td>5.</td>
<td>AGM 314</td>
<td>Environmental Science</td>
<td>2+1</td>
</tr>
<tr>
<td>6.</td>
<td>SAC 315</td>
<td>Soil Fertility, Fertilizers and Manures</td>
<td>2+1</td>
</tr>
<tr>
<td>7.</td>
<td>GPB 316</td>
<td>Plant Biotechnology</td>
<td>2+1</td>
</tr>
<tr>
<td>8.</td>
<td>HOR 317</td>
<td>Production Technology of Fruits and Plantation Crops</td>
<td>2+1</td>
</tr>
<tr>
<td>9.</td>
<td>AEC 318</td>
<td>Agribusiness 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></td>
<td><strong>Total</strong></td>
<td>17+ 10=27</td>
</tr>
</tbody>
</table>

### VI Semester

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course code</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>AGR 320</td>
<td>Climate Change and Disaster Management</td>
<td>1+0</td>
</tr>
<tr>
<td>2.</td>
<td>AGR 321</td>
<td>Crop Production-II</td>
<td>0+1</td>
</tr>
<tr>
<td>3.</td>
<td>AEG 322</td>
<td>Post Harvest Technology and Value Addition of Field Crops</td>
<td>2+0</td>
</tr>
<tr>
<td>4.</td>
<td>PAT 323</td>
<td>Diseases of Field and Horticultural Crops and Their Management</td>
<td>3+1</td>
</tr>
<tr>
<td>5.</td>
<td>SAC 324</td>
<td>Crops and Pesticide Chemistry and Nanotechnology</td>
<td>2+1</td>
</tr>
<tr>
<td>6.</td>
<td>GPB 325</td>
<td>Breeding of Field and Horticultural Crops</td>
<td>2+1</td>
</tr>
<tr>
<td>7.</td>
<td>HOR 326</td>
<td>Production Technology of Vegetables, Spices,Flowers and Landscape Gardening</td>
<td>3+1</td>
</tr>
<tr>
<td>8.</td>
<td>AEC 327</td>
<td>Agricultural Finance, Banking and Co-operation</td>
<td>1+1</td>
</tr>
<tr>
<td>9.</td>
<td>AEX 328</td>
<td>Extension Methodologies and Transfer of Agricultural Technology</td>
<td>1+1</td>
</tr>
<tr>
<td>10.</td>
<td>GPB 329</td>
<td>Principles of Seed Production, Seed Quality Regulation and Storage</td>
<td>2+1</td>
</tr>
<tr>
<td>11.</td>
<td>OPC XXX 001</td>
<td>Optional Course*</td>
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</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td>18+9=27</td>
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### VII Semester

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course code</th>
<th>Title</th>
<th>Credit</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>RAWE AEX 410</td>
<td>Village attachment and Technology Transfer</td>
<td>0+5</td>
</tr>
<tr>
<td>2.</td>
<td>RAWE AGR 411</td>
<td>Agronomical Interventions</td>
<td>0+3</td>
</tr>
</tbody>
</table>
**VIII Semester**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course code</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>EXP XXX 42X</td>
<td>Experiential Learning I#</td>
<td>0+10</td>
</tr>
<tr>
<td>2.</td>
<td>EXP XXX42X</td>
<td>Experiential Learning II#</td>
<td>0+10</td>
</tr>
</tbody>
</table>

*Registration of Optional Courses OPC XXX 001*

The optional courses are to be registered by B.Sc. (Hons.) Agriculture students. A student can select one optional course during VI semester from the list of optional courses offered as detailed below. If more number of students opts for a particular optional course then OGPA of the student is to be considered.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course No.</th>
<th>Optional Course</th>
<th>Credit</th>
<th>Department offering the course</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>OPC AGR 001</td>
<td>Indigenous Technology in Agricultural Production</td>
<td>1+1</td>
<td>Agronomy</td>
</tr>
<tr>
<td>2.</td>
<td>OPC ENT 001</td>
<td>Industrial Entomology</td>
<td>1+1</td>
<td>Entomology</td>
</tr>
<tr>
<td>3.</td>
<td>OPC PAT 001</td>
<td>Emerging Trends in Plant Disease Management</td>
<td>1+1</td>
<td>Plant Pathology</td>
</tr>
<tr>
<td>4.</td>
<td>OPC AGM 001</td>
<td>Advanced Microbial Biotechnology</td>
<td>1+1</td>
<td>Microbiology</td>
</tr>
<tr>
<td>5.</td>
<td>OPC SAC 001</td>
<td>Farm Advisory on Soil Health, Water Quality and Plant Nutrition</td>
<td>1+1</td>
<td>Soil Science and Agrl. Chemistry</td>
</tr>
<tr>
<td>6.</td>
<td>OPC GPB 001</td>
<td>Plant tissue culture</td>
<td>1+1</td>
<td>Genetics and Plant Breeding</td>
</tr>
<tr>
<td>7.</td>
<td>OPC HOR 001</td>
<td>Supply Chain Management, processing and Value Addition in Horticulture Crops</td>
<td>1+1</td>
<td>Horticulture</td>
</tr>
<tr>
<td>8.</td>
<td>OPC AEC 001</td>
<td>Agricultural Project Management</td>
<td>1+1</td>
<td>Agri. Economics</td>
</tr>
<tr>
<td>9.</td>
<td>OPC AEX 001</td>
<td>Advertising Technology</td>
<td>1+1</td>
<td>Agrl. Extension</td>
</tr>
<tr>
<td>10.</td>
<td>OPC AHS 001</td>
<td>Goat Rearing and Management</td>
<td>1+1</td>
<td>Animal Husbandry</td>
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</tbody>
</table>
**Registration of Experiential Learning** EXP XXX 42X

For experiential learning the student can choose any two courses from the professional packages indicated below during VIII semester. The Head of the Department in consultation with the Dean, shall restrict the number of professional packages according to the practical feasibility and climatic conditions.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course No.</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>EXP AGR 421</td>
<td>Production of Liquid Organic Formulations</td>
<td>0+10</td>
</tr>
<tr>
<td>2.</td>
<td>EXP AGR 422</td>
<td>Seed Production of Legumes/Green Manure/Fodder</td>
<td>0+10</td>
</tr>
<tr>
<td>3.</td>
<td>EXP ENT 421</td>
<td>Bio Pesticides and Biocontrol Agents Production Technology</td>
<td>0+10</td>
</tr>
<tr>
<td>4.</td>
<td>EXP ENT 422</td>
<td>Commercial Apiculture</td>
<td>0+10</td>
</tr>
<tr>
<td>5.</td>
<td>EXP ENT 423</td>
<td>Commercial Sericulture</td>
<td>0+10</td>
</tr>
<tr>
<td>6.</td>
<td>EXP PAT 421</td>
<td>Mushroom Culture</td>
<td>0+10</td>
</tr>
<tr>
<td>7.</td>
<td>EXP PAT 422</td>
<td>Biological Control of Plant Diseases</td>
<td>0+10</td>
</tr>
<tr>
<td>8.</td>
<td>EXP AGM 421</td>
<td>Microbial Inoculants Production and Quality Control</td>
<td>0+10</td>
</tr>
<tr>
<td>9.</td>
<td>EXP AGM 422</td>
<td>Composting Technologies for Sustainable Agriculture</td>
<td>0+10</td>
</tr>
<tr>
<td>10.</td>
<td>EXP SAC 421</td>
<td>Hands on Training for Soil, Water and Plant Analysis</td>
<td>0+10</td>
</tr>
<tr>
<td>11.</td>
<td>EXP SAC 422</td>
<td>Hands on Training on Soil Constraints and Its Management for Sustainable Crop Productivity</td>
<td>0+10</td>
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<tr>
<td>12.</td>
<td>EXP GPB 421</td>
<td>Commercial Seed Production in Vegetable Crops</td>
<td>0+10</td>
</tr>
<tr>
<td>13.</td>
<td>EXP GPB 422</td>
<td>Seed Production Techniques in Field Crops</td>
<td>0+10</td>
</tr>
<tr>
<td>14.</td>
<td>EXP HOR 421</td>
<td>Organic Vegetable Production</td>
<td>0+10</td>
</tr>
<tr>
<td>15.</td>
<td>EXP HOR 422</td>
<td>Commercial Horticultural Nursery</td>
<td>0+10</td>
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<tr>
<td>16.</td>
<td>EXP HOR 423</td>
<td>Commercial Landscaping</td>
<td>0+10</td>
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<tr>
<td>17.</td>
<td>EXP HOR 424</td>
<td>Processing and Value Addition of Horticultural Crops</td>
<td>0+10</td>
</tr>
<tr>
<td>18.</td>
<td>EXP AEC 421</td>
<td>Marketing Skills for Agri Professionals</td>
<td>0+10</td>
</tr>
<tr>
<td>19.</td>
<td>EXP AEC 422</td>
<td>Managerial Skills for Agripreneurs</td>
<td>0+10</td>
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<tr>
<td>20.</td>
<td>EXP AEX 421</td>
<td>Extension and Communication Skills</td>
<td>0+10</td>
</tr>
<tr>
<td>21.</td>
<td>EXP AEX 422</td>
<td>Transformation through Extension Programme Planning</td>
<td>0+10</td>
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<tr>
<td>22.</td>
<td>EXP AHS 421</td>
<td>Broiler Production</td>
<td>0+10</td>
</tr>
<tr>
<td>23.</td>
<td>EXP AHS 422</td>
<td>Japanese Quail Production</td>
<td>0+10</td>
</tr>
<tr>
<td>24.</td>
<td>EXP AHS 423</td>
<td>Technology of Value-added Milk Products</td>
<td>0+10</td>
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Abstract of Department-wise Credit

<table>
<thead>
<tr>
<th>Departments/Division</th>
<th>Credit hours</th>
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<tbody>
<tr>
<td>Agronomy</td>
<td>15 + 13 = 28</td>
</tr>
<tr>
<td>Entomology</td>
<td>8 + 6 = 14</td>
</tr>
<tr>
<td>Plant Pathology</td>
<td>6 + 5 = 11</td>
</tr>
<tr>
<td>Microbiology</td>
<td>6 + 3 = 9</td>
</tr>
<tr>
<td>Soil Science and Agricultural Chemistry</td>
<td>11 + 6 = 17</td>
</tr>
<tr>
<td>Genetics and Plant Breeding</td>
<td>13 + 7 = 20</td>
</tr>
<tr>
<td>Horticulture</td>
<td>7 + 5 = 12</td>
</tr>
<tr>
<td>Agricultural Economics</td>
<td>5 + 11 = 16</td>
</tr>
<tr>
<td>Agricultural Extension</td>
<td>3 + 9 = 12</td>
</tr>
<tr>
<td>Animal Husbandry</td>
<td>2 + 1 = 3</td>
</tr>
<tr>
<td>Statistics</td>
<td>1 + 1 = 2</td>
</tr>
<tr>
<td>Engineering</td>
<td>5 + 3 = 8</td>
</tr>
<tr>
<td>Languages (Tamil, English)</td>
<td>0 + 3 = 3</td>
</tr>
<tr>
<td>Common Courses</td>
<td>1 + 24 = 25</td>
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<tr>
<td>Total</td>
<td>83 + 97 = 180</td>
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List of Courses Offered (Department-wise)
Department of Agronomy

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Semester</th>
<th>Course code</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I</td>
<td>AGR 110</td>
<td>Principles of Agronomy and Agricultural Heritage</td>
<td>2+1</td>
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<tr>
<td>2.</td>
<td>I</td>
<td>AGR 111</td>
<td>Fundamentals of Agricultural Meteorology</td>
<td>1+1</td>
</tr>
<tr>
<td>3.</td>
<td>II</td>
<td>AGR 120</td>
<td>Weed Management</td>
<td>1+1</td>
</tr>
<tr>
<td>4.</td>
<td>III</td>
<td>AGR 121</td>
<td>Irrigation Management</td>
<td>1+1</td>
</tr>
<tr>
<td>5.</td>
<td>III</td>
<td>AGR 210</td>
<td>Agronomy of Field Crops - I</td>
<td>2+1</td>
</tr>
<tr>
<td>6.</td>
<td>IV</td>
<td>AGR 220</td>
<td>Agronomy of Field Crops - II</td>
<td>2+1</td>
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<tr>
<td>7.</td>
<td>IV</td>
<td>AGR 221</td>
<td>Study Tour -I</td>
<td>0+1</td>
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<tr>
<td>8.</td>
<td>V</td>
<td>AGR 310</td>
<td>Farming System, Organic Agriculture, Agro forestry and Dry farming</td>
<td>3+1</td>
</tr>
<tr>
<td>9.</td>
<td>V</td>
<td>AGR 311</td>
<td>Crop Production-I</td>
<td>0+1</td>
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<tr>
<td>10.</td>
<td>VI</td>
<td>AGR 320</td>
<td>Climate Change and Disaster Management</td>
<td>1+0</td>
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<tr>
<td>11.</td>
<td>VI</td>
<td>AGR 321</td>
<td>Crop Production-II</td>
<td>0+1</td>
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<tr>
<td>12.</td>
<td>VI</td>
<td>AGR 322</td>
<td>Post Harvest Technology and Value addition of Field Crops</td>
<td>2+0</td>
</tr>
<tr>
<td>13.</td>
<td>VII</td>
<td>RAWE AGR 411</td>
<td>Agronomical Interventions</td>
<td>0+3</td>
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<tr>
<td>Total</td>
<td></td>
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<td></td>
<td>15+13= 28</td>
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</table>
### Department of Entomology

<table>
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<tr>
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<th>Semester</th>
<th>Course code</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>II</td>
<td>ENT 122</td>
<td>Fundamentals of Entomology</td>
<td>2+1</td>
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<tr>
<td>2.</td>
<td>III</td>
<td>ENT 211</td>
<td>Economic Entomology and Introductory Nematology</td>
<td>2+1</td>
</tr>
<tr>
<td>3.</td>
<td>IV</td>
<td>ENT 222</td>
<td>Insect Ecology and Principles of Pest Management</td>
<td>2+1</td>
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<tr>
<td>4.</td>
<td>V</td>
<td>ENT 312</td>
<td>Pests of Crops, Stored Products and their Management</td>
<td>2+1</td>
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<tr>
<td>5.</td>
<td>VII</td>
<td>RAWE CPT 413</td>
<td>Crop Protection (Entomology and Plant Pathology)</td>
<td>0+2</td>
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</tbody>
</table>

**Total** 8+6=14

### Department of Plant Pathology

<table>
<thead>
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<th>Semester</th>
<th>Course code</th>
<th>Title</th>
<th>Credit</th>
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<tbody>
<tr>
<td>1.</td>
<td>III</td>
<td>PAT 212</td>
<td>Fundamentals of Plant Pathology</td>
<td>2+1</td>
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<tr>
<td>2.</td>
<td>V</td>
<td>PAT 313</td>
<td>Principles of Plant Disease Management</td>
<td>1+1</td>
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<tr>
<td>3.</td>
<td>VI</td>
<td>PAT 323</td>
<td>Diseases of Field and Horticultural Crops and their Management</td>
<td>3+1</td>
</tr>
<tr>
<td>4.</td>
<td>VII</td>
<td>RAWE CPT 413</td>
<td>Crop Protection (Entomology and Plant Pathology)</td>
<td>0+2</td>
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</table>

**Total** 6+5=11

### Department of Agricultural Microbiology

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<th>Semester</th>
<th>Course code</th>
<th>Title</th>
<th>Credit</th>
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<tbody>
<tr>
<td>1.</td>
<td>II</td>
<td>AGM 123</td>
<td>Fundamentals of Microbiology</td>
<td>2+1</td>
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<tr>
<td>2.</td>
<td>IV</td>
<td>AGM 223</td>
<td>Soil and Applied Microbiology</td>
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<tr>
<td>3.</td>
<td>V</td>
<td>AGM 314</td>
<td>Environmental Science</td>
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**Total** 6+3 = 9

### Department of Soil Science and Agricultural Chemistry

<table>
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<th>Semester</th>
<th>Course code</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I</td>
<td>SAC 112</td>
<td>Principles of Analytical Chemistry</td>
<td>1+1</td>
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<tr>
<td>2.</td>
<td>II</td>
<td>SAC 124</td>
<td>Fundamentals of Biochemistry</td>
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</tr>
<tr>
<td>3.</td>
<td>III</td>
<td>SAC 213</td>
<td>Fundamentals of Soil Science</td>
<td>2+1</td>
</tr>
<tr>
<td>4.</td>
<td>IV</td>
<td>SAC 224</td>
<td>Soil Resource Inventory and Problem Soils</td>
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<tr>
<td>5.</td>
<td>V</td>
<td>SAC 315</td>
<td>Soil Fertility, Fertilizers and Manures</td>
<td>2+1</td>
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<tr>
<td>6.</td>
<td>VI</td>
<td>SAC 324</td>
<td>Crop and Pesticide Chemistry and Nanotechnology</td>
<td>2+1</td>
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**Total** 11+6 =17
### Department of Genetics and Plant Breeding

<table>
<thead>
<tr>
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<th>Semester</th>
<th>Course code</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I</td>
<td>GPB 113</td>
<td>Fundamentals of Plant Physiology</td>
<td>2+1</td>
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<tr>
<td>2.</td>
<td>II</td>
<td>GPB 125</td>
<td>Introduction to Agricultural Botany</td>
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</tr>
<tr>
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<td>III</td>
<td>GPB 214</td>
<td>Principles of Genetics and Cytogenetics</td>
<td>2+1</td>
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<tr>
<td>4.</td>
<td>IV</td>
<td>GPB 225</td>
<td>Principles and Methods of Plant Breeding</td>
<td>2+1</td>
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<tr>
<td>5.</td>
<td>V</td>
<td>GPB 316</td>
<td>Plant Biotechnology</td>
<td>2+1</td>
</tr>
<tr>
<td>6.</td>
<td>VI</td>
<td>GPB 325</td>
<td>Breeding of Field and Horticultural Crops</td>
<td>2+1</td>
</tr>
<tr>
<td>7.</td>
<td>VI</td>
<td>GPB 329</td>
<td>Principles of Seed Production, Seed Quality Regulation and Storage</td>
<td>2+1</td>
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</table>

**Total 13+7=20**

### Department of Horticulture

<table>
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<th>Semester</th>
<th>Course code</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>III</td>
<td>HOR 215</td>
<td>Basic Horticulture and Plant Propagation</td>
<td>2+1</td>
</tr>
<tr>
<td>2.</td>
<td>V</td>
<td>HOR 317</td>
<td>Production Technology of Fruits and Plantation Crops</td>
<td>2+1</td>
</tr>
<tr>
<td>3.</td>
<td>VI</td>
<td>HOR 326</td>
<td>Production Technology of Vegetables, Spices, Flowers and Landscape Gardening</td>
<td>3+1</td>
</tr>
<tr>
<td>4.</td>
<td>VII</td>
<td>RAWE HOR 412</td>
<td>Horticultural Interventions</td>
<td>0+2</td>
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</tbody>
</table>

**Total 7+5=12**

### Department of Agricultural Economics

<table>
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<th>S. No.</th>
<th>Semester</th>
<th>Course code</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>II</td>
<td>AEC 126</td>
<td>Principles of Economics</td>
<td>1+1</td>
</tr>
<tr>
<td>2.</td>
<td>III</td>
<td>AEC 216</td>
<td>Production Economics and Farm Management</td>
<td>1+1</td>
</tr>
<tr>
<td>3.</td>
<td>IV</td>
<td>AEC 226</td>
<td>Agricultural Marketing, Trade and Prices</td>
<td>1+1</td>
</tr>
<tr>
<td>4.</td>
<td>V</td>
<td>AEC 318</td>
<td>Agribusiness Management and Entrepreneurship</td>
<td>1+1</td>
</tr>
<tr>
<td>5.</td>
<td>VI</td>
<td>AEC 327</td>
<td>Agricultural Finance, Banking and Co-operation</td>
<td>1+1</td>
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<tr>
<td>6.</td>
<td>VII</td>
<td>AIA AEC 415</td>
<td>Agro Industrial Attachment</td>
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**Total 5+11=16**
### Department of Agricultural Extension

<table>
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<th>Semester</th>
<th>Course code</th>
<th>Title</th>
<th>Credit</th>
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<tbody>
<tr>
<td>1.</td>
<td>II</td>
<td>AEX 127</td>
<td>Fundamentals of Rural Sociology and Educational Psychology</td>
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<td>Extension Methodologies and Transfer of Agricultural Technology</td>
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### Division of Animal Husbandry

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### Department of Statistics

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### Division of Computer Science & Information Science (Faculty of Engineering)

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Faculty of Indian Languages
(Department of Tamil Studies & Research and Department of English)

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**Total** 0+3=3

**Common Courses**

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<td>Principles and Practices of Yoga</td>
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**Total** 1+24=25
SYLLABI

AGR 110 PRINCIPLES OF AGRONOMY AND AGRICULTURAL HERITAGE (2 +1)

LEARNING OBJECTIVES:
- To know about the basic principles and practices of crop production
- To gain knowledge on various agricultural development from ancient to modern age
- To understand about various factors affecting crop production
- To acquire knowledge on basic agricultural operations *viz.* seeds and sowing, after cultivation practices, irrigation and nutrient management
- To obtain awareness on harvesting, cleaning and storage of agricultural products.

THEORY

Unit – I: Introduction to Agriculture

Unit – II: History of Agriculture Development

Unit – III: Crop Classification and Crop Production

Unit – IV: Basic Agricultural Operations

Unit – V : Harvesting and Storage
Maturity symptoms of field crops – methods of harvesting – Cleaning and drying - methods of storage. Current stream of developments

PRACTICAL

THEORY LECTURE SCHEDULE
1. Agriculture – Definition – Agriculture as Art, science and Business
2. Importance and scope of agriculture in India and Tamilnadu
3. Branches of agriculture
4. Agronomy – definition – meaning and scope
5. National and International Agricultural Research Institutes in India
6. Indian agriculture- Indian economy – National income– Agricultural income in GDP
7. Women in agriculture and empowerment
8. History of agricultural development in the world and India
9. Agricultural heritage – Agriculture in ancient India and Evolution of man
10. Development of scientific agriculture
11. Stages of agriculture development - Era of civilization
12. Importance of Neolithic civilization
13. Chronological agricultural technology development in India
14. Kautilya’s Arthasasstra - Sangam literature
15. Tamil Almanac and rainfall prediction- ITK
16. Agronomic classification of crops
17. Economic and agricultural importance of crops in Tamil Nadu and India
18. Mid-semester Examination
19. Major crops of India and Tamil Nadu
20. Major soils of India and Tamil Nadu
22. Tillage – Definition – objectives -Types of tillage
23. Field preparation - Modern concepts of tillage
24. Seeds - Seed rate – Seed treatment- Different methods of sowing
25. Germination –Factors affecting germination
27. Inter cultivation - Thinning - gap filling and other intercultural operations
28. Weeds – Definition – beneficial and harmful effects of weeds
29. Irrigation and its impact on plant growth
30. Role of manures and fertilizers in crop production
31. Method of fertilizer application – slow release nutrients
32. Ways to improve FUE and concepts of INM
33. Maturity symptoms of field crops and methods of harvesting
34. Cleaning, drying and storage of field crops

PRACTICAL SCHEDULE
1. Visit to college farm to observe wet land, garden land and dry land farming systems
2. Identification of principle crops and seeds
3. Identification of manures and fertilizers
4. Identification of agrochemicals and their usage
5. Identification of green manures and green leaf manures and practicing incorporation methods
6. Identification of tools and implements-Acquiring skill in handling these implements
7. Identification of secondary tillage implements-Acquiring skill in handling these implements
8. Study of labour saving and special purpose implements
9. Practicing different methods of Seed treatments -Nursery preparation
10. Study on different methods of sowing and practicing seeding implements
11. Practicing application methods of manures and fertilizers
12. Acquiring skill in foliar fertilization
13. Calculation on plant population and working out seed rates
14. Practicing thinning, gap filling operations and intercultural operations
15. Working out fertilizer requirement of crops
16. Maturity symptoms and harvesting methods.
17. Orientation for final examination

**COURSE OUTCOMES:**

**CO 1:** To understand the basic principles and practices of crop production

**CO 2:** To gain knowledge on various agricultural development from ancient to modern age

**CO 3:** To critically assess the inter relationship between crop production and different factors affecting the production of crops

**CO 4:** To construct skills on basic agricultural operations viz., seeds and sowing, after cultivation practices, irrigation and nutrient management

**CO 5:** To understand about harvesting, cleaning and storage of agricultural products.

**CO-PO MAPPING MATRIX**

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**REFERENCES**


**E-RESOURCES**

LEARNING OBJECTIVES:
- To know the basic concepts of agricultural meteorology and recording various weather elements in observatory.
- To understand about solar radiation, temperature and relative humidity on crop production.
- To be familiar with cyclones, EL Nino and La Nino.
- To aware clouds, precipitation, drought, flood and evapotranspiration.
- To study about different Agro climatic zones of India and Tamil Nadu, importance of weather forecasting and remote sensing.

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

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**

**COURSE OUTCOMES**
**CO 1:** To gain knowledge about role of weather elements in crop growth and how to record various weather elements
CO 2: To construct information about effect of solar radiation, temperature and relative humidity on crop production

CO 3: To comprehend knowledge with cyclones, El Nino and La Nino

CO 4: To create awareness on cloud types, precipitation, drought, flood and evapotranspiration.

CO 5: To formulate cropping pattern for different agro climatic zones of India and Tamil Nadu, importance of weather forecasting and remote sensing.

CO-PO MAPPING MATRIX

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REFERENCES

E-RESOURCES

SAC 112 PRINCIPLES OF ANALYTICAL CHEMISTRY (1 +1)

LEARNING OBJECTIVES:
- To familiarize with the basic principles of Analytical Chemistry and instrumentation techniques.
- 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 LECTURE SCHEDULE
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. Permanganometry – 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

COURSE OUTCOMES

CO 1: Students gain knowledge on basic principles of analytical chemistry
CO 2: Students learn the techniques of stand preparations and various methods of qualitative and quantitative analysis
CO3: Students develop a conceptual understanding on the principles of different instrumental techniques followed for soil and plant analysis.

CO-PO MAPPING MATRIX

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REFERENCES


E-RESOURCES

LEARNING OBJECTIVES:

- To impart basic knowledge on various functions and processes related to crop production, mineral nutrition, plant growth regulators and environmental stresses.
- To understand the mechanism of absorption and translocation of water and nutrients from the soil.
- To study the different pathways in photosynthesis and respiration.
- To study the topics on plant growth regulators and stress physiology.

THEORY

Unit I: Plant Water Relations

Unit II: Plant Mineral Nutrition
Criteria of essentiality - classification of nutrients - macro, micro, mobile, beneficial elements and immobile - mechanism of nutrient uptake- Physiological functions, deficiencies and disorders of macro and micro nutrients – Hidden hunger- Foliar nutrition- root feeding and fertigation – sand culture, hydroponics and aeroponics.

Unit III: Photosynthesis and Respiration

Unit IV: Growth and Development

Unit V: Stress Physiology

PRACTICAL
Preparation of different types solutions -Measurement of plant water potential by different methods - Estimation of photosynthetic pigments- Chlorophylls and Carotenoids - Determination of stomatal index and stomatal frequency - Measurement of...
leaf area by different methods - Physiological and Nutritional disorders in crops plants -
Estimation of chlorophyll Stability Index - Estimation of Relative Water Content -
Determination of photosynthetic efficiency in crop plants - soluble protein - Estimation of
Nitrate Reductase activity - Growth Analysis - Bioassay of Cytokinin and GA - Estimation
of proline - Demonstration of Practical applications of PGRs. Field visit for foliar
diagnosis.

THEORY LECTURE SCHEDULE

1. Importance of Crop Physiology in Agriculture - Structure of plasma membrane,
   chloroplast, mitochondria, peroxisome and vacuole
2. Structure and role of water - water potential and its components - Diffusion -
   Osmosis - imbibition - Plasmolysis - Field Capacity and Permanent Wilting Point
3. Mechanisms of water absorption - Pathways of water movement - Apoplast and
   symplast
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
6. Mineral nutrition - criteria of essentiality - classification of nutrients - macro,
   micro, mobile and immobile - mechanism of nutrient uptake
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

COURSE OUTCOMES:
CO 1: Students will acquire basic knowledge on various functions and processes related to crop productivity
CO 2: Will be able to identify the mineral nutrient deficiencies and their symptoms
CO 3: Know about the various plant growth regulators and environmental stresses.
CO 4: In addition, hands on exposure to preparation of solutions, analysis of pigment composition, estimation of growth analytical parameters,
CO 5: Will be able to diagnose nutrient deficiencies in crops and ameliorate them and will be competent in enzyme assays and applications of plant growth regulators

CO-PO MAPPING MATRIX

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REFERENCES
E-RESOURCES
3. http://4e.plantphys.net
4. www.plantphysiol.org

TAM -114 jkpH; ,yf;fpa';fsp; ntshz;ika[k; mwptpay; jkpH;g; gad;gHkL; (0+1)

bra:Kiwg; gapw;rpfs;
1. bjhy;fhg;gpak; fhl;Lk; Kjw;bgUs;/ flUg:bgUs; - r';f ,yf;fpa;jjpy; ntshz; bjhHpy; El;g';fs; - gjpbzd; fPH;f;fzf;F E}y;fspy; ntshz;ikmwptpay; - gs;S ,yf;fpa';fs;/ VbuGgJ/ ,yf;fpaj;jpy; ntshz; bgwpapay; - njhl;ltpay; - tdtpay; kidapay; - NHypay; ntshz;ikg; ghBkhhHpsfs; - ,yf;fpak; fhl;Lk; thH;tpay; bewpKiwfs; - ,f;fhy ,yf;fpa';fspy; ntshz;ikr; rpe;jidfs; - gpiHapd;wpvGJk; Kiwfs; - ,yf;fpaj;jpy; bkd;jpwd;fs; - mwptpay; jkpH; tsh;rrrepyfs; fiyr;brhy;yhf;fk; - bkhHpbghah;g;ghsh; - Ml;rpj; jkpH; - cHth;sf;fhdmwptpg;g[fisbtspapLjy; - fl;LiuR;fk; vGJjy; - fpdpncyfpy; jkpH;
2. r';f ,yf;fpaj;jpy; ntshz; bjhHpy; El;g';fs; - (vl;Lj;bjhjhf/ gj;Jg;ghl;L)
3. gjpbdz; fPH;f;fzf;F E}y;fspy; ntshz;ikmwptpay;
4. gs;S ,yf;fpa';fs;/ VbuGgJ – cHth; thH;tpay; bewpKiwFSk; ntshz;ikj; bjhHpy; El;g';fSk; - jyf;fpa;jjpy; ntshz; bhgwppay; - njhl;ltpay; - tdtpay; - kidapay; - NHypay;
5. ntshz;ikg; ghBkhhHpsf; - cHTf tiptywpay; - ehw;WeLjy; - vU ,Ljy; - ePh;g;ghrdk; - fisnkyhz;ik – gaph;gHjfgf;g - mWti – cHth; rKJhak;
6. ,yf;fpak; fhl;Lk; thH;tpay; bewpKiwfs;
7. ,f;fhy ,yf;fpa';fspy; ntshz;ikr; rpe;jidfs; - ghujp; ghujpjhrd; gilg;gfs; - g[lf;fptij – rpWfij – g]jpdf;
9. ,ielpyg; gUtj;njh,t;
10. gpiHapd;wpvGJk; Kiwfs; - vGj;Jg; gpiHfs; - brhw;gpiHfs; - brhw; gphpg;g[g;gpiH – thf;fpag;gpiH – bka;g;gj; pfj;jmk;
11. ,yf;fpaj;jpy; bkd;jpwd;fs; - jiyikg;gz;g[ - fhynkyhz;ik
12. MSlkg;gz;g[ nkk;ghL – kdpj cwtlj;jpwd;fs; tsh;jjy;
13. mwptpay; jkpH; tsh;rrrepyfs/ ntshz; Eljy;fs/ ntshz; jH;fs;
14. fiyr;brhy;yhf;fk; - ntshz; fiyr; brhw;fiscUthf;Fk; Kiw – jug;gLjJjy; - ,yf;fpantshz; fiyr;brhw;fs; / tl;huntshz;iktHf;Fr; brhw;fs; - mfuhjppapy;
15. bkhHpbghah;g;g[ - Kf;fpatpj pysfs; - goeipjysf; - bkhHpbghah;ghshpD; ,d;wpaikahg; gz;gfs; - ntshz; bra;gpiHpiskhHpbghah;jjy;
16. Ml;rpj; jkpH; - murhizfs; mYtyf; fo';fjs; - cHth;sf;fhdmwptpg;g[fisbtspapLjy; - fl;Liu;Rf;fk; vGJjy;
17. fpdpncyfpy; jkpH; - xu';FfwpapLgapw;Wtpj;jy; - tiyg; g[f;fs; - tpf;fgpoah - ntshz;bra;jpfisg; gjpntw;wk; bra;ijy; - ntshz;bra;jpfis ,izajstHpmwpay;)

LEARNING OUTCOME (fw;wypd; btspghLfs;)
CO1: gzi:laf; fhye;bjhL ,yf;fpa';fspy; fhzt;gLk; ntshz;ik Fwpj;j bra;jpfis mwpe;J bfhs;tu/ mj;dhjLjw;fhy ntshz;jk;fhd jPu;fjfs; fpilf;Fk;
CO2: ghBkhhHpsfs; – kug[]; bjlhu;fs; thH ntshz;ik rhu;ej bra;jpfis mwpa[k; jpwd; bgw;wpUg;gu/;
CO3: fiyr;brhw;sf;fhd bgUs mwpe;J bfhs;tnjhl; gpw bkhHppoypape;J jkGpF;F ntshz;ik rhu;ej fiyr;brhw;fis cUthf;Fr; jpwd; khztu;sf;F Vw;gLk/;
CO4: ntshz;ik rhu;ej fl;LiuSfs; vGJjw;fhd gapw;rp bfhLj;fg;gLJjhy;,. gpiHapd; El;gkhd tfapy; fl;LiuSfs; vGJtj;u/;
CO5: ngr;Rg; gapw;rp msfp;fg;gLJjhy;,. tpwrhak; rhu;ej bra;jpfis Clf;Fsf;F tpf;fpf; tpf;fpo;anoah – ntshz;bra;jpfisg; ghpntw;wk; bra;jy; - ntshz;bra;jpfis ,izajstHpmwpay;
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**ENG 114 DEVELOPMENT EDUCATION (0+1)**

(Alternate courses for non-Tamil students)

**LEARNING 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

COURSE OUTCOME

The student will be able to

CO1: Understand the basic principles of learning
CO2: Have carrier development either in agriculture or allied sciences
CO3: Write edit and blog scientific articles
CO4: Have ideas to prepare project
CO5: Have a knowledge of Entrepreneurship and intrapreneurship

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ENG 115 ENGLISH FOR EFFECTIVE COMMUNICATION (0+1)

LEARNING OBJECTIVES:

- To introduce the students to the language skills.
- To enable the students to understand the difference between hearing and listening.
- To train the students in English speech with correct pronunciation, stress and tone modulation.
- To cultivate the students with reading habit.
To impart effective and flawless writing skills to the students.
To cultivate the students with good receptive, reading and productive skills.

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. Current stream of developments.

PRACTICAL SCHEDULE
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

COURSE OUTCOMES:
At the end of the course the students will be able to
CO1: Understand the nuances of the language skills.
CO2: Read different texts with improved skill
CO3: Speak and write in English effectively and flawlessly
CO4: Take part in group discussion activities with confidence
CO5: Face the challenging interviews with confidence. Become competent with 
effective communication skills.

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PED 116 PHYSICAL EDUCATION (0+1)

LEARNING OBJECTIVES:

- Participation in sports will yield optimum physical fitness and positive health for all.
- Physical activities play an important role in the development of children and school children have a tremendous energy and desire to explore. These activities increase strength, speed and overall development and have considerable import not only in their physical growth but also on social and emotional development.
- Physical education and sports, being an integral part of education, experience the impact of scientific advancements.
- Physical education in the development of neuro muscular skills.
- Physical education has concern for and with emotional responses, personal relationships, group behavior, mental learning and other intellectual, social, emotional, and an athletic outcome. Vigorous physical education is dispensable mean today for national strength.
- Physical fitness is the ability of the human body to function with vigor and alertness without undue fatigue and with ample energy to energy in leisure activities and to meet physical stresses. Muscular strength and endurance, Cardio respiratory integrity and general alertness are the overt signs of physical fitness.
- Physical Education has a special significance, unique role and has made unlimited contribution in the modern age as it caters to the biological, sociological and psychological necessities of the man.
- Sports training is the physical, technical, intellectual, psychological and moral preparation of an athlete by means of physical exercise. It is an entire systematic process of preparation of all levels of athletic performance.

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, flaying 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 persue and defence skills.

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

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

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

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

Table Tennis: Grip, tossing and serving, spin serve, rally, smash, flick, defence and offence tactics.

Shuttle Badminton: Grip, foot work, service, setting, smash, volley, forehand and 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, handging, 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 paryobraine, 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.

Current stream of developments.

COURSE OUTCOMES

CO 1: Physical education encourage through games and sports sportsmanship, Co-operation loyalty, sociality, self-control, leadership, patriotism, friendship, kindness, sympathy, tolerance, forgiveness and other similar qualities.

CO 2: Physical Education helps to improve one’s ability for work and self expression in the competitive condition of our modern life.

CO 3: Physical fitness is the combination of strength, flexibility, agility, power, speed, muscular endurance and cardio vascular endurance. It is the ability to enjoy our life and to achieve our goals without undue fatigue or stress. It is the production against the degenerative diseases and feeling of youthfulness, even when we are growing old.

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

LEARNING OBJECTIVES:
- Knowledge of classical and theoretical foundations of the Yoga.
- Knowledge and ability to use Yoga practice.
- Ability to use relationship based approaches to catalyze the positive changes.
- Critical thinking skills and science based literacy to advance the evolution of Yoga practice as an integrative health practice.

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

PRACTICAL SCHEDULE (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,Paschimotasana, 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
10. Dhayana practice – Meditation
11. Relaxation –Instant relaxation technique (IRT); Quick relaxation technique (QRT); Deep relaxation technique (DRT)
12. Practical record preparation
COURSE OUTCOMES

CO 1: Knowledge of Yoga Philosophy.

CO 2: Ability to establish the personal health and social health skills to apply.

CO 3: Appropriate application with practice of Asanas, Pranayama, Meditation and relaxation.

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NSS/ NCC 118 NATIONAL SERVICE SCHEME / NATIONAL CADET CORPS (0+1)

NATIONAL SERVICE SCHEME (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. Campus development, tree planting maintenance and greening the campus cleaning.
NATIONAL CADET CORPS (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.

II SEMESTER

AGR 120 WEED MANAGEMENT (1+1)

LEARNING OBJECTIVES:
- The students will know basic understanding on the biology and ecology of weeds.
- The students will equip with the concepts and principles of weed control and its management.
- The students will learn about various herbicides, formulations and adjuvant.
- The students will attain information on mechanism and mode of action of herbicides, persistence of herbicides.
- The students will be trained to manage the weeds of field crops, aquatic and problematic weeds.

THEORY

Unit-I: Weed biology and ecology
Weeds: Introduction, Definitions; harmful and beneficial effects, classification, propagation, dissemination and weed seed dormancy; Weed biology and ecology; Critical periods of crop weed competition and allelopathy.

Unit-II: Principles of weed Management
Concepts of weed prevention, control and eradication; Methods of weed management: Cultural, Mechanical, chemical, biological and biotechnological methods; Integrated weed management.

Unit-III: Herbicides
Herbicides: Definition - advantages and limitation of herbicide usage in India; Herbicide classification, formulations, methods of application; Introduction to Adjuvants
and their use in herbicides.

**Unit-IV: Behaviour of herbicides and Herbicide resistance**

Introduction to selectivity of herbicides; Herbicide absorption and translocation; Compatibility of herbicides with other agro chemicals - Mechanism of action of herbicides - Herbicide persistence and degradation, Herbicide residue management and Herbicide resistant crops.

**Unit-V: Weed management**

Weed management in field crops; aquatic, problematic, invasive alien weeds and their management. **Current stream of developments.**

**PRACTICAL**

Identification of weeds; Survey of weeds in crop fields and other habitats; Preparation of herbarium of weeds; weed seed bank; Biology of problematic weeds; Acquiring skill in mechanical and cultural methods of weed management, use of tools and implements; Calculations on weed indices; Herbicide label information; Computation of herbicide doses; Study of herbicide application equipments and calibration; Methods of herbicide application; Preparation of list of commonly available herbicides; Study of phytotoxicity symptoms of herbicides in different crops; Economics of weed management practices. Designing integrated weed management practices for various crops.

**THEORY LECTURE SCHEDULE**

1. Weeds – Definition, classification and characteristics, harmful and beneficial effect of weeds.
2. Classification and characteristics of weeds of different agro ecosystems – lowland weeds, irrigated upland and rainfed land weeds.
3. Classification and characteristics of weeds – Aquatic, parasitic and obnoxious weeds.
4. Life cycle of weeds, weed migration, weed seed distribution.
5. Weed dormancy, germination, establishment and perennation of weeds in different ecosystems.
6. Crop weed interactions – Critical crop weed competition, competitive and allelopathic effects of weeds and crops.
9. **Mid Semester Examination**
10. Classification and characteristics of herbicides and herbicide formulations – History and Development.
11. Herbicide Use Efficiency – Adjuvants, herbicide protectants and antidotes – Herbicide and herbicide mixtures in India – Interaction with moisture, fertilizer and other agrochemicals.
13. Herbicide persistence and degradation in plants and soils – Herbicide residue and management.
14. Herbicide resistant weeds and their impact on weed management.
15. Success of Herbicide Resistant Crops (HRC) in Indian and World agriculture.
16. IWM in crops and cropping systems – Agricultural Crops, Horticultural Crops.
17. Invasive alien weeds.

**PRACTICAL SCHEDULE**

1. Identification, classification and characterization of terrestrial weeds.
2. Identification, classification and characterization of aquatic weeds.
3. Identification, classification and characterization of problem and parasitic weeds.
4. Estimation of soil weed seed bank.
5. Study on seed production potential of problematic weeds
6. Weed survey and weed vegetation analysis - density, dominance, frequency, SDR and IVI.
7. Practicing skill development on cultural and non-chemical weed management.
8. Identification, classification and characterization of herbicides.
9. Practicing Skill development on herbicide application techniques.
11. Spray fluid calibration and calculation of herbicide quantity and recommendation for different eco systems.
12. Study on phytotoxicity symptoms of herbicides in different crops, visual scoring
13. Calculations on weed indices.
15. Study of Integrated Weed Management
16. Economic analysis of different weed management methods in crops and cropping systems.
17. Orientation for final examination

COURSE OUTCOMES:

CO 1: To create knowledge on facts and information from different sources, pertaining to weed biology and management and be able to explain how they are interrelated; demonstrated through successful completion of assignments.
CO 2: To critically assess different weed management strategies
CO 3: To synthesise idea about various herbicides, formulations and adjuvants
CO 4: To understand about mechanism and action of herbicides, persistence of herbicides.
CO 5: To construct information regarding management of weeds of field crops, horticultural crops, aquatic and problematic weeds.

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REFERENCES


E-RESOURCES

AGR 121 IRRIGATION MANAGEMENT (1+1)

LEARNING OBJECTIVES:
- The students will study the basic principles and practices of irrigation.
- The students will gain clear scientific knowledge on soil water plant relationship.
- The students will acquire knowledge on water requirement for various field crops.
- The students will learn about various methods of irrigation and improve irrigation efficiency.
- The students will study and understand how to use poor quality water for irrigation and importance of drainage.

THEORY

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

Unit - II: Soil, Water and Plant relationship
Soil - water - plant relationship - Soil Plant Atmospheric Continuum (SPAC) - Hydrological cycle - Soil water movement - soil moisture constants - Moisture extraction pattern - Absorption of water - Evapotranspiration - Plant water stress and its effect and methods to overcome stress.

Unit - III: Crop water requirement and Management
Crop water requirement - Potential evapotranspiration (PET) and consumptive use - Definition and estimation - Factors affecting water requirement - Effective rainfall - Critical stages for irrigation - Water requirement of crops - Water management for major field crops.

Unit - IV: Methods of Irrigation

Unit - V: Drainage and utilization of poor waters in Agriculture
Agricultural drainage - Importance - Methods - Irrigation management under limited water supply, Quality of irrigation water - Agronomic practices for use of poor quality water (saline, effluent and sewage water) for irrigation. Current stream of developments.

PRACTICAL
Estimation of soil moisture - Measurement of irrigation water through water measuring devices (flumes, weirs and water meter) - Calculation on irrigation Agronomy - Acquiring skill in land shaping for different surface irrigation methods - Operation and economics of drip and sprinkler irrigation systems - Estimation of crop water requirement - Scheduling of irrigation based on different approaches - Irrigation efficiency - Quality analysis of Irrigation water quality - On-farm irrigation structures - Visit to irrigation command area (Reservoirs and tanks) and water management institutes.
THEORY LECTURE SCHEDULE
1. Role of water in plants - Importance of irrigation - water resources of India and Tamil Nadu - History and development of irrigation in India - Irrigation systems of India and Tamil Nadu.
3. Plant water stress - causes - plant response and adaptations
5. Soil water movement - saturated and unsaturated flow and vapour movement
6. Soil moisture constants and their importance in irrigation.
7. Available soil moisture - definition and importance -
8. Moisture extraction pattern - soil physical characteristics (texture, structure, porosity, bulk density and particle density) in influencing irrigation - soil moisture estimation methods.
9. Mid-Semester Examination
10. Crop water requirement - factors affecting crop water requirement - effective rainfall - potential evapotranspiration (PET), consumptive use (CU) - definition and estimation.
11. Critical stages for irrigation - water requirement for cereals, millets, pulses and oilseeds.
13. Methods of irrigation - surface (flooding, beds and channels, border strip, ridges and furrows, broad bed and furrows, surge irrigation), sub-surface method and micro irrigation system (sprinkler and drip irrigation) - suitability, components, layout, operation, advantage and disadvantage.
14. Scheduling of irrigation - criteria based on plant, soil moisture - different approaches - climatological approach, empirical methods, crop co-efficient.
15. Water use efficiency - definition and concept - methods to improve WUE - conjunctive use of water - water budgeting.
16. Quality of irrigation water - irrigation management under limited water supply - Agronomic practices for use of poor quality water (saline, effluent and sewage water).
17. Drainage - Methods - Tank irrigation, well irrigation - Canal irrigation.

PRACTICAL SCHEDULE
1. Estimation of soil moisture by gravimetric method and tensiometer.
2. Estimation of soil moisture by Irrometer, resistance block and Neutron probe and other improved devices.
3. Measurement of irrigation water with flumes and weirs and their units.
4. Calculation on irrigation water based on source, water flow, soil moisture status and depth of irrigation and WUE.
5. Land leveling and land shaping - Beds and channels - ridges and furrows.
6. Land leveling and land shaping for border strips - broad bed furrow method of irrigation.
7. Operation and maintenance of sprinkler irrigation systems.
8. Operation and maintenance of drip irrigation systems.
9. Estimation of crop water requirement by direct and indirect methods.
10. Scheduling of irrigation based on simple techniques and devices.
11. Scheduling of irrigation based on depletion of available soil moisture and IW/CPE ratio.
12. Assessment of irrigation water quality parameters in the laboratory.
13. Observation of irrigation structures in wetlands and irrigated drylands.
14. Visit to irrigation command area and study of command area development.
15. Visit to fields under different method of irrigation / off campus field visit.
16. Visit to water management and training institute.
17. Orientation for final examination

COURSE OUTCOMES:

**CO 1:** To understand basic principles and practices of irrigation.
**CO 2:** To formulate ideas pertaining to soil water plant relationship.
**CO 3:** To evaluate water requirement for various field crops.
**CO 4:** To gain skill development on layout of different methods of irrigation and ways to improve irrigation efficiency.
**CO 5:** To analyse the quality of water for irrigation and formulate different drainage methods.

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**REFERENCES**


**E-RESOURCES**


**ENT 122 FUNDAMENTALS OF ENTOMOLOGY (2+1)**

**LEARNING OBJECTIVES:**

- To identify and distinguish insects from other closely related taxa
- To study about the relative position of insects in animal kingdom
• To explore the external morphology, anatomy, physiology and behaviour of insects
• To understand the classification of insects and to identify different groups of insects
• To study different methods of collection and preservation of insects

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, Pyralidae, Noctuidae, Arctiidae, Bombycidae, Cosmopteridae, Geometridae, Gelechiidae, Pterophoridae, Saturniidae, Sphingidae, Lymantriidae, Metamorbiidae and Hesperiidae) and Hymenoptera (Tenthredinidae, Apidae, Xylocopidae, Megachilidae, Bombidae, Sphecidae, Vespidae, Formicidae, Ichneumonidae, Braconidae, Platygasteridae, Bethylidae, Evanidae, Chalcididae, Encyrtidae, Eulophidae and Trichogrammatidae).

Current stream of development in Morphology, Physiology and Taxonomy.
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 – Psocodea (free living), Psocodea (parasitic), Thysanoptera and Hemiptera
31. Distinguishing characters of order Endopterygotes – Neuroptera, Megaloptera, Rhaphidioptera, 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.

11. Observation on distinguishing characters of Hemiptera (Families: Reduviidae, Pentatomidae, Miridae, Coreidae, Pyrrhocoridae, Lygaeidae, Nepidae, Belastomatidae, Gerridae, Cimicidae, Tingidae, Cimadidae, Cimadellidae, Delphacidae, Aphididae, Cercopidae, Memblicidae, Aleyrodidae, Coccidae, Diaspididae, Pseudococcidae, Kedidae, Lophopidae and Psyllidae)

12. Observation on distinguishing characters of Neuroptera, Megaloptera and Rhaphidioptera.

13. Observation on distinguishing characters of Coleoptera (Families: Cicindellidae, Carabidae, Dytiscidae, Curculionidae, Apionidae, Staphylinidae, Coccinellidae, Gyriniidae, Lampyridae, Hydrophilidae, Scarabaeidae, Cerambycidae, Melolonthidae, Anobiidae, Tenebrionidae, Bruchidae, Meloidae, Cetoniidae, Buprestidae, Elateridae and Bostrychidae)

14. Observation on distinguishing characters of Strepsiptera, Mecoptera, Siphonaptera, Trichoptera, Diptera (Families: Cecidomyiidae, Agromyzidae, Tephritidae, Asilidae, Tabanidae, Tachinidae, Pipunculidae, Drosophilidae, Hippoboscidae, Culicidae, Syrphidae and Muscidae)

15. Observation on distinguishing characters of Lepidoptera (Families: Nymphalidae, Lycaenidae, Pieridae, Papilionidae, Crambidae, Pyralidae, Noctuidae, Arctiidae, Bombycidae, Coccinellidae, Geometridae, Gelechiidae, Pterophoridae, Saturniidae, Sphingidae, Lymantriidae, Meteoridae and Hesperiidae)


17. Orientation for final examination

**COURSE OUTCOMES:**

**CO1:** Describe characters of Arthropoda and Insecta, and their relationship and reasons for insect dominance

**CO2:** Explain morphology of insects, its appendages, their modifications, growth and development (metamorphosis) and behaviour

**CO3:** Describe anatomy and physiology of various systems of insects

**CO4:** Identify different orders of insects based on their diagnostic characters up to family level

**CO5:** Demonstrate different collection and preservation techniques of insects

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AGM 123 FUNDAMENTALS OF MICROBIOLOGY (2+1)

LEARNING OBJECTIVES:
- To enable better understanding of students about the microscopic world around them
- To acquaint students with the basic laboratory techniques and tools of microbiology
- To introduce the fundamentals characteristics of various microorganisms
- To develop experimental skills, such as handling, various microorganisms, culturing & maintenance of Microorganisms

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 LECTURE 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

COURSE OUTCOMES:
CO 1: Students gained knowledge on the basic and applied aspects of understanding and exploitation of microorganisms for the welfare of human kind.

CO 2: Students gained knowledge on the historical developments and contributions of some scientist in the field of microbiology.

CO 3: Students exposed practical hands on experience in the basic skills employed in microbiological laboratories, which will equal them to carryout independent research in microbiological/ biotechnology in feature.

CO 4: Students thoroughly exposed to modern approaches in classification, nutrition, cytology, cultivation, purification and preservation of microorganisms.

CO 5: Students gained knowledge on biotechnological principle like genetic recombination, Immunological science and vaccines.

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E-RESOURCES
1. http://www.microbes.info

SAC 124 - FUNDAMENTALS OF BIOCHEMISTRY (2+1)

LEARNING 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**

**THEORY 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 proteins - 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. Mid Semester 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 fatty acids 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**
1. 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

COURSE OUTCOMES:

CO 1: Students gain knowledge about the biochemistry of amino acids, proteins, sugars, carbohydrates, and lipids.

CO 2: Students develop a conceptual understanding of different biochemical processes and metabolic pathways specific to plants.

CO 3: Students learn about the various quantitative aspects of biochemistry including enzyme kinetics, protein ligand binding, analytical techniques, and bioenergetics.

CO-PO MAPPING MATRIX

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REFERENCES

LEARNING OBJECTIVES:
- To expose the students to the basic features of botanical description, economic parts and economic importance of different field and horticultural crops.
- Collection and preparation of herbarium specimens representing minimum of ten families of the crop species.
- Collection and characterization of crop seeds of cultivated and traditional varieties.

THEORY

Unit I: Systems of classification and general morphological description
Bentham and Hooker’s classification of plant kingdom – Nomenclature and its major guidelines – author citation – Agricultural classification of crops; General morphology: Life span, habit, root, stem, leaf - petiole, leaf margin, leaf apex, leaf shape, venation and phyllotaxy; Modification of roots and leaf; Floral morphology: Kinds of bracts, inflorescence; Structure of flower, androecium, gynoecium, placentation, types of fruits.

Unit II: Botanical description and economic uses of Poaceae
List of cultivated crops, economic parts, chromosome number and family description of Poaceae: Key botanical features of Rice, Wheat, Sorghum, Maize, Pearl millet, Finger millet, list of small millets, Guinea grass, Napier grass, Cenchrus and Sugarcane

Unit III: Botanical description and economic uses of Papilionaceae
List of cultivated crops, economic parts, chromosome number and family description of Papilionaceae: Key botanical features of Red gram, Bengal gram, Soybean, Black gram, Green gram, Cowpea, Lablab, Horse gram, Groundnut, Lucerne, Stylosanthes, Clitoria, Agathi and Sunnhemp,

Unit IV: Botanical description and economic uses of Pedaliaceae, Asteraceae, Brassicaceae, Euphorbiaceae, Arecaceae and Malvaceae
List of cultivated crops, economic parts, chromosome number and family description of the following families and Key botanical features of the crops given against them: Pedaliaceae - Gingelly; Asteraceae - Sunflower, Safflower, Brassicaceae - Rapeseed and Mustard, Cabbage, Cauliflower; Euphorbiaceae: Castor; Jatropha and Tapioca; Arecaceae: Coconut, Areca nut, Oilpalm; Malvaceae: Cotton, Mesta and Bhendi.

Unit V: Botanical description and economic uses of Tiliaceae, Piperaceae, Chenopodiaceae, Solanaceae, Mimosae, Moraceae, Cucurbitaceae, Alliaceae, Musaceae, Rubiaceae, Theaceae
List of cultivated crops, economic parts, chromosome number and family description of the following families and key botanical features of the crops given against them. Tiliaceae: Jute; Piperaceae: Betelvine; Chenopodiaceae: Sugar beet; Solanaceae: Tobacco, Potato, Chilli, Tomato and Brinjal; Mimosae: Desmanthes, Subabul and Acacia; Moraceae: Mulberry; Cucurbitaceae: Cucumber, Pumpkin, Ashgourd; Alliaceae: Onion and Garlic; Musaceae: Banana; Rubiaceae: Coffee; Theaceae: Tea; Medicinal crops - Fabaceae: Senna, Apocynaceae: Periwinkle, Asphodelaceae: Aloe vera, Lamiaceae: Ocimum, Poaceae: Vettiver. Current stream of developments.

PRACTICAL
Family features - observation and description of habit, morphology of root, stem, leaves, inflorescence, flowers, floral diagram, floral formula and economic parts of...
Poaceae: Rice, Wheat, Sorghum, Maize, Pearl millet, Finger millet, Guinea grass, Napier grass, *Cenchrus* and Sugarcane; Papilionaceae: Redgram, Bengal gram, Soybean, Blackgram, Greengram, Cowpea, Lab-lab, Horse gram, Groundnut, Lucerne, *Stylosanthes*, Clitoria, Agathi and Sunnhemp; Pedaliaceae: Gingelly; Asteraceae: Sunflower, Safflower; Brassicaceae: Rape and Mustard, Cabbage, Cauliflower; Euphorbiaceae: Castor, Jatropha, Tapioca; Arecaceae: Coconut, Areca nut, Oilpalm; Malvaceae: Cotton, Mesta, Bhendi; Tiliaceae: Jute; Piperaceae: Betel vine; Chenopodiaceae: Sugar beet; Solanaceae: Tobacco, Potato, Chilli, Tomato and Brinjal; Mimosae: Desmanthes, Subabul and Acacia; Moraceae: Mulberry; Cucurbitaceae: Cucumber, Pumpkin, Ashgourd; Alliaceae: Onion and Garlic; Musaceae: Banana; Rubiaceae: Coffee; Theaceae: Tea

**THEORY LECTURE SCHEDULE**

1. Bentham and Hooker’s classification of plant kingdom — International code of nomenclature and its major guidelines — Agricultural classification of crops
2. General morphology: Life span, habit, root, stem, leaf - petiole, leaf margin, leaf apex, leaf shape, venation and phyllotaxy; Modification of roots and leaf
3. Floral morphology: Kinds of bracts, inflorescence; Structure of flower, androecium, gynoecium, placentation, types of fruits.
4. List of cultivated crops, economic parts, chromosome number and family description of Poaceae; Key botanical features of Rice and Wheat.
5. Key botanical features of sorghum, maize, pearl millet and finger millet. List of small millets
6. Key botanical features of Guinea grass, Napier grass, *Cenchrus* and sugarcane.
7. List of cultivated crops, economic parts, chromosome number and family description of (Papilionaceae) Key botanical features of Red gram, Bengal gram and Soybean.
8. Key botanical features of Black gram, Green gram, Cowpea, Lab-lab, Horse gram and Groundnut.
9. Mid Semester Examination
11. List of cultivated crops, economic parts, chromosome number and family description of Pedaliaceae and Asteraceae: Key botanical features of Gingelly, Sunflower, Safflower.
12. List of cultivated crops, economic parts, chromosome number and family description of Brassicaceae and Euphorbiaceae: Key botanical features of Rapeseed and Mustard, Cabbage, Cauliflower, Castor, Jatropha and Tapioca.
13. List of cultivated crops, economic parts, chromosome number and family description of Areceaceae and Malvaceae; Key botanical features of Coconut, Areca nut, Oilpalm, Cotton, Mesta and Bhendi.
14. List of cultivated crops, economic parts, chromosome number and family description of Tiliaceae, Piperaceae and Chenopodiaceae; Key botanical features of Jute, Betel vine, Sugar beet.
15. List of cultivated crops, economic parts, chromosome number and family description of Solanaceae, Mimosae and Moraceae; Key botanical features of Tobacco, Potato, Chilli, Tomato and Brinjal, Desmanthes, Subabul, Mulberry.
16. List of cultivated crops, economic parts, chromosome number and family description of Cucurbitaceae and Alliaceae; Cucurbitaceae: Key botanical features of Cucumber, Pumpkin, Ashgourd; Alliaceae: Onion and Garlic.
17. List of cultivated crops, economic parts, chromosome number and family description of Musaceae, Rubiaceae and Theaceae; Key botanical features of Banana, Coffee and Tea.
PRACTICAL SCHEDULE
1. Observing general morphology of roots, stems and leaves.
2. Observing general morphology of inflorescence - flowers, stamens and pistils.
3. Family characters, Botany, Economic parts, Floral diagram and Floral formula of the following crop plants:-Poaceae: Rice and Wheat
5. Poaceae: Guinea grass, Napier grass, Cenchrus and Sugarcane.
6. Papilionaceae: Redgram, Bengal gram and Soybean.
7. Papilionaceae: Blackgram, Greengram, Cowpea, Lab-lab, Horse gram and Groundnut.
13. Tiliaceae: Jute; Piperaceae: Betelvine; Chenopodiaceae: Sugar beet;
14. Solanaceae: Tobacco, Potato, Chilli, Tomato and Brinjal; Mimosae: Desmanthes, Subabul, Moraceae: Mulberry
15. Cucurbitaceae: Cucumber, Pumpkin, Ashgourd; Alliaceae: Onion and Garlic
16. Musaceae: Banana; Rubiaceae: Coffee; Theaceae: Tea

17. Orientation for final examination

ASSIGNMENT
1. Collection and preparation of 25 herbarium specimens representing minimum of ten families of the crop species studied.
2. Collection of crop seeds of 10 traditional varieties.

COURSE OUTCOMES
CO 1: The student will be able to characterize crops based on its anatomical characters such as root, shoot, leaf venation etc.
CO 2: Will be able to classify the plant species based on its economic importance
CO 3: The student will be able to identify the family to which a particular crop belongs to.
CO 4: Botanical features and economic importance of different crop plants belonging to 20 families will be exposed.

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E-RESOURCES
2. Society and Longman Co., Singapore
Publishing Co. Ltd., New Delhi.
Fundamentals of Crop Botany, Directorate of ODL, Tamil Nadu Agricultural
University, Coimbatore-641 003.

AEC 126 - PRINCIPLES OF ECONOMICS (1+1)

LEARNING OBJECTIVES
- To provide knowledge to students about basic concepts of economics
- To explain its relevance and importance in agricultural science

THEORY
Unit I: Nature and Scope of Economics
Economics: Nature and scope of economics: Science Vs. art, positive science Vs.
normative science, deductive method Vs. inductive method - Basic concepts: Goods,
services, value, cost, price, wealth and welfare - Wants: Characteristics and classification
- Definitions of Economics: Wealth, welfare, scarcity and growth - Different economic
systems: merits and demerits - Divisions of Economics - Microeconomics and
macroeconomics - Agricultural Economics: Definition and scope, importance and subject
matter.

Unit II: Theory of Consumption
Utility: Definition - Measurement: Cardinal and ordinal utility - Total and
Marginal utility - Law of Diminishing Marginal Utility and Law of Equi-Marginal
Utility: Definition, assumptions, limitations and applications - Indifference curve
analysis: Definition and properties of indifference curves and budget line - Standard of
Living: Definition, Engel’s Law of Family Expenditure - Consumer surplus: Definition
and importance. 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 - Elasticity of demand: Types - Degrees of
price elasticity of demand - Factors influencing elasticity of demand - Importance of
elasticity of demand.

Unit III: Theory of Production
Concept of production - Factors of production - Land: Characteristics of land -
Labour: Characteristics of labour - Division of labour, Malthusian and modern theories
of population - Capital: Characteristics of capital - Capital formation - Phases of capital
formation - Entrepreneur: Characteristics and functions of entrepreneur. Supply:
Definition - Law of Supply - Factors influencing supply - Elasticity of supply.

Unit IV: Theory of Exchange and Distribution
Exchange: Market - Equilibrium price determination. Distribution: Definition -
Marginal productivity theory of distribution - Pricing of factors of production: Rent:
Ricardian theory of rent and quasi rent - Wages: Real wage and money wage - Wage
theories - Interest: Pure interest and gross interest - Theories of interest - Profit:
Meaning of economic profit - Profit theories.

Unit V: Macroeconomic Concepts
Macroeconomics: Definition and subject matter - National income: Concepts -
GNP, GDP, NNP, disposable income and per capita income. Money: Definition, types
and functions of money. Inflation: Meaning - Types of inflation. Public finance: Meaning

**PRACTICAL**


**THEORY LECTURE 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.
16. Macroeconomics: Definition and subject matter - National income: Concepts -
GNP, GDP, NNP, disposable income and per capita income - Money: Definition, Types and functions of money - Inflation: Meaning and Types of inflation.

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.
7. Illustration on Engel’s Law of Family Expenditure.
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

COURSE OUTCOMES:
At the end of the course students will be able to
CO 1: Understand the important concepts on micro and macro economics.
CO 2: To know the principles of economics, concepts like GDP, GNP, Inflation.
CO 3: To acquire the practical exposure on application of economic principles related to agriculture.
CO 4: To work out the measurement of Human Development Index, welfare indicators.

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REFERENCES
AEX 127 FUNDamentals of Rural Sociology and Educational Psychology (1+1)

LEARNING OBJECTIVES:
To enable the students to learn about
- Basics concepts related to rural sociology
- Basics concepts related to educational psychology.
- Practical applications of important sociological and psychological concepts.

THEORY
UNIT I: Introduction to Sociology, Social groups and Culture
Sociology and Rural Sociology - definitions; Society - rural and urban, differences and relationships, important characteristics of Indian rural society; Social groups - definition, classification, role of social groups in extension; Culture - concept, cultural traits, characteristics, functions, Ethnocentrism, Cultural lag, Cultural diffusion, Marginal man, Ethos.

UNIT II: Social Structure, Social Stratification, Migration
Structure of Rural Society - patterns of rural settlement, Social Institutions - Types and Functions, Social Stratification - concept, functions, types, differences between class and caste system;

UNIT III: Social Control, Social Customs, Leadership
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, characteristics, types, functions, methods of selecting leaders.

UNIT IV: Introduction to Educational Psychology, Teaching-Learning Process
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, factors influencing personality; Teaching-Learning Process - Teaching - definition, meaning, principles of teaching, steps in extension teaching; Learning - definition, meaning, principles, learning situation.

UNIT V: Motivation, Attitude
Motivation - concept, Maslow’s hierarchy of needs, techniques of motivation, importance in extension; Attitude - concept, factors influencing the development of attitudes.

Current stream of developments.

PRACTICAL
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.

THEORY LECTURE SCHEDULE
1. Sociology and Rural Sociology - Definitions, nature of rural sociology, importance of rural sociology in extension education.
2. Society - rural and urban, characteristics, differences and relationship, important characteristics of Indian rural society; Social Groups - definitions, classification, role of social groups in extension.
3. Culture - concept, cultural traits, characteristics, functions, Ethnocentrism, Cultural lag, Cultural diffusion, Marginal man, Ethos.
4. Structure of Rural Society - patterns of rural settlement, Social Institutions - Types and Functions
5. Social Stratification - concept, functions
6. Types, differences between class and caste system;
7. Social Control – definition; Customs – conventions, folkways, mores, rituals, taboos; Social Interaction Process – definition, basic social processes.
9. Mid semester Examination.
10. Leadership – definition of leader and leadership, characteristics, types, functions, Methods of selecting leaders.
11. Education – Psychology – Educational Psychology – Social Psychology – definitions, importance of psychology in extension.
12. Basic principles of Human behaviour – Attention, Perception – meaning,
13. Intelligence – concept, types, measurement, factors affecting intelligence; Personality – concept, types, 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 extension.
17. Attitude – concept, factors influencing the development of attitudes.

PRACTICAL SCHEDULE
1. Understanding the sociological characteristics of a rural society – (Brainstorming).
2. Data collection methods – survey, questionnaire, mailed questionnaire, interview schedule, observation method, case study.
3 and 4. 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).
5. Visit to a village for data collection (Group exercise).
6 and 7. Processing of data and presentation of Reports.
8 and 9. Preparation of interview schedule to study the basic social institutions and social organizations and their functions in a village setting (Group exercise). Preparatory work for selection of leaders in a village (Group exercise).
10. Visit to a village for data collection (Group exercise).
11 and 12. Processing of data and presentation of reports.
13 and 14. Practicing Personality measurement techniques (Group exercise).
15 and 16. Practicing Intelligence measurement techniques (Group exercise).
17. Orientation for final examination

COURSE OUTCOMES:
At the end of the course students will be able to
CO 1: Understand basics concepts related to rural sociology and educational psychology.
CO 2: Gain expertise on practical applications of sociological and psychological concepts.
CO 3: Gain expertise on application of various psychological tests.
CO 4: Develop Leadership skills

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REFERENCES

E-RESOURCES
1. www.sociologyguide.com
2. eu.wikipedia.org
3. www.princeton.edu

COM 128 FUNDAMENTALS OF INFORMATION TECHNOLOGY (1+1)

LEARNING OBJECTIVES
- Create a document in Microsoft Word with formatting that complies with the APA guidelines
- Write functions in Microsoft Excel to perform basic calculations and to convert number to text and text to number
- Create a presentation in Microsoft PowerPoint that is interactive and legible

THEORY

UNIT I: COMPUTER BASICS

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

**COURSE OUTCOMES:**

At the end of the course students will be able to

- **Co1:** Know the basic components of the computer and working of each device
- **Co2:** Understand the representation of data in computer.
- **Co3:** Know the fundamentals of Computer Networking and Database.
- **Co4:** Performing common basic functions like editing, formatting, printing, scanning etc using tools.

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**REFERENCES**


**E-RESOURCES**

1. http://pearsoned.co.in/ITLEducationSolutionsLimited/

**III SEMESTER**

**AGR 210 - AGRONOMY OF FIELD CROPS - I (2+1)**

**LEARNING OBJECTIVES:**

- The students will gain knowledge about economic importance, origin, soil and climatic requirement of cereals viz., Rice, Wheat, Maize, Barley, Oat, Rye and Triticale
- The students will acquire knowledge about importance of minor millets and its cultivation practices
- The students will learn about various constraints of pulse production and production technologies for various pulse crops
- The students will acquire knowledge on agronomical aspects of cereals, legume and perennial fodders and its preservation
- The students will be familiar with importance and cultivation aspects of green and green leaf manures

**THEORY**

**Unit - I: Agronomy of Cereals**

Rice, Wheat, Maize, Barley, Oat, Rye and Triticale - Origin, geographic distribution, economic importance, soil and climatic requirements, varieties, cultural practices (from land preparation to harvest) and yield. Post harvest management practices. Value addition and by products utilization of cereals.
Unit - II: Agronomy of Major and Minor Millets

Unit - III: Agronomy of Pulses
Redgram, Blackgram, Greengram, Bengalgram, Horsegram, Cowpea, Soybean and Lentil - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield. Post harvest management practices. Value addition and by products utilization of pulses.

Unit - IV: Agronomy of Fodder and Forage Crops
Fodder crops: Sorghum, Maize, Pearl millet, Forage crops: Guinea grass, Cumbu - Napier, Water grass, Buffalo grass, Elephant grass, Kolukkattai grass, Lucerne, Berseem, Desmanthus, Stylosanthes and Cowpea - Economic importance, soil and climatic requirement, varieties, cultural practices and yield. Fodder preservation techniques.

Unit - V: Agronomy of Green Manures

PRACTICAL
Maintenance of crop cafeteria - Identification of crop plants, varieties and seeds of cereals, millets, pulses, green manures and forage crops - nursery preparation and management for rice, sorghum, cumbu and ragi - Main field preparation - Seed treatment techniques - Methods of sowing and manuring - Seeding implements - Estimation of plant population, seed rate and fertilizer requirement - After cultivation practices - Study of growth and yield parameters and yield estimation. Harvesting of crops; Cost Analysis. Fodder preservation techniques - Silage and hay making, - Visit to farmers fields, institutes and industries.

THEORY LECTURE SCHEDULE
1. Importance and area, production and productivity of cereals and major and minor millets of India and Tamil Nadu.
2. Rice - Origin - geographic distribution - economic importance - varieties - soil and climatic requirement.
4. Rice – Cultural practices – Nutrient management, weed management and Irrigation management – Pest and disease management - yield
5. Rice - Economic benefits - Special type of Rice cultivation - Rajarajan 1000 (SRI), Transgenic Rice - Hybrid rice.
7. Maize - Origin, geographic distribution, economic importance, classification soil and climatic requirement
8. Maize - varieties, cultural practices, yield and post harvest management.
9. Wheat - Origin, geographic distribution, economic importance, soil and climatic requirement verities
10. Wheat - varieties, cultural practices, yield and post harvest management.
11. Barley - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices, yield and post harvest management
12. Oats, Rye and Triticale - Origin, geographic distribution, economic importance,
soil and climatic requirement, varieties, cultural practices, yield and post harvest management

13. Sorghum - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices, yield and post harvest management.

14. Pearl millet - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices, yield and post harvest management.

15. Finger millet - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices, yield and post harvest management.

16. Minor millets - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices, yield and post harvest management.

17. Importance and area, production and productivity of pulses of India and Tamil Nadu.

18. Mid semester Examination.

19. Redgram - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices, yield and post harvest management.

20. Greengram, blackgram, chickpea and cowpea - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield - Post harvest management - Agronomy of rice fallow pulses.

21. Chickpea and cowpea - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.

22. Soybean - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties - Main field preparation - Nutrient management and weed management.


24. Lentil and Horse gram - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.

25. Forage crops - Fodder Sorghum, Maize, Pearl millet - Economic importance, soil and climatic requirement, varieties, cultural practices and yield.

26. Importance and area, production and productivity of green manures and forage crops of India and Tamil Nadu.

27. Forage crops - Cumbu, Napier Hybrid grass, Guniea grass and water grass - Economic importance, soil and climatic requirement, varieties, cultural practices and yield.

28. Forage crops - Buffalo grass, Elephant grass, Kolukkattaigrrass - Economic importance, soil and climatic requirement, varieties, cultural practices and yield.

29. Forage crops - Lucerne, Berseem and Desmodium: Economic importance, soil and climatic requirement, varieties, cultural practices and yield.

30. Forage crops - Stylosanthus and cowpea: Economic importance, soil and climatic requirement, varieties, cultural practices and yield.

31. Forage crops - Tree fodders - Preservation of fodders - Silage and hay making.

32. Green manures - Daincha, Sunhemp and S.rostrata - Importance - Soil and climatic requirement - cultural practices and yield.


34. Insitu incorporation of green manures.
PRACTICAL SCHEDULE
1. Identification of cereals, millets, pulses, green manures and forage crops in the crop cafeteria.
2. Practicing various nursery types and main field preparation for rice crop.
3. Nursery and main field preparation for important millets and pulses.
4. Acquiring skill in different seed treatment techniques in important field crops.
5. Estimation of plant population, seed rate and fertilizer requirement for important field crops.
6. Acquiring skill in field preparation, sowing and manuring of crops under pure and intercropping situations for cereals and millets.
7. Acquiring skill in field preparation, sowing and manuring of crops under pure and intercropping situations for pulses, green manures and forage crops.
8. Acquiring skill in using seed drill for sowing operations.
9. Acquiring skill in foliar nutrition for important field crops.
10. Observations on growth parameters of cereals, millets, pulses, green manures and forage crops.
11. Study on yield parameters and estimation of yield in cereals and millets.
13. Acquiring skills in post harvest technology for important cereals, millets and pulses.
14. Working out cost and returns of important cereals, millets and pulses.
15. Visit to Dairy Unit / farmers field to acquire skill and silage and hay making.
16. Visit to farmers field / research stations to study the cultivation techniques of cereal, millets, pulses, green manures and forage crops.
17. Orientation for final examination.

COURSE OUTCOMES:
CO 1: To understand the importance of food grain requirement and cultivation of major cereal crops
CO 2: To gain knowledge about importance of minor millets and its cultivation practices
CO 3: To formulate legume based cropping system and production technologies for various pulse crops
CO 4: To construct idea regarding knowledge on growing of legume and perennial fodders and its preservation
CO 5: To create awareness about role of green manures in soil fertility

CO-PO MAPPING MATRIX

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REFERENCES
ENT 211 ECONOMIC ENTOMOLOGY AND INTRODUCTORY NEMATOLOGY (2+1)

LEARNING OBJECTIVES:
- To explain species, morphology, anatomy and biology of bees and silkworms
- To understand the rearing techniques of honey bees, silkworm, and lac insects.
- To discuss about minor productive insects and their uses.
- To describe helpful insects and their services, injurious insects and their impacts
- To study the basic morphology, biology and extraction techniques of important plant parasitic nematodes.

THEORY

Unit–I: Apiculture

Unit–II: Sericulture

Unit–III: Lac Culture and Minor Productive Insects

Unit–IV: Helpful and injurious insects
Helpful insects - Parasitoids, Predators, difference between predators and parasitoids, Types of parasitoids and parasitism, Weed killers, pollinators, scavengers

**Unit-V : Morphology, Taxonomy, Biology and Extraction of Nematodes**

Nematology - Introduction - Brief history and development in India - Position of nematodes in animal kingdom - Importance of plant parasitic nematodes and entomophilic nematodes - Economic loss in crop plants. Morphology and anatomy of nematodes - segmentation, cuticle, cephalic region, alimentary, excretory, reproductive and nervous system, sense organs. Classification based on feeding habits and ecology. Taxonomy, Biology and ecology of important plant parasitic nematodes – *Meloidogyne, Heterodera, Globodera, Tylenchulus, Hoplolaimus, Aphelenchoides, Xiphinema, Pratylenchus, Rotylenchulus, Radopholus and Ditylenchus*. Extraction of nematodes – Soil and root sampling, Cobb’s sieving method, Baermann funnel technique and modified Baermann funnel technique, sugar flotation technique, cysts by conical flask technique, fenwick can method and Incubation and Blender technique.

**Current trends in Apiculture, Sericulture, Lac culture and Nematology.**

**PRACTICAL**


**Assignment:** Each student has to submit an assignment on bee keeping / sericulture / Parasitoids and Predators/ Forensic entomology / Entomophagy / entomophilic nematodes / Plant parasitic nematodes.

**THEORY LECTURE SCHEDULE**

2. Morphology, anatomy and structural adaptations of bees.
4. Bee pasturage, bee foraging, communication and swarming.
7. Bee pollination, bee products and their uses and Scope of beekeeping in India
11. Mulberry cultivation – soil type – mulberry varieties – Methods of propagation –
17. Importance and history of Lac culture. Species of Lac insect.
18. Mid Semester Examination.
22. Minor productive insects -Cochineal insect, Gall insect.Aesthetic, Scientific and Medicinal value of insects
24. Helpful insects - Parasitoids, Predators, difference between predators and parasitoids, Types of parasitoids and parasitism.
25. Weed killers, pollinators, scavengers and soil builders.
27. Identification and management of house hold insects
29. Importance of plant parasitic nematodes and entomophilic nematodes –Economic loss in crop plants.
30. Elementary knowledge on morphology of nematode – cuticle, segmentation, cephalic regions.
31. Elementary knowledge on alimentary, excretory, reproductive systems, nervous system and sense organs.
32. Classification based on feeding habits and ecology. Taxonomy of important plant parasitic nematodes.
33. Biology and ecology of important plant parasitic nematodes – Meloidogyne, Heterodera, Globodera, Tylenchulus,Hoplolaimus,Aphelenchoides, Xiphinema
34. Biology and ecology of important plant parasitic nematodes – Pratylenchus, Rotylenchulus, Radopholus and Ditylenchus.
35. Extraction of nematodes – Soil and root sampling, Cobb’s sieving method, Baermann funnel technique and modified Baermann funnel technique, sugar flotation technique, cysts by conical flask technique, fenwick can method and Incubation and Blender technique

PRACTICAL SCHEDULE
1. Acquaintance with honey bee species, castes of bees and structural adaptation.
2. Acquaintance with Bee – keeping equipments and bee forage plants.

5. Identification of rearing appliances for 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. Identification of Parasitoids, Predators, Weed killers, pollinators, scavengers and soil builders.

8. Identification and management of insects injurious to human beings, cattle, poultry and house hold insects.

9. Soil and root sampling. Extraction of nematodes by Cobb’s sieving method, Baermann funnel technique and modified Baermann funnel technique.

10. Extraction of nematodes by sugar floatation technique.

11. Extraction of cysts by conical flask technique, fenwick can method and incubation and blender technique.

12. Extraction of nematodes from roots and staining of roots infested with endoparasitic nematodes.

13. Preservation of nematodes and preparation of temporary and permanent slides.

14. Observing morphology of the order Tylenchida and Dorylaimida.


16. Observing the life stages of *Meloidogyne*.

17. Orientation for final examination.

**COURSE OUTCOMES:**

**CO 1:** Discuss bee morphology, biology, behaviour and describe apiary selection, bee pasturage and management of bee colony (Apiculture)

**CO 2:** Explain silkworm types, voltinism, biology and define mulberry cultivation, rearing techniques of silkworms and cocoon harvesting and processing of silk (Sericulture).

**CO 3:** Describe biology, strains and cultivation of lac and depict minor productive insects and their uses

**CO 4:** Compare and contrast predators and parasitoids, express other helpful insects, their uses. Discuss insects injurious to humans, farm animals and other house hold insects and their menace

**CO 5:** Explain basic morphology and anatomy of nematodes and describe biology of major plant parasitic nematodes

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**REFERENCES**


E-RESOURCES
5. http://ilri.ernet.in/~iinrg/

PAT 212 FUNDAMENTALS OF PLANT PATHOLOGY (2+1)

LEARNING OBJECTIVES:
- To study the basic concepts of Plant Pathology and causes of plant diseases
- To know about pathogenesis and plant defense mechanisms
- To study the general characters and classification of fungal kingdom Protozoa
- To study the general characters and classification of Phylum Ascomycota and Basidiomycota
- Study of general characters of bacteria, virus, virusoids, algae

THEORY

**Unit I: Plant pathogenic organisms**

**Unit II: Pathogenesis**
Pathogenesis – Mode of infection – pre-penetration, penetration and post penetration – Effect of pathogen on physiological functions of the plants – Role of enzymes and toxins on disease development – Plant defense mechanisms

**Unit III: General characters and molecular phylogeny of fungi**
General characters of fungi – somatic structures, types of fungal mycelia - Modification of mycelia – Reproduction in fungi (Vegetative, asexual and sexual) – Disease cycle - Symptoms of fungal diseases – Classification based on molecular phylogeny.

**I Kingdom: Protozoa**, Phylum: Plasmodiophoromycota, Class: Plasmodiophoromycetes (Plasmodiophorales)
**II. Kingdom: Chromista**, Phylum: Oomycota, Class: Oomycetes (Pythiales and Peronosporales)
**III. Kingdom: Fungi**, Phylum: *Chytridiomycota*, Class: Chytridiomycetes (Chytridiales, Spizellomycetales)
**Phylum: Blastocladiomycota**, Class: Blastocladiomycetes (Physodermaeae); *Phylum : Zygomycota*, Subphylum: Mucoromycotina (Mucorales).

**Unit IV: Phylum Ascomycota and Basidiomycota**
**Phylum: Ascomycota**, Classes: Taphrinomycetes (Taphrinales), Dothideomycetes (Dothidiales, Capnodiales, Pleosporales), Eurotiomycetes (Eurotiiales), Leotiomycetes (Leotiales).
(Erysiphales and Helotiales), Sordariomycetes (Hypocreales, Phyllochorales, Glomerales, Diaporthales), and mitosporic ascomycetes; **Phylum: Basidiomycota**, Classes: Agaricomycetes (Agaricales, Corticiales, Cantharellales and Polyporales), Pucciniomycetes (Pucciniales) and Ustilaginomycetes (Ustilaginales, Urocystidales) Exobasidiomycetes (Exobasidiales and Tilletiales)

**Unit V: Bacteria, Phytoplasma, Virus, Viroid, Algae, Phanerogams and Abiotic disorders**


**PRACTICAL**

Study of important taxonomic characters and symptoms produced by *Plasmodiophora, Pythium, Phytophthora, Albugo, Sclerospora, Peronospora, Peronosclerospora, Pseudoperonospora, and Plasmodiophora, Mucor, Rhizopus, Taphrina, Capnodium, Cercospora, (Mycosphaerella), Diplodia, Botryodiplodia (Botryosphaeria), Curvularia, Drechslera (Helminthosporium), Alternaria, Venturia, Erysiphe, Phyllactinia, Uncinula, Leveillula and Claviceps, Fusarium (Gibberella, Nectria), Verticillium, Colletotrichum (Glomerella) Pestalotia (Pestalosphaeria), Pyricularia (Magnaporthe), Sarocladium, Macrophomina, Puccinia, Uromyces, Hemileia, Ustilago, Sphacelotheca (Sporisorium), Tolyposporium (Moesziomyces), Exobasidium, Sclerotium, Rhizoctonia (Thanatephorus), Ganoderma, Agaricus, Pleurotus, Volvariella and Calocybe*. Symptoms of bacterial diseases, *Candidatus Phytoplasma*, Fastidious Vascular Bacteria, Algal parasite, Phanerogamic parasites and Non-parasitic diseases

Note: Students should submit 50 well-preserved Herbariums

**THEORY LECTURE SCHEDULE**

1. Definition of Plant Pathology – History of Plant Pathology
2. Koch’s Postulates
3. Causes of Plant diseases – Protozoa, Chromista, Fungi, Bacteria, Fastidious Vascular Bacteria, Spiroplasma, *Candidatus Phytoplasma*
4. Causes of Plant diseases - Virus, Viroid, Virusoid, Algal, Phanerogamic parasites, Nematodes and Abiotic disorders
5. Pathogenesis – stages in pathogenesis – pre-penetration, penetration and post penetration
6. Role of enzymes and toxins in disease development
7. Effect of pathogen on physiological functions of the plants- Effect on Photosynthesis- Transpiration- Respiration- translocation of water and nutrients
8. General characters of fungi- Mycelia – vegetative resting structures
9. Asexual reproduction in fungi
10. Sexual reproduction in fungi
11. Parasitism in fungi- Types of parasitism – parasite, saprophyte, obligate parasite, facultative parasite, facultative saprophyte-biotrophs, hemibiotrophs, perthotrophs/ necrotrophs and symbiosis
12. Classification of Kingdom- Protozoa - important taxonomic characters, symptoms and life cycle of *Plasmodiophorabassicae* and symptoms of Protozoan diseases
13. Classification of Kingdom Chromista- General characters of Oomycetes-Symptoms and life cycle of *Pythium, Phytophthora* and *Albugo*
14. Symptoms and life cycle of *Peronosclerospora, Sclerospora, Peronospora, Pseudoperonospora* and *Plasmodiophora*

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15. Classification of Kingdom- Chytridiomycota and Zygomycota - important characters, symptoms and life cycles of Synchytrium, Rhizopus and Mucor
16. Classification of Kingdom- Ascomycota - important characters
17. Symptoms and life cycles of Taphrina, Capnodium, Cercospora, (Mycosphaerella), Diplodia, Botryodiplodia (Botryosphaeria), Drechslera (Helminthosporium), Alternaria, Venturia and Macrophomina
18. Mid Semester Examination
19. Symptoms and life cycles of Eurotium, Talaromyces, Erysiphe, Leveillula, Phyllactinia, Uncinula, Podosphaera and Sphaerotheca
20. Symptoms and important characters of Claviceps, Fusarium (Gibberella, Nectria) and Verticillium
21. Symptoms and important characters of Colletotrichum (Glomerella), Pestalotia (Pestalosphaeria), Pyricularia (Magnoporthe) and Sarocladium
22. Classification of Kingdom - Basidiomycota - important characters
23. Symptoms and life cycles of Puccinia, Uromyces and Hemileia
24. Symptoms and life cycles of Ustilago, Sphacelotheca (Sporisorium), Tolypsomorium (Moesziomyces), Tilletia and Exobasidium
25. Symptoms and life cycles of Athelium, Thanatephorus and Ganoderma
26. Important taxonomic characters of Agaricus, Pleurotus, Volvariella and Calocybe
27. Classification and general characters of phytopathogenic bacteria
28. Symptoms of plant pathogenic bacteria
29. Mode of entry, spread and survival of bacterial pathogens
30. Important characters and symptoms of Candidatus Phytoplasma diseases - Phylloxy, little leaf, yellow dwarf and sandal spike, Fastidious Vascular Bacteria and Spiroplasma
31. Virus - definition, nature and properties of plant virus, Single stranded, Double stranded RNA and DNA viruses and Transmission of plant viruses
32. Virus vector relationship - symptoms of viral diseases
33. Important characters and symptoms of Viroid, Virusoid, Algal and Phanerogamic parasites
34. Non-parasitic disorders

PRACTICAL SCHEDULE
1. General characters of fungi – Types of mycelia -Types of vegetative, asexual and sexual spores- asexual and sexual fruiting bodies.
2. Study of important taxonomic characters and symptoms produced by Plasmodiophora, Pythium and Phytophthora.
3. Study of important taxonomic characters and symptoms produced by Sclerospora, Peronospora, Pseudoperonospora and Plasmopara
4. Study of important taxonomic characters and symptoms produced by Albugo and Rhizopus.
5. Study of important taxonomic characters and symptoms produced by Taphrina, Capnodium, Cercospora (Mycosphaerella), Diplodia, Botryodiplodia (Botryosphaeria), Drechslera (Helminthosporium) and Alternaria
6. Study of important taxonomic characters and symptoms produced by Eurotium, Talaromyces, Erysiphe, Leveillula, Phyllactinia, Uncinula, Podosphaera and Sphaerotheca
7. Study of important taxonomic characters and symptoms produced by Claviceps, Fusarium (Gibberella, Nectria) and Verticillium
8. Study of important taxonomic characters and symptoms produced by Colletotrichum (Glomerella), Pestalotia (Pestalosphaeria), Pyricularia (Magnoporthe), Sarocladium and Macrophomina
9. Study of important taxonomic characters and symptoms produced by Puccinia, Uromyces, and Hemileia
10. Study of important taxonomic characters and symptoms produced by *Ustilago, Sphacelotheca (Sporisorium), Tolyposporium (Moesziomyces)* and *Exobasidium*

11. Study of important taxonomic characters of *Agaricus, Pleurotus, Calocybe, Volvariella* and symptoms produced by *Athelium, Thanatephorus* and *Ganoderma*


13. Symptoms of *Candidatus Phytoplasma* and Algae

14. Symptoms and vectors of viral diseases – mosaic, chlorosis, leaf curl, stem pitting, spotted wilt, necrosis, ring spot, vein clearing, leaf crinkle, rosette and bunchy top

15. Phanerogamic parasites and non-parasitic diseases

16. Field visit

17. **Orientation for final examination**

18. Assignment: Students should submit 50 well-preserved disease specimens.

**COURSE OUTCOMES:**

**CO 1:** Aware of basic principles of Plant Pathology, causes and importance of crop diseases

**CO 2:** Having knowledge of pathogenesis and plant defense mechanisms

**CO 3:** Having in depth knowledge of fungal kingdom Protozoa

**CO 4:** Having in depth knowledge of Phylum Ascomycota and Basidiomycota

**CO 5:** Knowing the general characters of bacteria, virus, virusoids, algae

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**REFERENCES**


**E-BOOKS**


**E-RESOURCES**

81
SAC 213 FUNDAMENTALS OF SOIL SCIENCE (2+1)

LEARNING 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

Unit I: Earth origin and Weathering of rocks


Unit II: Soil Formation and soil forming processes

Soil formation- soil forming factors-active and passive. Soil forming processes - fundamental and specific soil forming processes .Soil profile-master horizons, subordinate horizons.-Definition of soil- Soil composition Pedalogical and edaphological concepts

Unit III: Physical properties - I


Unit IV: Physical properties -II


Unit V: Soil Colloids and Chemical Properties


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 LECTURE 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
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

25 Soil colloids - definition - general properties - shape, surface area, electrical charge, adsorption, flocculation, deflocculation, plasticity, cohesion, swelling, shrinkage, Tyndall effect and Brownian movement. Types of soil colloids - inorganic and organic colloids

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

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

30 Soil reaction (pH) - definition, pH scale, factors affecting soil pH, buffering capacity - signification Soil Electrical Conductivity - factors affecting EC - significance

31 Soil organic matter - various sources - composition - compounds in plant residues - their decomposability - mineralization and immobilization - humus - definition - synthesis of humus

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 - earthworms - 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
COURSE OUTCOMES:
CO 1: Students gain the knowledge origin of earth, weathering of rocks and minerals
CO 2: Students learn to explain soil formation and different soil forming processes.
CO 3: Students develop individual skills and ability to analysis the soil for Physical and Chemical properties.

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REFERENCES

E-RESOURCES

GPB 214 PRINCIPLES OF GENETICS AND CYTOGENETICS (2+1)

LEARNING OBJECTIVES:
- The fundamental concepts of Genetics and Cytogenetics will be presented to the students quoting classical examples.
- To impart knowledge on inheritance and variation and to understand the parallelism between the behavior of chromosomes and genes.
- To understand the modern concepts of genetics at molecular level.

THEORY
Unit I: Cytology
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

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. Mendel’s experiments and laws of inheritance. Rediscovery of Mendel’s work.. Chromosomal theory of inheritance. Allelic interactions – Dominance vs. recessive, Deviation from Mendelian inheritance – Non allelic interaction . Lethal genes, Pleiotrophy, penetrance and expressivity, phenocopy: Multiple alleles-blood group in humans, coat colour in rabbits, self incompatibility in plants; pseudo alleles, isoalleles.

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; Cistron, 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


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, lambrush, 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 eugenics.
8. Polyplold - 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)
15. iv.) Duplicate dominant epistasis (15:1)
16. v) Duplicate recessive epistasis (9:7) vi.) Dominant and recessive epistasis (13:3); Summary of epistatic ratios (i) to (vi).
17. Lethal genes, Pleiotrophy, penetrance and expressivity, phenocopy: Multiple alleles, blood group in humans, coat colour in rabbits, self incompatibility in plants; pseudo alleles, isoalleles.

18. Mid Semester Examination

19. DNA, the genetic material – Griffith’s experiment, experiment of Avery, McCleod and McCarthy - confirmation by Hershey and Chase; RNA as genetic material – Franklin, Conrat and Singer experiment.
20. Structure of DNA – Watson and Crick model – Central dogma of life
21. Proof for semi conservative method of DNA replication; Models of DNA replication; steps involved in DNA replication.
22. RNA types - mRNA, tRNA, rRNA; genetic code, protein synthesis - transcription. Translation
23. Regulation of gene expression – operon model of Jacob and Monad; Structural genes and regulator genes. Cistron, muton and recon;

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


27. Polygenes – transgressive segregation, comparison of quantitatively and qualitatively inherited characters; modifiers; Types of gene action controlling quantitative traits.

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

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

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

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

32. 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.

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

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


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, Duplicateand 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**

**COURSE OUTCOMES:**

- **CO 1:** The student will have knowledge in the basic principles of inheritance
- **CO 2:** Will be able to understand the modern concepts of genetics
- **CO 3:** Will have the capacity to work out the various classical examples in genetics, crossing over and their interactions
- **CO 4:** The student will be able to carry out cytological analysis in breeding populations

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**REFERENCES**


**E-RESOURCES**

1. www.nmsu.edu,
2. www.biology200.gsu.edu

**HOR 215 BASIC HORTICULTURE AND PLANT PROPAGATION (2+1)**

**LEARNING OBJECTIVES:**

- To make the students learn different methods of plant propagation.
- To impart knowledge on nursery management of various horticultural crops.
- To make them familiarize with the tools and implements essential for all horticultural operations.

**THEORY**

**Unit-I: Basic concepts of horticulture**

Unit-II: Methods of propagation in horticultural crops


Unit-III: Orchard management and cropping systems


Unit-IV: Growth and development of horticultural crops


Unit-V: Protected cultivation


PRACTICAL

Study of different features of an orchard – Tools, implements and machineries used for horticultural operations - Planning and layout of orchard and planting- Media and containers for propagation of plants- Preparation of pot mixture, potting and repotting of plants – Preparation of nursery beds for raising rootstocks and seedlings – Methods of propagation – Cutting, layering, grafting and budding – Specialized plant parts for propagation – Rejuvenation – Micro propagation, protocol for mass multiplication and hardening -- Propagation structures, mist chamber, shade net, glass houses and poly houses – Their operations and maintenance – Preparation and application of PGR’s for propagation and crop regulation – Bearing habits – Training, pruning and special practices – Visit to commercial orchards and nurseries.

THEORY SCHEDULE

2. Classifications of horticultural crops.
3. Area and production ,export and import of horticultural crops
4. Different climatic zones of India and Tamil Nadu in relation to horticultural crops.
5. Factors limiting horticultural crop production – Horticultural developmental agencies.
7. Dormancy and measures to overcome seed dormancy.
8. Techniques of vegetative propagation – Advantages and disadvantages of Vegetative/Asexual propagation.
9. Detailed study about principles underlying cutting and layering.
10. Detailed study about grafting and budding – Stock and scion relationship.
11. Nursery practices, principles and practices of mist propagation.
13. Principles and practices of propagation by specialized plant parts.
14. Detailed study of establishment of an orchard.
15. Study about different planting systems followed in horticulture.
16. Study of different types of manures and manuring practices
17. Mid Semester Examination
18. Study of different types of irrigation methods followed in horticultural crops.
19. Study of different methods of cropping systems – intercropping – multil-tier cropping – cover crops-mulching-
21. Detailed study on bearing habits in horticultural crops.
24. flowering, pollination and fruit set in horticultural crops.
25. Unfruitfulness - causes and prevention in horticultural crops.
26. Fruit drop - causes and prevention in horticultural crops.
27. Role of growth regulators in horticultural crops.
28. Rejuvenation of old and senile orchards- Top working.
29. Protected cultivation – definition, importance and scope in india
30. types of protected structures for propagation and crop production.
31. types of green house.
32. factors controlled under green house.
33. different media used for protected cultivation.
34. hydrophonics – methods and advantages

PRACTICAL SCHEDULE
1. Visit to Orchard and study of different features of an orchard
2. Planning, layout and planting of horticultural crops
3. Machineries, tools and implements used for various horticultural operations
4. Media and containers for propagation of plants
5. Preparation of potting mixture, potting and repotting of plants
6. Seed treatment techniques
7. Preparation of nursery beds for raising rootstocks and seedlings
8. Demonstration of propagation through cutting
9. Demonstration of propagation through layering
10. Demonstration of propagation through grafting and top working
11. Demonstration of propagation through budding
12. Propagation through specialized plant parts
13. Bearing habits of horticultural crops
14. Special training and pruning practices followed in horticultural crops
15. Preparation of plant growth regulators and methods of application in horticultural crops
16. Visit to tissue culture laboratory and study of micropropagation protocols and hardening
17. Plant propagation structures including mist chamber, shade net, glass houses and poly houses and Orientation for final examination

COURSE OUTCOMES
CO 1: The student will be able to understand basics of plant propagation and nursery management techniques.
CO 2: Can demonstrate advanced propagation methods of horticultural crops.

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REFERENCES
AEC 216 PRODUCTION ECONOMICS AND FARM MANAGEMENT (1+1)

LEARNING OBJECTIVES:
- To provide knowledge to the students about the principles of farm management
- To help the students in using different methods and tools for decision making in farm management
- To explain ways for 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, Current Streams of thought.

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 LECTURE 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

COURSE OUTCOMES:
At the end of the course students will be able to

CO 1: Understand the concepts, nature and Scope of farm management
CO 2: Know the importance of farm planning and budgeting.
CO 3: Work out the cost of cultivation for different crops
CO 4: Importance of farm records and accounts and farm business analysis

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AEX 217 DIMENSIONS OF AGRICULTURAL EXTENSION (1+1)

LEARNING OBJECTIVES:
To enable the students to learn about
- Fundamentals of extension education.
- Extension systems in India.
- Programme planning and rural development.
- Extension activities of different organizations

THEORY
UNIT 1: Introduction to Extension Education
Extension Education - meaning, definition, scope, objectives, philosophy, principles; Extension Education Process; Differences among formal, informal and non-formal education.
UNIT II: Early Rural Development attempts, Extension approaches in India
Historical development of extension in India – Scheme of Rural Reconstruction, Economic Conference of Mysore, Gurgaon Experiment, Sriniketan, Sevagram, Marthandam project, Firka development scheme, Etawah pilot project, Nilokheri Experiment; Extension programmes of Ministry of Agriculture – Training and Visit (TandV) System, Broad Based Extension System (BBES), Farming System Research Extension (FSRE), Agricultural Technology Management Agency (ATMA); Firstline Extension System – KVK, ATIC, Frontline demonstrations.

UNIT III: Major Rural Development Programmes
Rural Development – meaning, definition, concept, importance; Democratic Decentralization – Panchayat Raj – Three tiers of Panchayat Raj system – Powers, Functions and Organizational setup – Community Development Programme (CDP), National Extension Service (NES), IADP, IAAP, HYVP, IVLP, NATP, ITDP, IRDP, SFDA, MFAL, NREP, RLEG, DPAP, CADP, FFW, JRY, EAS, IAY, SGSY, SJSRY, PMGSY, SGRY, MGNREGA, PURA, NAIP, NADP (RKVY).

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

UNIT V: Extension Programme Planning
Extension Programme Planning – definition, principles; meaning of project, plan, calendar of work, plan of work; steps in programme planning. Current Streams of thought.

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 Grama Panchayat activities; Study of the functions of JDA / ADA 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 Krishi Vigyan 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.

THEORY LECTURE SCHEDULE
1. Extension Education – meaning, definition, scope, objectives, philosophy, principles.
2. Extension Education Process, Differences among formal, informal and non-formal education.
3. Historical development of extension in India – Scheme of Rural Reconstruction, Economic Conference of Mysore, Gurgaon experiment, Sriniketan.
4. Sevagram attempt, Marthandam Project, Firka Development Scheme, Etawah Pilot project, Nilokheri Experiment.
8. Community Development Programme (CDP), National Extension Service (NES), Intensive Agricultural District Programme (IADP), Intensive Agricultural Area Programme (IAAP).

9. Mid Semester Examination
11. National Agricultural Technology Project (NATP), Integrated Tribal Development Agency (ITDA), Small Farmers Development Agency (SFDA), Marginal Farmers and Agricultural Labourers Development Agency (MFAL) - National Rural Employment Programme (NREP).
12. Rural landless Employment Guarantee Programme (RLEGP), Drought Prone Area Programme (DPAP), Command Area Development Programme (CADP), Food for Work Programme (FFW), Jawahar Rozgar Yojana (JRY).
13. Employment Assurance Scheme (EAS), Indira Awaas Yojana (IAY), Swarnajayanthi Gram Swarozgar Yojana (SGSY), Swarna Jayanti ShahariRozgar Yojana (SJRSY), Pradhan Mantri Gram Sadak Yojana (PMGSY).
15. Women Development Programmes - Development of Women and Children in Rural Areas (DWCRA), MahilaSamridhi Yojana (MSY), Tamil Nadu Women in Agriculture (TANWA).
16. Youth Development Programmes - TRYSEM, Nehru Yuva Kendra (NYK), Attracting Rural Youth towards Agriculture (ARYA).
17. Extension Programme Planning - definition, principles; meaning of project, plan, calendar of work, plan of work; steps in programme planning.

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. Exposure to the activities of a Gram Panchayat.
4. Study of the functions of JDA / ADA and to understand the reorganized extension system, organizational setup, functions, ATMA scheme and other schemes.
5. Interaction with a SHG to study its activities.
6. Exposure to an NGO to study their role in rural development activities.
7. Study of the extension activities of the State Department of Horticulture.
8. Visit to a nearby KVK to study its role and activities.
9. Visit to the Social Welfare Department to study the social welfare and women development programmes.
10. and 11. Construction of interview schedule to study the awareness and participation of people in rural development programmes implemented in a village (Group exercise)
12. Visit to a village to collect data (Group exercise).
13. Visit to a village to collect data (Group exercise).
14. Visit to a village to collect data (Group exercise).
15. Preparation of report.

COURSE OUTCOMES :  
At the end of the course students will be able to
CO 1: Understand fundamentals of extension education.
CO 2: Understand extension systems in India.
CO 3: Gain expertise on various rural development programmes.
CO 4: Expose on Extension activities of different organizations.

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**REFERENCES**


**E-RESOURCES**

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2. www.panchayat.gov.in
3. wcd.nic.in
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**AHS 218 LIVESTOCK AND POULTRY MANAGEMENT**  (2+1)

**LEARNING OBJECTIVES:**

- 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.
- To provide hands on training about livestock, poultry-based farming and preparation of dairy products.
- 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. **Current Streams of thought.**

**PRACTICAL**

**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**
COURSE OUTCOMES:

CO 1: Basic managerial practices of different livestock enterprises such as cattle, sheep, goat, pig and poultry.

CO 2: Clean milk production and its impact on the society.

CO 3: Modern rearing practices of sheep and goat for meat and milk production.

CO 4: Management practices of swine, broiler and layer farming for egg and meat production.

CO 5: Integrated farming system (IFS) along with plantation and horticultural crops for income generation and entrepreneurship skill development.

CO-PO MAPPING MATRIX

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7. Prabakaran, R., 1998. Commercial Chicken Production. Publisher P.Saranya, 5/2,
8. Ramalingam Street, Seven Wells, Chennai

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2. www.ansci.umn.edu/poultry/resources/layermgmt.htm
3. www.armso.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
LEARNING OBJECTIVES:

- The students will acquire the basic knowledge of scientific crop production of major oilseed crops.
- The students will gain knowledge about economic importance, origin, soil and climatic requirement of sugar crops viz., Sugarcane, Sugarbeet and Sweet sorghum.
- The students will acquire knowledge about importance of fibre crops and its cultivation practices.
- The students will learn about various production technologies for various tuber crops.
- The students will be familiar with importance and cultivation aspects of Tobacco and Betelvine.

THEORY

Unit – I: Agronomy of Oilseed crops

Groundnut, sesame, sunflower, castor, coconut, oilpalm Rape seed and mustard, safflower, Linseed, Niger and Jatropha - Origin and geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices (from land preparations to harvest) and yield. Post harvest management practices. Value addition and by products utilization of oilseed crops.

Unit - II: Agronomy of sugar crops

Sugarcane, Sugarbeet and Sweet sorghum - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield. Post harvest management practices. Value addition and by products utilization of Sugar crops.

Unit - III: Agronomy of fibre crops

Cotton, Jute, Mesta, Sunnhemp and Agave - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield. Post harvest management practices. Value addition and by products utilization of fibre crops.

Unit IV: Agronomy of Tuber Crops

Tapioca, Potato and Sweet potato - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield. Post harvest management practices. Value addition and by products utilization of tuber crops.

Unit V: Agronomy of Narcotics

Tobacco and Betelvine - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield. Post harvest management practices. Current Streams of thought.

PRACTICAL

Maintenance of crop cafeteria - Identification of oil seeds, sugar, fibre, Tuber and narcotic crops - nursery preparation and management for sugarcane and tobacco - main field preparation; Seed treatment techniques - Sowing and manuring - Seeding implements - Estimation of plant population, seed rate and fertilizer requirement - After cultivation practices - Study of growth - Yield parameters and yield estimation. Harvesting of crops - Cost analysis- Visit to farmers’ fields, institutes and industries.

THEORY LECTURE SCHEDULE

1. Introduction – Importance and constraints of oil seeds, sugar crops, fibre, tubers and narcotics crops.
2. Area, production and productivity of oil seeds, sugar, fibre crops and tuber crops in India and Tamil Nadu.
3. Groundnut - Origin, geographical distribution, economic importance, soil and
climatic requirements
4. Groundnut – season and varieties, cultural practices, yield and economics.
5. Sesame - Origin, geographical distribution, economic importance, soil and climatic requirements- season and varieties- cultural practices and yield.
6. Sunflower - Origin, geographical distribution, economic importance, soil and climatic requirements, season and varieties, cultural practices and yield.
7. Castor - Origin, geographical distribution, economic importance, soil and climatic requirements, season and varieties, cultural practices and yield.
8. Coconut - Origin, geographical distribution, economic importance, soil and climatic requirements season and varieties- Preparation of nursery - cultural practices and yield - Post harvest technologies – Special problems in coconut cultivation.
9. Oilpalm - Origin, geographical distribution, economic importance, soil and climatic requirements, season and varieties- Preparation of nursery - Cultural practices and yield.
10. Rape seed and Mustard - Origin, geographical distribution, economic importance, soil and climatic requirements, season and varieties, cultural practices and yield.
11. Safflower - Origin, geographical distribution, economic importance, soil and climatic requirements, season and varieties, cultural practices and yield.
12. Linseed and Niger - Origin, geographical distribution, economic importance, soil and climatic requirements, season and varieties, cultural practices and yield.
13. Jatropha - Origin, geographical distribution, economic importance, soil and climatic requirements, season and varieties, cultural practices and yield.
16. Sugarbeet - Origin, geographical distribution, economic importance, soil and climatic requirements, season and varieties, cultural practices, yield and by product utilization.
17. Sweet sorghum - Origin, geographical distribution, economic importance, soil and climatic requirements, season and varieties, cultural practices, yield and by product utilization.
18. Mid-semester Examination.
19. Cotton - Origin, geographical distribution, economic importance, soil and climatic requirements - Season and varieties.
22. Jute - Origin, geographical distribution, economic importance, soil and climatic requirements- Season and varieties.
23. Jute – Cultural practices and yield– economics
24. Mesta and Agave - Origin, geographical distribution, economic importance, soil and climatic requirements, season and varieties, cultural practices and yield
26. Potato - Origin, geographical distribution, economic importance, soil and
climatic requirements, season and varieties, cultural practices and yield.
27. Sweet potato - Origin, geographical distribution, economic importance, soil and climatic requirements, season and varieties, cultural practices and yield.
28. Tapioca - Origin, geographical distribution, economic importance, soil and climatic requirements, season and varieties, cultural practices and yield.
29. Tobacco - Origin, geographical distribution, economic importance, soil and climatic requirements, Season and varieties.
31. Tobacco –cultural practices and yield- Curing methods.
32. Betelvine - Origin, geographical distribution, economic importance, soil and climatic requirements, Season and varieties.
33. Betelvine – Cultural practices and yield.
34. Post harvest management for narcotics crops.

PRACTICAL SCHEDULE
1. Identification of oil seeds, sugar crops, fibre, tubers and narcotics in the crop cafeteria.
3. Acquiring skill in field preparation, sowing and manuring of crops under pure and intercropping situations.
4. Acquiring skill in different seed treatment techniques and foliar nutrition of crops.
5. Estimation of plant population per unit area for crops – Seed rate and fertilizer requirement for oilseeds, fibre, sugar, tuber and narcotics.
6. Acquiring skill in after - cultivation practices in sugarcane - detrashing, Cotton - earthing up, Tobacco - topping.
7. Study on growth parameters of oil seeds and sugar crops.
8. Study on growth parameters of fibre, tubers and narcotics.
9. Study on yield parameters and estimation of yield in oil seeds / sugar.
10. Study on yield parameters and estimation of yield in tuber, fibre and narcotics.
11. Cost and returns of important oil seeds, sugar, fibre, tuber and narcotics.
12. Visit to oil seeds research station.
13. Visit to Sugarcane Breeding Institute/ Research Station to study cultivation of sugarcane and its byproducts.
14. Visit to - nearby sugar mill, for observing juice extraction, quality assessment, sugar manufacture and by products.
15. Visit to - Cotton Research Station, nearby ginning factory and Tobacco curing centre.
16. Visit to farmers field to study sugarcane and cotton based cropping systems.
17. Orientation for final examination

COURSE OUTCOMES :
CO1: To understand the importance of oil seed production and cultivation of major oil seed crops
CO2: To gain knowledge about importance of sugar crops and its cultivation practices
CO3: To formulate different cropping system and production technologies for various fibre crops
CO4: To construct idea regarding knowledge on growing of tuber crops
CO5: To create awareness about narcotics crops and its production technologies
### CO-PO Mapping Matrix

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### References

### E-resources

### AGR 221 – Study Tour (0+1)

**Learning Objectives:**
- The students will undertake tour to learn different soil types in various regions
- The students will gain knowledge about the cropping pattern for major crops in different agro ecosystem.
- The students will visit important Agricultural research stations and institutions.
- The students will familiar with various agro based industries and its operation
- The students will understand the practical constraints in production technologies and post harvest management for various crops in farmers field

Students will be taken to tour within South India to study soil types, crops and cropping pattern and cultivation practices for major crops in the various agroclimatic zones. During the tour, the students will visit important Research Station / Institutions at least one in each zone. Students should maintain a tour diary to record their observations regarding the places of visit. A tour record has to be submitted after the tour.

**Course Outcomes:**
- **CO 1:** To gain knowledge about various soil types presented in different regions
- **CO 2:** To formulate different cropping systems followed in various agro climatic regions
- **CO 3:** To understand information pertaining to the different crops and their cultivation methods.
- **CO 4:** To create awareness about different agro based industries
- **CO 5:** To apply new post harvest management technologies and value addition of crops
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ENT 222 INSECT ECOLOGY AND PRINCIPLES OF PEST MANAGEMENT (2+1)

LEARNING OBJECTIVES:
- To understand the basic ecological concepts in relation to insects
- To evaluate influence of abiotic and biotic factors in insect population dynamics and its relevance in Integrated Pest Management (IPM)
- To illustrate various components of IPM and their importance
- To discuss ecological perspectives of insecticides
- To illustrate use of sampling and AESA in pest management decision making

THEORY

Unit I: Insect Ecology


Unit II: Integrated Pest Management and its Components

IPM - Introduction, definition, importance, limitations of IPM. Components of IPM - Cultural, Mechanical, Physical and Legal methods - invasive insect pests, Host plant resistance in IPM, Biological methods in IPM - classical biological control, merits and limitations of biological control, Parasitoids, Predators and Pathogens, difference between predator and parasitoid Types of parasitoids and parasitism, Important families of predators and parasitoids, Microbial control - groups of microbial agents and their actions on insects, Mass multiplication and application techniques of important groups of parasitoids, predators, pathogens and entomophilic nematodes. Conservation, importation, augmentation and release of bio control agents. Role of birds in insect and rodent management.

Unit III: Bio rational Pest Management Strategies

Semiochemicals in IPM - Pheromones, Allomones, Kairomones and Synomones and their role in pest management - Traps - Insect growth regulators in IPM - Moult inhibitors and JH mimics - Push and Pull techniques - Botanical insecticides in IPM - antifeedants and repellants. Formulation techniques of botanicals. Traditional methods in IPM - Biotechnology, Sterile male technique and gamma radiation in IPM.

Unit IV: Chemical methods of Insect Pest Management

Chemical control - importance and history. Classification of pesticides. Toxicity ranges - LD_{50}, LC_{50} etc. Basic and newer formulations of insecticides. Handling hazards of insecticides - Symptoms of poisoning, first aid and antidotes, Compatibility and phytotoxicity. Newer insecticides in pest management.

Unit V: Ecological Perspectives of chemical methods and IPM Strategies for crops

PRACTICAL


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

THEORY LECTURE SCHEDULE

1. Definition and importance of Insect ecology. Terminologies related to Insect ecology - anecology, synecology, biosphere, habit, habitat, biome, population, community, niche, ecosystem and agro-ecosystem.


3. Effect of abiotic factors on insect population – temperature, moisture, humidity, rainfall, light, atmospheric pressure, air currents etc.

4. Effect of biotic factors on insect population– intra specific, inter specific relations.

5. Definition and categories of pests, biotypes and causes for pest outbreak. Symptoms and losses of pest attack. Sampling techniques, Surveillance and pest forecasting. Concepts of Economic Injury Level (EIL) and Economic Threshold Level (ETL).

6. Definition of IPM. Concepts, Scope and limitations of IPM.

7. Definition and examples of Cultural, Physical and Mechanical methods of pest management


11. Biological methods- classical biological control, merits and limitations, Parasitoids and Predators – definition - difference between a predator and a parasitoid - Types of parasitoids - Types of parasitism.
12. Important families of predators and parasitoids and their role in pest management.
13. Microbial control – definition, Important groups of microbial agents, Mode of action and symptoms of pathogenicity. Their role in pest management.
14. Mass multiplication and application techniques of important groups of Parasitoids and Predators.
15. Mass multiplication and application techniques of important Entomopathogenic Viruses, Bacteria, Fungi and nematodes.
17. Mid Semester Examination
18. Pheromones in IPM – Sex pheromones, Alarm pheromones, trail pheromones and aggregation pheromones
23. Formulation techniques of Botanicals.
24. Traditional methods in IPM.
25. Chemical control – importance and history.
27. Toxicity ranges. Basic and newer Formulations of insecticides.
29. Insecticide residues, insecticide resistance, Insect resurgence
30. Insecticide contamination and pollution, bio accumulation and bio magnification. Compatibility and Phytotoxicity.
31. Newer insecticides in pest management. Insecticide resistance and residue management.
32. Integrated pest management strategies for Rice and cotton, sugarcane and coconut.
33. Integrated pest management strategies for Sugarcane and Coconut
34. Integrated pest management strategies for Brinjal and Mango.

PRACTICAL SCHEDULE
2. Observation on types of damage and major symptoms caused by insect pests.
3. Practicing various sampling techniques and assessment of insect population and their damage in field/horticultural crops.
4. Practicing Pest surveillance through light traps/ pheromone traps and forecasting of field incidence.
5. Practicing common Cultural, Mechanical and Physical methods in pest management.
6. Analysing distinguishing characters of few resistance varieties of important crops.
7. Observation on models of traps in pest management – Pheromone traps, light traps, sticky traps and other traps.
8. Identification of different types of parasitoids, predators and entomopathogens.
10. Practicing Mass culturing techniques of *Chrysopa* and *Coccinellids*
13. Identification of different groups of pesticide formulations.
14. Recognizing label information, Precautions in pesticide applications, First aid and antidotes information. Identification of types of Pesticide application equipments and practicing of application of insecticides.
15. Preparations of spray fluids for field application. Calculation of doses/concentrations of insecticides.
17. Orientation for final examination

**COURSE OUTCOMES:**

**CO 1:** Depict basic ecological concepts, understand the impact of ecology on the insect population and concepts of IPM, ETL and EIL. To employ AESA and pest survey as pest management decision making tools.

**CO 2:** Explain role of biological pest suppression and mass production of various biocontrol agents.

**CO 3:** Describe non chemical methods of pest management viz., bio rations and other novel techniques like sterile insect method.

**CO 4:** Discuss classification and formulations of insecticides, their poisoning effects and antidotes.

**CO 5:** Describe ill effects of over use of insecticides and define various IPM modules for different crops.

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**REFERENCES**


**E-RESOURCES**

AGM 223 SOIL AND APPLIED MICROBIOLOGY (2+1)

LEARNING OBJECTIVES:
- To enlighten the students with the knowledge of microbial diversity in soils and their interaction with plants.
- To highlight the role of soil microorganisms in soil fertility and plant growth promotion.
- To develop experimental skills in soil microbiology which includes isolation of beneficial microorganisms from soil and plant and their mass production.
- 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

PRACTICAL

THEORY LECTURE 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 Bionoculants
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 production of AM fungi
15. Mass multiplication of blue green algae and *Azolla*
COURSE OUTCOMES

CO 1: The students would thoroughly understand about the role of microorganisms in soil and industries their influence on the plant growth and industrial production historical perspectives.

CO 2: The students exposed to soil microbial diversity, their functions in soil transformation of nutrient and humus formation.

CO 3: The students would expose to the beneficial and harmful relationships between soil microorganism and different parts of plants.

CO 4: The students gained hands on experience o production and quality control aspects of different microbial inoculants and to have self confidence to become successful entrepreneurship.

CO 5: Further, they would enriched on the industrial production of important products like fermentation products antibiotics, microbial foods, dairy products, etc.

CO - PO MAPPING MATRIX

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SAC 224 SOIL RESOURCE INVENTORY AND PROBLEM SOILS (2+1)

LEARNING OBJECTIVES:

- To impart proficiency to the students in exploring the problems and potentials of soil and water
- To decide the most appropriate land use planning and water use.

THEORY

Unit-I - Concepts of Soil Survey and Soil taxonomy

- Soil resource inventory - Early and modern concepts - Standard soil survey - Scope and objectives - Soil systematics - Soil mapping units - Methods and types of soil survey - Soil maps.
- Soil Classification - Earlier and genetic systems - Modern Soil Taxonomy - USDA System - Salient features, structure - Diagnostic horizons - Differentiating characteristics - Soil orders - Characteristics and distribution - Soils of India and Tamil Nadu.
Unit-II - Soil Survey Interpretations and Land Use Planning

Soil Survey Reports - Preparation, Soil Survey Interpretations - Land Capability Classification - Soil and Land Irrigability Classification - Storie’s Index Rating - Productivity potential - Fertility Capability Classification - Land suitability for field crops and horticultural crops and forest trees - Land Use Planning - concepts and objectives.

Unit-III - Modern tools for Soil resource inventory


GIS - Definition, principles - Components - Role of GIS in Agriculture. GPS - Definition, principles - Components - Role of GPS in Agriculture.

Unit-IV - Soil constraints


Unit-V - Irrigation water quality and use


PRACTICAL


THEORY LECTURE SCHEDULE

1. Early and modern concepts of soil resource inventory, Concepts of Standard Soil Survey, its scope and objectives
2. Soil systematics - Characteristics of genetic horizons, subordinate distinctions, pedon, polypedon and control section,
3. Soil mapping units - Soil series, soil association, soil complex, variants, inclusions and miscellaneous land types.
4. Methods of soil survey - Free and grid survey
5. Types of soil survey - Reconnaissance, Detailed soil survey
6. Semi detailed, Exploratory and Rapid reconnaissance survey
7. Soil classification - Purpose, early, genetic and modern systems of classification
8. USDA Soil taxonomy - Structure and differentiating characters - Appreciation and Criticism.
9. USDA Soil taxonomy - Epipedons and Endopedons
10. Diagnostic organic materials, diagnostic soil characteristics - Soil moisture and Temperature regimes.
11. Soil orders - Characteristics and distribution in world
12. Soils of India and Tamil Nadu
13. Soil maps, kinds of soil maps and their preparation
14. Soil survey report preparation and interpretation
15. Land Evaluation - Land Capability Classification (LCC) - Fertility Capability Classification (FCC)
16. Soil and Land Irrigability Classification,
17. Mid semester Examination
18. Storie Index Rating and Productivity potential - Land Suitability Classification
20. Remote Sensing- Definition, stages in remote sensing , principles of remote sensing
21. EMR, Atmospheric windows, Energy matter, Interactions, Spectral signatures
22. Types of remote sensing- Sensors and plat forms
24. Aerial photography - definition, Advantages and disadvantages, Basic concepts-Types of aerial photography, Aerial photo interpretations.
25. GIS – Definition-, principles – Components- Role of GIS in Agriculture
26. GPS- Definition- principles – Components- Role of GPS in Agriculture
27. Soil physical constraints - slow permeable, excessively permeable soils, Soil crust shopping, sub soil hard pan, fluffy paddy soil, shallow soil - Characteristics and management
28. Aeolian , ill drained and polluted soils- Characteristics and their management
29. Acid soil and Acid sulphate soils - Genesis and characteristics.
30. Lime requirement of acid soil, liming materials and reclamation of acid soil
31. Genesis and classification of salt affected soils - Effect of saline soils on plant growth and their management
32. Genesis and classification sodic and saline sodic soil - characteristics and their management
33. Quality of irrigation waters - quality criteria and appraisal- USSL and other systems
34. Effect of poor quality water on soil health, crop growth and management.

PRACTICAL SCHEDULE
1. Profile description
2. Nomenclature of soil as per Soil Taxonomy
3. Study on Soil survey maps, Land evaluation methods
4. Estimation of pH and EC in saturation paste of problem soils
5. Estimation of CEC in problem soils
6. Estimation of Exchangeable calcium and magnesium
7. Estimation of Exchangeable sodium and potassium and working out ESP
8. Estimation of lime requirement of acid soil
9. Estimation of gypsum requirement of sodic soil
10. Estimation of pH, EC, TSS and chloride in irrigation water
11. Estimation of carbonate and bicarbonate in irrigation water
12. Estimation of sulphate in irrigation water by gravimetry
13. Estimation of calcium and magnesium in irrigation water
14. Estimation of sodium and potassium in irrigation water
15. Classification of irrigation waters as per USSL and other systems and Computation of salts in irrigation water
16. Visit to Soil Survey and Land Use Organization
17. Record certification

COURSE OUTCOMES:

CO 1: Basic contents of soil survey and soil taxonomy would enhance competence and provide knowledge of soil present in all over the world.

CO 2: The modern tools (remote Sensing, GIS and GPS) used in soil survey in order to enhance in better understanding of land use planning of the soil.
CO 3: Understanding the physical, chemical constrains would enhance the knowledge of the soil and sustainable agriculture production.

CO 4: Sound knowledge about quality of irrigation and influence would increase the high land use to increase the agricultural production using poor quality irrigation water.

**CO-PO MAPPING MATRIX**

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**E-RESOURCES**


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

**LEARNING OBJECTIVES:**

- To expose the students to basic and applied principles of plant breeding.
- To impart knowledge on emasculation and pollination techniques of various crops
- To impart knowledge on application of various genetic principles in crop improvement

**THEORY**

**Unit I: Reproductive systems in plant breeding**

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

THEORY LECTURE SCHEDULE
1. Objectives and role of plant breeding - historical perspective - activities in Plant Breeding.
2. Centres of origin - contribution of Vavilov, Harlan, Zhukovsky - law of homologous series.
4. Germplasm: evaluation - use of descriptors, documentation, utilization; Agencies - national and international; germplasm exchange - quarantine.
8. TGMS, PGMS, Gametocides, Transgenic Male sterility and applications.
9. Apomixis - introduction - classification-applications; Parthenocarpy and its types.
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**
25. Synthetics and composites - steps in development of synthetics and composites – achievements – merits and demerits
28. Wide hybridization-history-importance-barriers and techniques for overcoming barriers-utilization
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 Breeding
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
9. Induction of polyploidy using colchicine
10. Studies on different wild species in crop plants and wide hybridization.
12. Germplasm preservation – conservation - records maintained in research stations
13. Calculation of PCV, GCV, heritability, genetic advance
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

COURSE OUTCOMES:

CO 1: The student will have the gist of the various self and cross pollinated crops.
CO 2: Will be able to develop expertise in the various crossing and emasculation techniques in various crops
CO 3: Students will develop the capacity to carry out independent plant breeding experiments
CO 4: The students will be able to multiply and modify the vegetatively propagated crops.

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

LEARNING OBJECTIVES:
• To give exposure to the Under Graduate students on market concepts
• To understand domestic and export trade
• To study 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 LECTURE 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
6. Grading and standardization - Agmark, FPO, BIS, HACCP, FSSAI and ISO.
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

**COURSE OUTCOMES:**
At the end of the course students will be able to

CO 1: To understand the marketing channels of different commodities.

CO 2: To gain the practical knowledge of price spread and its implications.

CO 3: To know the role of marketing institutions and trade in agricultural products like WTO and APEDA.

CO 4: Gain practical knowledge on FCI, CWC and regulated market activities.

CO 5: Role of CACP for price fixation, and price stabilization measures.

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**STA 227 AGRICULTURAL STATISTICS (1+1)**

**LEARNING OBJECTIVES:**

- To understand and apply fundamental concept of statistical applications in biology
- 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**


**THEORY LECTURE 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
2. Measures of dispersion: Range, Quartile deviation, Mean deviation, standard deviation, and coefficient of variation - Skewness and kurtosis. TBII 41 - 48
5. Binomial and Poisson distribution TBI 58 - 61
6. Continuous distribution: Normal distribution TBI 55 - 57
7. Null and alternative hypothesis – types of errors - critical region and tests of significance. TBII 16-17
8. Large sample test – single mean and difference between two means. Single proportion and difference between two proportions. TBII 20-24
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

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

COURSE OUTCOME
CO1: Understand fundamental concept of statistical applications in biology
CO2: Application of statistical concepts
CO3: Acquire theoretical concept of descriptive statistics, testing of hypothesis, correlation, regression and basic design of experiments.
CO4: Practical exposure to concept of descriptive statistics, testing of hypothesis, correlation and regression
CO5: Practical exposure to basic design of experiments

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4. www.stats.gla.ac.uk/steps/glossary/index.html
7. www.businessbookmall.com/Statistics Internet Library.htm

ENG 228 SOFT SKILLS OF EMPLOYABILITY (0+1)

LEARNING 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
Attitude - Psychological and sociological definitions - types of attitude - consequences - suggestions to keep good attitude. Emotional Intelligence - Introduction to Emotional Intelligence – four branch model of EQ - five point scale to measure EI – suggestions to improve EI. Interpersonal skills - Interpersonal Skills - Study of character traits - formal interpersonal skills - greeting, enquiring, answering, complimenting and acknowledging. Self Development/Empowerment - Self Development - Empowerment - SWOC Analysis - Goal setting based on the principle of SMART - self motivation strategies.

UNIT III: Communication Skills

UNIT IV : Employability Skills
-how to answer the questions

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

**UNIT V : Corporate Skills**

**Leadership qualities** - Definition - basic requirements - (responsibility - self - knowledge - rapport with subordinates- knowledge of the assignment- goal setting- decision making - team work) - leadership and vision. **Negotiation skills** - Select definitions - functions of negotiation - kinds of negotiation - phases of the process - rules - steps to improve negotiation skills. **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. **Stress management** - Definition of stress -kinds - stress at work - causes, effects and solution - stress and stroke - different kinds of stroke - stress in interview. **Current Streams of thought.**

**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**

**COURSE OUTCOMES:**
At the end of the course the students will be able to

**CO1:** Understand the values of soft skills
**CO2:** Acquire various soft skills necessary for being good citizens as well as successful employees
**CO3:** Understand the difference between emotional intelligence and intelligence quotient
**CO4:** Shine as effective communicators and successful leaders
CO5: Face various kinds of interviews with courage and confidence

CO/PO Mapping Matrix

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4. [www.negotiation.com](http://www.negotiation.com)
5. [www.businessballs.com](http://www.businessballs.com)
6. [www.study-habits.com](http://www.study-habits.com)
AEG 229 FARM POWER, MACHINERY AND RENEWABLE ENERGY (2+1)

LEARNING OBJECTIVES:

- To gain knowledge on the various types of IC engines, types and selection of tractors.
- To understand the construction and working of various farm implements like tillage implements, seed drills, transplanters, plant protection and harvesting equipments.
- To gain knowledge on the various renewable energy sources like solar, wind, biogas and biomass energy.
- 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 - sources - Tillage - Ploughing Methods - Primary Tillage Implements - Types of plough - Secondary tillage implements - Cultivators, Harrows and rotavators - Wetland equipment - Puddlers, Trampers 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 different components of IC engine, four stroke petrol engine, two stroke petrol engine. Study of MB plough, disc plough, seed-cum-fertiliser drills, their mechanisms.
- Operation of tractor and implements – operation and maintenance of power tiller – Study of different inter-cultivation equipments – Sprayers and dusters – their operation, repairs
and adjustment - Paddy transplanting. Harvester for paddy, sugarcane, groundnut – horticultural tools.

Study of constructional details of KVIC and JANATHA type and DeenBandu 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.

THEORY LECTURE SCHEDULE

1. Farm power in India – human, animal, mechanical and electrical energy sources   TB1: 1-10
2. Objectives of Primary tillage, mouldboard , disc plough, chisel plough and subsoiler, components and functions, types, advantages and disadvantages   TB1: 177-179
4. Wet land equipment – puddlers, Green manure tramplers and cage Wheels   TB1:216-221
5. Seed Sowing methods and Equipments   TB1:223-225
6. Seed drills, seed cum fertilizer drills – components and functions,   TB1:222-227
7. Paddy transplanters, types, working principle, field and nursery Requirements   TB1:232-235
8. Sprayers and their functions, classification, manually operated Sprayers, power sprayers – dusters, types and uses   TB1:261-271
9. Harvesting tools and equipment- sickles, paddy harvester   TB1:273-280
11. Equipment for land development and soil conservation – dozers   TB1:323-327
12. Equipment for intercultural tools levelers, chisel plough, sub soil plough, Blade harrow and bund former   TB1:185-211
15. IC engines- working principles, two stroke and four stroke engines, Different systems of IC engine   TB1:22-35
16. Electronic fuel injection system, dual fuel operation engine, Tractors- types and utilities.   TB2:1-21
18. Mid-Semester Examination   TB3:428-438
24. Biogas technology – Feed stocks – Factor influences biogas yield- Biogas Plants Types – Construction and Working – Applications   TB4:311-381
26 Solar collectors-Types - Solar energy gadgets.  
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 Bio fuels  
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  

COURSE OUTCOME  
CO1: To Gain knowledge on the various types of IC engines, types and selection of tractors.  
CO2: To Understand the construction and working of various farm implements like tillage implements, seed drills, transplanters, plant protection and harvesting equipments.  
CO3: To Gain knowledge on the various renewable energy sources like solar, wind, biogas and biomass energy.  
CO4: 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.
CO/PO Mapping Matrix

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TEXT BOOKS

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E-RESOURCES
1. www.agricoop.nic.in/dacdivision/Machinery1/directory.htm
2. www.farmmachineryshow.org
3. www.freesolaronline.com

V SEMESTER
AGR 310: FARMING SYSTEM, ORGANIC AGRICULTURE, AGROFORESTRY AND DRY FARMING (3+1)

LEARNING OBJECTIVES
- Learning the concept of cropping and farming systems as vital tool in enhancing agricultural productivity and intensive farming.
- Aims at incurring knowledge on various aspects of organic farming and its importance in present world scenario and its impact on environment and soil health.
- To impart knowledge on Agroforestry systems and dryland technologies
THEORY

Unit-I: Cropping system and Farming System


Unit-II: Organic farming Practices and Management


Unit-III: LEISA Concepts and Principle


Unit-IV: Agro forestry


Unit-V: Dry Farming


PRACTICAL


THEORY LECTURE SCHEDULE

1. Cropping system: Definition, Principles and basic concepts, types of cropping systems – multiple cropping system
2. Advantages and disadvantages of various cropping systems – criteria for assessing yield advantages
3. Principles and advantages of cropping system, principles and factors influencing in cropping scheme, preparation of cropping schemes.
6. Agronomic requirement for crops and cropping system in intercropping and sequential cropping.
7. Farming system: definition, principles and concepts and advantages of farming system.
8. Integrated farming system – Scope and advantages - Allied enterprises for wetland, irrigated upland and dryland and their interactions.
9. Integrated farming system – models for wetland, irrigated upland and dryland ecosystem.
10. Indices used to evaluate land use efficiency and yield advantages and economic viability in multiple cropping.
12. Sources of organic manures – plant, animal and microbial origin, On-farm resources; FYM, poultry manure, sheep and goat manures; green manures, crop residues; biogas slurry and vermicompost.
13. Off-farm resources; coir pith, press mud, oilcakes, fly ash, bio compost, minerals, bone meal, bio fertilizers, traditional preparations.
15. Non – chemical weed management methods; preventive, physical, cultural, use of tools and implements and biological measures.
19. Quality considerations – assessment methods – premium and export opportunities-
20. Good crop husbandry practices for important field crops.
21. Cost reduction technologies and non-monetary inputs in cropping and farming system.
22. LEISA– principles and concepts – Basic ecological principles of LEISA and promising LEISA techniques.
24. Marketing of organic products-legislation
25. Crop residues management (CRM) for sustainable Agriculture.
26. Mid-semester Examination.
27. Conservation agriculture (CA), scope, advantages and CA technology for sustainable Agriculture.
28. Forests- Role of forest – Status - Types of forests.
31. Wind break and shelter belts – design of shelter belts and species composition.
32. Role of agroforestry in soil, water and ecological conservation – industrial Agroforestry – constraints and merits.
33. Afforestation – importance - methods
34. Social forestry phase I and II projects – Joint Forest Management and Tamil Nadu Afforestation Programme.
35. Agroforestry systems for different problem soils and tree species suitable for problem soils.
36. Silviculture practices for Teak – Casuarina –Subabul.
37. Silviculture practices for Tamarind – Neem – Acacia – Prosopis.
38. Silviculture practices for Pungam – Ailanthus – Bamboo
39. Dry farming and rainfed farming: Definition and Characteristics.
40. Major constraints in dry farming for crop production
41. Rainfall climatology – length of growing period
42. Drought: definition and types - Effects of drought on crop production
43. Drought management strategies and contingent crop planning
44. Mid-season correction – mulching – thinning – antitranspirants – antievaporants.
45. In-situ soil moisture conservation techniques and approaches – Agronomical measures
46. In-situ soil moisture conservation – Mechanical – Biological measures
47. Integrated dryland technologies and farm mechanization.
48. Resource management under constraint situations for irrigated and rainfed farming
49. Watershed: definition, principles, classification and management.
50. Water harvesting, storage and recycling.
51. Alternate land use systems in different watershed

**PRACTICAL SCHEDULE**

1. Visit to cropping system experiments in wetland, irrigated upland and dryland.
2. Preparation of cropping scheme, inputs and working out various indices
3. Preparation of integrated farming system models for different eco systems
4. Indigenous practices in seed treatment and raising of field crop (Rice / Maize/ Cowpea / Cotton / Sugarcane).
5. Hands-on-experience in recycling techniques-composting and vermicomposting, Production techniques – grading, packaging
6. ITK based preparations (Panchakavya, Dasakavya, Amirthakaraisal, fish amino acids)
7. Manures and bio-fertilizers application methods practical experience
8. Exposure visit to bio – control agent units and bio-fertilizer production units.
9. Working out cost of production for organic cultivation of important field crops.
10. Identification and description of agroforestry tree seeds and seedlings of Teak, Casuarina, Eucalyptus, Tamarind, Ailanthus, Pungam, Neem, Acacia, Prosopis and Bamboo.
11. Identification and description of fuel, fodder and green manure trees in the locality.
13. Rainfall analysis and crop planning
14. Soil erosion and soil conservation practices, water harvesting structure and their use.
15. Drought management technologies to mitigate drought in dry farming agriculture.
17. Orientation for final practical examination

**COURSE OUTCOMES:**

CO 1: To gain the information and acquire practical knowledge on various types of cropping systems.

CO 2: To understand interaction between different farm enterprises and to gain the information about the impact of organic farming and indigenous practices

CO 3: To understand the procedure followed for organic certification as per NPOP guidelines and to evaluate different resource management techniques in conservation agriculture.

CO 4: To gain the information about forestry and their role on the environment and practicing silviculture.

CO 5: To know about integrated dry farming technologies and Watershed management.

**CO-PO MAPPING MATRIX**

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**REFERENCE BOOKS**

7. Thanunathan. K. and V. Imayavaramban. 2011, Agroforestry and Agronomy of Multipurpose Trees. SCITECH Publication (India) Pvt. Ltd. Chennai -56 e.mail : scitech@airtelmail.in

**E – RESOURCES**

AGR 311 CROP PRODUCTION - I (0+1)

LEARNING OBJECTIVES:
- Students will acquire knowledge about cultivation of rice in different ecosystem
- Students will acquire skill on different nursery techniques
- The students will be trained to treat the seeds with biofertilizers and fungicides
- The students will aware about different methods of planting techniques
- The students will learn about harvesting methods and processing

Transplanted rice
- Rice ecosystems - Climate and weather - Seasons and varieties of Tamil Nadu.
- Preparation of nursery - Application of manures to nursery - seed treatment - Forming nursery beds and sowing seeds - Weed and water management and plant protection to nursery.
- Harvesting, threshing, drying and cleaning the produce – Working out cost of cultivation and economics.
- Value addition and by products utilization.

PRACTICAL SCHEDULE
Transplanted rice
1. Study of rice ecosystems, climate, weather, seasons and varieties of Tamil Nadu
2. Acquiring skills in selection of nursery area and preparation of different types of nursery.
3. Acquiring skills in seed treatment, seed soaking and incubation, nursery sowing and management and calculation of seed requirement.
4. Study and practice of main field preparation and green manuring and bio-fertilizer application in rice
5. Study of different growth stages of rice.
6. Study and practice of transplanting techniques in lowland rice
7. Study of system of rice intensifications
8. Bio- metric observations and estimation of plant population and acquiring skills in cultural operations.
9. Mid – Semester examination
10. Study of weeds and weed management in rice.
11. Acquiring skill in nutrient management, calculation on fertilizer requirement and practicing top dressing techniques.
13. Observation of insect pests and diseases and their management.
15. Post harvest techniques, value addition and by products utilization in rice.
16. Working out cost of cultivation and economics.
17. Orientation for final examination

COURSE OUTCOMES
CO 1: To gain knowledge about cultivation aspects of rice
CO 2: To understand the different nursery management practices
CO 3: To apply different seed treatment methods for rice
CO 4: To evaluate different methods of planting techniques
CO 5: To construct methodologies in harvesting and processing

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E-RESOURCES

ENT 312 PESTS OF CROPS, STORED PRODUCTS AND THEIR MANAGEMENT (2+1)

LEARNING OBJECTIVES:
- To study the distribution, bionomics and symptoms of damage of pests of crops and storage.
- To distinguish various symptoms of damage and identify different life stages of the major pests of crops and storage.
- To discuss integrated pest management protocols for major crops and pests.
- To perform rearing and collection of major pests for better understanding of their biology and identification characters.

THEORY
Distribution, Bionomics, Symptoms of damage and Integrated management strategies for insects and non-insect pests such as mites, nematodes, rodents, birds and other vertebrates of the following crops.

Unit I: Pests of Cereals, Millets and Pulses
Rice, Wheat, Maize, Sorghum, Cumbu, Ragi, Tenai; Redgram, Greengram, Blackgram, Bengal gram, Cowpea and Soybean

Unit II: Pests of Oilseeds, Cotton, Sugarcane, Green manures, Forage crops and Tobacco
Groundnut, Castor, Sesame, Sunflower, Safflower, Linseed, Jatropa, Mustard; Cotton; Sugarcane; Sunhemp, Sesbania, Daincha, Glyricidia; Lucerne, Subabul; Tobacco

Unit III: Pests of Vegetables, Tubers, Spices and Plantation crops
Brinjal, Tomato, Bhendi, Crucifers, Cucurbits, Moringa, Amaranthus, Potato, Sweet Potato, Tapioca, Yam; Chillies, Onion, Garlic, Ginger, Turmeric, Coriander, Curry leaf, Cardamom, Pepper and Betel vine; Coconut, Areca nut, Coffee, Tea, Rubber, Cocoa

Unit IV: Pests of Fruits and Forest trees
Mango, Sapota, Citrus, Cashew, Banana, Grapevine, Guava, Jack, Custard apple, Pomegranate, Pineapple, Papaya, Aonla, Ber, Tamarind, Apple; Neem, Teak, Sandalwood, Eucalyptus, Casuarina

Unit V: Pests of Flower crops, Ornamentals, Medicinal plants and Stored products
Rose, Jasmine, Crossandra, Chrysanthemum, Tuberose, Cut flowers, Greenhouse crops and Mushroom, Lawn and Turf; Gloriosa, Coleus, Phyllanthus, Periwinkle, Aswagantha, Senna; Stored grains, Dry fruits and Nuts; Locusts and their management.

Current Streams of Thoughts in pest management.

PRACTICAL
Identification of symptom of damage and life stages of important insect, non-insect pests such as mites, nematodes and rodents, various crops and storage – cereals, millets, pulses, oilseeds, cotton, sugarcane, green manures, forage crops, fruits, forest trees, flower crops, plants, Ornamentals, Lawn Medicinal and Stored products.

Assignment
- Collection and submission of 25 insect pests of crops and storage.
- Rearing a minimum of 10 insect pests of crops and storage

THEORY LECTURE SCHEDULE
Distribution, Bionomics, Symptoms of damage and Integrated management strategies for insect, non-insect pests such as mites, nematodes, rodents, birds and other vertebrate pests of
1. Rice – Leaf feeders and borers
2. Rice – Sap feeders
3. Wheat, Maize, Sorghum
4. Cumbu, Ragi, Tenai
5. Redgram, Greengram, Blackgram
6. Bengal gram, Cowpea and Soybean
7. Groundnut
8. Castor, Sesame
9. Sunflower, Safflower, Linseed, Jatropa, Mustard
10. Cotton
11. Sugarcane
12. Sunhemp, Sesbania, Daincha, Glyricidia; Lucerne, Subabul; and Tobacco
13. Brinjal, Tomato
14. Bhendi, Crucifers
15. Cucurbits, Moringa and Amaranthus
16. Potato, Sweet Potato, Tapioca, Yam
17. Chillies, Onion, Garlic, Ginger, Turmeric, Coriander, Curry leaf
18. Mid-semester examination
19. Cardamom, Pepper and Betel vine
20. Coconut, Areca nut
21. Coffee
22. Tea, Rubber, Cocoa
23. Mango, Sapota
24. Citrus, Cashew
25. Banana, Grapevine
26. Guava, Jack, Custard apple, Pomegranate, Pineapple
27. Papaya, Aonla, Ber, Tamarind, Apple
28. Neem, Teak, Sandalwood, Eucalyptus, Casuarina
29. Rose, Jasmine, Crossandra, Chrysanthemum, Tuberose, Cut flowers
30. Green house crops and Mushroom,
31. Lawn and Turf
32. Gloriosa, Coleus, Phyllanthus, Periwinkle, Aswaganta, Senna
33. Stored grains, Dry fruits and Nuts
34. Locusts and their management

PRACTICAL SCHEDULE
Identification of symptoms of damage and life stages of insect, non-insect pests such as mites, nematodes, rodents, birds and other vertebrate pests of
1. Rice
2. Wheat, Maize, Sorghum, Cum, Ragi, Tenai
3. Redgram, Greengram, Blackgram, Bengal gram, Cowpea and Soybean
4. Groundnut, Castor, Sesame, Sunflower, Safflower, Linseed, Jatropa, Mustard
5. Cotton
6. Sugarcane, Sunhemp, Sesbania, Daincha, Glyricidia; Lucerne, Subbul; and Tobacco
7. Brinjal, Tomato, Bhendi,
8. Crucifers, Cucurbits, Moringa and Amaranthus, Potato, Sweet Potato, Tapioca, Yam
9. Mid-semester examination
10. Chillies, Onion, Garlic, Ginger, Turmeric, Coriander, Curry leaf, Cardamom, Pepper and Betel vine
11. Coconut, Arecanut
12. Coffee, Tea, Rubber, Cocoa
13. Mango, Sapota, Citrus, Cashew, Banana, Grapevine
14. Guava, Jack, Custard apple, Pomegranate, Pineapple, Papaya, Aonla, Ber, Tamarind, Apple
15. Neem, Teak, Sandalwood, Eucalyptus, Casuarina, Rose, Jasmine, Crossandra, Chrysanthemum, Tuberose, Cut flowers
16. Green house crops and Mushroom, Lawn and Turf, Gloriosa, Coleus, Phyllanthus, Periwinkle, Aswaganta, Senna, Stored grains, Dry fruits and Nuts
17. Orientation for final examination

COURSE OUTCOMES:
CO 1: Define bionomics, symptoms of damage and integrated management strategies for pests of cereals, millets and pulses
CO 2: Discuss bionomics, symptoms of damage and integrated management strategies for pests of Oilseeds, Cotton, Sugarcane, Green Manures, Forage Crops and Tobacco
CO 3: Explain bionomics, symptoms of damage and integrated management strategies for pests of Vegetables, Tubers, Spices and Plantations
CO 4: Define bionomics, symptoms of damage and integrated management strategies for pests of Fruits, Ornamentals and Medicinal Plants
CO 5: Discuss bionomics, symptoms of damage and integrated management strategies for pests of Tree, Lawn, Stored Products, Mushroom and green house crops
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2. http://agritech.tnau.ac.in/
5. ipm.illinois.edu

PAT 313 PRINCIPLES OF PLANT DISEASE MANAGEMENT (1+1)

LEARNING OBJECTIVES:
- To study the classification, disease surveillance and Molecular detection of plant pathogens
- To study the General Principles and legislative method of plant disease management
- To study about methods eradicating disease causing pathogen
- To study about methods of protection the host from disease causing pathogen
- To learn about Biotechnological approaches for crop disease management.
- To learn about biological control of plant diseases

THEORY
UNIT I: Epidemiology and Diagnosis of Plant Diseases
Classification of plant diseases - Disease triangle, Disease Pyramid - Epidemiology of plant diseases - role of weather factors in disease development and spread - survival and dispersal of plant pathogens - Disease surveillance, assessment and forecasting - Diagnosis of plant diseases - Seed health tests - Chemodiagnosis, Serodiagnosis and Molecular detection of plant pathogens

UNIT II: Exclusion and Avoidance

UNIT III: Eradication
Eradication from Seed and Planting materials - Eradication of diseased plants - Surgery and Rouging - Eradication of Alternate and Collateral host - different methods of eradication - Mechanical, Physical, Chemical and Biological methods.

UNIT IV: Protection
Protection of crops from air-borne, seed-borne, soil-borne and vector-borne plant diseases - Physical methods - soil solarization, Hot water treatment, Incineration, Chemical control of plant diseases - fungicides - Different group of fungicides and antibiotics in plant disease management - Biological control of plant diseases - Plant products and Antiviral principles - method of application - plant protection appliances.

Unit V: Immunization and Biotechnological approaches

PRACTICAL
Survey and Assessment of important plant diseases- Diagnosis of Plant diseases - Classification and grouping of fungicides - Preparation of Bordeaux mixture (1%) and Bordeaux paste (10%), Burgundy mixture and Cheshunt compound - Calculation of fungicides quantity and methods of application of fungicides - Special methods of application. Mass multiplication of Trichoderma viride, Pseudomonas fluorescens and Bacillus subtilis and method of application -Preparation of leaf extracts, oil emulsion of neem and antiviral principles. Cross protection - Tissue culture - meristem tip culture technique. Visit to seed Testing Laboratory and pesticide testing laboratory.

THEORY LECTURE SCHEDULE
1. Plant diseases -Classification based on mode of infection, inoculums built up, spread, symptoms, severity and occurrence - Disease triangle - Role of weather factors in plant disease development.
2. Survival and dispersal of Plant Pathogens
4. Diagnosis of plant diseases - Seed health tests, Chemodiagnosis, Serodiagnosis and Molecular detection of plant pathogens
5. Exclusion - Plant quarantine - Domestic, International and Embargo - Phytosanitary certificate - Quarantine in India. Exotic diseases introduced into India.
6. Role of cultural practices in Plant Disease Management. Different methods of Eradication of Plant Diseases
7. Protection - Physical methods of protection - Chemical fungicides - Definition - Classification - Sulphur and Copper fungicides, Mode of action and Uses
8. Mercury fungicides, Heterocyclic Nitrogen compounds, Organotin, Quinone, Benzene and Miscellaneous compounds, Mode of action and Uses
9. Mid semester examination
10. Systemic fungicides including antibiotics – Classification – Mode of action - Uses. New generation fungicides
11. Methods of application of fungicides: seed treatment, foliar spray, soil drenching and special methods of application
13. Plant Protection appliances – Duster, Sprayers, Soil injector/Soil gun, Granular applicator and slurry seed treater
14. Disease Resistance – Types - Resistant varieties. Methods of developing resistant varieties
15. Mechanisms of resistance- structural and bio chemical resistance in plants
16. Immunization technique- Cross protection against viral and bacterial diseases.
17. Biotechnological approaches in plant diseases management: Tissue culture techniques- meristem tip culture, somoclonal variation and transgenic plant production by genetic engineering.

PRACTICAL SCHEDULE
1. Survey and Assessment of important plant diseases
2. Diagnosis of Plant diseases: Tetrazolium test, Iodine test and ELISA test
3. Seed health tests for diagnosis of seed borne pathogens - dry seed examination, seed washing, Blotter test and ELISA.
4. Classification and grouping of fungicides.
5. Preparation of Bordeaux mixture (1%) and Bordeaux paste (10%), Burgundy mixture, Chaubattia paste and Cheshunt compound.
6. Calculation of fungicides quantity and methods of application of fungicides – Seed (wet and dry) soil, foliar and post harvest dipping.
7. Special methods of application: swabbing, acid delinting, pseudostem injection, capsule application
8. Special methods of application: Corm injection, Paring and Pralinage, root feeding and trunk injection.
9. Mass multiplication of Trichoderma viride and method of application
10. Mass multiplication of Pseudomonas fluorescens and method of application
11. Mass multiplication of Bacillus subtilis and method of application
14. Tissue culture – Production of virus free plants through meristem tip culture technique.
15. Seed Testing Laboratory equipments
16. Pesticide testing laboratory equipments
17. Record certification

COURSE OUTCOMES:
CO 1: Having knowledge of classification, disease surveillance and Molecular detection of plant pathogens
CO 2: Having knowledge of general Principles and legislative method of plant disease management
CO 3: Trained in eradicating disease causing pathogen and Expertise in protection the host from disease causing pathogen
CO 4: Aware of Biotechnological approaches for crop disease management.
CO 5: Knowing about biological control of plant diseases

CO - PO MAPPING MATRIX

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E-BOOKS

E-RESOURCES
1. www.apsnet.org/educenter/illglossary/pages/default.aspx - APS Education center
2. www.croplife.org
3. www.plantdisease.com
4. www.cropprotection.html
AGM 314 ENVIRONMENTAL SCIENCE (2+1)

LEARNING OBJECTIVES:
- Student will develop basic knowledge about the environment and ecology
- Student will develop an attitude of concern for the surrounding.
- Student will know the role of different microbes on leading of areas and advanced biochemical methods in controlling environmental pollution.

THEORY
Unit I - Ecology and Ecosystems

Unit II - Natural Resources and Biodiversity

Unit III- Environmental pollution

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

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

THEORY 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
COURSE OUTCOMES:
CO 1: The students gained basic understanding of different ecosystem concepts, energy flow, food web and interactions.
CO 2: The students gained knowledge on the natural resources like renewable and non-renewable, Biodiversity concept etc.
CO 3: The students would expose to different types of pollutions and their impact on environment and agriculture.
CO 4: The students gained knowledge on management of different types of solid wastes and waste waters.
CO 5: The students would be exposed to the laws and acts in forest with respect to environment.

CO - PO MAPPING MATRIX

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REFERENCES
1. P.D. Sharma, 2009, Ecology and Environment, Rastogi Publications, Meerat, India

SAC 315 SOIL FERTILITY, FERTILIZERS AND MANURES (2+1)

LEARNING OBJECTIVE
- 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

Current Streams of thought.

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 micro nutrients 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 KMnO₄ 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 K_2SO_4
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. Practical Examination.

COURSE OUTCOMES:

CO 1: Students gain a basic knowledge on essential nutrients.
CO 2: Students familiarize with source, forms, mobility, transformation, fixation, losses and availability of macro and micro nutrients.
CO 3: Students acquire themselves with knowledge on manufacturing of fertilizers at industry level.
CO 4: Students acquired practical knowledge on precision farming and organic farming.
CO 5: Students may be visit fertilizer mixing unit.

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E-RESOURCES

1. www.fspublishers.org/ijab/past-issues/IJAB Vol_5_No_3/47.pdf
2. www.springerlink.com/index/IQ11256h8t325054.pdf
Learning Objectives:
- To impart knowledge on basic and applied aspects of plant biotechnology.
- To teach various aspects of plant tissue culture
- To familiarize recent strides in molecular genetics, gene transformation and immunotechnology

Theory
Unit I: Basics of Plant Tissue Culture
Principles in plant tissue culture, Historical achievements, Nutrient media and its composition, Plant growth regulators, Tissue culture techniques-callus culture, suspension culture, anther and ovule culture, embryo culture, meristem tip culture, protoplast culture and somatic hybridization, Regeneration methods - organogenesis and embryogenesis, Synthetic seeds, somaclonal variation, secondary metabolite production, germplasm conservation and application of plant tissue culture in crop improvement.

UNIT II: Basic Molecular Biology
Milestone in DNA research- Structure of nucleic acids, DNA, RNA and its types - Central dogma of life - DNA replication, genetic codes and amino acids, palindrome sequence, shine-dalorgano sequence, transcription, translation or protein biosynthesis, Structure of a gene-Lac Operon concept

Unit-III: Gene cloning
DNA manipulation enzymes - nucleases, ligases, polymerases, modifying enzymes and topoisomerases, Vectors - plasmids and its classifications, Bacteriophage, plasmids, cosmid, BAC, YAC and HAC, Construction of recombinant DNA molecules and Bacterial transformation.

Unit IV: Techniques and analysis of gene expression
Genetic engineering methods- Direct and Indirect methods of gene transfer - Agrobacterium mediated and particle bombardment-Transgenic plants-herbicide, pest and disease resistant, abiotic stress resistant, nutritional enhancement and improved quality, Molecular detection of transgenics-Polymerase chain reaction (PCR) - Real Time PCR, Reverse transcription-PCR (RT-PCR), Hybridization and Blotting-Southern, Northern and Western – ELISA, DNA sequencing methods.

Unit-V: Molecular markers

Practical
Biotech Laboratory organization, safety regulations – basics of reagents and solution preparation- Plant tissue culture media preparation- shoot tip culture (rose) - Meristem culture (tapioca)- Micro propagation of banana - Callus culture – Culturing of E.coli and determination of growth curve- Isolation of bacterial plasmid DNA- Restriction Digestion and Ligation- Competent cell preparation and Bacterial transformation – confirmation of transformation through colony screening - DNA extraction from plants- Quantification of DNA and quality check through Agarose gel electrophoresis - Molecular marker analysis- DNA fingerprinting using RAPD/SSR markers - NTSys-analysis of diversity in crop plants- Visit to tissue culture units /biotech labs in seed industry/Bt cotton field/tissue culture banana fields

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THEORY LECTURE SCHEDULE
1. Plant tissue culture: Basic principles, Concepts, historical achievements
2. Plant nutrient media and its composition, Plant growth regulators
3. Culture types - callus culture and cell suspension culture
4. Meristem tip culture (virus free plants)
5. Protoplast isolation and fusion, somatic hybridization
6. Regeneration methods - organogenesis and embryogenesis
7. Synthetic seeds, somaclonal variation and secondary metabolite production
8. In vitro germplasm conservation
9. Application of plant tissue culture in crop improvement.
10. Milestone in DNA Research
11. Structure of nucleic acids
12. Central dogma of life- DNA replication
13. Aminoacids and their classification and genetic codes, transcription
14. Translation and protein synthesis
15. Structure of a gene
16. Structure of gene and Lac Operon
17. DNA manipulation enzymes: Polymerases, restriction endonucleases and ligases

18. Mid semester Examination
19. Different types of vectors: plasmids, phagemids, cosmids
20. BAC, YAC and HAC
21. Construction of recombinant DNA molecules- Bacterial transformation
22. Direct and indirect gene transfer methods in plants-particle bombardment
23. Agrobacterium mediated gene transfer method
24. Transgenic plants: herbicide, pest and disease resistant, abiotic stress resistant,
25. Transgenic plants: nutritional enhancement and traits for improved quality
26. Molecular detection of Transgenics- Polymerase chain reaction RT-PCR
27. Hybridization and Blotting and ELISA techniques
28. DNA sequencing methods
29. DNA markers - hybridization based markers (RFLP) - PCR based markers: RAPD, SSR, AFLP, and SNPs
30. DNA fingerprinting of crop varieties
31. Development of mapping populations
32. Linkage and QTL analysis
33. Principles, methods and applications of Marker Assisted Selection in crop improvement
34. Applications of Plant Genomics and genome databases

PRACTICAL SCHEDULE
1. Biotech Laboratory organization, safety regulations
2. Instrumentation in DNA laboratory and
3. Units and formula, reagents and solution preparation
4. Plant tissue culture media preparation
5. Meristem culture
6. Micro propagation of banana
7. Isolation of bacterial plasmid DNA
8. Restriction Digestion and Ligation
9. Competent cell preparation and Bacterial transformation
10. DNA extraction from plants
11. Quantification of DNA and quality check through Agarose gel electrophoresis
12. PCR and DNA fingerprinting using SSR markers
13. Blotting techniques in molecular biology
14. Biolistic and *Agrobacterium* mediated genetic transformation in plants
15. NTSys- analysis of diversity in crop plants
16. Visit to tissue culture units /biotech lab in seed industry/Bt cotton field/tissue culture banana field
17. Orientation for final examination

**COURSE OUTCOMES:**

**CO 1:** The student will have knowledge in the basic biotechnological techniques
**CO 2:** The students will be able to do the various sterilization methods
**CO 3:** Will be able to dissect the mother plant or explants for initiation of tissue culture
**CO 4:** The students will be familiarised with the development of pathogen and virus free plants
**CO 5:** Will be able to do basic research involving DNA and marker based technology

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**REFERENCES**


**E-RESOURCE**

http://www.isaaa.org/india/- Briefs
LEARNING OBJECTIVES:

- To make them acquire knowledge on the cultivation aspects of plantation crops, spices and condiments.
- To provide knowledge on basic nursery management practices of plantation crops, spices and condiments.
- To acquaint knowledge on post harvest operations such as grading, packing and value addition.

THEORY

Unit–I: Crop production techniques in fruit crops - I

Unit–II: Crop production techniques in fruit crops – II
Grapes, citrus (sweet orange, mandarin and acid lime), pineapple, jack, pomegranate

Unit–III: Crop production techniques in fruit crops - III
Apple, pear, plum and peach.

Unit–IV: Crop production techniques in plantation crops- I

Unit–V: Crop production techniques in plantation crops - II
Cocoa, cashew, coconut, arecanut, oil palm and palmyrah. Current Streams of thought.

PRACTICAL

Propagation techniques, selection of planting material, varieties, important practices for the fruit crops : mango, banana, grapes, citrus (sweet orange, mandarin, acid lime), papaya, sapota and guava – visit to commercial orchards located at different horticultural cropping zones, post harvest handling of important tropical crops. propagation techniques, selection of planting material, varieties, important practices for the plantation crops: tea, coffee, rubber, cocoa, cashew, coconut, arecanut and oilpalm, study of post harvest handling of important plantation crops and visit to plantation and processing units.

THEORY LECTURE SCHEDULE

1. Scope and importance of fruits – global and national scenario of fruits – classification of fruits –
2. Area, production, export potential and nutritive value
3. Importance of GAP and organic fruit production
Important disorders – Maturity indices and harvest – post harvest management of mango
5. - do - banana
6. - do - papaya
7. - do - sapota
8. - do - guava
9. - do - grapes
10. - do - citrus (sweet orange, mandarin and acid lime)
11. - do - pineapple
12. - do - jack and pomegranate
13. - do - custard apple and aonla
14. - do - apple
15. - do - pear
16. - do - plum and peach

18. Mid Semester examination
19. Production technology of Tea – soil, climate, varieties, nursery and planting, training and pruning
20. Production technology of Tea – water, weed and nutrient management – canopy management and shade regulation – harvest, processing, grading, packing and storage of Tea
21. Production technology of Coffee – soil, climate, varieties, nursery and planting, training and pruning
22. Production technology of Coffee – water, weed and nutrient management – canopy management and shade regulation – intercropping, harvest, processing, grading, packing and storage of coffee
23. Production technology of Rubber – soil, climate, varieties, nursery and planting, training and pruning
24. Production technology of Rubber – water, weed and nutrient management – Canopy management and shade regulation – Intercropping, harvest, processing, grading, packing and storage of Rubber
25. Production technology of Cocoa – soil, climate, varieties, nursery and planting, training and pruning
26. Production technology of Cocoa – water, weed and nutrient management – Canopy management and shade regulation – harvest, processing, grading, packing and storage of cocoa
27. Production technology of Cashew – Soil, climate, varieties, nursery and planting, training and pruning
28. Production technology of Cashew – water, weed and nutrient management – canopy management and shade regulation – intercropping, harvest, processing, grading, packing and storage of Cashew
29. Production technology of Coconut – soil, climate, varieties, nursery and planting
30. Production technology of Coconut – water, weed and nutrient management, intercropping, harvest and post harvest handling
31. Production technology of Areca nut – soil, climate, varieties, nursery and planting, water, weed and nutrient management, intercropping, harvest and post harvest handling
32. Production technology of oil palm – soil, climate, varieties, nursery and planting, training and pruning, water, weed and nutrient management, intercropping, harvest, post harvest handling and processing
33. Production technology of Palmyrah – soil, climate, varieties, nursery, planting, nutrient management – canopy management – harvest and processing
34. Value addition in plantation crops

PRACTICAL SCHEDULE
1. Mango – varietal identification, selection of planting material and important cultural practices viz., training and pruning
2. Sapota – varietal identification, selection of planting material and important cultural practices viz., training and pruning
3. Banana – Varietal identification, selection of planting material and important intercultural practices viz., desuckering and propping
4. Grapes – Varietal identification, selection of planting material and important cultural practices viz., training and pruning practices
5. Citrus – Varietal identification and sub groups in citrus and important cultural practices viz., training and pruning practices
6. Papaya and guava – Varietal identification and important cultural practices
7. Visit to commercial orchards located at different horticultural cropping zones
8. Post harvest handling practices of important tropical fruit crops.
16. Visit to commercial plantations and processing industries
17. Orientation for final examination

COURSE OUTCOMES:
CO 1: Can acquire knowledge on the cultivation aspects of fruits and plantation crops.
CO 2: Can demonstrate important production techniques and diagnose problems in cultivation of fruits and plantation crops.

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REFERENCES
LEARNING OBJECTIVES:
- To impart skill, training, proficiency in decision making
- To enhance ability, to direct, to coordinate and control the work at all levels of management for the farm graduates
- To 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

Unit III: Management Functions II

Unit IV: Functional Areas of Management

Unit V: Entrepreneurship

Current Streams of thought.

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 LECTURE 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

COURSE OUTCOMES:
At the end of the course students will be able to

CO 1: To understand the opportunities in agribusiness sectors
CO 2: To understand the marketing mix, and supply chain management in agribusiness.
CO 3: To know the management functions and how to prepare agribusiness project.

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REFERENCES

AEG 319 FUNDAMENTALS OF SOIL AND WATER CONSERVATION ENGINEERING (2+1)

Learning Objectives:
- 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
recharge. Gully control structures - Check dams - Temporary and permanent. Watershed concept - Integrated approach and management

**Unit IV: Irrigation and drainage**


**Unit V: Wells and Pumps**


**PRACTICAL**


**THEORY 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.
6. Soil Erosion - causes and evil effects of soil erosion - geologic and accelerated erosion
7. Water erosion - causes - erosivity and erodibility - mechanics of water erosion
8. Splash, sheet, rill and gully erosion - ravines - land slides
9. Wind erosion - factors influencing wind erosion - mechanics of wind erosion - suspension, saltation, surface creep
10. Effects of water and wind erosion
11. Erosion control measures for agricultural lands - biological measures - contour cultivation - strip cropping - Cropping systems - vegetative barriers - Windbreaks and shelterbelts - shifting cultivation
12. Mechanical measures - contour bund - graded bund - Broad beds and furrows - basin listing - random tie ridging
13. Mechanical measures for hill slopes - contour trench - bench terrace - contour stone wall
14. Rain water harvesting - insitu soil moisture conservation - Runoff Computation - runoff water harvesting
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.

COURSE OUTCOME
CO1: Student can under gain understanding on basics of soil and water conservation engineering to the undergraduate students
CO2: Can able to define irrigation system and drainage facility for agricultural land

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

VI SEMESTER

AGR 320 CLIMATE CHANGE AND DISASTER MANAGEMENT (1+0)

LEARNING OBJECTIVES:
- The students will gain competence about climate changes, causes and importance of mitigation.
- The students will aware about conservation of various resources and eco system management
- The students will acquire knowledge about natural and manmade disaster management
- The students will know about efforts to mitigate natural disasters
- The students will learn about the disaster rehabilitation

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 NGOs and other organizations.
16. Rehabilitation – Bio shields livelihood options – insurance and compensation
17. Prepadness - EOCs

COURSE OUTCOMES:

CO 1: To gain knowledge about causes of climate change and ways to mitigate it
CO 2: To construct different resource conservation and remediation measures
CO 3: To understand natural and manmade disasters.
CO 4: To apply various mitigation strategies in emergencies
CO 5: To formulate various disaster rehabilitation measures.

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E-RESOURCES


AGR 321 CROP PRODUCTION- II (0+1)

LEARNING OBJECTIVES

- To impart practical aspects of scientific cultivation of any upland crop (maize / sorghum / pearl millet / finger millet / cotton / sunflower / groundnut /sesame) to the students
- To acquire sound knowledge in detailed aspects of cultivation and to make them competent to suggest appropriate technology to the farmers based on the varying soil and climatic conditions.
- To allot a minimum land area and he / she will do all field operations in the allotted land from field preparation to harvest and processing.

IRRIGATED DRY CROP

Ecosystem - Climate and weather - Seasons and varieties of Tamil Nadu, Growth stages of crop. Selection of field - Main field preparation - seed treatment - Application of
manures and fertilizers - Sowing – practicing pre- emergence application of herbicides--
Thinning and gap filling - Estimation of seed rate and plant population - Top dressing -
Weed management - Water management – Pest and disease management - Observation
on nutrient deficiency - Recording growth, yield attributes and yield .Harvesting,
threshing and cleaning the produce - Cost of cultivation and economics.

**PRACTICAL SCHEDULE**
1. Study of ecosystems, climate, weather, seasons and varieties of Tamil Nadu
2. Growth stages of crop and selection of field for crop cultivation.
3. Acquiring skill in seed treatment practices.
4. Study and Practice of main field preparation.
5. Practicing of application of manures and fertilizers and fertilizer calculations.
6. Practicing sowing methods and acquiring skill in pre-emergence application of
   herbicides.
7. Estimation of seed rate and plant population
8. Acquiring skill in gap filling ,thinning  and recording bio metric observations
9. Mid semester examination
10. Study of weeds and weed management.
11. Observation of nutritional deficiency symptoms and corrective measures.
12. Study of water management practices.
13. Observation of insect pests and diseases and their management
14. Estimation of yield and yield parameters
15. Harvesting, threshing and cleaning of the produce.
16. Working out cost of cultivation and economics.
17. Orientation for final examination

**COURSE OUTCOMES:**

**CO 1:** To acquire skill in various agronomic practices that can bring improved
crop yield.

**CO 2:** To gain hands on experience on cultivation of crops individually.

**CO 3:** To understand the different sowing methods for garden land crops

**CO 4:** To apply different seed treatment techniques

**CO 5:** To evaluate different harvesting methods and processing

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**AGR 322: POST HARVEST TECHNOLOGY AND VALUE ADDITION OF FIELD CROPS (2+0)**

**LEARNING OBJECTIVES**

- To gain knowledge on post-harvest technology and its importance for agricultural
  crops
- To acquire perception in processing of various agricultural produce
- To understand the basic concepts in value addition and byproducts

**THEORY**

*Unit-I: Post harvest losses, moisture content and properties*

Post harvest technology – importance-post harvest losses – causes - role of post
harvest technology on food security - moisture content – methods of estimation -
Unit-I: Post-harvest technology, definition, and importance and value

1. Post-harvest technology, definition, and importance and value
2. Food Preservation, role of post-harvest technology in food security
3. Post-harvest losses: Quantitative and qualitative, and causes
4. Moisture content and its good and bad effects on storage of food grains.
5. Methods of estimation of moisture content- direct and indirect methods – wet basis and dry basis.
6. Physical properties of grains – mass, volume, density, bulk density, true density, porosity, surface area and sphericity
7. Threshing concepts, methods of threshing and factors affecting threshing
8. Types of threshers for different crops, combine harvester, paddy baler, threshing efficiency of different threshers
9. Winnowing concepts, winnower types, cleaning, grading and sorting methods and its importance in value addition
10. Types of screens – air screen cleaners - rotary - vibratory
11. Working principles of spiral separator, magnetic separator, Specific gravity separator, colour sorter and inclined belt separator
12. Working principles of maize sheller, husker sheller, hand and power operated groundnut decorticator
14. Different methods of drying- mechanical and chemical methods
15. Grain dryers – different types- batch and continuous, Mixing and non-mixing – LSU drier – solar drier
16. Storage of food grains – factors affecting storage

17. Mid Semester Examination
18. Fumigation-methods of fumigation-dosage of fumigants
19. Traditional storage methods-advantages-disadvantages over other methods
21. Food refrigeration and cold storage construction
22. Rice processing – Parboiling – physio-chemical changes – advantages and disadvantages.
23. Traditional and modern methods of rice parboiling and milling.
24. Understanding various types of milling equipment in modern rice mill
25. Wheat milling – concepts – important machineries used in wheat milling.
26. Pulse milling – concepts - wet, dry and CFTRI methods - equipment used
27. Oil seed processing - methods and machineries – groundnut-gingelly-sunflower
28. Oil seed processing - methods and machineries –coconut - mustard - castor - cotton seed
29. Principles and concepts of solvent extraction process in rice bran oil-refining process
30. Value addition and byproducts utilization of rice and maize
31. Value addition and byproducts utilization of millets and pulses
32. Value addition and byproducts utilization of oilseeds and fibres
33. Value addition and byproducts utilization of tuber crops
34. Processing of sugarcane – Extraction of sugar – Jaggery preparation – preservation and storage

**COURSE OUTCOMES**

CO1: Understand the basics of post harvest losses in agriculture.
CO2: Understand the threshing, cleaning and grading of processing.
CO3: Understand Technologies for Shelling, drying and storage of processed foods.
CO4: Acquire the knowledge on Cereals, pulses and oilseed processing
CO5: Understand the Value addition, byproducts and utilization of products

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**REFERENCE BOOKS**


**E – RESOURCES**

1. www.foodnetbase.com
2. www.fao.org
3. food.oregonstate.edu/security/preserve.html
4. www.postharvest.ucdavis.edu
LEARNING OBJECTIVE

- To acquire knowledge on etiology, symptoms, epidemiology, mode of spread, survival and integrated management of important diseases due to fungi, bacteria, viruses, phytoplasma, phanerogamic parasites and non-parasitic causes of the field and horticultural crops.

THEORY

UNIT I: Diseases of Cereals and Pulses
Rice, Wheat, Sorghum, Maize, Bajra, Ragi, Minor Millets, Pulses and Post-harvest spoilage of grains during storage and their management.

UNIT II: Diseases of Oil Seeds and Cash Crops
Groundnut, Sesame, Sunflower, Castor, Mustard, Cotton, Jute, Sugarcane, Sugar beet, Tobacco and Mulberry

UNIT III: Diseases of fruits & flower crops
Mango, banana, citrus, grapevine, guava, sapota, pomegranate, papaya, jack, pineapple, apple, peach and Post-harvest disease of fruits. Flower crops: Jasmine, rose, crossandra, chrysanthemum, tuberose, carnation, gladiolus and marigold

UNIT IV: Diseases of vegetables crops
Brinjal, tomato, bhendi, cucurbits, crucifers, potato, sweet potato, cassava, beet root, radish, carrot and Post-harvest disease of vegetables.

UNIT V: Diseases of Plantation crops, spices and condiments & medicinal plants
Chillies, cardamom, turmeric, ginger, onion, garlic, pepper, betel vine, Coconut, Tea, coffee, cocoa, rubber and arecanut. Medicinal plants: Gloriosa, stevia, coleus, aloe.

Current Streams of thought.

PRACTICAL

Study of symptoms, host-parasite relationship of important diseases of cereals, pulses, oilseeds, cash crops, horticultural crops, post harvest diseases and their management. Herbarium collection (100 numbers).

THEORY LECTURE SCHEDULE

1. Introduction to field crop diseases and their significance
2. Fungal diseases of rice
3. Bacterial diseases of rice
4. Viral, Phytoplasma and deficiency disorders of rice.
5. Diseases of wheat
6. Diseases of Cumbu and Sorghum
7. Diseases of Minor millets
8. Diseases of pulses
9. Diseases of pulses
11. Diseases of ground nut
12. Diseases of Sesame and Sunflower
13. Diseases of Castor and Mustard
14. Diseases of cotton
15. Diseases of sugarcane
16. Diseases of sugar beet
17. Diseases of Jute and mulberry
18. Diseases of tobacco
19. Diseases of Mango
20. Diseases of Banana
21. Diseases of Citrus
22. Diseases of grapevine
23. Diseases of Guava and sapota
24. Diseases of pomegranate and jack
25. Diseases of Papaya and pineapple
26. Diseases of Apple and Peach
27. Post harvest diseases of fruits
28. Diseases of Jasmine and rose
29. Diseases of Crossandra, chrysanthemum and Carnation
30. Diseases of tuberose, Marigold and gladiolus

31. Mid semester examination
32. Diseases of Brinjal and bhendi
33. Diseases of Tomato
34. Diseases of Cucurbits
35. Diseases of Crucifers
36. Diseases of Potato
37. Diseases of Sweet potato and cassava
38. Diseases of Beet root, carrot and radish
39. Post Harvest diseases of vegetables and their management
40. Diseases of Chillies
41. Diseases of Cardamom and Turmeric
42. Diseases of ginger and onion
43. Diseases of garlic and Pepper
44. Diseases of Betel vine and Coconut
45. Diseases of Tea and Coffee
46. Diseases of Cocoa
47. Diseases of areca nut
48. Diseases of Rubber
49. Diseases of Gloriosa
50. Diseases of Stevia
51. Diseases of Coleus

PRACTICAL SCHEDULE

Study of symptoms and host-parasite relationship of:

1. Diseases of cereals
2. Diseases of cereals and minor millets
3. Diseases of pulses
4. Diseases of storage grains
5. Diseases of oilseeds
6. Diseases of cash crops
7. Field visit
8. Diseases of fruits
9. Diseases of fruits
10. Diseases of flower crops
11. Diseases of vegetables
12. Diseases of vegetables
13. Post-harvest diseases of vegetables
14. Diseases of plantation crops
15. Diseases of spices and condiments
16. Diseases of medicinal plants
17. Field visit, FCI warehouse visit

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

**COURSE OUTCOMES:**

CO 1: To acquire the knowledge on about new emerging diseases of Cereals and pulses

CO 2: Having expertise in identifying and managing diseases in Oil Seeds and Cash Crops

CO 3: Having expertise in identifying and managing diseases in fruits & flower crops

CO 4: Having expertise in identifying and managing diseases in vegetables crops

CO 5: Trained in identifying and managing disease of Plantation crops, spices and condiments & medicinal plants

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2. www.ictv.org
3. www.vivo.library.cornell.edu
4. agridr.in/tnauAgri/eagri50/PATH272/index.html

**SAC 324 CROPS AND PESTICIDE CHEMISTRY AND NANOTECHNOLOGY (2+1)**

**LEARNING OBJECTIVES**

- To impart knowledge on the chemistry and nutritional significance of various field and horticultural crops, as well as on different pesticides, their nature and, mode of action and their fate in soil so as to monitor their effect on the environment.
To throw some light on application of nanotechnology in agriculture.

**THEORY**

**Unit-I Chemistry of Agricultural Crops**

**Unit-II Chemistry of Horticultural Crops, alkaloids and Essential oils**
Chemical composition and nutritional quality of fruits, vegetables, spices, condiments, narcotics and beverages. Post harvest changes in fruits. Chemistry of essential oils and alkaloids - Medicinal and aromatic plants.

**Unit –III Pesticide and its Formulations, Insecticides and Rodenticides**

**UNIT IV - Fungicides, Herbicides, PGRs and Pesticides and Environment**
Fungicides - classification of fungicides - properties, mode of action of inorganic, organic and systemic fungicides - Herbicides - classification - properties - mode of action of inorganic and organic herbicides like phenoxy compounds, substituted ureas, amides, thiocarbamates, triazines, pyridines, imidazolines and sulphonyl ureas. Insecticide Act and Insecticide Rules - Fate of pesticides in soil- Impact of pesticides on environment.

**Unit-V Nanomaterials- Synthesis, Properties and applications in Agriculture**
Nano materials synthesis -Top-down and bottom-up approaches - Physical, Mechanical, Chemical and Biological methods of synthesis of nanomaterials. Physical, Mechanical, optical, magnetic, thermal and electrical properties – Characterization – SEM, TEM, AFM, FT-IR, XRD. Applications of Nanotechnology in Agriculture. **Current Streams of thought.**

**PRACTICAL**
Estimation of moisture, ash, crude protein, P, K and crude fibre and crude fat in plant samples - Determination of reducing and non-reducing sugars in jaggery. Estimation of total solids, ascorbic acid, titratable acidity in fruits. Analysis of pesticides - Physical tests - Bulk density, wettability, suspensibility - Chemical test - Acidity andAlkalinity -Estimation of pesticide residues in soil and pesticidal calculations Visit to pesticide formulation unit and pesticide testing laboratory

**THEORY LECTURE SCHEDULE**
1. Proximate and ultimate constituents of plants.
2. Chemical composition and nutritional quality of cereals - Rice, wheat, maize, sorghum, ragi and pearl millet. Synthesis of starch
3. Chemical composition and nutritional quality of pulses - Red gram, blackgram, greengram, cowpea, lablab and soybean-Protein synthesis
5. Chemical composition and nutritional quality of fibre (Cotton, jute, sunhemp and mesta) and forage crops
6. Chemical composition and nutritional quality of sugar crops- sugarcane and sugar beet -Sucrose synthesis - Post harvest changes in sugarcane
7. Chemical composition and nutritional quality of fruits - Mango, banana, papaya,
8. Chemistry of post harvest changes in fruits.
11. Chemical composition of spices and condiments - Turmeric, chillies, pepper, ginger, onion, garlic, coriander and fenugreek.
13. Essential oils in aromatic plants - Geranium, eucalyptus and Alkaloids in medicinal plants - Cinchona, gloria, colesus and aloevera
15. Pesticide formulations - dusts - wettable powders flowables sprays, granules, fumigants and aerosols - manufacture, characteristics and uses.
16. Pesticide formulations - sprays - emulsion concentrates - water soluble liquids-manufacture, characteristics and uses.
17. Mid semester examination
19. Characteristics, Mode of action and use of synthetic pyrethroids - Deltamethrin, Fenvalerate, Cypermethrin and Lambdacluthrin
24. Systemic fungicides - Characteristics, Mode of action and use of Benomyl, Carbendazim, Metalaxyl, Quinoones, Diclones, Dicarboximides - vincozolin
25. Rodenticides - Characteristics, mode of action and use of Zinc phosphate - Aluminium phosphate -Bromodiolone
27. Characteristics, Mode of action and use of Alachlor, Butachlor, Oxyfluorfen, Fulchloralin, Pendimethalin, Atrazine, Paraquat and Glyphosate. PGRS- Auxins, Gibbrelins, cytokinins, ABA, Ethylene and brassinosteroids
29. Fate of pesticides in soil-Impact of pesticides on the environment.
30. Top down and Bottom up approaches - Physical method, Physical Vapour Deposition (PVD), Etching - Molecular Beam Epitoxy - Sputtering – Lithography -Mechanical synthesis - Ball milling – Types - Mechanical alloying.
32. Chemical Vapour Deposition (CVD) – electro-deposition-thin film. Mechanical, magnetic and thermal properties of nanomaterials.
PRACTICAL SCHEDULE
1. Sampling, processing and storage of plant materials for chemical analysis
2. Estimation of moisture and ash content
3. Preparation of di and tri acid extracts of plant samples
4. Estimation of P and K in triple acid extract
5. Estimation of crude protein
6. Estimation of crude fibre
7. Estimation of crude fat
8. Estimation of reducing and non-reducing sugars in jaggery
9. Estimation of total solids and titrable acidity in fruit samples
10. Colloquium on-Safe handling and use of pesticide - label - storage - mixing - application methods
11. Determination of particle size (sieve test), bulk density in dust formulation, Wettability and suspensibility test in wettable powder formulations
12. Estimation of emulsion stability in EC formulation and acidity or alkalinity of pesticides
13. Estimation of purity of Phosphamidon by Iodometry method
14. Estimation of copper content in copper oxychloride
15. Visit to Pesticide Testing Laboratory, Manufacturing unit and Nanotechnology Laboratory
16. Pesticide residue analysis in soil and pesticide requirement calculations
17. Record certification

COURSE OUTCOMES
CO 1: Students thoroughly understand the chemistry of agricultural crops.
CO 2: Students gain a comprehensive knowledge of the chemistry of horticultural crops, alkaloids and essential oils.
CO 3: Students gain skills in handling of insecticides and their mode of action.
CO 4: Students have an insight on the fungicides, herbicides and their classification, properties and mode of action
CO5: Acquire information about synthesis of nonmaterial and applications of nanotechnology in agriculture

PO-CO MAPPING MATRIX

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REFERENCE BOOKS

E-RESOURCES
1. www.researchgate.net/...Chemical_composition...nutritional.../60b7d52b...
2. www.intechopen.com/.../pesticides-in-the-modern-world-trends-in-pestic...

GPB 325 BREEDING OF FIELD AND HORTICULTURAL CROPS (2+1)

LEARNING OBJECTIVES
- To acquire the knowledge about the breeding of field and horticultural crops
- To impart knowledge on specific breeding techniques followed in crop improvement of various Field crops and Horticultural crops.

THEORY

Unit I: Cereals and Millets
Cereals: Rice, Wheat, Grain and fodder Maize, Grain and fodder Sorghum, Pearl millet, Finger millet, Foxtail millet, Kodo millet, Little millet, Proso millet and Barn yard millet.

Unit II: Pulses, Oilseeds
Pulses: Red gram, Bengal gram, Green gram, Black gram, Grain and fodder Cowpea, Soybean, Horse gram and lab-lab; Oilseeds: Groundnut, Sesame, Mustard, Castor, Sunflower, Safflower, Niger, Coconut and Oilpalm.

Unit III: Fibres, Sugars, Starch.
Fibres: Cotton, Jute and Mesta; Sugars: Sugarcane, Sugar beet; Starch: Potato, Tapioca.

Unit IV: Forages, Fumitories, Masticatories and Green manures
Forages: Guinea grass, Napier, Pearl millet – Napier, Cenchrus sp., Paragrass; Forage legumes: Lucerne, Stylosanthes, Desmanthus, Desmodium, Siratro, Subabul Fumitories: Tobacco, Masticatories; Betelvine; Green manures: Daincha, Sunnhemp.

Unit V: Horticultural crops

PRACTICAL
2. Pulses: Redgram and Bengal gram, Green gram, Black gram and Cowpea; Soybean, Horse gram and Lab-lab.
4. Fibres: Cotton, Jute and Mesta
5. Sugars: Sugarcane and sugar beet
6. Starch: Potato and tapioca
7. Narcotics: Fumitories - Tobacco
8. Masticatories: Betel vine
9. Forages: Guinea grass, fodder Sorghum, fodder maize fodder pearl millet, Pearl millet - Napier hybrids, Cenchrus, Lucerne, fodder cowpea, Desmanthus, desmodium, Stylosanthes, siratro, subabul
11. Horticultural crops: Chilies, bhendi, brinjal, tomato, papaya
12. Horticultural crops: Banana, Mango, Rose, Jasmine, Chrysanthimum

THEORY LECTURE SCHEDULE
2. Cereals: Rice.
4. Cereals: Wheat
5. Cereals: Grain and fodder Maize
6. Cereals: Grain and fodder Sorghum, Pearl millet.
7. Cereals: Finger millet, Foxtail millet, Kodo millet,
8. Cereals: Little millet, Proso millet and Barn yard millet.
9. Pulses: Redgram, Bengal gram
10. Pulses: Greengram, Blackgram, Grain and fodder Cowpea
11. Pulses: Soybean, Horsegram, lab-lab
12. Oilseeds: Groundnut
13. Oilseeds: Gingelly and Mustard
14. Oilseeds: Castor
15. Oilseeds: Sunflower
16. Oilseeds: Safflower, Niger
17. Oilseeds: Coconut and Oilpalm
18. Mid Semester Examination.
19. Fibres: Cotton
20. Fibres: Jute, Mesta
21. Sugars: Sugarcane, Sugar beet
22. Starch: Potato, Tapioca
23. Fumitories: Tobacco, Masticatories - Betelvine
24. Forage grasses: Guinea grass, Napier, Pearl millet – Napier, Cenchrus sp., Paragrass
25. Forage legumes: Lucerne, Stylosanthes, Desmanthus,
26. Forage legumes: Desmodium, Siratro, Subabul
27. Green manures and green leaf manures: Daincha, Sunnhemp,
28. Vegetables: Bhendi,
29. Vegetables: Tomato
30. Vegetables: Brinjal,
31. Vegetables: Chilli
32. Fruits: Papaya, Banana
33. Fruits: Mango.
34. Flowers: Rose, Jasmine, Chrysanthimum

PRACTICAL SCHEDULE
1. Rice
2. Wheat and Maize.
4. Redgram and Bengal gram
5. Green gram, Black gram and Cowpea; Soybean, Horse gram and Lab-lab.
7. Safflower, Niger, Mustard. Castor, Coconut and Oilpalm
8. Cotton, Jute and Mesta.
10. Guinea grass, fodder Sorghum, fodder maize,
11. Fodder pearl millet, Pearl millet – Napier hybrids, Cenchrus.
12. Lucerne, fodder cowpea, Desmanthus
13. Desmodium, stylo, siratro, subabul
15. Chillies, bhendi, brinjal, tomato, papaya, mango, banana
16. Rose, jasmine, chrysanthemum

17. Orientation for final examination

COURSE OUTCOMES:
CO 1: The students will be able to identify putative parents and wild relatives
CO 2: Will be able to differentiate the crops based on its floral biology
CO 3: The students will be in a position to identify and understand the methodologies employed for self, cross and vegetatively propagated crops
CO 4: The students will have enchaned knowledge in the current trends in plant breeding.

CO-PO MAPPING MATRIX

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REFERENCE BOOKS

FURTHER READING

E-REFERENCES
1. www.cimmyt.org
2. www.nbpgr.nic.in
3. www.irri.org
4. www.icrisat.org

HOR 326 PRODUCTION TECHNOLOGY OF VEGETABLES, SPICES, FLOWERS AND LANDSCAPE GARDENING (3+1)

LEARNING OBJECTIVES
- To provide knowledge on cultivation of vegetables, spices and flower crops.
- To teach them techniques in precision farming for horticultural crops.
- To enable better understanding of basic principles and practices of landscape gardening.

THEORY
Unit–I: Crop production techniques in vegetable crops – I

Unit–II: Crop production techniques in vegetable crops – II
Cabbage, cauliflower, carrot, beet root, radish, tapioca, potato and sweet potato, moringa, amaranthus.

Unit–III: Crop production techniques in spice crops

Unit–IV: Crop production techniques in flower crops

Unit – V: Landscape gardening and designing
Landscape gardening – scope, importance and opportunities – history of gardening in India – elements and principles of landscape design – types of gardens – styles of garden – softscape elements in garden – hardscape elements in garden turf – establishment and maintenance – garden designing softwares and tools – Landscaping for specific areas. **Current Streams of thought.**

**PRACTICAL**


**THEORY LECTURE SCHEDULE**

1. Classification of vegetables
2. Scope, importance and constraints of vegetable growing in India and Tamil Nadu
3. Types of vegetable growing and cropping systems.
22. Mid-semester examination
23. Ginger
24. Seed spices – Coriander
25. Seed spices – Fenugreek, fennel
26. Trees spices – Clove
27. Importance, scope and constrains of commercial floriculture industry
28. Area, production and export potential of commercial flowers
30. Rose
31. Chrysanthemum
32. Tuberose and crossandra
33. Nerium and marigold
34. Landscape gardening – Definitions, scope, importance and opportunities – history of gardening
35. Styles and types of gardening
36. Principles and elements of landscape design.
37. Concepts in landscape designing
38. Growth habit, foliage and flower features, pruning, training and growth regulation of softscape elements – ornamental trees, shrubs, hedges and edges
39. Growth habit, foliage and flower features, pruning, training and growth regulation of softscape elements – creepers, climbers, annuals, topiary, trophy and carpet beds - indoor plants and plants for special purposes – palms, cacti, succulents, ferns and rosarium
41. Turf establishment and maintenance
42. Different hardscape elements in gardens and their position, establishment, materials required and maintenance – planter boxes, pavements, decks, garden benches and fences - fountains, cascades, jacuzzi, gazebo, statues and birds bath and water proofing techniques
43. Garden plan – elevation diagram
44. Garden plan - perspective diagram.
45. Layout of garden designs – matching the plant materials to design criteria – symbols in garden designing – garden designing softwares and tools
46. Landscape design for specific areas – institutions, industries, residents, hospitals, theme parks, IT parks and corporate
47. Landscape design for specific areas – Planting avenues, high way, traffic islands, dam sites and play grounds

PRACTICAL SCHEDULE
1. Identification and description of varieties of vegetables
2. Nursery management of vegetable crops
3. Layout of kitchen garden.
5. Practices in use of plant growth regulators in vegetables
6. Identification of physiological disorders in vegetable crops and remedial measures
7. Maturity indices of vegetable crops
8. Post harvest handling and seed production techniques in vegetable crops
9. Identification, description of varieties and propagation techniques in spices
10. Identification and description of species and varieties of loose flowers
11. Study of propagation and pruning of flower crops
12. Garden components, basic functions and utility
13. Identification and description of softscape elements
14. Identification and description of hardscape elements
15. Indoor gardening
16. Turf establishment and maintenance
17. Principles of landscape drawing and fundamentals of manual drawing – Plan view, elevation and perspective diagram

COURSE OUTCOMES:
CO 1: Students will be able to understand the production technology of vegetables, spices and flower crops, its advances and precision horticulture.
CO 2: The student will gain skill in managing precision horticulture units.
CO 3: Acquire information about the gardening and landscaping in urban and semiurban areas.

PO-CO MAPPING MATRIX

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REFERENCE BOOKS

E – RESOURCES
1. http://www.sus-veg-thai-de/
2. http://www.spices.rec.in
3. www.iisr.org
4. www.gardenadornment.com
5. www.toptropicals.com
6. www.bestgarden.net
LEARNING OBJECTIVES

- To aim at imparting knowledge on principles of finance, banking and cooperation, and farm financial analyses.
- To understand the functions of various institutions involved in farm financing and different crop insurance products implemented in India.

THEORY

Unit I: 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 II: 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 III: 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 IV: Banking and Insurance


Unit V: 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 Vaithiyanathan 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. Current Streams of thought.

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 LECTURE SCHEDULE
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 Vaithiyathan 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.

**Orientation for final examination**

**COURSE OUTCOMES:**

- **CO1:** To understand the functions of various institutions involved in farm financing.
- **CO 2:** To know the principles of credit, 5c’s, 3R’s and time value of money.
- **CO 3:** To gain knowledge on microfinance, role of SHG’s, NGO.
- **CO 4:** To understand risk mitigating measures like agricultural insurance schemes available for the benefits of famers.
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REFERENCE BOOKS


AEX 328 EXTENSION METHODOLOGIES AND TRANSFER OF AGRICULTURAL TECHNOLOGY (1+1)

LEARNING OBJECTIVES

- To impart knowledge to the students on different extension methods and approaches used for transfer of agricultural technology.
- 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, Shanon-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.

Current Streams of thought.
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 LECTURE 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

COURSE OUTCOMES:
At the end of the course students will be able to

CO 1: Understand extension methods and approaches used for transfer of agricultural technology.

CO 2: Understand various models of communication and communication barriers.

CO 3: Gain expertise on e-Extension and Agricultural journalism

CO 4: Prepare and use of different extension teaching methods.

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REFERENCE BOOKS

E-RESOURCES
1. www.i4d.com
2. www.panasia.org
3. www.joe.org
LEARNING OBJECTIVE

- To make the students understand the importance and principles involved in Quality seed production.

THEORY

Unit I - Introduction to seed and seed quality

Seed - definition - Seed structure - Seed development and maturation - Germination - phases of seed germination - Dormancy - types of seed dormancy - breaking treatments - Seed quality characteristics - significance - Causes of varietal deterioration and maintenance - Genetic and agronomic principles of seed production - Factors affecting quality seed production. Classes of seed - Generation system of seed multiplication in seed supply chain. Seed replacement rate and varietal replacement - Seed Multiplication Ratio - Seed renewal period

Unit II - Seed production techniques of Agricultural and Horticultural crops

Methods of seed production of varieties and hybrids - seed production techniques of rice, sorghum, maize and bajra varieties and hybrids - redgram, black gram varieties and hybrids - blackgram and greengram varieties - groundnut and sesame varieties - sunflower, castor and cotton varieties and hybrids. seed production techniques of tomato, chillies, brinjal, bhendi, onion, snakegourd, bittergourd, pumpkin, ashgourd, ribbedgourd and bottlegourd varieties and hybrids.

Unit III - Post harvest seed handling techniques

Threshing - methods - Drying - methods of seed drying - advantages and disadvantages - Seed processing - definition - importance - Seed cleaning and grading - upgrading - equipments - working principles - Seed treatments and containers - Mid storage treatments - importance - types - Seed inviguration techniques - seed hardening - seed fortification - seed priming - Seed enhancement techniques - seed coating - seed pelleting.

Unit IV - Seed Legislation and certification


Unit V - Seed quality testing, Storage and Marketing

Seed testing - importance - seed sampling - mixing and dividing - seed quality assessment (seed moisture content, physical purity, ODV, seed germination test, quick viability test, vigour tests and seed health test) - Pre and post quality regulation system (grow out test - molecular markers). seed storage - stages - factors affecting seed longevity - Types of seed storage. Seed marketing - Seed demand forecasting - Marketing organization - structure - pricing policy, factors influencing seed marketing. Current Streams of thought.

PRACTICAL

Study of seed structure of agricultural and horticultural crops - Seed invigouration techniques - hardening and priming - Seed enhancement techniques - seed coating and pelleting - Seed upgradation technique in rice - Acid delinting in cotton - Hybrid seed production techniques - Detasseling in maize - emasculation and dusting in cotton and vegetables - supplementary pollination in rice and sunflower - Physiological and harvestable maturity indices - Fruit grading - Seed extraction methods in vegetables -
tomato, brinjal, chillies, bhendi and cucurbits - Seed cleaning and grading techniques - Detection of seed mechanical injury - Seed sampling - Types of sample (service sample - certified sample - official sample) - seed sampling procedures - mixing and dividing - Seed moisture content estimation - Physical purity analysis - Seed germination test - Seedling evaluation - Viability test - Vigour tests - Seed health - Grow out tests.

THEORY LECTURE SCHEDULE
1. Seed - definition - seed structure - Seed development and maturation
2. Germination - phases of seed germination – Factors affecting seed germination.
3. Dormancy - types of seed dormancy - dormancy breaking treatments.
4. Seed quality characteristics – significance- Factors affecting quality seed production
5. Causes of varietal deterioration and maintenance - Genetic and agronomic principles of seed production.
6. Classes of seed - Generation system of seed multiplication in supply chain - Seed replacement rate and varietal replacement - Seed Multiplication Ratio - Seed renewal period
7. Methods of seed production of varieties and hybrids of rice and bajra
8. Methods of seed production of varieties and hybrids of sorghum and maize
9. Methods of seed production of varieties and hybrids of redgram and black gram
10. Methods of seed production of varieties and hybrids of groundnut and sesame.
11. Methods of seed production of varieties and hybrids of sunflower and castor.
12. Methods of seed production of varieties and hybrids of cotton
14. Methods of seed production of varieties and hybrids – bhendi and onion
15. Methods of seed production of varieties and hybrids - snakegourd, bittergourd, pumpkin.
17. Mid semester examination
19. Seed processing - definition - importance - sequence - seed cleaning and grading - equipments (cleaner cum grader)
20. Seed upgrading - equipments (colour sorter, Indented cylinder separator, specific gravity separator, spiral separator, magnetic separator - working principles
21. Seed treatment - importance - types.
22. Seed invigouration techniques - seed hardening - seed fortification - seed priming - Seed enhancement techniques - seed coating - seed pelleting.
23. Introduction and importance of seed quality regulation - The Seeds Act and Rules
26. Field inspection, field counts, field and seed standards- LFR- Downgrading- Post harvest inspection and seed quality assurance.
27. Seed testing - importance - Seed sampling procedures - mixing and dividing.
28. Seed quality assessment (seed moisture content, physical purity, ODV).
29. Seed germination test and quick viability test.
30. Vigour tests and seed health test.
31. Pre and post quality regulation system (grow out test).
32. Seed treatments and containers - Mid storage treatments - Storage godown sanitation
33. Advances in seed storage techniques - ultra dry storage, modified atmospheric seed storage and cryopreservation.
34. Seed marketing - seed demand forecasting - marketing organization - structure - pricing policy.

**PRACTICAL SCHEDULE**
1. Study of seed structure of agricultural and horticultural crops.
2. Practicing seed invigouration techniques - seed hardening and seed priming seed coating and seed pelleting
3. Seed upgradation technique in rice - Acid delinting in cotton.
4. Detasseling techniques for hybrid seed production in maize.
5. Emasculation and dusting techniques for hybrid seed production in cotton and vegetables.
6. Hybrid seed production techniques - supplementary pollination in rice and sunflower.
7. Determination of physiological and harvestable maturity indices.
8. Fruit grading and seed extraction methods in vegetables - tomato, brinjal, chillies, bhendi and cucurbits.
9. Seed cleaning and grading techniques and detection of seed mechanical injury.
10. Seed sampling - types of sample - service sample-certified sample - official sample - sampling - mixing and dividing.
11. Seed moisture content estimation.
12. Physical purity analysis.
13. Seed germination test and seedling evaluation.
14. Practicing viability test and vigour tests.
15. Seed health assessment test.
16. Grow out test
17. **Orientation for final examination**

**COURSE OUTCOMES:**
- CO 1: Acquire knowledge on Seed quality characteristics, significance and Genetic and agronomic principles of seed production
- CO 2: Understand the Seed production techniques of Agricultural crops. Post harvest seed handling techniques
- CO 3: Understand the Seed production techniques of Horticultural crops. Post harvest seed handling techniques
- CO 4: Understand the Seed Legislation and certification procedures and Seed quality testing, Storage and Marketing

**CO-PO MAPPING MATRIX**

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OPC 001: OPTIONAL COURSES

OPC AGR 001: INDIGENOUS TECHNOLOGY IN AGRICULTURAL PRODUCTION (1+1)

LEARNING OBJECTIVES
- Aims at incurring indigenous knowledge and experiencing ITK technologies for various field crops.
- To provide experience on ITK’s based biological preparations.
- To cover various aspects of indigenous technologies with relevance to its advantages, importance in the present world scenario and its impact on soil and environment.

THEORY
Unit-I: Concept of ITK’s
ITK – Definition – Concept – Need – Importance – Types of ITK’s – ITK belief – Centre disseminating ITK’s – International, National and State level. ITK practices followed in different parts of Tamil Nadu and India.

Unit-II: ITK’s Technology
ITK in predicting rainfall – Water source identification – Preparatory cultivation.

Unit-III: ITK’s in Sustainable Agriculture
ITKs and their role in sustainable Agriculture – ITK’s in growth promoters – Biofortified Farming Systems – Analysis, implication and issues – Indigenous Post harvest processing.

Unit-IV: ITK’s Conceptual Model
Sources of ITK, special features of ITK, ITK in organic farming – Conceptual model for farming with local knowledge and modern technology – Good Agricultural practices (GAP) – Concept and prospects.

Unit-V: ITK’s Crop Production Technology
ITK technologies for important crops – rice, maize, millets, pulses, groundnut, gingelly, sunflower, cotton and sugarcane. Traditional crop varieties – salient features.

Current Streams of thought.

PRACTICAL

THEORY LECTURE SCHEDULE
1. ITK – Definition, concept, need and Importance
2. Types of ITK’s – ITK belief – Centre disseminating ITK’s
3. International, National and State level. ITK practices followed in different parts of Tamil Nadu.
4. ITK in predicting rainfall
5. ITK in predicting water source identification, preparatory cultivation.
6. ITK practices in seeds and seed treatment
8. ITK’s and their role in sustainable Agriculture
9. **Mid semester examinations**
10. ITK’s in growth promoters, biofortified Farming Systems
11. ITK’s analysis, implication and issues – Post harvest processing.
12. Sources of ITK, special features of ITK, ITK in organic farming
13. Conceptual model for farming with local knowledge and modern technology
14. Good Agricultural practices (GAP), Concept and prospects.
15. ITK technologies for important crops Rice, Maize, Millets and Pulses
16. ITK technologies for groundnut, gingelly, sunflower, cotton and sugarcane.
17. Traditional varieties and salient features.

**PRACTICAL SCHEDULE**
1. Collection and study of traditional crop verities
2. Collection of indigenous technologies
3. Preparation of indigenous technologies for various field crops
4. Methods of predicting rain fall and wind
5. Indigenous tools and implements
6. Indigenous farming system practices
7. Developing a biofortified farming model
8. ITK’s for improving soil fertility
9. ITK’s weed management
10. ITK’s pest and disease management
11. ITK for identification of water resources
12. ITK’s in growth promoters
13. ITK’s for seed treatment
14. ITK’s technology for storage of food grains
15. ITK’s technologies for recycling of Agricultural wastes
16. Visit to nearby farmers field and ITK’s centers
17. Record Certification

**COURSE OUTCOMES**

**CO1:** To execute the concepts, need and importance of indigenous knowledge in agriculture

**CO2:** To learn indigenous knowledge in predicting rainfall, crop production techniques, pest and disease management

**CO3:** To analyse situations to blend indigenous knowledge with modern technologies in farming

**CO4:** To develop sustainable indigenous farming practices with modern technologies

**CO5:** To improvise technology for seed treatment, storage of food grains recycling of agricultural wastes

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**REFERENCE BOOK**
LEARNING OBJECTIVES

- To practice the students for bee keeping and silkworm rearing
- To formulate biopesticides and marketing strategies
- To impart knowledge on urban pest control and insect farming.

THEORY

Unit – I: Commercial Apiculture
Scope, importance and Benefits of Apiculture -Traditional Beekeeping - Modern Beekeeping - Urban or backyard beekeeping - Role of Central Honey Bee Research & Training Institute - Basic requirements for starting beekeeping - Economics of small scale and large scale beekeeping - Establishment of Apiary - Installation of various hive models usage of various accessories - Value addition Production and Storage of quality honey, wax, pollen and royal jelly - Apitherapy. Marketing of Bee products - Pollination service.

Unit – II: Commercial Sericulture

Unit –III: Commercial production of Biopesiticides
Novel methods of collection, preservation and identification of important predator and parasitoids. Commercial production and field release techniques of predators and parasitoids. Identification and commercial production of important entomopathogens -Quality control and formulation of entomopathogens.

Unit–IV: Commercial urban pest management
Scope and prospects of Urban Pest Management - Economic and public health importance of pests in residential areas - Commercial management of termites, mosquitoes, house flies, cattle pests and rodents. Essential equipments and their usage in urban pest management. Formulations of pesticides and traps used in urban pest management. Calibration calculations for application of pesticides per unit area. Establishing procedures for commercial Pest control and Fumigation services for employment. Laws and regulations in urban pest management.

Unit– V: Commercial Insect Farming
Introduction to edible insects and Promoting Entomophagy - Insect Usage as an Industrial Animal Feed/Feed Ingredient. Successful case histories and their farming-market possibilities.

THEORY SCHEDULE

1. Scope, importance and Benefits of Apiculture. Traditional, Modern and Urban or backyard Beekeeping. Role of Central Honey Bee Research & Training Institute. Basic requirements for starting beekeeping - Economics of beekeeping- Economics of commercial small scale and large scale beekeeping.
3. Marketing of Bee products - Marketing Honeycomb and Honey, Honey extraction, Processing, costing, Packaging - Marketing. Bee wax rendering,

4. Scope and importance of sericulture and Ericulture as allied industry in India - Contribution of Sericulture and Ericulture to rural economy, GDP and Export. Cost of production of mulberry for rearing 100 dfls - Land preparation to harvest and labour requirement per acre.


7. Cost of production of Eri cocoons and its marketing.

8. Novel methods of collection, preservation and identification of important predator, parasitiods and pathogens.

9. **Mid semester Examination**

10. Novel methods of collection, preservation and identification of important predator, parasitiods and pathogens formulation and marketing.

11. Compatibility of bio pesticides, botanical and chemical pesticides.

12. Bio pesticides for important agricultural and Horticultural crops.


14. Termite proofing in buildings both under construction and existing. Establishing procedures for commercial Pest control and Fumigation services for self employment. Laws and regulations in urban pest control.

15. Introduction to edible insects - History of entomophagy - Edible insects farming and concepts

16. Insect farming for feed and human consumption

17. Food Safety in Insect Based Foods - Insects and their connection to Food Allergy

**PRACTICAL SCHEDULE**

1. Installation of Hives - Production and Storage of quality honey

2. Marketing of Bee products and visit to commercial apiculture unit

3. Working out cost benefits ratio of Apiary

4. Preparing bankable bee keeping project.

5. Cost of production of mulberry for rearing 100 dfls

6. Identifying commercially important silkworm races.

7. Working out Cost Benefit ratio for CB, CSR breeds and eri silkworm.

8. Identification Commercial production techniques of important predators and parasitoids.

9. Commercial production of Entomopathogens


11. Establishment of urban pest management Unit

12. Practicing various equipments used for urban pest management and calibration calculation including for termite proofing.

13. Working out cost benefit ratio of urban pest management unit.
14. Establishment of Insect rearing facility – Insect specimen & their requirements
15. Semi-cultivation of edible insects
16. Working out cost benefit ratio in using poultry insects as feed.
17. Visit to commercial Apiculture, Sericulture and Bio-pesticide production units.

COURSE OUTCOMES:
CO 1: Development of Apiary and practice bee keeping
CO 2: Practice silk worm rearing and marketing
CO 3: Formulate biopesticides and marketing
CO 4: Importance of household pest control and using various related techniques
CO 5: Understand various techniques for insect farming.

CO-PO MAPPING MATRIX

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REFERENCE BOOKS
5. Sengupta K. 1989. A guide for bivoltine sericulture:, Director, CSR & TI, Mysore
LEARNING OBJECTIVE

- To study the novel approaches and recent developments in crop disease management

THEORY

Unit I: Conventional Plant Disease Management

Unit II: New generation chemical/fungicides

Unit III: Biological approaches in Plant Disease Management
Biological control – fungal and bacterial bio-formulations – mass multiplication – methods of applications – compatibility with other agrochemicals – Biological control of post harvest diseases of fruits and vegetables – Suppressive soil – Biochemical changes as induced by biological products.

Unit IV: Biotechnological approaches for plant disease management

Unit V: Botanicals in plant disease management
Botanicals with antimicrobial properties – AVP – improved extraction methods, characterization and synthesis of secondary plant compounds – Bioassay for antifungal, antibacterial property of botanicals – Biochemical changes as induced by plant products.

Current Streams of thought.

PRACTICAL

THEORY LECTURE SCHEDULE
1. Identification of plant diseases – symptoms, biochemical and molecular
2. Cultural and physical methods of disease management
3. Prophylaxis, avoidance, exclusion, eradication, protection and resistance
4. Quarantine legislation - Plant quarantine order 2003 – APEDA, seed act – SPS under WTO and TRIPS, ISTA, EPPO, OECD
5. New generation chemical/fungicides
6. Characteristics of an ideal fungicide, Antibiotics – mode of action- Biochemical changes as induced by chemical fungicides
7. Fungicide formulations – Role of stickers, adjuvants and spreaders
9. Mid semester examination
10. Biological control – fungal and bacterial bio-formulations – mode of action-Biochemical changes as induced by bioagents
11. Compatibility with other agrochemicals – Biological control of post harvest diseases of fruits and vegetables – Suppressive soil
12. Immunity - resistance – Host defense mechanism – Types of resistance, resistance genes in plants
13. Biotechnological tools – molecular approach for plant disease management – Meristem tip culture – Cross protection
14. Transgenic plants– GM crops
15. Botanicals with antimicrobial properties – AVP
16. Improved extraction methods of botanicals, characterization and synthesis of secondary plant compounds
17. Characterization and synthesis of secondary metabolites – Bioassay to study mode of action of metabolites - Biochemical changes as induced by plant products

PRACTICAL SCHEDULE
1. Study of Symptoms, biochemical and molecular methods to identify the plant diseases
2. Diagnostic tests for identification of plant diseases
3. Disease management using Cultural and physical methods
4. New generation fungicides – Fungicide formulations, methods of applications
5. Antibiotics – Phytotoxicity and compatibility of fungicides and methods of application
7. Mass multiplication of Trichoderma viride
8. Mass multiplication of Pseudomonas fluorescens and Bacillus subtilis
9. Good laboratory practices for agrochemical laboratories
10. Molecular approach for plant disease management - Biotechnological tools –
11. Meristem tip culture
12. Botanicals - extraction methods - AVP preparation
14. Field / laboratory visit
15. Biochemical changes as induced by biological agents/products and botanicals
16. Biochemical changes as induced by chemical fungicides
17. Orientation for final examination

COURSE OUTCOMES
CO 1: Understand the conventional methods in Plant Disease Management
CO 2: Practice the use of new molecules of fungicides and their action on diseases management.
CO 3: Developed the skill on molecular techniques in plant disease management
CO 4: Understand the biological and botanical methods and their utilization in plant disease management
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REFERENCE BOOKS


OPC AGM 001 ADVANCED MICROBIAL BIOTECHNOLOGY (1+1)

LEARNING OBJECTIVES

The subject is designed to impart knowledge on
- The fermentation concepts and types
- Industrial production of microbial inoculants and dairy products
- Utilization of microorganisms for bioremediation and waste water treatment

THEORY

Unit-I

Brief history of fermentation - General concepts and Types. Applications of fermentation; Range of fermentation process- Microbial biomass, enzymes, metabolites, recombinant products, transformation process; Culture media - types, components and formulations. Sterilization: Batch and continuous sterilization.

Unit-II

Microbial cells as products for commercial use; Selection and Improvement of Strains for biomass production; Single cell protein - microorganisms and raw materials used as substrate; nutritive value and uses of SCP.

Unit-III

Microbial inoculants - Production of Rhizobium, Azotobacter, Azospirillum and cyanobacteria Phosphate solubilizing bacteria; mycorrhiza; plant growth promoting
rhizobacteria (PGPR); Quality control of bio inoculants; Cyanobacterial and algal fuels;

**Unit-IV**

History and scope of fermented foods; Fermented foods of vegetables and fruits- Cereal and legume based fermented products. Microbiology of Fermented Dairy Products Buttermilk; Yogurt (probiotics, prebiotics, symbiotics); Properties and beneficial effects of probiotic and prebiotic. Fermented meat and fish products; Fermented beverages

**Unit-V**

Bioremediation - process and organisms involved; Water treatment- primary and secondary waste water treatments; Composting of solid wastes, Aerobic and anaerobic digesters: Microbial leaching of ores. A brief account of biodegradable plastics and super bug. **Current Streams of thought.**

**PRACTICAL**

Design and Preparation of Media for Bioprocesses; Isolation of industrially important microorganism from different sources using specific substrates; Production of ethanol from sucrose by yeast; To study the design of fermenter and its working; Production of extracellular enzymes; Ethanol production using immobilized yeast culture.

Isolations of nitrogen fixating bacteria; nitrogen fixing activity, indole acetic acid (IAA), siderophore production etc; Bioinoculant production and quality control. Isolation of xenobiotic degrading microorganisms, Anaerobic waste water treatment of industrial dyes and effluent; Estimation of BOD and COD levels of different water systems; Bacteriological analysis of water by presumptive, confirmatory and completed tests.

**THEORY LECTURE SCHEDULE**

1. History of fermentation and general concepts. Types of fermentations- Aerobic and anaerobic fermentation, Submerged and solid state fermentation; Factors affecting submerged and solid state fermentation; Substrates used in SSF and its advantages;
2. Applications of fermentation; Range of fermentation process- Microbial biomass, enzymes, metabolites-Primary and Secondary, recombinant products, transformation process;
3. Microbial cells as products for commercial use; Bacterial culture (lactic acid cultures; propionic acid culture; acetic acid bacteria);
4. Selection and Improvement of Strains for biomass production;
5. Single cell protein: microorganisms used; raw material used as substrate; condition for growth and production; nutritive value and uses of SCP and Baker’s yeast;
6. Microbial inoculants- Selection and establishment of nitrogen fixing bacteria. Phosphate solubilizing bacteria; mycorrhiza; plant growth promoting rhizobacteria (PGPR);
7. Mass Production of bio inoculants (bacterial and mycorrhizal biofertilizers)
8. Quality control of bio inoculants;
9. Cyanobacterial and algal fuels;
10. History and scope of fermented foods; Importance of fermented foods; health aspects of fermented foods. Organisms used for production of fermented food products; Fermented foods of vegetables and fruits- sauerkraut, pickles, Kimchi; and Cereal and legume based fermented products- bread, Soya Sauce, Koji, Tempeh, Miso, Natto, Tofu, Angkkak; Indian products like Idly, Dosa, Vada.
11. Microbiology of Fermented Dairy Products (Product Characteristics, Processing, 
Starter culture, Growth, Genetics). Buttermilk; Yogurt (probiotics, prebiotics, 
synbiotics); Acidophilus Milk; Bifidus Milk, Bulgarian milk; acidophilus 
milk; Kefir; Kumiss; Cheeses;
12. Fermented meat and fish products;
13. Fermented beverages- Microbial fermentation of tea, coffee and cacao. 
Production of different types of wine and beer;
14. Bioremediation- process and organisms involved; Microbes involved in aerobic 
and anaerobic processes in nature;
15. Water treatment Primary and secondary waste water treatments
16. Composting of solid wastes,
17. Microbial leaching of ores- process, microorganism’s involved and metal 
recovery with special reference to copper and iron. A brief account of 
biodegradable plastics and super bug.

PRACTICAL SCHEDULE
1. Isolation and characterization (morphological and biochemical) of Lactic Acid 
Bacteria (LAB)
2. Thermal Death rate and Thermal Death time
3. Mass production of bacterial bio inoculants
4. Mass production of algal bio inoculants
5. Mass production of mycorrhizhal biofertilizers
6. Screening of microbes for production of industrially important antibiotics
7. Purification of antimicrobial metabolites from a microbe
8. Yoghurt Fermentation
9. Cheese Fermentation
10. Production of alcoholic beverages
11. Production and characterization of emulsifiers by microbes
12. To study the various methods of biomass measurement
13. Bio hydrogen production
14. Production of extracellular enzymes

COURSE OUTCOMES:

CO 1: Students gained knowledge on the basic and applied aspects of Fermentor 
design and operation
CO 2: Students gained knowledge on the historical developments and microbial 
inoculants
CO 3: Students exposed to practical hands on experience in the basic skills 
employed in microbiological laboratories, food and dairy products
CO 4: Students thoroughly exposed to modern approaches in bioremediation
CO 5: Students gained knowledge on biodegradable plastic and superbugs.

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OPC SAC 001- FARM ADVISORY ON SOIL HEALTH, WATER QUALITY AND PLANT NUTRITION (1+1)

LEARNING OBJECTIVES
- To impart practical knowledge on soil related constraints, irrigation water quality appraisal guidelines & their efficient management.
- Diagnosis of plant nutrient related problems, soil & water pollution and their impact on crop production and techniques for development of commercial fertilizer formulations & organic preparations.

THEORY
UNIT – I - Soil related constraints and their management
Soil related constraints in crop production – Physical, Chemical and Biological constraints – Identification, extent, causes and measures to combat the constraints.

UNIT – II - Irrigation water quality appraisal and its management

UNIT – III - Diagnostic Techniques for nutrient disorders
Diagnosis of nutrient related problems in crop plants – Deficiency and Toxicity, Diagnostic key for identifying nutrient deficiency. Plant sampling for diagnosis of nutritional disorders – Tissue analysis and total analysis.

UNIT – IV - Prescription for nutrient disorders
Differentiating criteria for nutrient deficiency symptoms from insect and disease attack – Prescription – DRIS – Interpretation of plant analytical results.

UNIT – V - Soil and water pollution
PRACTICALS

LECTURE SCHEDULE
1. Soil constraints – extent and types
2. Physical constraints – Identification, types and causes
3. Management of soil physical constraints
4. Chemical constraints – Identification, Types, causes (Acid soil, salt affected soils)
5. Management of chemical constraints - Acid soils and (Salt affected soils)
6. Irrigation water resources – Groundwater potential and utilisation
7. Irrigation water characteristics and problems arising due to poor quality water
8. Water quality guidelines and their management
9. **Mid-Semester Examination**
10. Diagnostic key for identifying nutrient deficiency and toxicity
11. Plant sampling for diagnosing nutrient disorders for field crops
12. Plant sampling for diagnosing nutrient disorders for Horticultural crops
13. Establishment of DRIS
14. Interpretation and reporting of results of plant analysis
15. Pollution, types & extent of pollution
16. Remediation of polluted soils
17. **Mine spoils – Mining industries and their ill effects and Rehabilitation**

PRACTICAL SCHEDULE
1. Key to identify physical constraints (Soil aggregate analysis, Shear strength)
2. Key to identify chemical constraints I (EC, pH)
3. Key to identify chemical constraints II (ESP, SAR, CaCO₃)
4. Techniques for Reclamation of Acid soil (Lime Requirement)
5. Techniques for Reclamation of Sodic soil (Gypsum requirement)
6. Techniques for Reclamation of Saline soil (leaching requirement)
7. Methods of fertilizer application (for different crops & problems)
8. Assessing nutrient efficiency for enhanced productivity in acid soils
9. Assessing nutrient efficiency for enhanced productivity in salt affected soils
10. Interpretation of irrigation water quality I (pH, EC, SAR, RSC)
11. Interpretation of irrigation water quality II (Potential salinity & Potential alkalinity hazards)
12. Diagnosis of plant nutrient deficiency symptoms
13. Diagnosis of plant nutrient Toxicity symptoms
14. Diagnosis of physiological disorders in crop plants
15. Quick test / Tissue test for plant nutrient status and prescription.
16. Analysis of polluted soils & waters for heavy metals
17. Record Certification

**COURSE OUTCOMES:**

CO 1: Understand the Physical, Chemical and Biological constraints in soil
CO 2: Diagnosed the Irrigation water quality appraisal and its management
CO 3: Practice the diagnostic techniques for nutrient disorders and nutrient recommendations for reclamation of soil
CO 4: Identify the Soil and water pollution and its management
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OPC GPB 001 PLANT TISSUE CULTURE (1+1)

LEARNING OBJECTIVES
- To teach various methods in in-vitro culture of plants
- To teach commercial application of tissue culture techniques

THEORY
_unit I_
Introduction-Historical achievements in plant tissue culture - Fundamental principles in plant tissue culture- Totipotency, dedifferentiation, competency-different sterilization methods - Terminology-Explants and its types, cyto differentiation in plant tissue culture-Application of plant tissue culture

_unit II_
Plant nutrient media- types of nutrient media- MS, B5, SH, WPM and N6 media-functions of different elements in plant tissue culture- Nutritional requirements of a plant tissue culture medium- Gelling agents- classes of plant growth regulators in plant tissue culture

_unit III_
Types of in vitro cultures in plants-Callus, cell suspension cultures, single cell culture cell viability test- Haploid production - Anther culture, ovary and ovule culture-Doubled haploids-Embryo culture – embryo rescue technique – endosperm culture

_unit IV_

_unit V_
Meristem tip culture for virus free production-Protoplast fusion and somatic hybridization- cybrids- germlapsm conservation- synthetic seeds-somaclonal variation and its applications in crop improvement. Current Streams of thought.

PRACTICAL
Tissue culture laboratory and equipment needs - Sterilization techniques - Preparation of culture medium - Cell suspension culture and callus induction - Somatic embryogenesis - Synthetic seeds - Anther and pollen culture - Ovary and ovule culture - Embryo rescue techniques - Embryo culture - Endosperm culture - Meristem culture - Protoplast culture and somatic hybridization - Micro propagation in banana - Cryopreservation of plant parts - visit to commercial tissue culture laboratory.

THEORY LECTURE SCHEDULE

Introduction - Historical achievements in plant tissue culture - Fundamental principles in plant tissue culture - Totipotency, dedifferentiation, competency - Different sterilization methods - Terminology - Explants and its types, cyto differentiation in plant tissue culture - Application of plant tissue culture

1. Historical achievements in plant tissue culture.
2. Totipotency, dedifferentiation, competency.
3. Sterilization techniques and methods.
4. Explants and its types, cyto differentiation in plant tissue culture.
5. Plant nutrient media and its types.
6. Composition of tissue culture medium and preparation.
7. Plant growth regulators and its role in culture medium.
8. Callus culture and callus induction. Isolation of single cell and cell suspension culture.

9. Mid-Semester Examination.
10. Embryo culture and its application. Embryo rescue techniques.
11. Micropropagation and its stages, Shoot multiplication via auxiliary bud as explants.
12. Anther culture, Ovary culture and its application.
14. Micropropagation in banana and rose.
15. Meristem tip culture and Somatic hybridization
16. Synthetic seeds and germplasm conservation.
17. Somaclonal variation and its applications in crop improvement.

PRACTICAL SCHEDULE

1. Tissue culture laboratory and equipment needs.
2. Machines and equipments used in plant tissue culture laboratory.
3. Sterilization techniques.
4. Preparation of MS stock solutions.
5. Preparation of growth regulator stock solutions.
6. Preparation of MS culture medium.
7. Meristem tip culture.
8. Micro propagation in banana.
10. Regeneration via indirect organogenesis pathway.
12. Regeneration via indirect somatic embryogenesis pathway.
13. Synthetic seeds.
15. Embryo culture.
16. visit to commercial tissue culture laboratory
17. Orientation for final examination

COURSE OUTCOMES:

CO 1: The students will be able to prepare and sterilize growing medium
CO 2: Will be able to handle sterile transfer chamber and equipment
CO 3: Will be able to excise explants and transfer of plant material to tissue culture medium
CO 4: The students will have the ability to do independent tissue culture experiments by testing different growth parameters invitro

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OPC HOR 001 SUPPLY CHAIN MANAGEMENT, PROCESSING AND VALUE ADDITION IN HORTICULTURAL CROPS (1+1)

LEARNING OBJECTIVES
- To provide knowledge on the principles of post-harvest technology.
- To highlight the importance of post-harvest technology.
- To import knowledge on post harvest packaging and export preservative storage 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.

Unit-II: Post harvest handling and storage

Unit-III: Packaging of Horticultural produce

Unit-IV: Methods of preservation
Principles of preservation – Preservation with sugar, salt – preservatives-drying and dehydration-types of driers-canning-preparation of canned products and fermented beverages. Minimal processing of fruits and vegetables-techniques-Fresh cut- processing by irradiation- principle ,method,suitability-application of irradiation in food processing- waste and by product utilization from processing industry .

Unit-V: Quality standards and certification

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. Project preparation and working out cost economics.

THEORY LECTURE SCHEDULE
1. Importance and scope of post harvest technology and causes of post harvest losses.
2. Maturity indices and time of harvesting in fruits and vegetables
3. Pre and post harvest physiological changes in Horticultural produce.
4. Handling methods of fruits and vegetables: pre –cooling , washing and grading
5. Handling methods of fruits and vegetables: waxing, vapour heat treatment and fumigation
6. Ripening and Storage methods of fruits and vegetables: low temperature storage-refrigerated storage-storage using evaporative coolers
7. Hypobaric, controlled and modified atmospheric storage techniques – storage disorders.
8. Packaging of horticultural produce : type of containers and cushioning materials
9. Mid-semester Examination.
11. Principles of preservation – Preservation with sugar, salt – preservatives
12. Drying, dehydration and canning and preparation of canned products and fermented beverages.
13. Minimal processing of fruits and vegetables: processing by Fresh cut
14. Minimal processing of fruits and vegetables: irradiation- principle ,method, suitability
15. Waste and by product utilization from processing industry.
16. FPO- Fssai standards
17. Agmark standards- Indian and International standards for preservatives-
18. HACCP regulation WTO guidelines for export of horticultural produce-
19. CODEX standards and export standards for major fruits and vegetables - food safety standards.

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.
5. Preharvest treatments to enhance the post harvest life.
7. Packaging studies for fruits and vegetables.
8. Packaging studies for cut flowers and dry flowers.
10. Identification and study of working of equipments used in processing units.
11. Preparation of squash, RTS and syrup.
12. Preparation of Jam.
13. Preparation of Jelly and marmalade.
14. Preparation of sauce and ketch-up.
15. Preparation of pickles and dehydrated products.
16. Preparation of fresh cut vegetables and fruits.
17. Visit to food processing units.
18. Orientation for final examination

COURSE OUTCOMES

CO1: Students will able to understand the post harvest technology aspects, handling methods, storage methods, packaging and preservation.

CO 2: Will gain skill in doing post harvest operations pertaining to Horticultural products.

CO 3: Will become able to work in post harvest industries

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REFERENCES


OPC AEC 001: AGRICULTURAL PROJECT MANAGEMENT (1+1)

LEARNING OBJECTIVES

To provide knowledge to the students on project selection, formulation, financial feasibility analysis, monitoring and evaluation techniques with reference to agricultural sector.

THEORY

Unit I: Introduction to Project Management

Project - definition - characteristics - project cycle - classification, identification, formulation. Feasibility study - economic and market analysis - Environmental impact study - Financial analysis - Risk and uncertainty - project appraisal - detailed project report.

Unit II: Human Resource in Project Management


Units III: Project Management Techniques
Project management - Bar chart - Milestone chart - Gantt chart - Networks - PERT - Network diagram - Computation of EST & LST - Network analysis - CPM - Time cost relationship of an activity - Project crashing - Project Control.

**Unit IV: Monitoring**

Monitoring – Introduction, basic elements, importance - Monitoring and progress reporting - Monitoring techniques - Indicators for monitoring - Types of monitoring - Monitoring risk and uncertainties.

**Unit V: Evaluation**

Evaluation – Definition, introduction, features, importance - Comparison of appraisal, monitoring and evaluation - Types of evaluation - Designing monitoring and evaluation system - Salient aspects of evaluation - Quantitative and qualitative approaches - Participatory monitoring and evaluation - Social audit - Evaluation report.

**Current Streams of thought.**

**PRACTICAL**


**THEORY SCHEDULE**

1. Introduction - Project definition - Project characteristics - Project performance dimensions
2. Project cycle, conceptualization, planning, execution phases - Project classification
3. Project identification - Formulation - Feasibility study - Economic and market analysis
4. Environmental impact study - Financial analysis - Pay back period, ROI, NPV, BCR, IRR
6. Detailed project report - Project organization design
7. Human resource management - Role management - Team building
8. Communication - Motivation - Decision making leadership
9. **Mid Semester Examination**
10. Project management - Bar chart - Milestone chart - Networks - PERT - Network diagram - Computation of EST & LST - Network analysis - CPM
11. Time cost relationship of an activity - Project crashing - Project control
12. Monitoring – Introduction, basic elements, importance - Monitoring and progress reporting - Monitoring techniques
13. Indicators for monitoring - Types of monitoring - Monitoring risk and uncertainties
14. Evaluation – Definition, introduction, features, importance - Comparison of appraisal, monitoring and evaluation
15. Types of evaluation - Designing monitoring and evaluation system
16. Salient aspects of evaluation - Quantitative and qualitative approaches
17. Participatory monitoring and evaluation - Social audit - Evaluation report

**PRACTICAL SCHEDULE**

1. Development skills in identification of projects
2. Formulation of projects
3. Measuring of cost and benefit of projects
4. Appraisal of project using undiscounted techniques
5. Appraisal of project using discounted techniques
6. Use of sensitivity analysis
7. Selection methods among mutually exclusive projects
8. Preparation of case studies
9. Preparation of case studies
10. Social cost benefit analysis
11. Networks - PERT - Network diagram
12. PERT - CPM analysis
13. Time cost relationships of an activity
14. Developing network techniques for project management
15. Use of management tools in project monitoring
16. Analyzing risk in projects and environmental impact assessment
17. Practical Examination

COURSE OUTCOMES:
At the end of the course students will be able to
CO 1: Understand nature and scope of financial management in agribusiness.
CO 2: Identify the tools for credit, repayment and down payments.
CO 3: Do the appraisal of projects by measurement of costs benefits and sensitivity analysis.

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OPC- AEX 001 ADVERTISING TECHNOLOGIES (1+1)

LEARNING OBJECTIVES
To enable the students to learn about
- Various formats of advertising
- Elements of graphic design
- Copy writing and designs

THEORY
Unit I - Advertising: Basics Concepts
Definition, Nature, Scope, objectives of Advertising - social, economic, ethical and legal issues in advertising.

Unit II – Types and Trends in Advertising
Advertising based on target audience and geographic area, Components of advertising, outdoor advertising - transit advertising, point of purchase advertising, Latest trends in advertising.

**Unit III - Media Planning**
- Media planning, Media selection, Media scheduling

**Unit IV - Copy Writing**
- Guidelines for Copy writing, writing headlines, Writing slogans, Logos & Trademarks - Copy production and Copy testing.

**Unit V - Designing of Advertisements**

**PRACTICAL**
- Design an advertisement for a consumer product, public service advertisement, testimonial advertisement, comparative advertisement, an advertisement for brand promotion, advertisement with emotional appeal, advertisement with fear appeal, an advertisement with humorous appeal, visual dominant advertisement, souls advertisement, Designing a layout for a print advertisement, Practicing radio commercials, Developing storyboard for a TV commercial, Practicing TV commercials, Visit to an advanced digital studio, Visit to an advertising agency and a corporate to study its advertising strategy

**LECTURE SCHEDULE**
1. Definition, Nature, Scope and objectives of Advertising
2. Social and economic issues in advertising
3. Legal and ethical issues in advertising
4. Advertising based on target audience and geographic area
5. Components of advertising
6. Outdoor advertising - transit advertising
7. Point of purchase advertising
8. Latest trends in advertising
9. Mid-Semester Examination
10. Media planning, media selection, media scheduling
11. Guidelines for Copy writing
12. Writing headlines, writing slogans, Logos & Trademarks
13. Copy production and Copy testing.
14. Conceptualization, Ideation, Visualization
15. Designing a layout, Typography
16. Making a Story board
17. Measurement of advertising performance

**PRACTICAL SCHEDULE**
1. Design an advertisement for a consumer product
2. Design a public service advertisement
3. Design a testimonial advertisement
4. Design a comparative advertisement
5. Design an advertisement for brand promotion
6. Design an advertisement with emotional appeal
7. Design an advertisement with fear appeal
8. Design an advertisement with humorous appeal
9. Designing a layout for a print advertisement
10. Practicing radio commercials
11. Developing storyboard for a TV commercial
12. Practicing TV commercials
13. Visit to an advanced digital studio
14. Design a visual dominant advertisement
15. Design a souls advertisement
16. Visit to an advertising agency
17. Visit to a corporate to study its advertising strategy

COURSE OUTCOMES:
At the end of the course students will be able to
CO1: Understand the concepts social, economic, ethical and legal issues in advertising.
CO2: Evaluate the types and trends in advertising
CO3: Understand the media planning and copy righting.
CO4: Practice the designing techniques in advertising.

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OPC- AHS 001 - GOAT REARING AND MANAGEMENT (1+1)

LEARNING OBJECTIVES
- To impart the importance of goat rearing in rural farming
- To expose the students to essential goat management skills
- To offer hands on training in various goat rearing practices with emphasis to recent technologies

THEORY
Unit-I: Introduction

Unit II: Goat Breeds and Breeding Management
Breeds- classification of breeds - milk, meat and dual purpose- Breeding management- Estrous cycle - types of mating- Artificial insemination - Controlled breeding.
Unit III: Farming Practices
Goat and its role in integrated farming system - Housing management- systems of housing- slatted, pen and run, concrete - space requirements - Care and management of buck, doe and kids - Daily Farm routines.

Unit IV: Nutrition
Nutrition - Feeding management - Feeds and fodder - Flushing Vs Steaming up - Requirement of nutrients - grazing behavior.

Unit V: Disease Management
Introduction to goat diseases - Vaccination- Dipping - general control measures of diseases. Current Streams of thought.

PRACTICALS

THEORY LECTURE SCHEDULE
1. Introduction to goat farming.
2. Common terminologies in goat rearing.
3. Composition of goat milk and meat.
4. Importance of milk and meat in human nutrition.
5. Breeds – Classification of goat breeds.
6. Oestrous cycle in goats.
7. Types of mating, Artificial Insemination.
8. Caprine and its role in integrated farming system.
9. Mid Semester Examination.
10. Housing management and space requirements.
11. Daily farm routines.
12. Care and management of buck, doe and kids
14. Flushing vs Steaming up.
15. Fodder for goat rearing - grazing behavior of goats.
16. General Disease management its prevention and control measures.
17. Vaccination and dipping.

PRACTICAL SCHEDULE
1. Study of external parts of goats.
2. Restraining methods of goats.
3. Identification methods in goats.
4. Identification of goat breeds.
5. Judging of goats.
6. Dentition in goats.
7. Type and design of goat house.
8. Identification of does in oestrus.
10. Control of ecto and endo parasites.
11. Vaccination protocol.
12. Identification of feed and fodder.
14. Daily farm operations in goat farm.
15. Maintenance of goat farm records.
16. Visit to goat farms.
17. Practical Examination.
COURSE OUTCOMES:
At the end of the course students will be able to

CO 1: Understand the importance of goat farming.
CO 2: Identify the different types of goat breeds and its breeding management
CO 3: Understand the Housing management- and caring of goats
CO 4: Acquire knowledge on nutritional requirements and disease management in goats.

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3. Handbook of Animal husbandry, 2002 ICAR, New Delhi
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VII SEMESTER
STUDENT READY COMPONENT 1 - RURAL AGRICULTURAL WORK EXPERIENCE (0+20)

RAWE AEX 410 Village attachment and Technology Transfer (0 + 5)

LEARNING OBJECTIVES:
- 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

COURSE OUTCOMES:
At the end of the course students will be able to

CO 1: Understand rural situation, institutions and organizations.
**LEARNING OBJECTIVES:**

- 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 corps, preferable 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.
- Observation on crop growth and yield attributes shall be recorded as per the proforma.

**COURSE OUTCOMES:**

**CO 1:** To gain knowledge on the crop growth and yield of the crops grown by the contact farmer.

**CO 2:** To formulate different cropping systems according to the various agro eco system.

**CO 3:** To understand information pertaining to the different crops and their cultivation methods.

**CO 4:** To formulate recommendation practices for the major crops grown in their village.

**CO 5:** To analyse the various indigenous technologies practiced by farmers

**CO-PO MAPPING MATRIX**

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**RAW E AGR 411 Agronomical Interventions (0 + 3)**
RAWE HOR-412 Horticultural Interventions (0 + 2)

LEARNING OBJECTIVES

- The student will involve themselves in actual day-to-day horticultural operations along with their adopted farmers.
- A calendar of operations for the entire semester will be prepared in consultation with the host farmer and the course teacher.
- The course teacher will provide the recommendations for major horticultural crops grown in the village and in turn the students will compare these with the farmer's practice and get opinion about improved horticultural technologies.
- The students will maintain a record of daily work done in the prescribed proforma.
- Each student shall learn from the farmers cultivating Horticultural crops and study the technologies adopted by farmers.

COURSE OUTCOMES:

- CO1: Student will learn basic field knowledge and practical problems in production of horticultural crops
- CO2: Can learn to prepare calendar of operations for all horticultural crops
- CO3: Can become eligible to manage horticultural farms

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RAWE CPT-413 Crop Protection Interventions (Entomology and Plant Pathology) (0 + 4)

LEARNING OBJECTIVES

- To formulate ideas about on farm pest management situations
- To demonstrate pest management techniques learnt under field situation
- To interact with farmers and get acquainted with field situations
- To understand plant protection problems in standing crops in fields

The students get an opportunity to work with the farmers in the field and acquainted with various plant protection problems of the standing crops.

- They collect data on pest damage every week.
- They shall maintain record of plant protection work undertaken in the prescribed Performa 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 recorded separately.
- The students will also demonstrate preparation of fungicidal / insecticide spray fluids for important plant protection measures.

COURSE OUTCOMES:

- CO1: Illustrate identification of pest problems in farmers' fields
- CO2: Analyse various pest management practices practiced by farmers
- CO3: Demonstrate practical applications of pest management techniques learnt
CO 4: Manage real field situations in pest management scenarios

**CO-PO MAPPING MATRIX**

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**AEX 414 - ALL INDIA TOUR (0+1)**

**LEARNING OBJECTIVE**

- The course will provide an opportunity to the students to study the functioning of important national institutes related to agriculture 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.

**COURSE OUTCOMES:**

At the end of the course students will be able to

CO 1: Understand the functioning of important national institutes related to agriculture

CO 2: Understand the functioning of important national institutes related to allied fields.

CO 3: Get exposure on various agro-climatic zones and their features.

**STUDENT READY COMPONENT 2 - AIA AEC 415 Agro Industrial Attachment (0 + 6)**

**LEARNING OBJECTIVES**

- To develop entrepreneurial skill on agro based industries
- To gain practical knowledge and on field experience to understand economic feasibility of agro based industries

For each batch of students, there will be a designated AIA teacher from the Department of Agricultural Economics, who will continuously guide, supervise and monitor the work of students during their placements in the Agro based Industries. The designated teachers will visit and guide the students on technical aspects and to solve the problems, which are beyond the competence of students as well as to, evaluate the performance of the students.

It will consist of general orientation for a week followed by Agro-Industrial attachment. The students will be attached with the agro-industries to get an experience of the industrial environment and working. The students would be required to record their observations on daily basis and will prepare their project report based on these observations.

The detailed outline of the work to be carried in Agro Industrial attachment period is as follows:
• Each student will take up an agro-economic survey of a village as per questionnaire issued for this purpose by the Department of Agri. Economics.
• Each students shall collect data on economic conditions of the village, population, vital statistics cropping patterns, irrigation facilities, resource endowments and its utilization, labour problems and employment and other economic aspects covered in the schedule/questionnaire. The student will also conduct a farm holding survey as per proforma given to the student.
• Students has to work out the cost of cultivation of principal crops grown in the village.
• Students has to develop alternative farm plans in consultation with farmers and extension staff for re organization of the farm business for higher income.
• Identification of various marketing constraints of agricultural produces.
• The students shall record family budgets of the farmers in the village
• The students will be attached to any of the following industries/units depending upon the availability of facilities.
  • Seed production farms/ Processing units
  • Bio technological industries (Tissue Culture Labs)
  • Bio pesticides/ fertilizer industries
  • Commercial Nurseries of Horticulture / Forest Department
  • Food processing units
  • Sugar factories/Rice mills/Daal mills
  • Dairy/Poultry / Fishery units
  • Agri-Clinic and Agri- Business Cell/ Agro-Service Center
  • Cool chain / Storage units
  • Agricultural finance institutions / Banks / Credit Societies etc
  • Non- Government organizations related to agriculture and rural development
• During the attachment of students to the identified agro-based industries, the students are given an opportunity to acquaint themselves with the organizational set up, functioning, infrastructure available, records maintained and financial, technical and marketing aspects. The students must record all the items of work either carried out by them/ shown to them during the period of attachment to the Agro-based Industries.
• At the end of the attachment period, the students shall submit a project report which includes all the aspects pertaining to the infrastructure facilities, organizational set up, financial and technical aspects.
• In addition, the students shall also describe in their report the operational and market constraints/ problems faced by the Industry.

**COURSE OUTCOMES:**

At the end of the course students will be able to

CO 1: Have practical knowledge on different agro-based industries situated in and around the neighboring districts

CO 2: Start own business and become an entrepreneur

CO 3: Prepare project report

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VIII SEMESTER
STUDENT READY COMPONENT 3 - EXPERIENTIAL LEARNING/SKILL DEVELOPMENT (0+20)

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

EXP AGR 421 PRODUCTION OF LIQUID ORGANIC FORMULATIONS (0+10)
LEARNING OBJECTIVE

- To acquire practical experience in preparation and marketing of liquid organic formulations as a business enterprise.

WORK PLAN

Students will procure required raw materials for preparation of certain liquid organic formulations viz., Panchakavya, Dasagavya, Amirdhakaraisal, Jeevamirtham, Agniastra, Vermiwash, Beejamirtha, Amrut pani and other related formulations depending upon the availability and feasibility. On procurement of raw materials and other essentialities the students will prepare the formulation following the scientific procedures he/she learnt in the earlier classes. The final product will be marketed. A balance sheet will be prepared for making out profit and loss account.

COURSE OUTCOMES:

CO1: Student can gain basic knowledge on preparation of certain liquid organic formulations

CO2: Can gain skills on scientific procedures

CO3: Will become capable of doing marketing of products.

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EXP AGR 422 SEED PRODUCTION OF LEGUMES/GREEN MANURE/ FODDER (0+10)
LEARNING OBJECTIVE

- To motivate the students in seed production activities as a business enterprise and to gain confidence as a leader in seed production technology.

WORK PLAN

Students will procure quality seeds from certified agencies/ Agricultural Universities/ Government seed farms. Depending upon the availability choice of seed will be taken for production. Students will themselves raise the crop till harvest following all scientific principles and approved methods. The seeds harvested will be marketed after following seed legislation. A balance sheet will be prepared for making out profit and loss account.

COURSE OUTCOMES

CO1: Acquire knowledge on production of seeds of legumes and fodders

CO2: Develop skills on scientific principles of seed production
CO3: Trained to marketing of produced seeds.

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EXP ENT 421 BIO PESTICIDES AND BIOCONTROL AGENTS
PRODUCTION TECHNOLOGY (0+10)

LEARNING OBJECTIVES

- Have hands on Experience in production of botanical insecticides and microbial insecticides.
- To understand the economics of bio pesticides production unit.

PRACTICAL


COURSE OUTCOMES

CO1: Acquire knowledge on production of biopesticides
CO2: Develop skills on bioagents production
CO3: Trained to market of produced biopesticides and biocontrol agents.

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EXP ENT 422 COMMERCIAL APICULTURE (0+10)

LEARNING OBJECTIVES

- To have hands on training in apiculture
- To understand the economics of bee keeping and marketing of honey and other by-products

PRACTICAL


COURSE OUTCOMES

CO1: Acquire knowledge on bee keeping
CO2: Practice bee keeping and handling of bees at Apiary.
CO3: Packing and Marketing of honey.

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**EXP ENT 423 COMMERCIAL SERICULTURE (0+10)**

**LEARNING OBJECTIVES**
- To have hands on training in sericulture
- To understand the economics and marketing of cocoons

**PRACTICAL**

1. Training for the raising of Mulberry nursery
2. Hands on training for collection of leaves, chopping, pruning & preservation of leaves – feeding for chawki rearing.
3. Hands on training for late age rearing
4. Disinfection procedures to maintain aseptic condition in sericulture rearing rooms.
5. Care to be taken during moulting
6. Pests and disease management
7. Training on post cocoons technology
8. Importance of silk
9. Hands on training on Ericulture

**COURSE OUTCOMES**

**CO1**: Acquire knowledge on rearing of chawki and late age worms and also mulberry cultivation

**CO2**: Develop skills on silkworm rearing techniques

**CO3**: Practice training to market the cocoons.

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EXP PAT 421 MUSHROOM CULTURE (0+10)

LEARNING OBJECTIVE

- To give practical exposure to the students in various technologies in seed production.

WORK PLAN


COURSE OUTCOMES

- CO1: Practice the production of mushrooms
- CO2: Develop skills on handling and creation of infrastructure
- CO3: Trained to plan mushroom business and marketing.

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EXP PAT 422 BIOLOGICAL CONTROL OF PLANT DISEASES (0+10)

LEARNING OBJECTIVES

- To study the significance of biological agents, methods of isolation of the antagonistic organisms and mechanisms of action involved in disease suppression.
- To develop mass multiplication methods, bio-formulation development and delivery methods.

WORK PLAN

Safety procedures for handling equipment - Preparation of culture media - DA, KingsBandNA - Isolation of Trichoderma from soil - Cultural characteristics of Trichoderma - Assessment of in vitro efficacy of Trichoderma isolates - Mass production of Trichoderma viride - small and large scale - Development of formulations and quality parameters of Trichoderma - Packing and storage of Trichoderma formulations - Fermentation technology - Isolation of PGPR from soil - Cultural characteristics of PGPR - Assessment of in vitro efficacy of PGPR isolates - Mass production of PGPR - small and large scale - Development of formulations and quality parameters of PGPR - Packing and storage of PGPR formulations - Delivery system
COURSE OUTCOMES

CO1: Practice the production of *Trichoderma*
CO2: Improve the skills on development of formulations
CO3: Trained to sale the produced material commercially.

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EXP AGM 421 MICROBIAL INOCULANTS PRODUCTION AND QUALITY CONTROL (0+10)

LEARNING OBJECTIVE

- To study in detail about the microbial inoculants in Agriculture viz., isolation of bacterial fungal inoculants their mass production and quality control.

WORK PLAN

Isolation and screening method- Selection suitable strain – Strain improvement of different types of inoculants. *Rhizobium, Azotobacter, Phosphobacteria, Mycorrhiza, Bacillus thuringiensis, Pseudomonas, Trichoderma, Beauvaria, Verticillium, and Metarrhizium* etc. Testing the efficiency of microbial inoculants mass production of Bacterial inoculants, Mycorrhizal inoculants algal inoculants - Quality control methods shelf life - Method of inoculation.

COURSE OUTCOMES

CO1: Understand the Isolation and screening of inoculants.
CO2: Enhancing the skills on development of mass production of Bacterial inoculants, Mycorrhizal and algal inoculants
CO3: Trained identify the quality and to sale the inoculants.

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EXP AGM 422 COMPOSTING TECHNOLOGIES FOR SUSTAINABLE AGRICULTURE (0+10)

LEARNING OBJECTIVES

- To study the nature of different types of wastes and different techniques of preparing enriched composts
- To know the role of microorganism in composting techniques
- To study the quality standards of compost and its role in sustainable agriculture

WORK PLAN

estimation of N, P, K and micronutrient - Dehydrogenase activity of mature compost - value addition of compost - visit to compost yard.

COURSE OUTCOMES

CO1: Understand the Aerobic and Anaerobic method of composting
CO2: Enhancing the skills on estimation of microbial load and assessment of maturity of compost by physical and chemical tests.
CO3: Acquire skills on value addition of compost.

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EXP SAC 421 HANDS ON TRAINING FOR SOIL, WATER AND PLANT ANALYSIS (0+10)

LEARNING OBJECTIVES

- To train the students to get familiarised with the recent methods adopted in the analysis of soil, water and plants so as to gain knowledge,
- To set up soil, water and plant clinic, to interpret the soil and plant analysis data and to give suitable fertilizer recommendation to the farmers.

WORK PLAN

Soil Analysis: Collection and Preparation of Soil sample, Analysis of soil sample for pH, EC and available N, P, K, S exchangeable Ca and Mg, available (DTPA extractable Zn, Mn, Fe and Cu and hot water-soluble B.

Irrigation water Analysis: Collection of Irrigation water sample in borewell and open well, Analysis of water sample for pH, EC, Cations (Ca++, Mg++, Na+ and K+) anions (SO₄²⁻, Cl⁻, HCO₃⁻, CO₃²⁻, NO₃⁻, BO₃³⁻), Calculation of irrigation suitability indices.

Analysis of plant samples: Tissue test, plant analysis - visual nutrient deficiency symptoms - collection and preparation of plant sample, preparation of Di/Tri acid extract, Analysis of plant sample for total N, P, K, Ca, Mg, S, Zn, Fe, Mn, Cu, B and Cl. Interpretation of plant analysis data.

COURSE OUTCOMES:

CO1: Improve the knowledge on the recent methods adopted in the analysis of soil, water and plants
CO2: Able to interpret the soil and plant analysis data and to give suitable fertilizer recommendation to the farmers.

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EXP SAC 422 HANDS ON TRAINING ON SOIL CONSTRAINTS AND ITS MANAGEMENT FOR SUSTAINABLE CROP PRODUCTIVITY (0+10)
LEARNING OBJECTIVE

- To understand the methodology that allows soil constraints to be identified systematically from basic soil attributes. Inferences are then drawn about how individual soil should be managed to maximise their productive potential.

WORK PLAN

Analysis of constraints on agricultural production – physical and chemical constraint. Physical constraints – types – identification – field diagnosis (visual) and Laboratory diagnosis (Soil analysis) and modern tools like satellite imageries and soil photograph – assessment of soil physical health – LOIC, STORIE index, productivity rating index and soil physical rating index – management options for amelioration of soil physical fertility.

Chemical constraints – types – assessment – field (visual) and laboratory (soil test) and modern tools like satellite imageries and aerial photograph of acid soil and salt affected soils – methods of reclamation measures of problem soils; management options – agronomic and integrated soil fertility management for higher crop productivity, SSNM approach, use of decision support system.

Quality of irrigation water – assessment, development of quality indices and judgement on its profitable use.

COURSE OUTCOMES:

CO1: Understand the physical and chemical constraint in soil.

CO2: Improve the skills on the use of field (visual) and laboratory (soil test) and modern tools like satellite imageries and aerial photograph.

CO3: Acquire skills on agronomic and integrated soil fertility management for higher crop productivity.

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EXP GPB 421 COMMERCIAL SEED PRODUCTION IN VEGETABLE CROPS (0+10)

LEARNING OBJECTIVE

- To give practical exposure to the students in various techniques in seed production of Vegetable crops.

WORK PLAN

Floral biology - Pollination behaviour - Seed development and maturation - Techniques of seed production - Emasculation and pollination - Male sterility - types - Self incompatibility-seed production principles - Classes of seed - Generation system of seed multiplication - Seed rate - Seed treatment-isolation distance - Planting ratio - Border row- planting design - Field inspection - nutrient, irrigation and weed management - Plant protection-Physiological and Harvestable maturity -- Harvesting methods - Seed extraction - Processing techniques - Storage and marketing - Seed certification and Seed Standards.

COURSE OUTCOMES
CO1- Able to produce vegetable seeds on their own.
CO2- Improve the skills on the use latest techniques in seed production.
CO3- Acquire skills on packing and marketing to farmers and other needy people.

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**EXP GPB 422 SEED PRODUCTION TECHNIQUES IN FIELD CROPS (0+10)**

**LEARNING OBJECTIVE**

- To give practical exposure to the students in hybrid seed production in Field crops viz., Rice, Maize, Ragi, Minor Millets and Other field crops.

**WORK PLAN**

Floral biology, emasculation and pollination techniques - Male sterile lines - morphological characterization : observations of sterility : inducing sterility - Supplementary pollination - Planting ratio - Planting methods - Recommended package of practices for hybrid rice seed production - Estimation of various types of heterosis - Hybrid seed production - an account on the released rice hybrids; their potential; problems and ways of overcoming it.

**COURSE OUTCOMES**

CO1: Learnt about Hybrid seed production in rice, maize and other field crops.
CO2: Develop the skills on the problems in hybrid seed production and their commercial marketability.

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**EXP HOR 421 ORGANIC VEGETABLE PRODUCTION (0+10)**

**LEARNING OBJECTIVES**

- To promote entrepreneurial skills and knowledge through meaningful hands on experience through a business model enterprise.
- To provide skills in various organic production techniques and regulatory practices
- To provide an excellent opportunity to observe, think, analyse, synthesize, evaluate and apply the acquired knowledge with respect to organic vegetable production unit.

**WORK PLAN**

Students shall prepare a plan to start an organic cultivation unit for vegetable crops 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 project development, execution, procurement of raw materials, preparation of value-added compost, bio stimulants and organic foliar supplements, production, care, marketing, regulatory practices including organic certification, decision-making, individual and team coordination, approach to problem solving, accounting, marketing and resolving conflicts.

**COURSE OUTCOMES**

CO1: Student can gain basic knowledge on organic farming techniques
CO2: Can gain skills required to manage organic farms
CO3: Will become capable of managing organic farming and certification process.

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**EXP HOR 422 COMMERCIAL HORTICULTURAL NURSERY (0+10)**

**LEARNING OBJECTIVES**

- To promote entrepreneurial skills and knowledge through meaningful hands-on experience through a business model enterprise.
- To provide skills in various propagation methods and care of nursery plants.
- To provide an excellent opportunity to observe, think, analyse, synthesize, evaluate and apply the acquired knowledge with respect to commercial nursery business.

**WORK PLAN**

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 project development, execution, procurement of raw materials, production, care, marketing, decision-making, individual and team coordination, approach to problem solving, accounting, marketing and resolving conflicts, etc.

**COURSE OUTCOMES**

CO1: Students can gain knowledge on establishment and management of a commercial nursery
CO2: Can practice skills in various propagation methods and care of nursery plants and skillful in managing nursery business

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**EXP HOR 423 COMMERCIAL LANDSCAPING (0+10)**
LEARNING OBJECTIVES
- To enable students to gain hands-on experience in landscape designing and execution
- To develop entrepreneurial skills and confidence among students to develop their own landscape company.

WORK PLAN
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.

COURSE OUTCOMES
CO1: Student can gain hands on experience in landscape designing and execution
CO2: Can gain entrepreneurial skills required to do landscape projects
CO3: Will become capable of managing landscape projects and company.

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EXP HOR 424 PROCESSING AND VALUE ADDITION OF HORTICULTURAL CROPS (0+10)

LEARNING 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.

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

COURSE OUTCOMES
CO1: Student can gain basic knowledge on value added products
CO2: Can gain skills required to manage processing units
CO3: Will become capable of doing value addition works in horticultural products.

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EXP AEC 421 MARKETING SKILLS FOR AGRI PROFESSIONALS (0+10)

LEARNING OBJECTIVE
- To import practical knowledge and understanding marketing of products.

WORK PLAN

COURSE OUTCOMES
CO1: Students can design and forecast the market strategy
CO2: Acquire skills on distribution network and market planning process
CO3: Develop the capacity to new product development and marketing.

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EXP AEC 422 MANAGERIAL SKILLS FOR AGRI-PRENEURS (0+10)

LEARNING OBJECTIVE
- The objective of the course is to develop skills on analyzing case studies related to management aspects.

WORK PLAN
Case studies on supply chain management – approaches, elements, demand and procurement management in supply chain. Case studies on logistics management – elements, warehousing, sales and distribution management. Case studies on value chain in food retailing, marketing mix, brand management. Case studies on advertisement strategies, rural marketing, rural market research, buyer behavior. Case studies on customer relationship management.

COURSE OUTCOMES
CO1: Improve skills on supply chain management
CO2: Knowledge development on marketing mix and brand management
CO3: Develop the customer relationship management.

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EXP AEX 421 EXTENSION AND COMMUNICATION SKILLS (0+10)

LEARNING OBJECTIVES

To enable the students to

- Acquire Skills on selection and transfer of technology
- Acquire media skills
- Acquire programme planning and execution skills
- Acquire marketing and agricultural finance skills

WORK PLAN

Acquisition of skills in the selection of technologies along with the scientists of Agricultural Research stations, ‘transfer of technologies skills’ with the Krishi Vigyan Kendra, Cane divisions of sugar mills, State department of Agriculture, Horticulture and Rural Development, ‘media skills’ with All India Radio and Doordharsan, ‘programme planning and execution skills’ with the NGOs, ‘marketing skills’ with input dealers, ‘agricultural finance skills’ with credit institutions.

COURSE OUTCOMES

- CO 1: Students can gain knowledge on ‘transfer of technologies skills’
- CO 2: Develop ‘media skills’ with mass media
- CO 3: Improve programme planning and execution skills’ with the NGOs, and ‘marketing skills’ with input dealers
- CO 4: Acquint with ‘agricultural finance skills’ with credit institutions.

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EXP AEX 422 TRANSFORMATION THROUGH EXTENSION PROGRAMME PLANNING (0+10)

LEARNING OBJECTIVE

- To Acquire extension programme planning, execution and evaluation skills

WORK PLAN

Understanding the principles of extension programme planning, collecting facts, practicing various techniques of Participatory Rural Appraisal, analyzing the agricultural situation, determining programme objectives, (immediate and long term), selection of problems based on the classification, finding solutions with village level extension worker, developing plan of work and calendar of operations, executing the plan of work and calendar of operations, evaluating the progress with concurrent and ex-post facto evaluation.

COURSE OUTCOMES

- CO 1: Practicing various techniques of Participatory Rural Appraisal
- CO 2: Develop programme objectives and selection of problems
CO 3: Developing plan of work and calendar of operations, executing the plan of work

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EXP AHS 421 BROILER PRODUCTION (0+10)

LEARNING OBJECTIVES

- To provide a comprehensive knowledge about the scientific rearing of the broiler.
- To enable the students to acquire practical knowledge to manage a profitable small-scale commercial broiler farm.
- To impart the “cutting edge” technologies used in broiler industry which will reinforce the student’s entrepreneurship skills.

WORK PLAN


COURSE OUTCOMES

CO 1: Practicing various techniques of scientific rearing of the broiler
CO 2: Develop management of brood, litter and feeding etc.,
CO 3: Understand the farm economics and marketing of broiler

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EXP AHS 422 JAPANESE QUAIL PRODUCTION (0+10)

LEARNING OBJECTIVES

- To develop interest in scientific rearing of Japanese quail.
- To promote entrepreneurship among the students through systematic imparting of practical knowledge and startup guidance.
- To explore the possibilities of local marketing and maximizing income through value added products.

WORK PLAN

COURSE OUTCOMES
CO 1: Practicing various techniques of scientific rearing of Japanese quail
CO 2: Develop management of brood, litter and feeding etc.,
CO 3: Understand the farm economics and marketing of Quil

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EXP AHS 423 TECHNOLOGY OF VALUE-ADDED MILK PRODUCTS (0+10)

LEARNING OBJECTIVES
- To impart comprehensive knowledge of the existing technologies in Dairy Products preparation.
- To gain hands on experience in different technologies used in Dairy products preparation and to develop entrepreneurship skills among the students.

WORK PLAN

COURSE OUTCOMES
CO 1: Understand the various existing technologies in Dairy Products
CO 2: Acquire the techniques in the Preparation of fat rich Dairy products

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