1. TITLE AND SCOPE
1.1. These academic Regulations shall be called “Annamalai University Faculty of Agriculture B.Sc.(Ag.) Academic Regulations 2016” 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 2017-18 onwards.

2. DEFINITIONS
2.1. University: University means Annamalai University, Annamalainagar, Tamilnadu.
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 upto second decimal place.
2.10. Credit Point: A credit point is a product of grade point obtained by a student and number of credits in a course.

2.11. Grade Point Average (GPA): It is 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): 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

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

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. (Ag.) 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 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 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. (Ag.)</td>
<td>8 16</td>
<td>180</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.

9.1. Course with both theory and practical

<table>
<thead>
<tr>
<th>Marks</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Mid Semester Examination</td>
</tr>
<tr>
<td>40</td>
<td>Practical Examination (Written = 25, Record = 5 Specimen collection/Assignment = 5 and Viva–Voce = 5)</td>
</tr>
<tr>
<td>40</td>
<td>Final Theory Examination</td>
</tr>
</tbody>
</table>

Total 100

9.2. Course with only Theory / Practical*

<table>
<thead>
<tr>
<th>Marks</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>Mid Semester Examination</td>
</tr>
<tr>
<td>60</td>
<td>Final Semester Examination</td>
</tr>
</tbody>
</table>

Total 100

* 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.

- E - Incomplete (due to attendance deficiency)
- AB - Absent
- RR - Re-registration
- RA - Re-appearance
- IE - Improvement Examination
- EE - Incomplete for reasons other than attendance

9.4. Evaluation Pattern for Courses with only Practical

The evaluation pattern of courses with only practicals 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.
### Particulars
<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</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>(Attendance-30 and Activity -10)</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></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>Total</td>
<td>40</td>
<td>60</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>Total</td>
<td>40</td>
<td>60</td>
</tr>
</tbody>
</table>

F. RURAL AGRICULTURAL WORK EXPERIENCE (RAWE)

RAWE AEX 410 : Rural Agricultural Work Experience (0+5)

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

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

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

RAWE AGR 411, RAWE HOR 412 and RAWE CPT 413

The marks will be awarded as detailed below.

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Max. Marks</th>
<th>Evaluation by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation Note book</td>
<td>20</td>
<td>By Teacher in-charge</td>
</tr>
<tr>
<td>Skills learned</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Final Examination</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commendable activities</td>
<td>10</td>
<td>By the Examiners</td>
</tr>
<tr>
<td>Detailed project report presentation and Record</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Viva voce</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>
EDUCATIONAL TOURS: AGR 221 (0+1) and AEX 414 (0+1)

Educational tour for courses AGR 221 Study tour and AEX 414 All India Study tour are compulsory. The tours will be undertaken 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></td>
</tr>
<tr>
<td>Tour record</td>
<td>30</td>
<td>By the organising staff/Examiner</td>
</tr>
<tr>
<td>Viva voce</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
<td></td>
</tr>
</tbody>
</table>

AIA AEC 415: RURAL ECONOMICS AND AGRO INDUSTRIAL ATTACHMENT (0 + 6)

Course on Agro Industrial attachment will be offered in the VII Semester for eight 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 11th 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><strong>100</strong></td>
<td></td>
</tr>
</tbody>
</table>

G. EXPERIENTIAL LEARNING EXP 329 (0+6) AND EXP 424 (0+6)

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

A student can choose an experiential learning programme of his/her choice. The maximum number of students allowed to register 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 examiner. The final examination will be
conducted by the University before the commencement of regular final semester examinations. The distribution of marks will be 40 for periodical evaluation and 60 for final examination.

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

**H. APW 425 : PROJECT WORK (0+2)**

Course in Project work will be offered in the eighth semester.

A student can choose a research project of his/her choice in line with experiential learning course chosen during sixth semester (EXP 329).

Periodical evaluation of course will be done by the course teacher during different stages of work. Final evaluation of the above course will be done by the course teacher and another examiner. The final semester examination will be conducted by the university before the commencement of regular final semester examinations. The distribution of marks will be as follows.

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Periodical evaluation</th>
<th>Final examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research area identification and collection of literature</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>Work done</td>
<td>30</td>
<td>-</td>
</tr>
<tr>
<td>Report</td>
<td>-</td>
<td>40</td>
</tr>
<tr>
<td>Viva voce</td>
<td>-</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>40</td>
<td>60</td>
</tr>
</tbody>
</table>

**10. MID-SEMESTER EXAMINATION (MSE)**

10.1 Writing the mid-semester examination is a pre-requisite for writing the final theory and practical examinations. If a student does not appear for MSE, he/she is not eligible to appear for the final examinations. Such 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>Marks</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>i) Fill up the blanks @ $\frac{1}{2}$ mark for 10 questions out of 12</td>
<td>5</td>
</tr>
<tr>
<td>ii) Definition @ 1 mark for 5 questions out of 7</td>
<td>5</td>
</tr>
<tr>
<td>iii) Short notes @ 2$\frac{1}{2}$ marks for 2 questions out of 3</td>
<td>5</td>
</tr>
<tr>
<td>iv) Essay type @ 5 marks for 1 question out of 2</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
</tr>
</tbody>
</table>

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

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

| Marks | i) Fill up the blanks @ \( \frac{1}{2} \) mark for 10 questions out of 12 | 5 |
| Marks | ii) Definition @ 1 mark for 5 questions out of 7 | 5 |
| Marks | iii) Short notes @ 2\( \frac{1}{2} \) marks for 2 questions out of 3 | 5 |
| Marks | iv) Essay type @ 5 marks for 5 questions either or pattern (from each Unit) | 25 |
| Marks | Total | 40 |

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

| Marks | i) Fill up the blanks @ 1 mark for 10 questions out of 12 | 10 |
| Marks | ii) Define / Explain @ 2 marks for 5 questions out of 7 | 10 |
| Marks | iii) Short notes @ 3 marks for 5 questions out of 7 | 15 |
| Marks | iv) Essay type @ 5 marks for 5 questions either or pattern (from each Unit) | 25 |
| Marks | Total | 60 |

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.(Ag.) 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 FOR 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 expelled immediately 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.


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

Any student convicted of an offence under section 4 shall also be dismissed from the educational institution and such 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.(Ag,) shall be awarded during convocation under the
seal of the University to the students who have successfully completed all the
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. (Ag,) 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.
# LIST OF COURSES (SEMESTER WISE)

## FIRST SEMESTER

<table>
<thead>
<tr>
<th>Sl. 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;¨yf;fpw;fpsy; ntshz;ika[k; mwptpay; jkpH;g; gad;gLk; (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>
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<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/ NCC 118</td>
<td>National Service Scheme / 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>

## SECOND SEMESTER

<table>
<thead>
<tr>
<th>Sl. 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>

## THIRD SEMESTER

<table>
<thead>
<tr>
<th>Sl. 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>
### FOURTH SEMESTER

<table>
<thead>
<tr>
<th>Sl. 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>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><strong>Total</strong></td>
<td><strong>14+10=24</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### FIFTH SEMESTER

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course Code</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>AGR 310</td>
<td>Climate Change and Disaster Management</td>
<td>1+0</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>Principles of 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><strong>Total</strong></td>
<td><strong>15+9=24</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### SIXTH SEMESTER

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course Code</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>AGR 320</td>
<td>Farming System and Organic Agriculture</td>
<td>2+1</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>PAT 322</td>
<td>Diseases of Field Crops and their Management</td>
<td>2+1</td>
</tr>
<tr>
<td>4.</td>
<td>SAC 323</td>
<td>Crop and Pesticide Chemistry and Nanotechnology</td>
<td>2+1</td>
</tr>
<tr>
<td>5.</td>
<td>GPB 324</td>
<td>Breeding of Field and Horticultural Crops</td>
<td>2+1</td>
</tr>
<tr>
<td>6.</td>
<td>HOR 325</td>
<td>Production Technology of Vegetables, Spices, Medicinal and Aromatic Crops</td>
<td>2+1</td>
</tr>
<tr>
<td>7.</td>
<td>AEC 326</td>
<td>Agricultural Finance, Banking and Co-operation</td>
<td>1+1</td>
</tr>
<tr>
<td>8.</td>
<td>AEX 327</td>
<td>Extension Methodologies and Transfer of Agricultural Technology</td>
<td>1+1</td>
</tr>
<tr>
<td>9.</td>
<td>AEG 328</td>
<td>Post Harvest and Food Engineering</td>
<td>1+1</td>
</tr>
<tr>
<td>10.</td>
<td>EXP 329</td>
<td>Experiential Learning – I</td>
<td>0+6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>13+15=28</strong></td>
<td></td>
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</table>
### SEVENTH SEMESTER

<table>
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<tr>
<th>Sl. No.</th>
<th>Course Code</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>RAWE AEX 410</td>
<td>Rural Agricultural Work Experience</td>
<td>0+5</td>
</tr>
<tr>
<td>2.</td>
<td>RAWE AGR 411</td>
<td>Field Crop Production</td>
<td>0+3</td>
</tr>
<tr>
<td>3.</td>
<td>RAWE HOR 412</td>
<td>Horticultural Crop Production</td>
<td>0+2</td>
</tr>
<tr>
<td>4.</td>
<td>RAWE CPT 413</td>
<td>Crop Protection (Entomology and Plant Pathology)</td>
<td>0+4</td>
</tr>
<tr>
<td>5.</td>
<td>AEX 414</td>
<td>All India Study Tour</td>
<td>0+1</td>
</tr>
<tr>
<td>6.</td>
<td>AIA AEC 415</td>
<td>Rural Economics and Agro Industrial Attachment</td>
<td>0+6</td>
</tr>
</tbody>
</table>

**Total** 0+21 = 21

### EIGHTH SEMESTER

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course Code</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>AGR 420</td>
<td>Agro Forestry and Dry Farming</td>
<td>2+1</td>
</tr>
<tr>
<td>2.</td>
<td>GPB 421</td>
<td>Principles of Seed Production, Seed Quality Regulation and Storage</td>
<td>2+1</td>
</tr>
<tr>
<td>3.</td>
<td>PAT 422</td>
<td>Diseases of Horticultural Crops and their Management</td>
<td>2+1</td>
</tr>
<tr>
<td>4.</td>
<td>HOR 423</td>
<td>Commercial Floriculture and Landscape Gardening</td>
<td>2+1</td>
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<tr>
<td>5.</td>
<td>EXP 424</td>
<td>Experiential Learning – II</td>
<td>0+6</td>
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<tr>
<td>6.</td>
<td>APW 425</td>
<td>Project work</td>
<td>0+2</td>
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<tr>
<td>7.</td>
<td>OPC 426</td>
<td>Optional Course</td>
<td>1+1</td>
</tr>
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</table>

**Total** 9+13 = 22

### ABSTRACT

<table>
<thead>
<tr>
<th>Semester</th>
<th>Number of Courses</th>
<th>Credit</th>
</tr>
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<tbody>
<tr>
<td>I</td>
<td>9</td>
<td>6+9 = 15</td>
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<tr>
<td>II</td>
<td>10</td>
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<td>11</td>
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<td>IV</td>
<td>8</td>
<td>14+10 = 24</td>
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<tr>
<td>V</td>
<td>8</td>
<td>15+9 = 24</td>
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<td>VI</td>
<td>11</td>
<td>13+15 = 28</td>
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<td>VII</td>
<td>6</td>
<td>0+21 = 21</td>
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<td>VIII</td>
<td>7</td>
<td>9+13 = 22</td>
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**Total** 85+95 = 180
# LIST OF COURSES (DEPARTMENT WISE)

## Agronomy

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Semester</th>
<th>Course Code</th>
<th>Title</th>
<th>Credit</th>
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<tbody>
<tr>
<td>1.</td>
<td>I</td>
<td>AGR 110</td>
<td>Principles of Agronomy and Agricultural Heritage</td>
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<td>2.</td>
<td>I</td>
<td>AGR 111</td>
<td>Fundamentals of Agricultural Meteorology</td>
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<td>3.</td>
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<td>AGR 120</td>
<td>Weed Management</td>
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<td>AGR 121</td>
<td>Irrigation Management</td>
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<td>Agronomy of Field Crops – II</td>
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<td>IV</td>
<td>AGR 221</td>
<td>Study Tour – I</td>
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<td>V</td>
<td>AGR 310</td>
<td>Climate Change and Disaster Management</td>
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<td>Farming System and Organic Agriculture</td>
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<td>VI</td>
<td>AGR 321</td>
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## Entomology

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

<table>
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<tr>
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<td>PAT 212</td>
<td>Fundamentals of Plant Pathology</td>
<td>2+1</td>
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<td>V</td>
<td>PAT 313</td>
<td>Principles of Plant Disease Management</td>
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<td>VI</td>
<td>PAT 322</td>
<td>Diseases of Field Crops and their Management</td>
<td>2+1</td>
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<td>VII</td>
<td>RAWE CPT 413</td>
<td>Crop Protection (Entomology and Plant Pathology)</td>
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<td>PAT 422</td>
<td>Diseases of Horticultural Crops and their Management</td>
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### Microbiology

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<tbody>
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<td>Fundamentals of Microbiology</td>
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<td>2.</td>
<td>IV</td>
<td>AGM 223</td>
<td>Soil and Applied Microbiology</td>
<td>2+1</td>
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<td>3.</td>
<td>V</td>
<td>AGM 314</td>
<td>Environmental Science</td>
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*Total 6+3 = 9*

### Soil Science and Agricultural Chemistry

<table>
<thead>
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<th>Title</th>
<th>Credit</th>
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<tbody>
<tr>
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<td>Principles of Analytical Chemistry</td>
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<td>II</td>
<td>SAC 124</td>
<td>Fundamentals of Biochemistry</td>
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<td>III</td>
<td>SAC 213</td>
<td>Fundamentals of Soil Science</td>
<td>2+1</td>
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<td>IV</td>
<td>SAC 224</td>
<td>Soil Resource Inventory and Problem Soils</td>
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<td>V</td>
<td>SAC 315</td>
<td>Soil Fertility, Fertilizers and Manures</td>
<td>2+1</td>
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<td>VI</td>
<td>SAC 323</td>
<td>Crop and Pesticide Chemistry and Nanotechnology</td>
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*Total 11+6 = 17*

### Genetics and Plant Breeding

<table>
<thead>
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<th>Title</th>
<th>Credit</th>
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<tbody>
<tr>
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<td>Fundamentals of Plant Physiology</td>
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<td>2.</td>
<td>II</td>
<td>GPB 125</td>
<td>Introduction to Agricultural Botany</td>
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<td>3.</td>
<td>III</td>
<td>GPB 214</td>
<td>Principles of Genetics and Cytogenetics</td>
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<td>IV</td>
<td>GPB 225</td>
<td>Principles and Methods of Plant Breeding</td>
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<td>V</td>
<td>GPB 316</td>
<td>Plant Biotechnology</td>
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<td>VI</td>
<td>GPB 324</td>
<td>Breeding of Field and Horticultural Crops</td>
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<td>VIII</td>
<td>GPB 421</td>
<td>Principles of Seed Production, Seed Quality Regulation and Storage</td>
<td>2+1</td>
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*Total 13+7=20*

### Horticulture

<table>
<thead>
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<th>Course Code</th>
<th>Title</th>
<th>Credit</th>
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<tbody>
<tr>
<td>1.</td>
<td>III</td>
<td>HOR 215</td>
<td>Basic Horticulture and Plant Propagation</td>
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<td>V</td>
<td>HOR 317</td>
<td>Production Technology of Fruits and Plantation Crops</td>
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<td>3.</td>
<td>VI</td>
<td>HOR 325</td>
<td>Production Technology of Vegetables, Spices, Medicinal and Aromatic Crops</td>
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<td>4.</td>
<td>VII</td>
<td>RAWE HOR 412</td>
<td>Horticultural Crop Production</td>
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<td>VIII</td>
<td>HOR 423</td>
<td>Commercial Floriculture and Landscape Gardening</td>
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*Total 8+6=14*
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<th>Title</th>
<th>Credit</th>
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<tr>
<td>1.</td>
<td>II</td>
<td>AEC 126</td>
<td>Principles of Economics</td>
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<td>III</td>
<td>AEC 216</td>
<td>Production Economics and Farm Management</td>
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<td>AEC 226</td>
<td>Agricultural Marketing, Trade and Prices</td>
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<td>AEC 326</td>
<td>Agricultural Finance, Banking and Co-operation</td>
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<td>VII</td>
<td>AIA AEC 415</td>
<td>Rural Economics and Agro Industrial Attachment</td>
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**Total** 5+11=16

# Agricultural Extension

<table>
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<tbody>
<tr>
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<td>Fundamentals of Rural Sociology and Educational Psychology</td>
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<td>2.</td>
<td>III</td>
<td>AEX 217</td>
<td>Dimensions of Agricultural Extension</td>
<td>1+1</td>
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<td>3.</td>
<td>VI</td>
<td>AEX 327</td>
<td>Extension Methodologies and Transfer of Agricultural Technology</td>
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<td>4.</td>
<td>VII</td>
<td>RAWE AEX410</td>
<td>Rural Agricultural Work Experience</td>
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<td>5.</td>
<td>VII</td>
<td>AEX 414</td>
<td>All India Study Tour</td>
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**Total** 3+9=12

# Animal Husbandry

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<td>AHS 218</td>
<td>Livestock and Poultry Management</td>
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# Statistics

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<th>Title</th>
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<tr>
<td>1.</td>
<td>IV</td>
<td>STA 227</td>
<td>Agricultural Statistics</td>
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# Engineering

<table>
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<th>Semester</th>
<th>Course Code</th>
<th>Title</th>
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<tbody>
<tr>
<td>1.</td>
<td>I</td>
<td>COM128</td>
<td>Fundamentals of Information Technology</td>
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<td>IV</td>
<td>AEG 229</td>
<td>Farm Power, Machinery and Renewable Energy</td>
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<td>V</td>
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<td>Fundamentals of Soil and Water Conservation Engineering</td>
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<td>VI</td>
<td>AEG 328</td>
<td>Post Harvest and Food Engineering</td>
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**Total** 6+4=10
### Languages (Tamil and English)

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<td>II</td>
<td>TAM 114 (or) ENG 114</td>
<td>JkPH; yf;fp;fs;psy; ntshz;ika[k; mwptpay; JkPH;g; gad;ghLk; (or) Development Education</td>
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<td>I</td>
<td>ENG 115</td>
<td>English for effective Communication</td>
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<td>VI</td>
<td>ENG 228</td>
<td>Soft Skills of Employability</td>
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**Total** 0+3=3

### Common Courses

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<td>PED 116</td>
<td>Physical Education</td>
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<td>I</td>
<td>PED 117</td>
<td>Principles and practices of Yoga</td>
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<td>3.</td>
<td>I</td>
<td>NSS/NCC 118</td>
<td>National Service Scheme / National Cadet Corps</td>
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<td>VI</td>
<td>EXP 329</td>
<td>Experiential Learning - I</td>
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<td>5.</td>
<td>VIII</td>
<td>EXP 424</td>
<td>Experiential Learning - II</td>
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<td>APW 425</td>
<td>Project work</td>
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<td>OPC 426</td>
<td>Optional Course</td>
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**Total** 1+18=19

### ABSTRACT

#### Departments

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<td>Agronomy</td>
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<tr>
<td>Entomology</td>
<td>8 + 6 = 14</td>
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<tr>
<td>Plant Pathology</td>
<td>7 + 6 = 13</td>
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<tr>
<td>Microbiology</td>
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<td>Soil Science and Agricultural Chemistry</td>
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<td>Genetics and Plant Breeding</td>
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<td>Horticulture</td>
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<tr>
<td>Agricultural Economics</td>
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**Total** 85 + 95 = 180
SYLLABUS
AGR 110: PRINCIPLES OF AGRONOMY AND AGRICULTURAL HERITAGE (2+1)

OBJECTIVES
Principles of Agronomy and Agricultural Heritage deals with principles and practices of crop production. To learn about the history of agriculture and agricultural development from ancient to modern age.

THEORY
Unit–I: Introduction to Agriculture

Unit–II: History of Agricultural 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.

PRACTICAL
THEORY LECTURE SCHEDULE
1) Agriculture – Definition – Agriculture as an 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.
6) Indian agriculture – Indian economy – National income – Agricultural income in GDP.
7) Women in agriculture and empowerment.
8) History of agricultural development in world and India.
9) Agricultural heritage – Agriculture in ancient India and Evolution of man.
10) Development of scientific agriculture.
11) Stages of agricultural development – Era of civilization.
12) Importance of Neolithic civilization.
13) Chronological agricultural technology development in India.
14) Kautilya’s Arthasasthra – 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.
26) Crop stand establishment – Plant population and geometry.
27) Inter cultivation – Thinning – gap filling and other intercultural operations.
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 various 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 practical examination

REFERENCE BOOKS
E – RESOURCE
1) http://www.hillagric.ac.in/edu/coa/agronomy/lect/Teaching_Manual_on_Introductory_Crop_Production.pdf
2) http://www.dphu.org/uploads/attachements/books/books_2248_0.pdf
5) http://www.sun.worldcat.org/title/principles_of_agronomy/oclc/689265

AGR 111 : FUNDAMENTALS OF AGRICULTURAL METEOROLOGY (1+1)

OBJECTIVES
This course is scheduled to study the problems of plant growth and yield in relation to environmental factors. Agricultural Meteorology is mainly concerned with microclimatology in which the influence of the shallow layer of atmosphere immediately above the surface is studied.

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

Unit–II : Solar radiation and temperature

Unit–III : Atmospheric pressure

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.
8) Atmospheric pressure, diurnal and seasonal variation – causes for variation – Isobar – Low depression, anticyclone, Tornado, hurricane.
9) Mid Semester Examination.
12) Weather forecasting / Warning – 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.
16) Remote sensing and its application on crop production.
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
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
16) Mapping of agro climatic Zones of India and Tamil Nadu and its characterization.
17) Orientation for final practical examination

REFERENCE BOOKS

SAC 112 : PRINCIPLES OF ANALYTICAL CHEMISTRY (1 +1)

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

THEORY

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

Unit–II : Standards and Indicators

Unit–III : Gravimetric Analysis

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

Unit–V : Radiation Chemistry

PRACTICAL
THEORY LECTURE SCHEDULE
1) General principles in analytical chemistry – common analytical methods – quantitative and qualitative analysis – Accuracy and precision of analytical results.
2) Preparation of laboratory reagents – digestion and distillation techniques.
3) Volumetric analysis – preparation of primary standard solutions.
5) Theory of indicators and buffers. Preparation of indicator and buffer solutions.
6) Theory of acidimetry, alkalimetry, oxidometry, complexometry and thiocyanometry – titration curve.
9) Mid Semester Examination.
10) Filtration and choice of filters – washing – washing solutions and washing technique.
11) Instrumental methods of analysis – Principles and practices of potentiometry, conductometry, colorimetry 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.
14) Radiation chemistry – radioactivity.
16) Stable isotopes – Mass spectroscopic measurements and their application in agricultural research.
17) Use of radioactive and stable isotopes in analytical applications.

PRACTICALSCHEDULE
1) Study of common laboratory glasswares and apparatus – General Guidelines in the laboratory.
2) Volumetric analysis – Preparation of primary, secondary standards and indicators
3) Acidimetry – Standardization of bases
4) Alkalimetry – Standardization of acids
5) Permanganimetry – Standardization of KMnO4
6) Dichrometry – Standardization of Ferrous Sulphate
7) Iodimetry – Estimation of Copper
8) Complexometry – Estimation of Calcium and Magnesium
9) Principles of Gravimetry – Sulphate Estimation
10) Potentiometry and Conductometry – Determination of Potentiometric and Conductometric titration
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 practical examination

REFERENCE BOOKS

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

THEORY

Unit–І : Plant Water Relations

Unit–ІІ: Plant Mineral Nutrition

Unit–ІІІ : Photosynthesis and Respiration

Unit–ІВ : Growth and Development
Unit–V : Stress Physiology

PRACTICAL

THEORY LECTURE SCHEDULE
1) Importance of Crop Physiology in Agriculture – Structure of plasma membrane, chloroplast, mitochondria, peroxisome and vacuole
3) Mechanisms of water absorption – Pathways of water movement – Apoplast and symplast
4) Translocation of water – ascent of sap – mechanisms of xylem transport
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 – climateric and non climateric fruits – factors affecting ripening and manipulations
31) High and low temperature stress – physiological changes – membrane properties – adaptation
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 practical examination

REFERENCE BOOKS

E – REFERENCES
1) http://www.plantphys.org
2) http://www.Biologie.Uni-hamburg.de/b – online
3) http://4e.plantphys.net
4) www.plantphysiol.org

TAM 114 : jkpH; yf;fpaj;fs; spy; ntshz;ika[k; mwtpay; jkpH;g; gad;ghLk; (0 + 1)

bra;Kiwig; gapw;rpf;
1. bjhy;fg;gpak; fh;Lk; Kjw;bghUs;/ fUg;bghUs; – r’;f ,yf;fpajjpy; ntshz; bjhHpy; Ei;g’;fs; – gjpbdz; fPH;f;zF Ely;fspy; ntshz;ik mwtpay; – gs;S ,yf;fpajjpy; VbuGgJj; yf;fpajjpy; ntshz; bghwpapay; – njhl;ltpay; – tdtpay; kidapay; – NHypay; ntshz;ik gHbkhHfps; – ,yf;fpak; fh;Lk; thH;tpay; bwpKiws; – ,fhy ,yf;fpajjpy; ntshz;ikr; rpe;jidfs; – gpiHapd;wp vGJk; Kiws; – ,yf;fpajjpy; bkd;jpwd;fs; – mwtpay; jkpH; tsh;r;rp epiyfs; fiyr;brhy;yhf;fk; – bkhHp bgah;g;ghsh; – Mt;rpj; jkpH; – cHth;fSf;fhd mwtpay;g[fs btsapLjy; – fL;Liur; RUF;fk; vGJjy; – fpdp cyfpy; jkpH;,

bra;Kiwig; gapw;rpf;
ENG 114 : DEVELOPMENT EDUCATION (0+1)  
(ALTERNATE COURSES FOR NON – TAMIL STUDENTS)

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

THEORY 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 practical examination

REFERENCE BOOKS

ENG 115 : ENGLISH FOR EFFECTIVE COMMUNICATION (0+1)

OBJECTIVES
- To make the students competent in Listening – Receptive skill, Speaking – Productive skill, Reading – Receptive skill and Writing – Productive skill

Unit–I : Listening
Introduction – Listening vs Hearing – Basic listening modes – Types of listening – Intensive and Extensive Listening – Process of Listening – Methods of enhancing listening – Barriers of listening.

Unit–II : Speaking

Unit–III : Reading

Unit–IV : Writing

Unit–V
Integrated skills – Group Discussion – Presentation (Seminar) – Forum discussion – Brain Storming – Debate – Writing Fan – mail – e-mail.
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
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 practical examination.

REFERENCE BOOKS
2) Hariharan, S. 2003, Authentic English for Agriculture and Allied Sciences, Hyderabad, Orient Longman.
3) Helgesen, 1997, Mark et al., Active listening, , Cambridge University
8) Robert, A. Day, 2001, How to Publish a Scientific Article, Oxford University
9) Sahaneya Wandy, 2005, et.al. IELTS, Preparation and Practice, Oxford University.
14) Team of authors – Cambridge BEC Vantage, 2005, Cambridge University.
15) Team of authors – Cambridge IELTS Books 1 to 5, 2006, Cambridge University.

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www.eflweb.com www.softskills.com
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www.essays.com www.writing-skills.com
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www.tealit.com www.businessballs.com
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www.angelfire.com www.timethoughts.com
www.primesl.com www.applyesl.com
www.learnbusinessEnglish.com www.teachersdesk.com
www.bogglesworld.com www.flexiblelearning.net.an
OBJECTIVES
Exercises for strength, agility, co – ordination, flexibility, co – operation, vital capacity endurance, speed and for various systems of our body and team spirit.

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

SKILL DEVELOPMENT IN ANYONE OF THE FOLLOWING GAMES
Warming up, suitable exercise, lead up games, advance skill for all the games.

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

Volley Ball : Fingering, under arm pass, over head pass, setting, spiking, back pass, jump pass, stunts, elementary dive, flying 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.

**ATHLETICS**

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

2) Jumps: Western roll, belly roll, eastern cut off, fass ferry flop, approach, take off, straddle, hitch – kick, handging, clearance, landing, strides etc.

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

4) Hurdles: Finding lead leg, use of lead leg and trial leg, flight, clearing, finish.

5) Lead up games, advance skills and game for any one of the above games.

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

**OBJECTIVES**

To inculcate the basics of yoga for the rejuvenation of body, mind and intellect.

**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.

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.

REFERENCE BOOKS
2) Shivananda Saraswati, Yoga Therapy, Bihar School of yoga, Munger, 1998.
3) Swami Satyananda Saraswati, Asana, Pranayama, Mudra and Bandha, Bihar School of Yoga, Munger, 2002.

NSS/NCC 118: NATIONAL SERVICE SCHEME/NATIONAL CADET CORPS

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.
7) Social Service – weaker sections of our society and their needs.
9) Map reading – introduction to map, and lay out of map.
10) Disaster Management Civil defence organization and its duties.
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.

SECOND SEMESTER

AGR 120 : WEED MANAGEMENT (1+1)

OBJECTIVES
Basic understanding on the biology and ecology of weeds. Equipping with the concepts and principles of weed control and management. Exposure to different scientific advancement in the field of weed science.

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.

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.
7) Principles and methods of weed management: Preventive, cultural, mechanical.
8) Principles and methods of weed management: chemical, biological and alternate methods.
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 and their management.

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.
10) Practicing Skill development on spray equipments.
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.
14) Herbicide residue determination by bioassay techniques.
15) Study of Integrated Weed Management.
16) Economic analysis of different weed management methods in crops and cropping systems.
17) Orientation for final practical examination.

REFERENCE BOOKS

E – RESOURCES

AGR 121: IRRIGATION AGRONOMY (1+1)

OBJECTIVES
To impart knowledge on basic principles and practices of irrigation.
To disseminate the scientific knowledge on water management practices to achieve higher yields and utilization of poor quality waters.

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


Unit–III : Crop Water Requirement and Management


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.

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 – 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 and irrigation potential of India and Tamil Nadu – History and development of irrigation in India – Irrigation systems of India and Tamil Nadu.


4) Methods to overcome plant water stress.

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.


13) Methods of irrigation – surface (flooding, beds and channels, check basin, border strip, ridges and furrows, broad bed and furrows and 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.


16) Quality of irrigation water – irrigation management under limited water supply – Agronomic practices for use of poor quality water (saline, effluent and sewage water).


**PRACTICAL SCHEDULE**

1) Estimation of soil moisture by gravimetric method and tensiometer.

2) Estimation of soil moisture by resistance block and neutron probe and other improved devices.

3) Measurement of irrigation water with flumes and weirs.

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 – check basin – 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.
1) Scheduling of irrigation based on depletion of available soil moisture and IW/CPE ratio.

2) Assessment of irrigation water quality parameters in the laboratory.

3) Observation of irrigation structures in wetland, gardenlands and drylands.

4) Visit to irrigation command area and study of command area development.

5) Visit to fields under different methods of irrigation / off campus field visit.

6) Visit to water management and training institute.

7) Orientation for final practical examination.

REFERENCE BOOKS


E – RESOURCES


ENT 122 : FUNDAMENTALS OF ENTOMOLOGY (2+1)

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

THEORY
Unit – I : History and Importance
**Unit–II : Morphology and Behaviour**

Body segmentation, Structure and functions of insect cuticle – cuticular appendages and moulting. Basic Structures of head, thorax, abdomen and their appendages. Modifications of insect antennae, mouth parts, legs, wings, wing venation, wing coupling apparatus and abdomen and its appendages; Metamorphosis and its 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 (Cicindellidae, Carabidae, Dytiscidae, Curculionidae, Apionidae, Staphylidae, Heteroptera, Lampyridae, Hydrophilidae, Scarabaeidae, Dynastidae, Cerambycidae, Melolonthidae, Anobiidae, Tenebrionidae, Bruchidae, Meloidae, Cetoniidae, Buprestidae, Elateridae and Bostrichidae), Strepsiptera, Diptera (Cecidomyiidae, Agromyzidae, Tephritidae, Asilidae, Tabanidae, Tachinidae, Pipunculidae, Hippoboscidae, Culicidae, Syrphidae Muscidae and Drosophilidae), Mecoptera, Siphonaptera, Trichoptera, Lepidoptera (Nymphalidae, Lycaenidae, Pieridae, Papilionidae, Crambidae, Pyralidae, Noctuidae, Arctiidae, Bombycidae, Coccoidea, Geometridae, Gelechiidae, Pterophoridae, Saturniidae, Sphingidae, Lymantriidae, Lycaenidae, Hesperiidae) and Hymenoptera (Tenthredinidae, Apidae, Xylocopidae, Megachilidae, Bombidae, Sphecidae, Vespidae, Formicidae, Ichneumonidae, Braconidae, Platygastroidea, Bethylidae, Euphorbiae, Chalcididae, Encyrtidae, Eulophidae and Trichogrammatidae).
PRACTICAL

ASSIGNMENT
Each student has to submit 25 insects covering at least ten orders.

THEORY LECTURE SCHEDULE
2) Characters of Phylum Arthropoda and its classes.
3) Factors responsible for insect dominance.
4) Segmentation and Structure of Insect body wall and cuticular appendages.
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.


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.


26) Distinguishing characters of orders Collembola, Protura, Diplura, Archaeognatha and Zygentoma.


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, Cricadidae, Coccinellidae, Delphacidae, Aphididae, Cercopidae, Membracidae, Aleyrodidae, Coccidae, Diaspididae, Pseudococcidae, Kerridae, 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, Gyrinidae, Lampyriidae, Hydrophilidae,
Scarabaeidae, Dynastidae, Cerambycidae, Melolonthidae, Anobiidae, Tenebrionidae, Bruchidae, Meloidae, Cetonidae, 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, Pyraustidae, Noctuidae, Arctiidae, Bombycidae, Cochlidiidae, Geometridae, Gelechiidae, Pterophoridae, Saturniidae, Sphingidae, Lymantriidae, Metarbelidae and Hesperiidae)

16) Observation on distinguishing characters of Hymenoptera (Families: Tenthredinidae, Apidae, Xylocopidae, Megachilidae, Bombidae, Sphecidae, Vespidae, Formicidae, Ichneumonidae, Braconidae, Platygastridae, Bethylidae, Evanidae, Chalcididae, Encyrtidae, Eulophidae and Trichogrammatidae)

17) Orientation for final practical examination

**REFERENCE BOOKS**


**WEB RESOURCES**

1) http://www.itis.usda.gov/it is/

2) www.zin.ru/animalia

3) https://courses.cit.cornell.edu/ent201/content/anatomy2.pdf

4) www.insectsexplained.com/03external.htm

5) www.earthlife.net/insects/anatomy.html

6) www.insectidentification.org/orders_insect.asp
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 fundamental characteristics of various microorganisms.
- To develop experimental skills, including the collection and analysis of data, the ability to draw valid conclusions and apply these conclusions within a larger frame work.

THEORY

Unit–І : History of Microbiology


Unit–ІІ : 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–ІІІ : Position of Microbes in the living World and their Structure


Unit–ІV : Growth, Nutrition and Metabolism


Unit–V : Viruses, Bacterial Genetics and Immunology

General properties of viruses: different types; overview of bacteriophages; morphology of bacteriophages: Lytic and lysogenic cycles; lytic and temperate phages. Mutation types and mutagens. Genetic recombinations: Transformation,

**PRACTICAL**


**THEORY LECTURE SCHEDULE**

1) Definition and scope of microbiology – Development of microbiology as science.

2) Biogenesis and abiogenesis theory. Contributions by Antonie Van Leeuwenhoek, Louis Pasteur.


5) Microscopy; principles – resolving power and magnification. Light microscopy.

6) Different types of microscopes – UV, Dark Field, Phase Contrast, Fluorescence Microscope.


8) Staining techniques – principle and types of stains staining techniques – simple staining.

9) Negative, differential and structural staining methods.

10) Sterilization – principle – physical agents and chemical methods.

11) Isolation and enrichment culture techniques; preservation techniques.


14) Cell biology; size, shape, structure and arrangement of cells. External structures in bacteria and their functionality.

16) Morphology of algae – economic importance.
17) Mid Semester Examination.
18) Bacterial growth population growth and growth cycle – continuous culture – chemostat and turbidostat; synchronous culture.
21) Nutritional types of bacteria; energetics in bacteria. Metabolic diversity / pathways specific to bacteria.
22) Microbial metabolism – Energy generation by substrate level phosphorylation, oxidative and Photophosphorylation.
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.
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 glassware.
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’s staining.
10) Bacterial spore staining.
11) Capsule staining.
12) Negative staining.
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 practical examination

**TEXT BOOKS**

**REFERENCE BOOKS**

**E – REFERENCES**
1) http://www.microbes.info
2) http://aem.asm.org
3) http://microbelibrary.com
4) http://www.rapidmicrobiology.com

**SAC 124 : FUNDAMENTALS OF BIOCHEMISTRY (2+1)**

**OBJECTIVES**
- To gain basic knowledge of the biomolecules \textit{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**

\textbf{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.
3) Physical properties of carbohydrates – Mutarotation, optical activity, isomerism.
4) Chemical reactions of carbohydrates.
5) Amino acids – Classification and structure.
Classification of proteins based on function and solubility.

Structure of protein – Primary, secondary, tertiary and quaternary structure.

Protein folding, physical and chemical properties of proteins.

Enzymes – Properties, classification and nomenclature.

Mechanism of enzyme action. Factors affecting enzyme activity.

Enzyme inhibition – competitive, non-competitive, uncompetitive and allosteric enzymes.

Coenzymes, cofactors and isoenzyme.

Lipids – occurrence and classification.

Storage lipids – Structural lipids – types and importance.

Sterols – basic structure and their importance.

Mid Semester Examination

Physical and chemical constants of oils. Rancidity of oils.

Carbohydrate metabolism – breakdown of starch by amylases

Glycolysis – Reactions and bioenergetics.

TCA cycle – Reactions and bioenergetics.

Pentose phosphate pathway – Reactions.

Respiration – electron transport chain and oxidative phosphorylation.

Lipid metabolism – lipases and phospholipases.

Beta – oxidation of fatty acids and bioenergetics.

Biosynthesis of fatty acids and triacylglycerol.

Transamination, deamination and decarboxylation of amino acids.

Ammonia assimilating enzymes – GS, GOGAT and GDH.

Metabolic inter – relationship.

Secondary metabolites – occurrence, classification and functions of phenolics.

Occurrence, classification and functions of terpenes and alkaloids.

Vitamins – Definition – general characteristics and classification.

Plant Hormones – definitions – Role of Auxins, Gibberellins in plants.

Cytokinins and other natural growth hormones and inhibitors in plants.

PRACTICAL SCHEDULE

I. Qualitative tests for carbohydrates

1) Identification of glucose and fructose.

2) Identification of sucrose and maltose.

3) Identification of lactose.

4) Identification of dextrin.

5) Identification of starch.

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

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

IV. Analysis of lipids
  12) Determination of acid value of an oil.
  13) Determination of iodine value of an oil.
  14) Determination of saponification value of an oil.
  15) Determination of peroxide value of an oil.
  16) Determination of ascorbic acid (vitamin C).
  17) Record certification.

REFERENCES

E – REFERENCES
  2) http://bcswfreeman.com/lehninger6e
GPB 125 : INTRODUCTION TO AGRICULTURAL BOTANY (1+1)

OBJECTIVES
To expose the students to the basic features of botanical description, economic parts and economic importance of different field and horticultural crops.

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, Stiossanthes, Clitoria, Agathi and Sunhemp.

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 and Safflower, Brassicaceae – Rapeseed, Mustard and Cabbage, Cauliflower; Euphorbiaceae: Castor, Jatropha and Tapioca; Arecaceae: Coconut, Areca nut and 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, Medicinal Plants
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.
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 and Cauliflower; Euphorbiaceae: Castor, Jatropha and Tapioca; Arecaceae: Coconut, Areca nut, Oil palm; Malvaceae: Cotton, Mesta and 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 and 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 – author citation – 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.
10) Key botanical features of Lucerne, Stylosanthes, Clitoria, Agathi, and Sunnhemp.
11) List of cultivated crops, economic parts, chromosome number and family description of Pedaliaceae and Asteraceae: Key botanical features of Gingelly, Sunflower, and 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 Arecaceae 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 and 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 and Mulberry.

16) List of cultivated crops, economic parts, chromosome number and family description of Cucurbitaceae and Alliaceae; Cucurbitaceae: Key botanical features of Cucumber, Pumpkin and Ash gourd; 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.

4) Poaceae: Sorghum, Maize, Pearl millet and Finger millet.

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.


9) Pedaliaceae: Gingelly; Asteraceae: Sunflower and Safflower.

10) Brassicaceae: Rapeseed and Mustard, Cabbage and Cauliflower.

11) Euphorbiaceae: Castor, Jatropha, Tapioca; Arecaceae: Coconut, Areca nut and Oilpalm.

12) Malvaceae: Cotton, Mesta and Bhendi.

13) Tiliaceae: Jute; Piperaceae: Betel vine; Chenopodiaceae: Sugar beet.
14) Solanaceae: Tobacco, Potato, Chilli, Tomato and Brinjal; Mimosae: Desmanthes and Subabul, Moraceae: Mulberry.
15) Cucurbitaceae: Cucumber, Pumpkin, Ashgourd; Alliaceae: Onion and Garlic.
16) Musaceae: Banana; Rubiaceae: Coffee; Theaceae: Tea.
17) Orientation for final practical 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.

REFERENCE BOOKS

FURTHER READING

AEC 126 : PRINCIPLES OF ECONOMICS (1+1)

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

THEORY
Unit–I : Nature and Scope of Economics

Unit–II : Theory of Consumption
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

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 – Principles – Public revenue: Meaning – Classification of taxes – Canons of

PRACTICAL

Indifference curve analysis and consumer equilibrium – Law of Demand, demand
schedule – Graphical derivation of individual and market demand – Estimation of
own price, income and cross price elasticities of demand – Estimation of Consumer
surplus – Illustration on Engel’s Law of Family Expenditure – Law of supply –
Estimation of supply elasticity – Equilibrium price determination. Types and
functions of money – Inflation: Analysis of causes of inflation and control measures.
Approaches to computation of national income – Study of structural changes in the
economy. Food grain production in India – Growth rate analysis – Study of
demographic changes in India – Measures of human development: Welfare
indicators – Human Development Index (HDI) and Physical Quality of Life Index
(PQLI).
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
2) Basic concepts – Goods, services, use value and exchange value, cost, price, wealth and welfare – Wants: Characteristics and classification of wants.
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
10) Concept of production – Factors of production – Land and its characteristics.


PRACTICAL SCHEDULE
1) Exercise on Law of Diminishing Marginal Utility.
2) Exercise on Law of Equi – Marginal Utility.
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.
6) Estimation of Consumer surplus.
7) Illustration on Engel’s Law of Family Expenditure.
9) Equilibrium price determination.
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 practical examination.

REFERENCE BOOKS
AEX 127 : FUNDAMENTALS OF RURAL SOCIOLOGY AND EDUCATIONAL PSYCHOLOGY (1+1)

OBJECTIVES
This course will enable students to acquire knowledge on basic concepts related to rural sociology and educational psychology. Students will also learn the 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 and 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–ІІІ : 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 and 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.

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.
8) Social Change – concept, factors influencing social change.
9) Mid Semester Examination.
10) Leadership – definition of leader and leadership, characteristics, types, functions, Methods of selecting leaders.
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) 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).
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) Processing of data and presentation of reports.

7) Processing of data and presentation of reports.

8) 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).

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) Processing of data and presentation of reports.

12) Processing of data and presentation of Reports.

13) Practicing Personality measurement techniques (Group exercise).

14) Practicing Personality measurement techniques (Group exercise).

15) Practicing Intelligence measurement techniques (Group exercise).

16) Practicing Intelligence measurement techniques (Group exercise).

17) Orientation for final practical examination.

**REFERENCE BOOKS**


COM 128 : FUNDAMENTALS OF INFORMATION TECHNOLOGY (1+1)

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
3) Data Representation in Computers, Computer Memory and Storage, Input Output Media and Current Trends in Computer.


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.

13) Generation of Programming Languages, Current Trends in Computer Programming and 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.
15) Working with DBMS softwares.
16) Working with SQL commands.
17) Orientation for final practical examination.

TEXT BOOK

REFERENCE BOOK

E – REFERENCE
http://pearsoned.co.in/ITLEducationSolutionsLimited/

THIRD SEMESTER
AGR 210 : AGRONOMY OF FIELD CROPS – I (2+1)

OBJECTIVES
Acquiring knowledge on agronomical aspects of various field crops such as cereals, millets, pulses, forage and green manure crops.

THEORY
Unit–І : 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–ІІ : Agronomy of Major and Minor Millets

Unit–ІІІ : 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, Stylosanthus and Cowpea – Economic importance, soil and climatic requirement, varieties, cultural practices and yield. Fodder preservation techniques.

Unit–V : Agronomy of Green Manures


PRACTICAL


THEORY LECTURE SCHEDULE

1) Importance and area, production and productivity of cereals and major and minor millets of India and Tamil Nadu.
6) Rice – Quality of rice – Post harvest management – Value addition and by products utilization.
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 varieties.
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, Kolukkattai grass – 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.


34) *In situ* 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 red grams.

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.

12) Study on yield parameters and estimation of yield in pulses and forage crops.

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 practical examination.

**REFERENCE BOOKS**

**E – RESOURCES**
3) http://nsdl.niscair.res.in/123456789/527 Millets (Sorghum, Pearl Millet, Finger Millet) – Formatted.pdf

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

**OBJECTIVES**
- To study the techniques in rearing honey bees, silkworms and lac insects.
- To know about minor productive insects and their importance.
- To know about helpful and injurious insects and their uses
- To study the basic morphology, biology and extraction of important plant parasitic – nematodes.

**Unit-I : Apiculture**
bee pollination, bee products and their uses, bee poisoning and Scope of beekeeping in India.

Unit–II : Sericulture


Unit–ІІІ : Lac Culture and Minor Productive Insects


Unit–ІV : Helpful and injurious insects


Unit–V : Morphology, Taxonomy, Biology and Extraction of Nematodes

PRACTICAL
Acquaintance with honey bee species, structural adaptation, castes, Bee -
keeping equipment, bee forage plants, enemies of bees and Handling of bee colonies
and Artificial queen rearing. Acquaintance with silkworm types, life stages of
mulberry silkworm, Mulberry varieties, Rearing appliances for silkworm, Enemies of
silkworm, Preparation of mulberry cuttings and Handling of silkworm – shelf and
shoot rearing, skill involved in brushing – feeding – moulting care – bed cleaning –
spacing – mountages – spinning and cocoon harvest. Identification of pests and
diseases of silkworm – symptoms. Identification of lac insect, lac products and
minor productive insects. Survey and sampling for plant parasitic nematodes.
Extraction of plant parasitic nematodes and cysts from soil and roots (Cobb’s
sieving technique, Baermann funnel technique, conical flask technique, Sugar
floatation technique, Fenwick can method, Incubation and Blender technique).
Mounting of plant parasitic nematodes – Diagnostic characters of orders *Tylenchida*
and *Dorylaimida*. Identification of important plant parasitic nematodes –
*Meloidogyne*, *Heterodera*, *Globodera*, *Tylenchulus*, *Hoplolaimus*, *Aphelenchoides*,
*Xiphinema*, *Radopholus*, *Ditylenchus*, *Pratylenchus*, *Rotylenchulus* and *Tylenchulus*.
Important plant parasitic nematodes of major crops – symptoms and biology.

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
1) Economic classification of insects. Importance and history of apiculture,
species of bees.
2) Morphology, anatomy and structural adaptations of bees.
4) Bee pasturage, bee foraging, communication and swarming.
5) Apiary – selection of site, bee – keeping equipment, seasonal management
and Artificial queen rearing.
6) Bee enemies and diseases of bees.
7) Bee pollination, bee products and their uses and Scope of beekeeping in
India.
8) History of sericulture – silk road – Organizations in sericulture industry,
Types of silkworm – Non – mulberry, Eri, Tasar and Muga silkworms.
10) Morphology and biology of mulberry silkworm. structure and function of silk
glands.
11) Mulberry cultivation – soil type – mulberry varieties – Methods of
propagation.


16) Importance and history of Lac culture. Species of Lac insect.

17) Mid Semester Examination.

18) Morphology, biology and secretion of lac.

19) Host plants of lac insect – maintenance of host plants. Inoculation of Lac insect and Yield. Enemies of lac insect.


23) Helpful insects – Parasitoids, Predators, difference between predators and parasitoids, Types of parasitoids and parasitism.

24) Weed killers, pollinators, scavengers and soil builders.


26) Identification and management of household insects.


28) Importance of plant parasitic nematodes and entomophilic nematodes – Economic loss in crop plants.

29) Elementary knowledge on morphology of nematode – cuticle, segmentation, cephalic regions.

30) Elementary knowledge on alimentary, excretory, reproductive systems, nervous system and sense organs.

31) Classification based on feeding habits and ecology. Taxonomy of important plant parasitic nematodes.
32) Biology and ecology of important plant parasitic nematodes – *Meloidogyne, Heterodera, Globodera, Tylenchulus, Hoplolaimus, Aphelenchoides, Xiphinema*.

33) Biology and ecology of important plant parasitic nematodes – *Pratylenchus, Rotylenchulus, Radopholus* and *Ditylenchus*.

34) 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.

3) Studies on seasonal management and identification of enemies of honey bees.


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.

15) Identification of nematodes – *Meloidogyne, Heterodera, Globodera, Tylenchulus, Radopholus, Rotylenchulus, Ditylenchus, Hirschmanniella, Hemicriconemoides, Criconema, Aphelenchoides, Pratylenchus* and *Tylenchulus*.

16) Observing the life stages of *Meloidogyne*.

17) Orientation for final practical examination.
REFERENCE BOOKS

E – RESOURCES
1) http://www.sristi.org/hbnew
4) http://www.csb.gov.in/publications/books/
5) http://ilri.ernet.in/~iinrg/

PAT 212 : FUNDAMENTALS OF PLANT PATHOLOGY (2+1)

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

THEORY
Unit–I : Plant pathogenic organisms

Unit–II : Pathogenesis
Pathogenesis – Mode of infection – pre-penetration, penetration and post penetration – 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


Unit–IV : Phylum Ascomycota and Basidiomycota

Phylum: Ascomycota, Classes: Taphrinomycetes (Taphrinales), Dothideomycetes (Dothidiales, Capnodiales, Pleosporales,) Eurotiomycetes (Eurioiales), Leotiomycetes (Erysiphales and Helotiales), Sordariomycetes (Hypocreales, Phyllochoreales, Glomerales, Diaporthales,) and mitosporic ascomycetes. Phylum: Basidiomycota, Classes: Agaricomycetes (Agaricales, Corticales, Cantharellales and Polyporales), Pucciniomycetes (Pucciniales) and Ustilaginomycetes (Ustilaginales, Urocystidales), Exobasidiomycetes (Exobasidiales and Tilletiales).

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


PRACTICAL

Study of important taxonomic characters and symptoms produced by Plasmodiophora, Pythium, Phytophthora, Albugo, Sclerospora, Peronospora, Peronosclerospora, Pseudoperonospora, and Plasmopara, Mucor, Rhizopus, Taphrina, Capnodium, Cercospora (Mycosphaerella), Diplodia, Botryodiplodia (Botryosphaeria), Curvularia, Drechslera (Helminthosporium), Alternaria, Erysiphe, Phyllactinia, Uncinula, Leveillula and Claviceps, Fusarium (Gibberella, Nectria), Verticillium, Colletotrichum (Glomerella) Pestalotia (Pestalosphaeria), Pyricularia (Magnoporthe), Sarocladium, Macrophomina, Puccinia, Uromyces, Hemileia, Ustilago, Sphacelotheca (Sporisorium), Tolyposporium (Moesziomyces), Exobasidium, Sclerotium, Rhezoctonia (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 Plasmodiophora brassicae 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, Perenospora, Pseudoperenospora and Plasmodpara
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* (*Magnopusporhe*) 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*), *Tolyposporium* (*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 – Phyllody, 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 *Plasmidiophora*, *Pythium* and *Phytophthora*

3) Study of important taxonomic characters and symptoms produced by *Sclerospora*, *Peronospora*, *Peronosclerospora*, *Pseudoperonospnora* and *Plasmopora*

4) Study of important taxonomic characters and symptoms produced by *Albigo* 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

12) Symptoms of bacterial diseases – leaf blight, leaf streak, canker, scab, crown gall, wilt and soft rot.

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 practical examination.

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

REFERENCE BOOKS
E – BOOKS

E – REFERENCES
1) www.mycobank.org
2) www.mycology.net
3) www.bspp.org.uk
4) www.ictv.org
5) www.bibo.library.cornel.edu

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

OBJECTIVES
To Demonstrate basic knowledge of terms and concepts in soil science, apply this knowledge to new problems and situations. Learn the key physical, chemical, and biological aspects of soils and form a basic understanding of formative processes for different soil types. The recognition of soil as a natural body.

Unit–I : Earth origin and weathering of rocks

Unit–II : Soil formation and soil forming processes

Unit–III : Physical properties – I

Unit–IV : Physical properties – II
Soil water classification, potentials, Soil moisture constants, movement of soil water – saturated and unsaturated flow – Infiltration, hydraulic conductivity, percolation, permeability. Soil air – composition, gaseous exchange, influence of soil

**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 method, 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

6) Soil formation – soil forming factors – classification – active and passive – their role in soil formation – catena – definition

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

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

9) Soil and Phases of soils – solid, liquid and gaseous phase – mineral matter, organic matter, water and air – definition and functions of soil and various concepts of soil – Pedological and edaphological concepts
10) Soil physical properties – soil texture – definition – various inorganic components in soil and their properties – particle size analysis – methods – various textural classes in soil and their properties

11) Stoke’s Law – assumptions and limitations – significance of soil texture

12) Soil structure – classification – types, classes and grades of soil structure – factors affecting soil structure

13) Genesis of soil structure – importance of soil structure and its management


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

17) Mid Semester examination


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


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

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

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

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

27) Origin of charge in organic and inorganic colloids – negative and positive charges – organic colloids – differences between organic and inorganic soil colloids

28) Adsorption of ions – types of ion exchange – cation and anion exchange – cation and anion exchange capacities of soil

29) Base saturation – factors affecting ion exchange capacity of soils – importance of Cation Exchange Capacity (CEC) and Anion exchange capacity (AEC) of soils


32) Importance of soil organic matter and humus – fractionation of soil humus – carbon cycle – biomass carbon and nitrogen


34) Soil organisms – soil flora and fauna – beneficial and harmful roles – 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 – 11
9) Determination of particle size analysis – Bouyoucos Hydrometer
10) Determination of soil colour using Munsell color chart
11) Estimation of pH and EC in soil
12) Estimation of soil organic carbon
13) Estimation of CEC in soil
14) Estimation of exchangeable cations in soil – calcium and magnesium
15) Estimation of exchangeable cations – Potassium and Sodium
16) Determination of base saturation and interpretation
17) Record certification

REFERENCE BOOKS

E – REFERENCES
1) http://www.sciencedirect.com/science/books

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

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

THEORY
Unit–I : Cytology
Brief history of developments in genetics and cytogenetics; Physical basis of heredity: Structure and function of cell and cell organelles – Differences between Prokaryotes and Eukaryotes. Cell division – amitosis, 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 supernumary chromosomes, ring and isochromosomes; Chromosomal aberration: Variation in chromosome structure – genetic and cytological implications; Variation in chromosome number – euploid, aneuploid,
Nondisjunction – Klinefelter syndrome, Down’s syndrome, Izmeyer syndrome and Turner syndrome; Definition of eugenics and eugenics; evolution of Wheat, Triticale, cotton, tobacco, Brassicas.

**Unit–II : Mendelian laws and modifications of Mendelian laws**


**Unit–III : Modern concept of genetics and mutation**

DNA, the genetic material – Griffith’s experiment, experiment of Avery, McCleod and McCarthy – confirmation by Hershey and Chase; RNA as genetic material – Frankel, Conrat and Singer experiment. Chemical structure of DNA – Watson and Crick model – Central dogma of life. Proof for semi conservative mode 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**

Sex determination: Autosomes and sex chromosomes – chromosomal theory of sex determination – different types – sex determination in human, fowl, butterfly, grasshopper, honey bee, fumea; Sex determination in plants – Melandrium, papaya, maize. Genic balance theory of Bridges, quantitative theory, hormonal theory, barr bodies, metabolic differentiation theory; Gynandromorphs – sex reversal in chicken. Sex linked inheritance – criss cross inheritance – reciprocal difference; holandric genes; sex influenced and sex limited inheritance. Cytoplasmic inheritance and

**PRACTICAL**


**THEORY SCHEDULE**

1) Definition of genetics, heredity, inheritance, cytology, cytogenetics; Brief history of developments in genetics and cytogenetics.

2) Physical basis of heredity: Structure and function of cell and cell organelles – Differences between Prokaryotes and Eukaryotes.

3) Cell division – mitosis, meiosis and their significance, cell cycle; zygote formation and embryo development – identical and fraternal twins.

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

5) Types of chromosomes based on position of centromere, based on structure and function: normal and special chromosomes – polypene, lampbrush, based on the role in sex determination: autosomes and allosomes, Other types of chromosomes – B, ring and isochromosomes.


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

8) Polyploid – auto and allopolyploids their characters; meaning of genome; evolution of Wheat, Triticale, Cotton, Tobacco, *Brassica*

9) Pre – Mendelian ideas about heredity – Vapour and fluid theory, Magnetic power theory, Preformation theory, Lamarck’s theory, Darwin’s theory, Germplasm theory and Mutation theory.

10) Mendel’s experiments and laws of inheritance. Rediscovery of Mendel’s work

11) Terminologies: gene, allele, locus, homozygous, heterozygous, hemizygous, genotype, phenotype, monohybrid, dihybrid, trihybrid, polyploid.
12) Chromosomal theory of inheritance. Allelic interactions – Dominance vs recessive, complete dominance, codominance, incomplete dominance, over dominance.

13) Deviation from Mendelian inheritance – Non allelic interaction without modification in Mendelian ratio – Bateson and Punnett’s experiment on fowl comb shape. Non allelic interaction with modification in Mendelian ratio –
   i.) Dominant epistasis (12:3:1)
   ii.) Recessive epistasis (9:3:4) iii.) Duplicate and additive epistasis (9:6:1).
   iv.) Duplicate dominant epistasis (15:1)
   v) Duplicate recessive epistasis (9:7) vi.) Dominant and recessive epistasis (13:3); Summary of epistatic ratios (i) to (vi).

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

15) Mid Semester Examination

16) 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.

17) Structure of DNA – Watson and Crick model – Central dogma of life

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

19) RNA types – mRNA, tRNA, rRNA; genetic code, protein synthesis – transcription. Translation

20) Regulation of gene expression – Operon model of Jacob and Monad; Structural genes and regulator genes.Cistron, muton and recon;

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

22) Mutation – characteristics of mutation – micro and macro mutation – ClB technique – molecular basis of mutation – Transition and transversion; major physical and chemical mutagens.

23) Quantitative inheritance – Multiple factor hypothesis – Nilsson Ehle experiment on wheat kernel colour.

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

25) 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.


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.
3) Study of behavior of chromosomes in mitosis.
4) Study of the mitotic phases in root tips of onion / Aloe sp.
5) Procedure for fixing and observing different meiotic phases in the inflorescence of rice/maize.
6) Procedure for fixing and observing different meiotic phases in the inflorescence in pearl millet/ sorghum/ /horticultural crop/forest tree.
7) Repetition of meiotic studies in maize/ sorghum/ pearl millet/ forest tree and making temporary and permanent slides.
8) Observation of bivalents, trivalents, quadrivalents and chromosome banding.
9) Principles of dominance, recessive, back cross, test cross, incomplete dominance, codominance and lethal factor; Chi square test; Monohybrid genetic ratio with dominance, with incomplete dominance and test cross.
10) Dihybrid ratio with dominance, with incomplete dominance and test cross
11) Simple interaction of genes – comb character in fowls; Dominant epistasis.
12) Recessive epistasis, Duplicate and additive epistasis.
13) Duplicate dominant epistasis, Duplicate recessive epistasis, Dominant and recessive epistasis.
14) Multiple alleles and polygenic inheritance
15) Estimation of linkage with F2 and test cross data; Coupling and repulsion.
16) Problems on two point test cross and three point test cross; Working out interference, coincidence and drawing genetic maps.
17) Orientation for final practical examination.

**REFERENCE BOOKS**

**FURTHER READING**

**E – REFERENCES**
1) www.nmsu.edu
2) www.biology200.gsu.edu

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

**OBJECTIVES**
This course will expose the basic and fundamental aspects of horticulture including propagation methods, planting systems, training, pruning, orchard layout, growth regulation and components of protected cultivation.

**THEORY**
**Unit–I : Basic concepts of horticulture**

**Unit–II : Methods of propagation in horticultural crops**
Propagation techniques – Seed and vegetative propagation methods – Advantages and disadvantages – Techniques of seed propagation – Dormancy and

**Unit–III : Orchard management and cropping systems**

**Unit–IV : Growth and development of horticultural crops**

**Unit–V : Protected cultivation**
Protected cultivation – definition, importance and scope in India – modes of protected cultivation – types of green houses – factors controlled under green house – media – Hydroponics – Methods and Advantages.

**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 LECTURE SCHEDULE**
1) Horticulture – definitions, scope and importance of horticulture – Divisions of horticulture.
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.
6) Principles of propagation – Advantages and disadvantages of seed propagation.
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.
12) Principles and practices of micro 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.
20) Detailed study of organic farming.
21) Detailed study on bearing habits in horticultural crops.
22) Principles and methods of training in horticultural crops.
23) Principles and methods of pruning in horticultural crops.
24) Flowering, pollination and fruit set 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 an 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 – Preparation of nursery beds for raising rootstocks and seedlings
7) Demonstration of propagation through cutting
8) Demonstration of propagation through layering
9) Demonstration of propagation through grafting and top working
10) Demonstration of propagation through budding
11) Propagation through specialized plant parts
12) Bearing habits of horticultural crops
13) Special training and pruning practices followed in horticultural crops
14) Preparation of plant growth regulators and methods of application in horticultural crops
15) Visit to tissue culture laboratory and study of micropropagation protocols and hardening
16) Plant propagation structures including mist chamber, shade net, glass houses and poly houses and orientation for final examination
17) Orientation for Final Practical Examination.

REFERENCE BOOKS

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

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

THEORY
Unit–I: Production Economics and Farm Management – Nature and Scope
**Unit–II : Factor – Product Relationship / Principle of Variable Proportions**


**Unit–ІІІ : Factor – Factor Relationship / Principle of Factor Substitution**


**Units–IV : Product – Product Relationship / Principle of Product Substitution**


**Unit–V : Farm Planning and Budgeting**


**PRACTICAL**

THEORY LECTURE SCHEDULE

1) Production Economics: Definition – 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.


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.


12) Isoclines, 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.


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
13) Preparation of cash flow statement.
14) Preparation of complete and partial budgets
15) Preparation of farm plan.
16) Graphical solution to linear programming problem.
17) Orientation for final practical examination.

REFERENCES

AEX 217 : DIMENSIONS OF AGRICULTURAL EXTENSION (1+1)

Objective
The course intends to expose students to the fundamentals of extension education, extension systems in India, programme planning and rural development efforts. The course will also provide an opportunity to students to visit different organizations involved in extension activities and rural development work.

Unit–I : 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 (T&V) 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.

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.


6) Firstline Extension System – Krishi Vigyan Kendra (KVK) Agricultural Technology Information Centre (ATIC), Frontline demonstrations.


8) Community Development Programme (CDP), National Extension Service (NES), Intensive Agricultural District Programme (IADP), Intensive Agricultural Area Programme (IAAP).

9) Mid Semester Examination

10) High Yielding Variety Programme (HYVP), Institution Village Linkage Programme (IVLP), Integrated Rural Development Programme (IRDP).

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 Swarojgar Yojana (SGSY), Swarna Jayanthi Shahari Rozgar Yojana (SJSRY), Pradhan Mantri Gram Sadak Yojana (PMGSY).

14) Sampoorna Grameen Rozgar Yojana (SGRY), Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), Providing Urban Amenities to Rural Areas (PURA), National Agricultural Innovation Project (NAIP), NADP (RKVY).
15) Women Development Programmes – Development of Women and Children in Rural Areas (DWCR), Mahila Samridhi Yojana (MSY), Tamil Nadu Women in Agriculture (TANWA).

16) Youth Development Programmes – TRYSEM, Nehru Yuvak 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) Construction of interview schedule to study the awareness and participation of people in rural development programmes implemented in a village (Group exercise)
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) Preparation of report.
15) Preparation of report.
16) Preparation of report.
17) Orientation for final practical examination.

REFERENCE BOOKS


E – REFERENCES
1) rural.nic.in
2) www.panchayat.gov.in
3) wcd.nic.in
4) moud.nic.in
5) mhupa.gov.in

AHS 218 : LIVESTOCK AND POULTRY MANAGEMENT (2+1)

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-1: Introduction to Livestock and Poultry Management

Unit-1I: Dairy Cattle Management

**Unit–ІІІ : Sheep and Goat Management**

**Unit–ІВ : Swine Management**
Breeds – Classification – Economic traits – Housing – Nutrition – Creep feeding – Care and management of young and adult stock – Prophylactic and control measures of diseases.

**Unit–ІV : 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.

**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


6) Breast characteristics of exotic cattle – Jersey and Holstein friesian – Indian buffaloes – Murrah, Surti and Toda.

8) Estrous cycle – signs of estrum – Artificial Insemination – merits and demerits

9) Housing management – selection of site and floor space requirement for calves, heifer, and milch animals.


11) Care and management of new born calf, heifers, pregnant and lactating cows.


13) Classification of feed stuff – Importance of green fodder.

14) Milking methods – Clean milk production.


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.


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 practical examination.

**REFERENCE BOOKS**


E – REFERENCES
1) www.sciencecentral.com
2) www.ansci.umn.edu/poultry/resources/layermgmt.htm
3) www.armsd.com/
4) www.animalwebsites.co.uk
5) www.intervet.com/species/pigs/websites.aspx
6) www.britishangoragoats.org.uk/management.htm
7) www.indiagoatfarm.com
8) www.indiadairy.com
9) www.indiagronet.com
10) www.foodsci.uoguelph.ca
11) www.fil–idf.org

FOURTH SEMESTER
AGR 220: AGRONOMY OF FIELD CROPS – II (2+1)

OBJECTIVE
To obtain knowledge on cultivation aspects of oilseeds, Sugar, Fibre, Tuber and Narcotic crops.

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.

PRACTICAL


THEORY LECTURE SCHEDULE

1) Introduction – Importance and constraints of oil seeds, sugar crops, fibre, tubers and narcotic 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.
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.


15) Sugarcane – Ratoon management techniques, crop logging, maturity and ripening sugar and gur manufacture – value addition and by product utilization.

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.

20) Cotton – Cultural practices, yield and quality parameters.


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) Post harvest management practices. Value addition and by products utilization of tuber crops.
30) 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.
2) Nursery preparation and management for Sugarcane and Tobacco.
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.
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.
REFERENCES
2) Ahlawat, I.P.S., Om Prakash and G.S. Saini. 2010. Scientific Crop Production in India. Rama publishing House, Meerut

E – RESOURCES
1) http://nsdl.niscair.res.in/123456789/532Cotton – Formatted.pdf
2) http://nsdl.niscair.res.in/123456789/509LINSEED – Formatted.pdf
3) http://nsdl.niscair.res.in/123456789/512SUNFLOWER – Formatted.pdf
4) http://nsdl.niscair.res.in/123456789/511NIGER – Formatted.pdf

AGR 221 : STUDY TOUR (0+1)
Students will undertake 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 Stations / 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.

ENT 222 : INSECT ECOLOGY AND PRINCIPLES OF PEST MANAGEMENT (2+1)
OBJECTIVES
- To study the influence of ecosystems on insect populations.
- To know about various pest management methods.

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


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

Insecticide residues, Insecticide resistance, Insect resurgence, Insecticide contamination and pollution, Bio accumulation and Bio magnification, Acute and Chronic toxicity, Insecticide resistance and residue management. Integrated pest management strategies in different crop ecosystems – Rice, cotton, sugarcane, coconut, brinjal and mango.

PRACTICAL

dose/concentration of insecticides. Compatibility of pesticides and phytotoxicity of insecticides. Effective application of insecticides.

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
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.
16) Conservation, importation, augmentation and release of natural enemies. Role of birds in insect and rodent management.
17) Mid Semester Examination
18) Pheromones in IPM – Sex pheromones, Alarm pheromones, trail pheromones and aggregation pheromones
20) Traps in management of crop and storage pests. Push and Pull techniques.
21) Biotechnology in IPM – genetic engineering – transgenic crops – Constraints in using transgenic crops. Sterile male technique and gamma radiation in IPM.
22) Botanical insecticides in IPM – Neem and other examples. Antifeedant, Repellant and Insect growth disturbance properties of botanicals.
23) Formulation techniques of Botanicals.
24) Traditional methods in IPM.
25) Chemical control – importance and history.
26) Classification of pesticides – different modes of classification.
27) Toxicity ranges. Basic and newer Formulations of insecticides.
28) Hazards of insecticides – Symptoms of poisoning, first aid and antidotes.
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.
33) Integrated pest management strategies for Sugarcane and Coconut
34) Integrated pest management strategies for Brinjal and Mango.

**PRACTICAL SCHEDULE**
1) Characterization of terrestrial /pond ecosystems and preparation of charts.
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 resistant 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.
9) Practicing Mass culturing techniques of *Trichogramma*.
10) Practicing Mass culturing techniques of *Chrysopa* and *Coccinellids*. 
12) Studies on models of bird perches, owl nesting and placement. Preparation of Botanical formulations. Practicing few Traditional methods of pest management.
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.
16) Observation on compatibility of pesticides and Phytotoxicity of insecticides. Effective application of insecticides.
17) Orientation for final practical examination.

**REFERENCE BOOKS**


**E – REFERENCES**

1) http://www.ncipm.org.in/recent – publications.htm
2) http://www.ipmnet.org
AGM 223 : SOIL AND APPLIED MICROBIOLOGY(2+1)

OBJECTIVES

- To enlighten the students with the knowledge of microbial diversity in soils and their interaction with plants.
- To highlighten 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


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

rhizobacteria (Pseudomonas sp) and phyllosphere (PPFM) microbes. Examination of AM fungal infection in plants and recovery of AM spores from soil. Isolation of Blue Green algae. Mass production of bacterial bioinoculants, blue green algae, Azolla and AM fungi. Isolation of yeast and Lactobacillus. Industrial products – wine and sauerkraut fermentation.

**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
6) Biological nitrogen fixing microorganisms – free living, associative N fixers.
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 rhizobacteria (PGPR).
20) Bioinoculants – types, carrier based and liquid based – bacterial, fungal (AMF) and algal bioinoculants.
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 yeast 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 *Azospirilum*.
8) Isolation of *Gluconoacetobacter* from sugarcane.
9) Isolation of phosphobacteria.
10) Isolation of PPFM.
11) Examination of AM infection in roots and recovery of spores from soil.
12) Mass production of bacterial bioinoculants.
13) Mass production of AM fungi.
14) Mass multiplication of blue green algae and *Azolla*.
15) Methods of application of different bioinoculants.
16) Wine fermentation.
17) Orientation for final practical examination.

**TEXT BOOKS**
SAC 224 : SOIL RESOURCE INVENTORY AND PROBLEM SOILS (2+1)

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

THEORY

Unit–I : Concepts of Soil Survey and Soil Taxonomy


Unit–II : Soil Survey Interpretations and Land Use Planning

Unit–III : Modern tools for Soil Resource Inventory

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
19) Land Use Planning – Concepts and objectives – Tropical, subtropical and temperate regions.
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 platforms
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 crusting, 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

REFERENCE BOOKS

E – REFERENCES
2) www.iuss.org/Bulletins/00000096.pdf

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

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

THEORY
Unit–I : Reproductive systems in plant breeding

Objectives and role of plant breeding – historical perspective – activities in Plant Breeding. Centres of origin – contribution of Vavilov, Harlan, Zhukovosky – law of

**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.


4) Germplasm: evaluation – use of descriptors, documentation, utilization; Agencies – National and International; Germplasm exchange – Quarantine.


6) Self incompatibility – classifications – mechanisms – application – measures to overcome and limitations.


8) TGMS, PGMS, Gametocides, Transgenic Male sterility and applications.


17) Backcross breeding – genetic principles – prerequisites – procedures for transferring dominant and recessive genes.

18) Mid Semester examination.


22) Breeding methods of cross pollinated crops involving artificial hybridization: Recurrent selection principles – types – merits and demerits.


25) Synthetics and composites – steps in development of synthetics and composites – achievements – merits and demerits


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

31) Types of cultivars – procedure for release of new varieties – stages in seed multiplication – concept of seed certification and TC plants certification.

32) Maintenance Breeding: General seed production techniques – steps in Nucleus and Breeder seed production – varietal rundown and renovation.

33) Current trends in Plant Breeding: Marker assisted breeding

34) Transgenic crops. Concept of Plant Varietal protection, geographical indications and DUS
PRACTICAL SCHEDULE
1) Pollination and reproduction in plants – Alternation of generation and life cycle.
2) Description and drawing different pollination systems – Mechanisms enforcing self and cross pollination in crops; Pollen morphology – Exine structure of different crops. Fertility and sterility in A, B, R and TGMS lines.
3) Breeder’s 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
8) Estimation of heterosis.
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.
16) Procedure for marker assisted selection.
17) Orientation for final practical examination.

REFERENCES
3) D.N.Bharadwaj. 2012. Breeding Field Crops. Agrobios (India), Jodhpur
AEC 226 : AGRICULTURAL MARKETING, TRADE AND PRICES (1+1)

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

THEORY
Unit–I : Agricultural Marketing – Nature and Scope

Unit–II : Marketing Functions and Marketing Efficiency

Unit–ІІІ : Marketing Institutions

Unit–IV : Trade in Agricultural Products
Unit–V : Agricultural Prices


PRACTICAL


THEORY LECTURE SCHEDULE


2) Approaches to study of marketing. Characteristics of agricultural marketing.


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. Market research – Steps – Market information and intelligence.


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
16) Case studies on implications of trade liberalization.
17) Orientation for final practical examination.

REFERENCES

STA 227 : AGRICULTURAL STATISTICS (1+1)

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

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

Unit–II : Sampling Theory and Probability Distributions


Unit–III : Testing of hypothesis
Null and alternative hypothesis – types of errors – critical region and tests of significance. Large sample test – single mean and difference between two means – single proportion and difference between two proportions.

Small sample tests – F-test – t-test for testing the significance of single mean – independent and paired t test – chi square test for testing the association of r × c contingency table.
Unit–IV : Correlation and Regression
Correlation – Scatter diagram – Karl Pearson’s correlation coefficient – Spearman’s rank correlation – computation and properties.

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

THEORY 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
4) Probability distributions – Discrete distributions: Bernoulli TBI 55 – 57
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 × 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
14) Regression – simple linear regression – fitting of simple linear regression equation – properties of regression coefficient. 157 – 165
15) Analysis of Variance (ANOVA) – assumptions – one way and two way classifications. Basic principles of experimental designs. TBI 227 – 231
16) Completely Randomized Design (CRD) – Randomized Block Design (RBD). TBI 269 – 284
17) Latin Square Design (LSD). TBI 315 – 320
PRACTICAL SCHEDULE
1) Computation of arithmetic mean, geometric mean, harmonic mean, median and mode
2) Computation of range, standard deviation, variance, coefficient of variance
3) Selection of sample using simple random sampling method
4) Simple problems in Bernoulli distribution
5) Simple problems in Binomial distribution and Poisson distribution
6) Simple problems in Normal distribution
7) Large sample test – test for single proportion and difference between two proportions
8) Large sample test – test for single mean and difference between two means
9) Small samples test – t-test for single mean – t test for difference between two sample means (equal variances only)
10) Paired t-test
11) Chi square test
12) Computation of Karl Pearson’s correlation coefficient
13) Fitting of simple linear regression equation y on x – correlation and regression using MS Excel functions
14) Analysis of Completely Randomised Design (CRD) – for equal replications only
15) Analysis of Randomised Block Design (RBD)
16) Analysis of Latin Square Design (LSD) – analysis of CRD, RBD and LSD
17) Orientation for final practical examination

TEXT BOOKS

REFERENCE BOOKS
2) Chand and Sons, New Delhi.
WEB RESOURCES
1) http://www.statistics.com/resources/glossary/
2) www.statsoft.com
3) http://www.iasri.res.in/ebook/EB_SMAR/index.htm
4) www.stats.gla.ac.uk/steps/glossary/index.html
5) http://davidmlane.com/hyperstat/
6) http://wwwstattrek.com/
7) http://www.businessbookmall.com/Statistics Internet Library.htm
8) http://www.stat-help.com/
9) www.statsci.org/journlist.html

ENG 228 : SOFT SKILLS OF EMPLOYABILITY (0+1)

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

Unit–I : Introduction to Soft Skills
Soft skills – an introduction – career skills and corporate skills – definitions.

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

Unit–III : Communication Skills
5. Types of Communication
   Communication – Basic Communication Model – Verbal and Non – verbal Communication.

Business Communication
Writing memo – short notes – short reports, Agenda, minutes, Business proposals, newspaper advertisement.
6. **Group Dynamics**
   Study of affiliation, participation, goal consciousness – Forming, Storming, Norming – Performing.

7. **Kinesics**
   Definition – personal appearance, posture, gestures, facial expressions, eye contact and movements.

8. **Mid Semester**
   **Unit–III : Employability Skills**

9. **Interview Skills – I**

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

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

**Unit–V : Corporate Skills**

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

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

14. **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.

15. **Stress management**

16. **Orientation for final examination**

   **PRACTICAL SCHEDULE**

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

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

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

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

   5) Types of communication viz., verbal and non verbal communication and basic communication model.
6) Writing – writing memo, short notes, short reports, agenda, minutes, business proposals, newspaper advertisement.

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

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

9) Mid semester examination.

10) Mock interview, group interview, telephone interview, skype interview and panel interview – simulation.

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

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

13) Goal setting and decision making – exercises.

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 practical examination

REFERENCE BOOKS
1) Alex, 2009. *Soft Skills Know yourself and know the world*. S. Chand and Co. Publishing House, New Delhi,


**TEXT BOOK**


**E – BOOKS**


**E – REFERENCES**

1) www.softskills.com

2) www.reportingskills.com

3) www.writing– skills.com

4) www.negotiation.com

5) www.businessballs.com

6) www.study – habits.com

7) www.timethoughts.com

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

**OBJECTIVES**

This subject will enable the student

- 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


Unit–II : Plant Protection Gadgets, Harvesting Machinery and Equipment for Land Development


Unit–III : Agriculture Diesel Engine and Tractors

IC engines – Working principles, Two stroke and four stroke engines, IC engine terminology, modern agriculture diesel engine, Electronic fuel injection, dual fuel operation engine, Tractors – Types and Utilities.

Unit–IV : Energy scenario and biomass energy conversion systems


Unit–V : Solar energy, Wind energy and bio – fuels and its applications


PRACTICAL


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

**THEORY LECTURE SCHEDULE**

1. Farm power in India – human, animal, mechanical and electrical energy sources  
   **TB1: 1 – 10**

2. Objectives of Primary tillage, mould board, disc plough, chisel plough and subsoiler, components and functions, types, advantages and disadvantages  
   **TB1: 177 – 179**

   **TB1: 177 – 198**

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**

10. Combine – Harvesting machinery for groundnut, tuber crops and sugarcane  
    **TB1:273 – 288**

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**

13. Implements for intercultural operations – cultivators, sweep, junior hoe, Manual weeders and  
    **TB1:213 – 221**

14. Power operated weeders for wet land and garden land  
    **TB5:216 – 222**

15. IC engines – working principles, two stroke and four stroke engines, Different systems of IC engine  
    **TB1:22 – 35**

    **TB2:1 – 21**

    **TB3:387 – 411**

18. Mid – Semester Examination

19. Potential of Solar, Wind, Biogas, Biomass, and other Renewable Energy sources achievements in India  
    **TB4:1 – 44**
20 Methods of energy conversion – Thermo chemical conversion methods – Principles of combustion, Pyrolysis


22 Briquettes – Types of briquetting machines – Uses of briquettes – Shredders

23 Biochemical conversion methods – Biogas and Ethanol Production – Applications

24 Biogas technology – Feed stocks – Factor influences biogas yield – Biogas Plants Types – Construction and Working – Applications

25 Solar energy – Solar energy applications

26 Solar collectors – Types – Solar energy gadgets.


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
5) Study of plant protection equipment – power sprayers, knapsack sprayers and dusters – minor repairs and adjustment of sprayers
6) Study of power tiller their operation and maintenance.
7) Study of tractors and Harvesting Machinery – operation and maintenance
8) Study and constructional details of different bio gas plant types
9) Study and constructional details of different types Gasifiers and biomass Briquetting
10) Study of different types of solar collector.
11) Study of working principle of solar water heater and solar air heater.
12) Study the Performance of a solar still, solar dryer and solar cooker
13) Study the working of solar photovoltaic pumping system and solar street light
14) Study the different types of wind mills
15) Study the processing of Bio diesel production from Jatropha
16) Orientation for final practical examination

TEXT BOOKS

REFERENCE BOOKS
E – RESOURCES
1) www.agricoop.nic.in/dacdivision/Machinery1/directory.htm
2) www.farmmachineryshow.org
3) www.freesolaronline.com
4) www.rsnz.org
5) www.finwea.org
6) www.mnre.gov.in.

FIFTH SEMESTER
AGR 310 : CLIMATE CHANGE AND DISASTER MANAGEMENT (1+0)

OBJECTIVES
Acquiring knowledge on ecological principles, concepts, basic understanding of climate change and its impact, key concepts of disasters and practices of mitigation, assessment of hazards and their management.

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

REFERENCE BOOKS

E – RESOURCES
2) http://nsdl.niscair.res.in/123456789/607Biosafety.pdf
3) http://nsdl.niscair.res.in/123456789/1069environments.ppt
AGR 311: CROP PRODUCTION – I (0+1)

OBJECTIVES
This course is designed to impart practical aspects of scientific cultivation of rice to the students and to acquire sound knowledge in each and every aspect of rice cultivation and to make them competent to suggest appropriate technology to the farmers based on the varying soil and climatic conditions. Each student will be allotted a minimum land area and he/she will do all field operations in the allotted land from field preparation to harvest and processing of irrigated lowland rice (Transplanted rice or Direct sown rice).

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 intensification.
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.
12) Study of water management practices for lowland rice.
13) Observation of insect pests and diseases and their management.
14) Yield parameters and estimation of yield in rice.
15) Post harvest techniques, value addition and by products utilization in rice.
16) Working out cost of cultivation and economics.
17) Orientation for final practical examination.

REFERENCE BOOKS

E-RESOURCES
1) http://nsdl.niscair.res.in/123456789/524RICE–FORMATTED.pdf
2) http://farmer.gov.in/imagedefault/pestanddiseasescrops/rice.pdf

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

OBJECTIVE
To study the distribution, bionomics, symptoms of damage and management strategies of pests of crops and storage.

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, Foragecrops and Tobacco

Groundnut, Castor, Sesame, Sunflower, Safflower, Linseed, Jatropha, Mustard; Cotton; Sugarcane; Sunhemp, Sesbania, Daincha, Glycicidia; 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, Aswaganth, Senna; Stored grains, Dry fruits and Nuts; Locusts and their 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, Ornamentals, Lawn plants, Medicinal and Stored products.

ASSIGNMENT

• Collection and submission of 25 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, Jatropha, 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) Mid Semester Examination
18) Chillies, Onion, Garlic, Ginger, Turmeric, Coriander, Curry leaf
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, Cumbu, 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, Subabul; and Tobacco
7) Brinjal, Tomato, Bhendi,
8) Crucifers, Cucurbits, Moringa and Amaranthus, Potato, Sweet Potato, Tapioca, Yam
9) Chillies, Onion, Garlic, Ginger, Turmeric, Coriander, Curry leaf,
10) Cardamom, Pepper and Betel vine
11) Coconut, Areca nut
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, Aswagantha, Senna, Stored grains, Dry fruits and Nuts
17) Orientation for final practical examination.

REFERENCE BOOKS

E – RESOURCES
1) http://www.ncipm.org.in
2) http://agritech.tnau.ac.in/
3) http://www.nbaii.res.in/
4) http://www.nrca.res.in/
5) ipm.illinois.edu
OBJECTIVES
The subject covers the various principles involved in plant disease management. Also classification of fungicides, methods of application of fungicides and various bio-control agents used in the management of crop diseases are taught.

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 Avoidence

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

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
6) Role of cultural practices in Plant Disease Management. Different methods of Eradication of Plant Diseases
7) 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, 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 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
12) Preparation of leaf extracts, oil emulsion of neem and antiviral principles
13) Cross protection: production of pre immunized citrus seedlings against *Tristeza virus*
14) Tissue culture – Production of virus free plants through meristem tip culture technique
15) Visit to seed testing laboratory
16) Visit to pesticide testing laboratory
17) Record certification

REFERENCE BOOKS
AGM 314 : ENVIRONMENTAL SCIENCE (2+1)

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

Unit–I : Ecology and Ecosystems

Unit–II : Natural Resources and Biodiversity
Unit–III : Environmental pollution

Unit–IV : Solid and Liquid waste management

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.
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.
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 wastes, agricultural wastes, domestic wastes – characteristic and environmental impact.
24) Solid waste management techniques – physical methods.
26) Waste water treatment methods – physical, chemical and biological methods.
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.
30) Environmental impact assessment – stages and monitoring.
31) Environmental Education.
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 practical examination.

**REFERENCE BOOKS**

1) P.D. Sharma, 2009, Ecology and Environment, Rastogi Publications, Meerut, India.

**REFERENCES**

OBJECTIVES
To impart knowledge on essential nutrients, soil fertility, nutrient transformations in soil, manures, fertilizers and soil fertility management through various approaches.

THEORY

Unit–I : Essential Nutrients

Unit–II : Nutrient Dynamics

Unit–III : Classification of Fertilizers

Unit–IV : Application Methods

Unit–V : Nutrient Management

PRACTICAL
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
19) Complex fertilizers – definition, manufacture of ammonium phosphate, nitro phosphate and N,P,K complexes
20) Mixed fertilizers – definition, preparation and compatibility
21) Preparation and characteristics and compatibility – Speciality/ 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) Soil Organic Matter (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 K₂SO₄
12) Estimation of N in FYM / Compost by Macro Kjeldahl method
13) Preparation of triple acid extract – Estimation of P in FYM / Compost by Vanado molybdate yellow colour method
14) Estimation of K in FYM / Compost by Flame Photometry.

15) Colloquium on establishment of soil testing laboratories – Fertilizer calculations

16) Soil test based fertilizer prescription

17) Visit to STL and FTL, Visit to fertilizer manufacturing / mixing unit

18) Practical Examination.

REFERENCE BOOKS


E – REFERENCES
1) www.fspublishers.org/ijab/past – issues/IJAB Vol_5_No_3/47.pdf
2) www.springerlink.com/index/IQ11256h8t325054.pdf.

GPB 316 : PRINCIPLES OF PLANT BIOTECHNOLOGY (2+1)

OBJECTIVES
To impart knowledge on basic and applied aspects of plant biotechnology.

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


Unit–III : Gene cloning

DNA manipulation enzymes – nuclease, ligase, polymerase, modifying enzymes and topoisomerase, Vectors – plasmids and its classifications, Bacteriophage, phagemid, cosmide, BAC, YAC and HAC, Construction of recombinant DNA molecules and Bacterial transformation.

Unit–IV : Techniques and analysis of gene expression


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.

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 practical examination

**REFERENCE BOOKS**


**E – RESOURCE**

OBJECTIVES
The students will be educated on the cultivation aspects of major fruit crops grown in tropical, sub-tropical and temperate regions and also about the plantation crops.

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.

PRACTICAL
Propagation techniques, selection of planting material, varieties, important practices for the fruit crops: mango, banana, grapes, citrus (sweet orange, mandarin and 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 oil palm, study of post harvest handling of important plantation crops and visit to plantations 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

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

17) Scope and importance – status of national and International scenario – area – production – productivity – export potential – Importance of GAP and Organic production of plantation crops

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 – 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 arecanut – 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 – 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
5) Citrus – Varietal identification and sub groups in citrus and important 
cultural practices viz., training and pruning
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.
9) Tea – Identification of species and varieties – nursery practices – training 
and pruning – processing
and pruning – Processing
processing
16) Visit to commercial plantations and processing industries
17) Orientation for final practical examination

REFERENCE BOOKS

AEC 318 : AGRI BUSINESS MANAGEMENT AND ENTREPRENEURSHIP (1+1)

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

THEORY
Unit–I : Agri Business Management
Unit–II : Management Functions I

Unit–III : Management Functions II

Unit–IV : Functional Areas of Management

Unit–V : Entrepreneurship

PRACTICAL

THEORY LECTURE SCHEDULE
1) Management – Definition and concepts – Approaches.
2) Principles of Management.
9) Mid Semester Examination
12) Financial management – Concept and financial planning for agri business.
14) Marketing mix, market promotion – Promotion mix – Consumer buying behavior.
16) EDP Programmes – government schemes and incentives – Government Policy.
17) Agri Clinics and Agri Business Consortium (ACABC).

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 agribusiness 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.
11) Pricing of products of small agribusiness – Cost analysis – Working out cost of production.
12) Preparation of advertisement and sales promotion programs for an agribusiness firm.
13) Balance sheet and Income Statement of agribusiness and ratio analysis.
14) Assessment of entrepreneurial skill and competency
15) Presentation of business plan and discussion.
16) Model project discussion.
17) Orientation for final practical examination

REFERENCE BOOKS

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

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

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

Unit–II : Soil erosion

Unit–III : Soil conservation and watershed management
Unit–IV : Irrigation and drainage


Unit–V : Wells and Pumps


PRACTICAL


THEORY LECTURE SCHEDULE

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
10) Effects of water and wind erosion
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.
4) Compass – radiation, intersection.
5) Levelling – fly levels – determination of difference in elevation.
6) Computation of area
7) Computation of volume
8) Contouring – Block contouring
9) Design of contour bund and graded bund.
10) Drip Irrigation systems.
11) Sprinkler irrigation system
12) Problems on water measurement.
13) Problems on duty of water, irrigation efficiencies.
14) Problems on water requirement – agricultural drainage.
15) Study of different types of wells and its selection.
16) Study of pumps and Selection of pumps.
17) Orientation for final practical examination

REFERENCE BOOKS

E – RESOURCES
1) http://nptel.ac.in/courses/105107122/13
2) http://soilwater.okstate.edu/courses/lectures – powerpoint

SIXTH SEMESTER
AGR 320: FARMING SYSTEM AND ORGANIC AGRICULTURE (2+1)

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.

THEORY
Unit–I : Cropping system

Unit–II : Farming System
Unit–III : Organic farming for sustainable Agriculture


Unit–IV : Organic Certification and labelling


Unit–V : Resource management


PRACTICAL


THEORY LECTURE SCHEDULE

1) Cropping system: Definition, Principles and basic concepts, types of cropping systems – Mono cropping, intensive cropping, multiple cropping, intercropping.
2) Advantages and disadvantages of various cropping systems – criteria for selection of intercrops
3) Crop rotation, principles and advantages, major cropping systems prevailing in India and Tamil Nadu for different agro eco – systems.
4) Cropping scheme, principles and factors influencing in cropping scheme, preparation of cropping schemes.
5) Complementary and competitive interaction in different cropping system – light, nutrient, water and weed.
6) Allelopathy, legume effect – effect of preceding and associated crops.
7) Agronomic requirement for crops and cropping system in inter cropping.
8) Agronomic requirement for crops and cropping system in sequential cropping.
9) Farming system: definition, principles and concepts and advantages of farming system.
10) Factors influencing choice and size of enterprises.
11) Integrated farming system – Scope and advantages.
12) Allied enterprises for wetland, irrigated upland and dryland and their interactions.
13) Management of agricultural allied enterprises and crops in IFS models.
14) Integrated farming system – models for wetland,
16) Indices used to evaluate land use efficiency in multiple cropping.
17) Indices used to evaluate yield advantages and economic viability in multiple cropping.
18) Mid Semester Examination
20) Pre-requisites and basic steps for organic farming – planning and processes of conservation of organic farming.
21) Sources of organic manures – plant, animal and microbial origin-on-farm resources; FYM, green manures, crop residues, poultry manure, sheep and goat manures, biogas slurry and vermicompost.
22) Off-farm resources; coir pith, press mud, oilcakes, flyash, bio compost, minerals, bone meal, bio fertilizers, traditional preparations.
26) Quality considerations – assessment methods – premium and export opportunities. Good crop husbandry practices for important field crops
27) Non – chemical weed management methods; preventive, physical, cultural, use of tools and implements and biological measures
29) Resource management under constraint situation.
30) Cost reduction technologies and non monetary inputs in cropping and farming system.
31) LEIA and HEIA – principles and concepts – Basic ecological principles of LEISA and promising LEISA techniques
32) Labour management in cropping and farming system.
33) Crop residues management (CRM) for sustainable Agriculture
34) Conservation agriculture (CA), scope, advantages and CA technology for sustainable Agriculture.

PRACTICAL SCHEDULE
1) Visit to cropping system experiments in wetland, irrigated upland and dryland.
2) Preparation of cropping scheme for wetland and working out input requirement.
3) Preparation of cropping scheme for irrigated upland and working out input requirement.
4) Calendar of operations for wet land and irrigated upland cropping system.
5) Working out indices for evaluating the cropping system – land use, yield advantage, economics, sustainability.
6) Preparation of integrated farming system models: wetland eco – system, Irrigated upland and dryland eco systems.
7) Resources Inventory of Organic Farming.
8) Study on green manures and raising of green manures (Sunnhemp / Daincha / Fodder cowpea).
9) Indigenous practices in seed treatment and raising of field crop (Rice / Maize / Cowpea / Cotton / Sugarcane).
10) Hands on experience in recycling techniques – composting and vermicomposting, Production techniques – grading, packaging and Post harvest management.
12) Acquiring skills in quality aspects of inputs and products, grading and packaging.
13) ITK based preparations (Panchakavya, Dasakavya, Amirthakaraisal, fish amino acids)
14) Exposure visit to organic farm market outlets and organic certification agencies.
15) Exposure visit to bio – control agent units and bio-fertilizer production units.
16) Cost of production for organic cultivation of important field crops.
17) Orientation for final practical examination
REFERENCE BOOKS

E – RESOURCES
1) http://www.fao.org/docrep/016/i2718e/i2718e.pdf
   http://nsdl.niscair.res.in/123456789/671Revised farming system.pdf

AGR 321 : CROP PRODUCTION – II (0+1)

OBJECTIVES
This course is designed to impart practical aspects of scientific cultivation of any upland crop (maize / sorghum / pearl millet / finger millet / cotton / sunflower / groundnut / sesame) to the students and 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. Each student will be allotted 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
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 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 practical examination

E – RESOURCE
1) http://nsdl.niscair.res.in/123456789/532Cotton–Formatted.pdf

PAT 322 : DISEASES OF FIELD CROPS AND THEIR MANAGEMENT (2+1)

OBJECTIVE
The subject covers 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 following crops.

THEORY
Unit–I : Diseases of Cereals and Millets
Etiology, symptoms, mode of spread, survival, epidemiology and integrated management of important diseases of Rice, Wheat, Barley, Oats, Sorghum, Maize, Bajra, Ragi and Small Millets.

Unit–II : Diseases of Pulses
Etiology, symptoms, mode of spread, survival, epidemiology and integrated management of important diseases of Redgram, Blackgram, Greengram, Bengalgram, Soybeans, Cowpea, Lablab and Horse gram.
Unit–III : Diseases of Oil Seeds
Etiology, symptoms, mode of spread, survival, epidemiology and integrated management of important diseases of Coconut, Groundnut, Sesame, Sunflower, Castor, Mustard, Safflower, Linseed, Niger and Jatropa.

Unit–IV : Diseases of Cash Crops
Etiology, symptoms, mode of spread, survival, epidemiology and integrated management of important diseases of Cotton, Jute, Sugarcane, Sugar beet, Tobacco and Mulberry.

Unit–V : Post-harvest Spoilage of Grains
Post-harvest spoilage of grains during storage and their management.

PRACTICAL
Study of symptoms, host – parasite relationship of important diseases of cereals, pulses, oilseeds, cash crops, post harvest diseases of grains and their management. Herbarium collection (50 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 wheat
7) Diseases of barley and oats
8) Diseases of sorghum
9) Diseases of sorghum
10) Diseases of maize
11) Diseases of Pearl millets
12) Diseases of ragi (finger millet), small millets
13) Diseases of pulses (Redgram)
14) Diseases of pulses (Blackgram, Greengram)
15) Diseases of pulses – chickpea, soybean,
16) Diseases of pulses – cow pea, lablab and horse gram
17) Diseases of coconut
18) Mid semester examination
19) Diseases of groundnut
20) Diseases of coconut
21) Diseases of sesame and sunflower
22) Diseases of safflower and castor
23) Diseases of mustard, niger, linseed and Jatropa
24) Diseases of cotton
25) Diseases of jute
26) Diseases of sugarcane
27) Diseases of sugarcane
28) Diseases of sugar beet
29) Diseases of tobacco and mulberry
30) Post-harvest spoilage of grains by field fungi, mycotoxin and their management
31) Post-harvest spoilage of grains during storage and their management.
32) Integrated management of post – harvest diseases

PRACTICAL SCHEDULE

Study of symptoms and host-parasite relationship of:
1) Rice – fungal diseases
2) Rice – Bacterial, viral and phytoplasma diseases
3) Diseases of wheat, barley and oats
4) Diseases of sorghum
5) Diseases of maize and pearl millet
6) Diseases of ragi and small millets
7) Diseases of redgram, blackgram, greengram
8) Diseases of chickpea, soybean, cow pea and lablab
9) Diseases of groundnut and coconut
10) Diseases of Sesame, sunflower and castor
11) Diseases of linseed, safflower, niger and mustard
12) Diseases of cotton and jute
13) Diseases of sugarcane and sugar beet
14) Diseases of tobacco, mulberry and Jatropa
15) Fungal spoilage of grains during storage and management.
16) Field visit, FCI, CWC visit
17) Orientation for final practical examination

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

REFERENCE BOOKS

E – BOOKS

E – RESOURCES
1) www.ucmp.berkeley.edu/fungi
2) www.ictv.org
3) www.vivo.library.cornell.edu
4) agridr.in/tnauEAgri/eagri50/PATH272/index.html

SAC 323 : CROP AND PESTICIDE CHEMISTRY AND NANOTECHNOLOGY (2+1)

OBJECTIVES
This course will 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. This course will also 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


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.

PRACTICAL


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
4) Chemical composition and nutritional quality of oil seed crops – Groundnut, sesame, sunflower, castor, coconut and palm.
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
8) Chemistry of post harvest changes in fruits.
9) Chemical composition and nutritional quality of vegetables – Tomato, bhendi, brinjal, moringa, gourds and greens.

10) Chemical composition and nutritional quality of cabbage, cauliflower, potato, radish and peas.

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, gloriosa, coleus and aloevera


17) Mid semester examination

18) Characteristics, Mode of action and use of Carbamates – Carbaryl, carbofuran, carbosulfan and aldicarb.

19) Characteristics, Mode of action and use of synthetic pyrethroids – Deltamethrin, Fenvalerate, Cypermethrin and Lambdacyclothrin


24) Systemic fungicides – Characteristics, Mode of action and use of Benomyl, Carbendazim, Metalaxyl, Quinones, Diclones, Dicarboximides – vincozolin

25) Rodenticides – Characteristics, mode of action and use of Zinc phosphide – 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.


**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
REFERENCE BOOKS

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

GPB 324 : BREEDING OF FIELD AND HORTICULTURAL CROPS (2+1)

OBJECTIVES
Knowledge about the breeding of field and horticultural crops will be exposed to the students.

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

1) Cereals: Rice, Wheat, Maize, Sorghum, Pearl millet, Finger millet, Little millet, Kodo millet, Barn yard millet, Proso millet and Foxtail millet.
2) Pulses: Redgram Bengal gram, Green gram, Black gram Cowpea, Soybean, Horse gram and Lab – lab.
3) Oilseeds: Groundnut, Sesame, Sunflower, Safflower, Niger, Mustard, Castor, Coconut and Oilpalm
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: Chillies, Bhendi, Brinjal, Tomato, Papaya
12) Horticultural crops: Banana, Mango, Rose, Jasmine, Chrysanthimum

THEORY LECTURE SCHEDULE

1) Cereals: Rice.
2) Cereals: Rice.
3) 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, Stylosanthsus, 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.
3) Sorghum and Pearl millet, finger millet, Little millet, Kodo millet, Barn yard millet, Proso millet and Foxtail millet.
4) Redgram and Bengal gram
5) Green gram, Black gram and Cowpea, Soybean, Horse gram and Lab – lab.
6) Groundnut, Sesame and Sunflower.
7) Safflower, Niger, Mustard, Castor, Coconut and Oilpalm
8) Cotton, Jute and Mesta.
9) Sugarcane, sugar beet, potato, tapioca, tobacco and betel vine.
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
14) Green manures – daincha, sunnhemp.
15) Chillies, bhendi, brinjal, tomato, papaya, mango, banana
16) Rose, jasmine, chrysanthemum
17) Orientation for final practical examination

REFERENCE BOOKS

FURTHER READING
E – REFERENCES
1) www.cimmyt.org
2) www.nbpg.nic.in
3) www.irri.org
4) www.icrisat.org

HOR 325: PRODUCTION TECHNOLOGY OF VEGETABLES, SPICES, MEDICINAL AND AROMATIC PLANTS (2+1)

OBJECTIVES
The students will be educated on the cultivation aspects of major vegetables, spices, medicinal and aromatic plants.

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

Unit–II: Crop production techniques in vegetable crops – II
- Cucurbits, cabbage, cauliflower, dolichos bean, french bean, peas, onion, potato.

Unit–III: Crop production techniques in vegetable crops – III
- Carrot, beet root, radish, tapioca, elephant foot yam, moringa, amaranthus.

Unit–IV: Crop production techniques in spice crops

Unit–V: Crop production techniques in medicinal and aromatic crops
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.
5) – do – Brinjal
6) – do – Chillies
7) – do – Bhendi
8) – do – Cucurbits – Pumpkin, ashgourd and bottle gourd.
9) – do – Cucurbits – Snake gourd, ribbed gourd and bitter gourd
10) – do – Cabbage
11) – do – Cauliflower
12) – do – Dolichos bean and French bean
13) – do – Peas
14) – do – Onion
15) – do – Potato
16) Precision farming in vegetable cultivation
17) Carrot, beetroot and radish
18) Mid Semester Examination
19) Tapioca
20) Elephant foot yam
21) Moringa
22) Amaranthus
24) Cardamom
25) Turmeric
26) Ginger
27) Seed spices – Coriander and cumin
28) Seed spices – Fenugreek and fennel
29) Trees spices – Clove, nutmeg and cinnamon
30) Varieties – soil and climate – propagation – sowing and planting, nutrient, water and weed management – harvest and processing – post harvest handling of Senna and Periwinkle
31) Glory lily and ashwagandha,
32) Medicinal coleus and Aloe vera
33) Ocimum and mint
34) Lemon grass and vettiver

PRACTICAL SCHEDULE
1) Identification and description of varieties of solanaceous vegetables, bhendi and cucurbits
2) Identification and description of varieties of cole crops, roots and tuber crops
3) Nursery management of vegetable crops
4) Layout of kitchen garden.
5) Practices in manuring, fertilizer application and irrigation in vegetables.
6) Practices in use of plant growth regulators
7) Identification of physiological disorders in vegetable crops and remedial measures
8) Study of maturity standards and harvesting of vegetables.
9) Seed production techniques in vegetable crops
10) Project preparation for commercial production of vegetables
11) Identification and description of varieties in spices
12) Propagation techniques in spices
13) Processing and value addition in spices
14) Identification, description and propagation techniques of medicinal and aromatic plants.
15) Extraction of secondary metabolites from medicinal plants
16) Extraction of essential oils from aromatic plants
17) Orientation for final practical examination.
REFERENCE BOOKS
1) Arumugam Shakila and A.Anburani. 2013. Production technology of spices – Agrobios, India.
4) Kader Mohideen, Arumugam Shakila and A.Anburani. 2011. Production technology of medicinal and Aromatic crops – Agrobios.India

E – REFERENCES
2) http:// www. Spices.rec.in
3) www.iisr.org
OBJECTIVES

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

THEORY

Unit–I : Agricultural Finance – Nature and Scope


Unit–II : Farm Financial 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


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

1) Agricultural Finance: Definition – Importance – Nature and scope. Agricultural credit:

2) Meaning – Definition – Need and classification.

3) 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.

4) 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.

5) Time value of money: Compounding and discounting – Appraisal of farm credit proposals – Undiscounted and discounted measures.


8) 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.

9) Mid Semester Examination.

10) 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.

11) 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.


16) 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.

17) Policies for revitalizing co-operative credit: Salient features of Vaithiyanathan Committee – Report on revival of rural cooperative credit institutions – Reorganization of co-operative credit structure in India and single window system.

18) 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.
5. Preparation of Balance Sheet and Income Statement.
7. Exercise on financial ratio analysis.
8. Appraisal of farm credit proposals.
9. Visit to Commercial Bank / Lead Bank to study its role and functions.
10. Visit to NABARD to study its role and functions.
11. Visit to Regional Rural Bank to study its role and functions.
12. Visit to Primary Agricultural Co-operative Bank (PACB) to study its role, functions and procedures for availing loan.
13. Visit to District Central Cooperative Bank (DCCB) to study its role, functions and procedures for availing loan – Fixation of Scale of Finance.
14. Visit to Cooperative Agricultural and Rural Development Bank (Land Development Bank) to study procedures for availing long term credit.
15. Visit to Self – Help Group to study its characteristics, roles and functions.
16. Analysis of Different Crop Insurance Products/Visit to crop insurance implementing agency.
17. Orientation for Final Examination.

**REFERENCE BOOKS**

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

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

THEORY
Unit–I : Extension Education and Transfer of Technology

Unit–II : Communication
Communication – Meaning, definition and types, Communication models (Aristotle, Shawon – Weaver, Berlo, Schramm, Leagans, Rogers and Shoemaker) – elements of communication and their characteristics – Barriers in communication

Unit–III : Extension Teaching Methods
Extension teaching methods – meaning, definition, functions, classification (Individual, Group, Mass contact methods), Merits and Demerits; Audio aids, Visual aids and Audio – Visual aids – definition, classification – Factors influencing selection and use of audio visual aids; Participatory Extension Approaches – RRA, PRA and PTD.

Unit–IV : e – Extension and Agricultural journalism
e – Extension – Internet, video and teleconferencing, Interactive Multimedia Compact Disc (IMCD), Agri portals, Information Kiosks, Kisan Call Centre (KCC), Mobile phone, Expert System, Village Knowledge Centre (VKC) and DEMIC. Agricultural journalism (Print media) – Definition, principles, importance, ABC of news, types of news.

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

PRACTICAL
Study of communication methods followed by State Department of Agriculture; Planning and writing script for radio, television and print media; Planning and preparation of visual aids – posters, charts and graphs, flash cards, flannel graph and extension literature; Planning and practice in conduct of method demonstration and brain storming. 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 models of communication (Aristotle, Shanon – Weaver, Berlo, Schramm, Leagans, Rogers and Shoemaker)

4) Elements of communication and their characteristics – Barriers of communication.

5) Extension teaching methods – Meaning, definition, functions and classification. Individual contact methods – Farm and home visit, Farmers call, Personal letter, Result demonstration.

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.
12) Art of public speaking.
13) Practicing PRA techniques in a village setting.
14) Preparation of interview schedule to study the spread and acceptance of Agricultural technologies
15) Visit to village to study the spread and acceptance of Agricultural technologies
16) Processing of data, preparation and presentation of reports.
17) Orientation for Final Examination.

REFERENCE BOOKS

E – RESOURCES
1) www.i4d.com
2) www.panasia.org
3) www.joe.org

AEG 328 : POST HARVEST AND FOOD ENGINEERING (1+1)

THEORY
Unit–I : Post harvest losses, moisture content and properties

Unit–II : Threshing, cleaning and grading

UNIT–III : Shelling, drying and storage

Unit–IV : Cereals, pulses and oilseed processing

Unit–V : Material handling and Food Plant layout
PRACTICAL
Determination of moisture content – study of threshers, winnowers and graders – components, operations, adjustment and performance – determination of efficiency of maize shellers, groundnut decorticators, cleaners and graders, rice milling and pulse milling – experiments on tray and thin layer drier – experiments on screw conveyor and bucket elevator, study of improved grain storage structures – Study of packaging machine – visit to food processing industry.

THEORY LECTURE SCHEDULE
1) Post harvest losses – causes and estimates – unit operations of crop processing – moisture content – methods of estimation – direct and indirect methods – wet basis and dry basis.
2) Engineering properties of grains – mass, volume, density, bulk density, true density, porosity, surface area and sphericity – Thermal properties – applications.
3) Threshing – threshers for different crops – parts, terminology – operational safety and maintenance.
5) Construction and working principles of spiral separator, magnetic separator, specific gravity separator, colour sorter and inclined belt separator
6) Construction and working of maize sheller, husker sheller, hand and power operated groundnut decorticator – care and maintenance.
9) Mid Semester Examination


17) Food Packaging – requirements – types – packaging of raw and processed foods.

**PRACTICAL SCHEDULE**

1) Determination of moisture content by direct and indirect methods

2) Study of types of thresher and components.

3) Performance evaluation of grain winnower.

4) Performance evaluation of grader.

5) Study of maize sheller / husker sheller for maize.

6) Study of groundnut decorticator.

7) Performance evaluation of cleaner cum grader.

8) Study on paddy parboiling.

9) Study of shelling equipment for paddy.

10) Study of pulse milling equipment.

11) Experiment on tray dryer / thin layer dryer to determine drying characteristics.

12) Performance evaluation of screw conveyor

13) Performance evaluation of bucket elevator

14) Study of improved grain storage structures

15) Study of packaging machine

16) Visit to modern rice mill / oil mill / pulse mill.

17) Orientation for final practical examination

**REFERENCE BOOKS**


**E–RESOURCES**

1) www.foodnetbase.com

2) www.fao.org

3) food.oregonstate.edu/security/preserve.html

4) www.postharvest.ucdavis.edu
EXP 329 : EXPERIENTIAL LEARNING I

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course No.</th>
<th>LIST OF COURSES</th>
<th>Credits</th>
<th>Department offering the course</th>
</tr>
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<tbody>
<tr>
<td>1.</td>
<td>EXP AGR 329</td>
<td>Design and Operation of Pressurized Irrigation</td>
<td>0 + 6</td>
<td>Agronomy</td>
</tr>
<tr>
<td>2.</td>
<td>EXP ENT 329</td>
<td>Apiculture and Sericulture Technology</td>
<td>0 + 6</td>
<td>Entomology</td>
</tr>
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<td>3.</td>
<td>EXP PAT 329</td>
<td>Mushroom Culture</td>
<td>0 + 6</td>
<td>Plant Pathology</td>
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<td>4.</td>
<td>EXP AGM 329</td>
<td>Microbial Inoculants Production and Quality Control</td>
<td>0 + 6</td>
<td>Agrl. Microbiology</td>
</tr>
<tr>
<td>5.</td>
<td>EXP SAC 329</td>
<td>Soil and plant judging for sustainable Agriculture</td>
<td>0 + 6</td>
<td>Soil Science and Agrl.Chemistry</td>
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<tr>
<td>6.</td>
<td>EXP GEN 329</td>
<td>Commercial Seed Production</td>
<td>0 + 6</td>
<td>Genetics and Plant Breeding</td>
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<td>7.</td>
<td>EXP HOR 329</td>
<td>Protected Cultivation Of High Value Vegetable Crops</td>
<td>0 + 6</td>
<td>Horticulture</td>
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<td>8.</td>
<td>EXP AEC 329</td>
<td>Basic Analytical Tools For Agri Business</td>
<td>0 + 6</td>
<td>Agrl. Economics</td>
</tr>
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<td>9.</td>
<td>EXP AEX 329</td>
<td>Extension And Communication Skills</td>
<td>0 + 6</td>
<td>Agrl. Extension</td>
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<tr>
<td>10.</td>
<td>EXP AHS 329</td>
<td>Broiler and Layer Management</td>
<td>0 + 6</td>
<td>Division of Animal Husbandry</td>
</tr>
</tbody>
</table>

EXP AGR 329 : DESIGN AND OPERATION OF PRESSURIZED IRRIGATION (0+6)

OBJECTIVES
- To acquire skill in handling micro irrigation system related to cost effective layout, designing, maintenance and operation.
- To establish and evaluate cost effective pressurized irrigation design for major field crops.

PRACTICAL
EXP ENT 329 : APICULTURE AND SERICULTURE TECHNOLOGY (0+6)

OBJECTIVES

- To study the rearing techniques of honey bees and practicing the techniques of production of various bee products
- To study the cultivation practice of mulberry plant and rearing techniques of mulberry and eri silkworm

PRACTICAL


EXP PAT 329 : MUSHROOM CULTURE (0+6)

OBJECTIVES

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

PRACTICAL

solving – Identification of key pests and formulating management strategies –
Problem solving – weed moulds and abiotic disorders – formulating management
strategies – Commercial importance of spent mushroom substrate –
vermicomposting and coir pith/waste composting – Mushroom business planning –
project preparation and cost analysis

**EXP AGM 329: MICROBIAL INOCULANTS PRODUCTION AND QUALITY CONTROL (0+6)**

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

**PRACTICAL**
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, Micorrhizal inoculants algal inoculants – Quality control methods shelf life – Method of inoculation.

**EXP SAC 329: SOIL AND PLANT JUDGING FOR SUSTAINABLE AGRICULTURE (0+6)**

**OBJECTIVES**
The students get familiarised with factors affecting soil quality and also understands how to interpret soil and plant data in relation to status of plant condition and develop suitable fertilizer program for individual crops through need based preparation of fertilizer formulation.

**PRACTICAL**
Soil Judging – measuring soil and land properties in the field – the soil resources evaluation – soil quality assessment frame work – soil quality indicators – physical, chemical and biological.


Corrective measures: Techniques for the development of commercial fertilizer formulation – fertilizer mixtures – macro and micronutrient mixture – crop based nutrient mixture.
EXP GEN 329 : COMMERCIAL SEED PRODUCTION (0+6)

OBJECTIVES
To give practical exposure to the students in various techniques in seed production.

PRACTICAL

EXP HOR 329 : PROTECTED CULTIVATION OF HIGH VALUE VEGETABLE CROPS (1+1)

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

PRACTICAL
Types of protected structures – Greenhouses, poly houses, shade houses, rain shelters etc., Designing and erection of protected structures; Low cost/Medium cost/High cost structures – Location specific designs; Containers and substrates, Structural components; Suitable vegetable crops for protected cultivation – Green house automation – control systems – sensors – decision support systems for vegetable production in green house – Cucumber, tomato, capsicum, chillies, etc.) – Management of hi – tech nursery for vegetable seedlings – water and nutrient management, weed management, physiological disorders, IPM and IDM. Harvest indices, harvesting techniques, post – harvest handling techniques, Pre cooling, sorting, grading, packing, storage, quality standards and marketing – calculation of cost economics including project preparation.

EXP AEC 329 : BASIC ANALYTICAL TOOLS FOR AGRI BUSINESS (0+6)

OBJECTIVE
The objective of the course is to impart practical exposure to the students on the basic financial and managerial tools which are relevant to agri – business.

PRACTICAL
of Break even quantity – Inventory Management – Economic Order Quantity (EOQ) – Reorder point – SWOT analysis – Identification of marketing strategies and marketing channels.

EXP AEX 329 : EXTENSION AND COMMUNICATION SKILLS (0+6)

OBJECTIVES

- To inculcate a superior level of knowledge and Extension and Communication skills through Experiential Learning.
- To train the students on different behavioural skills that would help to improve their employability as successful extension workers.

PRACTICAL

Introduction to Behavioural Skills – practicing assessment of skills using Johari’s Window, Life Skills – types of Attitude, Communication – concept, models, feedback, mass communication, interpersonal communication, non-verbal communication, networking skills, Group Approaches – practicing lecture, brainstorming, buzz session, demonstration, folk media. Communication Behaviour of Farmers – survey and presentation, Decision Making – survey to study the decision making behaviour of farmers, Interactive Skills – types, importance, exercises on questioning, interviewing and group discussion. Leadership – concept, types, qualities, methods of identifying leaders – village visit to conduct sociometry, Team Building – concept, principles, exercises on team work, exercises on tower building, Formation of groups – concept, types of farmers organizations, interaction with successful farmers organization and SHG, Participatory Rural Appraisal (PRA) – Practicing PRA exercises in a village, Public Relations – concept, principles, practice on art of public speaking.

EXP AHS 329 : BROILER AND LAYER MANAGEMENT (0+6)

OBJECTIVES

- The course aims to provide a comprehensive knowledge about the scientific rearing of the broiler and layer birds.
- To enable the students to acquire practical knowledge to manage a profitable small scale, commercial poultry enterprise.
- To impart the “cutting edge” technologies used in poultry industries which will reinforce the students entrepreneurship.

PRACTICAL

SEVENTH SEMESTER
RURAL AGRICULTURAL WORK EXPERIENCE (RAWE)

A. Village Stay Programme
Guidance to students

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

It will consist of general orientation by different faculties for one week followed by village attachment. The students would be required to record their observations in field on daily basis and will prepare their project report based on these observations.

The detailed outline of the work to be carried in each subject during Village stay period is as follows:

RAWE AEX 410 : RURAL AGRICULTURAL WORK EXPERIENCE(0 + 5)

- Study of rural institution – village settlement pattern, demography, climate,
- Land utilization pattern, resources inventory, infrastructural facilities, rural institutions, organizations, groups, customs, beliefs and value systems.
- Study of cropping pattern, extent of adoption of latest technologies and identify the constraints.
- Conducting need based method demonstrations in the village.
- Organization of field visits and group discussion with farmers.
- Organization of farmers/ rural youth training programme.
- Participation in village social service work.
- Identification of communication media in the transfer of technologies.
- Study on – going central/state sponsored rural development and extension programmes.
- Visit to village institutions to study their role in development programmes and extension work.
- Exposure visit to block and district level Agricultural/Horticultural research and extension institutions.
RAWE AGR 411: FIELD CROP PRODUCTION (0 + 3)

- The student will involve themselves in actual day-to-day Agricultural operations along with their adopted farmers.
- A calendar of operations for the entire semester will be prepared in consultation with the host farmer, course teacher and programme officer.
- The course teacher will provide the recommendations for major crops grown in the village and in turn the students will compare these with farmer's practice and get opinion about improved technology.
- The students will maintain a record of daily work done in the prescribed proforma.
- Each student shall cover a minimum of three crops, 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.

RAWE HOR 412: HORTICULTURAL CROP PRODUCTION (0 + 2)

- The student will involve themselves in actual day-to-day horticultural operations along with their adopted farmers.
- For this purpose, a calendar of operations for the entire semester will be prepared in consultation with the adopted farmer and the member of the advisory committee.
- The advisory committee will provide the recommendations for major horticultural crops grown in the village and in turn the student compare these with farmer's practice and get opinion about improved horticultural technology.
- The students shall maintain a record of daily work done in the Proforma given to them by the Department of Horticulture.
- Each student shall cultivate/plant a minimum of three crops, preferable one from fruits like Mango, Papaya, Lime, Guava and two from vegetables like cabbage/cauliflower/tomato/brinjal/chilli or any other seasonal vegetables.

RAWE CPT 413: CROP PROTECTION: ENTOMOLOGY AND PLANT PATHOLOGY (0 + 4)

The students get an opportunity to work with the farmers in the field and acquaint with various plant protection problems of the crops.
- They collect data on pest damage every week.
- They shall maintain record of plant protection work undertaken in the prescribed proforma given to them by the Department of Entomology and Plant Pathology for this purpose.
The student will also conduct a survey on adoption of recommended plant protection measures and the incidence/occurrence of different diseases and insect pests on different crops in the village.

Students shall submit 15 herbarium specimens each of insect damage and plant disease symptoms for any of the crops grown in the village.

Information on other plant disorders, nematode problems, bird and rodent damage if any, shall also be mentioned in the plant protection record separately.

The students will also demonstrate preparation of fungicidal / insecticide spray fluids for important plant protection measures.

B. Agro Industrial Attachment

Guidance to students

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:

AEX 414 : ALL INDIA STUDY TOUR (0+1)

OBJECTIVES

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. The tour will be for a period of 15 days.
Rural Economics

- Each student will take up an agro-economic survey of a village as per questionnaire issued for this purpose by the Department of Agrl. Economics.
- Each student 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 reorganization 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

Attachment with Agro – based Industries

- 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
- Cold 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.

EIGHTH SEMESTER
AGR 420 : AGROFORESTRY AND DRY FARMING (2+1)

OBJECTIVE
To impart knowledge on Agroforestry systems and dryland technologies

THEORY
Unit–I : Forests and its importance

Unit–II : Agronomy of tree species and wasteland management
Silviculture practices for important agroforestry species viz., Teak, Casuarina, Eucalyptus, Subabul, Tamarind, Ailanthus, Pungam, Neem, Acacia spp and Bamboos – Wastelands – definition – Classification – Suitable tree species – planting techniques for wastelands – Agroforestry systems for different types of problem soils and wastelands.

Unit–III : Dry Farming

Unit–IV : Drought and Contingent crop planning

Unit–V : Watershed management
PRACTICAL
Identification of trees, seeds and seedlings of important Agroforestry species – Forest nursery – types – layout – nursery technology for important tree species – visit to different agroforestry systems – visit to social forestry plantations – economics – assessing fodder and fuel requirements of a village. Zonation of Dry farming regions of Tamil Nadu, India and World – Characteristics of ACZs of Tamil Nadu and cropping pattern – Rainfall analysis and crop planning – Study of tools, implements and machineries for tillage, sowing and after cultivation. Seed treatment technologies for dryfarming. Working out LGP. Preparation of contingency crop plan to mitigate aberrant rainfall situations – Visit to watershed.

THEORY LECTURE SCHEDULE
1) Role of forest – global and Indian forest status – National forest policy.
2) Social forestry and Agro forestry – definition – concepts – Agroforestry Vs social forestry
3) Social forestry phase I and II Projects – Achievements
4) Joint forest management – Tamilnadu Afforestation programme.
7) Agroforestry – Subsystem – Home garden – Multitier cropping – wind break and shelter belts – design of shelter belts and species composition
8) Role of agroforestry in soil, water and ecological conservation – industrial Agroforestry – constraints and merits.
9) Silviculture practices for Teak – Casuarina – Eucalyptus – Subabul.
10) Silviculture practices for Tamarind – Neem – Acacia – Prosopis.
11) Silviculture practices for pungam – Ailanthus – Bamboo
12) Waste land – Definition – Classification – suitable tree species
13) Agroforesty systems for different problem soils and waste lands
14) Planting techniques and afforestation for wastelands.
15) Significance and scope of dry farming in India and history of dryland agriculture.
16) Dry farming and rainfed farming: Definition and Characteristics.
17) Distribution of arid and semi – arid regions in World, India and Tamil Nadu.
18) Mid – Semester Examination
19) Major crops of dryland in India and Tamil Nadu.
20) Characteristics of dryland farming and major constraints for crop production.
22) Effects of drought on crop production – Drought management strategies and contingent crop planning
24) In-situ soil moisture conservation techniques and approaches – Agronomical measures
25) In-situ soil moisture conservation – Mechanical – Biological measures
26) Water harvesting, storage and recycling.
27) Integrated dryland technologies and farm mechanization.
28) Mechanization in dryland farming.
29) Resource management under constraint situations for irrigated and rainfed farming
31) Tillage – Summer tillage – Pre monsoon sowing
32) Watershed: definition, principles, classification and management.
33) Alternate land use systems in dryland – Agro forestry systems.
34) Role of institutions – Government policies for promotion of drylands.

**PRACTICAL SCHEDULE**

1) Identification and description of seeds and seedlings of Teak, Casuarina, Eucalyptus, Tamarind, Ailanthus, Pungam, Neem, Acacia, Prosopis and Bamboo.
2) Production of pre sprouted seeds in Pungam, Neem, Acacia, Prosopis and Bamboo.
3) Identification and description of fuel, fodder and green manure trees in the locality.
5) Visit to woodlots of Casuarinas, Eucalyptus, Neem, Tamarind, Teak – observing spacing, height, girth and calculating tree volume using the formula.
6) Working out economics of cultivation of tree species like Teak, Casuarina, and Eucalyptus.
7) Visit to nearby village and assessing the needs of fodder, fuel and greenmanue.
8) Agroclimatic, Agro ecological zones and characteristics. Zonation of dry farming regions of Tamil Nadu, India and World.
9) Characteristics of ACZs of Tamil Nadu and cropping pattern. Cropping and farming systems in dryland.
10) Rain fall analysis and crop planning
12) Study of tools, implements, and machineries for tillage, sowing and after cultivation and assessing their efficiencies.
13) Indices in dry farming – working out LGP and planning for cropping system.
14) Drought management technologies to mitigate drought in dry farming agriculture.
15) Preparation of contingency crop plan for aberrant rainfall situations.
16) Visit to watershed area to study the impact of various soil and moisture conservation methods.
17) Orientation for final practical examination

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

E – RESOURCES
1) http://nsdl.niscair.res.in/jspui/bitstream/123456789/656/1/revised%20agroforestry.pdf

GPB 421 : PRINCIPLES OF SEED PRODUCTION, SEED QUALITY REGULATION AND STORAGE (2+1)

OBJECTIVE
This course help the students to understand the importance and principles involved in Quality seed production and presentation.

THEORY
Unit-I : Introduction to seed and seed quality
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

Unit–IV : Seed legislation and certification

Unit–V : Seed quality testing, storage and marketing

PRACTICAL

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
13) Methods of seed production of varieties and hybrids – tomato, brinjal and chillies.
14) Methods of seed production of varieties and hybrids – bhendi and onion
15) Methods of seed production of varieties and hybrids – snakegourd, bittergourd, pumpkin.
16) Methods of seed production of varieties and hybrids – ashgourd, ribbedgourd and bottlegourd.
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 seed separator) – working principle.
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, 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.
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 practical examination
REFERENCE BOOKS
Text Books

Online References
1) www.fao.org
2) www.seednet.gov.in
3) www.agricoop.nic.in
4) www.online library.willey.com
5) www.sciencedirect.com

e – journals
1) Seed Science Research (www.jgateplus.com)
2) Seed Science and Technology (www.jgateplus.com)

e – books

PAT 422 : DISEASES OF HORTICULTURAL CROPS AND THEIR MANAGEMENT (2+1)

OBJECTIVE
The subject covers etiology, symptoms, mode of spread, survival and integrated management of important diseases due to fungi, bacteria, viruses, phytoplasma, phanerogam parasites and non-parasitic causes of the following crops.

THEORY
Unit–I : Diseases of fruit crops
Mango, banana, citrus, grapevine, guava, sapota, pomegranate, annona, papaya, jack, pineapple, ber, aonla, apple, pear, peach, plum, cashew, fig, avocado and litchi.

Unit–II : Diseases of vegetable crops
Brinjal, tomato, bhendi, cucurbits, crucifers, beans, peas, potato, sweet potato, beet root, raddish, carrot, cassava, yam, lettuce and colocasia, Post-harvest disease of fruits and vegetables.

Unit–III : Diseases of spices and condiments
Chillies, cardamom, turmeric, ginger, onion, garlic, pepper, betel vine, fenugreek, coriander, clove, nutmeg and cinnamon.

Unit–IV : Diseases of plantation crops
Tea, coffee, cocoa, rubber, coconut, arecanut and vanilla.
Unit–V: Diseases of flower crops, medicinal plants and mushroom cultivation


THEORY LECTURE SCHEDULE

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

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

Study of symptoms and host-parasite relationship of:

1) Diseases of mango and banana
2) Diseases of citrus and grapevine
3) Diseases of guava, sapota, pomegranate, annona, jack, papaya, pineapple, ber and aonla.
4) Diseases of apple, pear, plum, peach
5) Diseases of tomato and brinjal
6) Diseases of cucurbits and crucifers
7) Diseases of bean, peas and potato
8) Diseases of cassava, sweet potato, yam and colocasia
9) Diseases of onion, garlic, chillies, pepper and betel vine
10) Diseases of turmeric, ginger, cardamom, fenugreek, coriander, clove, nutmeg and cinnamon
11) Diseases of tea, coffee and rubber
12) Diseases of coconut, arecanut and vanilla
13) Diseases of rose, jasmine, crossandra, chrysanthemum, tuberose, marigold, lilium and carnation
14) Diseases of medicinal plants: Coleus, Gloriosa, Stevia and Aloe
15) Mushroom cultivation: Agaricus, Pleurotus, Calocybe and Volvariella
16) Field visit
17) Orientation for final practical examination

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

REFERENCE BOOKS


E – BOOK

E – REFERENCES
1) www.ucmp.berkeley.edu/fungi
2) www.ictv.org
3) www.vivo.library.cornell.edu

HOR 423 : COMMERCIAL FLORICULTURE AND LANDSCAPE GARDENING (2+1)

OBJECTIVES
This course provides the basic knowledge and state of the art information on the commercial flower crops and landscape gardening, which aims to develop a strong foundation for careers in the floriculture and landscape industry to meet the needs of an ever changing world.

Unit–І :Production technology of loose flowers

Unit–II : Production technology of cut flowers

Unit–ІІІ : Landscape gardening
Unit–IV : Garden components


Unit–V : Principles and designing of Landscape gardens

Elements and Principles of landscape design – – site analysis and plants adaptability for different locations – Preparation and drawing of site plan – Garden designing softwares and tools – Landscaping for specific areas – institutions, industries, residents, hospitals, theme parks, IT parks, corporates, high way, traffic islands, dam sites and play grounds – Special types of gardens – Xeriscaping – Bonsai culture – Terrarium.

PRACTICAL

Description and identification of species and varieties in jasmine, rose, chrysanthemum, tuberose, crossandra, marigold, cut rose, gladiolus, carnation, cut chrysanthemum, gerbera, lilies, anthurium and orchids – propagation and planting – seed treatment and sowing – planting of tubers and suckers – lay out and planting of rose and jasmine – media preparation and potting of orchids and anthurium – After cultivation practices in rose, jasmine, chrysanthemum and marigold – harvesting, postharvest handling and storage – visit to commercial fields and preparation of project reports for fresh flower production.


THEORY LECTURE SCHEDULE

1) Importance, scope and constrains of commercial floriculture industry
2) Area, production and Export potential of commercial flowers
4) – do – Rose
5) – do – Chrysanthemum
6) – do – Tuberose
7) – do – Crossandra
8) – do – Marigold
10) – do – Gladiolus
11) – do – Carnation
12) – do – Cut Chrysanthemum
13) – do – Gerbera
14) – do – Anthurium
15) – do – Lilies and
16) – do – Tropical orchids
17) Landscape gardening – Definitions, scope, importance and opportunities
18) History of gardening in India
19) Mid Semester Examination
20) Styles and Types of gardening
21) Growth habit, foliage and flower features, pruning, training and growth regulation of softscape elements – Ornamental trees, shrubs, hedges and edges
22) Growth habit, foliage and flower features, pruning, training and growth regulation of softscape elements – Creepers, climbers, annuals, topiary, trophy and carpet beds
23) Growth habit, foliage and flower features, pruning, training and growth regulation of softscape elements – Indoor plants and plants for special purposes – palms, cacti, succulents, ferns and rosarium
24) Turf management – Functional utility in garden, turf grasses, establishment and maintenance
25) Different hardscape elements in gardens and their position, establishment, materials required and maintenance – Planter boxes, pavements, decks, garden benches and fences
26) Different hardscape elements in gardens and their position, establishment, materials required and maintenance – Fountains, cascades, jacuzzi, gazebo, statues and birds bath and water proofing techniques
27) Principles and elements of landscape design and Concepts in landscape designing
28) Assessing site and plants adaptability for different locations – cliental preference in landscape design planning
29) Garden plan – Elevation diagram – Perspective diagram – Layout of garden
designs – Matching the plant materials to design criteria – Symbols in
garden designing – Garden designing softwares and tools

30) Landscape design for specific areas – institutions, industries, residents,
hospitals, theme parks, IT parks and corporates

31) Landscape design for specific areas – Planting avenues, high way, traffic
islands, dam sites and play grounds

32) Special types of garden

33) Xeriscaping

34) Bonsai making and terrarium

PRACTICAL SCHEDULE

1) Identification and description of species and varieties in jasmine, tuberose
and marigold.

2) Identification and description of species and varieties of rose,
chrysanthemum and crossandra.

3) Study of propagation and pruning of jasmine and loose rose

4) Identification and description of species and varieties of cut rose, gladiolus,
carnation and cut chrysanthemum.

5) Identification and description of species and varieties of gerbera, lilies,
anthurium and tropical orchids.

6) Media preparation and potting of cut flowers

7) Working out benefit cost ratio for loose and cut flowers.

8) Garden components, basic functions and utility

9) Identification and description of softscape elements.

10) House plant and indoor gardening

11) Turf – Establishment and maintanence

12) Basic function, utility, fabrication and maintenance of nonliving components

13) Description and designing of hardscape elements

14) Principles of landscape drawing and fundamentals of manual drawing – Plan
view, elevation and perspective diagram

15) Computer aided designing in landscaping of different areas.

16) Bonsai culture and terrarium

17) Orientation for final practical examination

REFERENCE BOOKS

Publishers, New Delhi

Publication Co., Kolkata.


4) Chadha, K.L. 1986. Ornamental Horticulture in India. ICAR. KrishiBhavan,
New Delhi.

E – RESOURCES
1) www.gardenadornment.com
2) www.toptropicals.com
3) www.bestgarden.net

EXP 424 : EXPERIENTIAL LEARNING – II

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course No.</th>
<th>LIST OF COURSES</th>
<th>Credits</th>
<th>Department offering the course</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>EXP AGR 424</td>
<td>Integrated Farming Systems</td>
<td>0 + 6</td>
<td>Agronomy</td>
</tr>
<tr>
<td>2</td>
<td>EXP ENT 424</td>
<td>Bio Pesticides And Biocontrol Agents Production Technology</td>
<td>0 + 6</td>
<td>Entomology</td>
</tr>
<tr>
<td>3</td>
<td>EXP PAT 424</td>
<td>Biological Control of Plant Diseases</td>
<td>0 + 6</td>
<td>Plant Pathology</td>
</tr>
<tr>
<td>4</td>
<td>EXP AGM 424</td>
<td>Composting Technologies For Sustainable Agriculture</td>
<td>0 + 6</td>
<td>Agrl. Microbiology</td>
</tr>
<tr>
<td>5</td>
<td>EXP SAC 424</td>
<td>Soil constraints and its management for sustainable crop productivity</td>
<td>0 + 6</td>
<td>Soil Science and Agrl.Chemistry</td>
</tr>
<tr>
<td>6</td>
<td>EXP GPB 424</td>
<td>Hybrid Seed Production Techniques in Rice</td>
<td>0 + 6</td>
<td>Genetics and Plant Breeding</td>
</tr>
<tr>
<td>7</td>
<td>EXP HOR 424</td>
<td>Commercial Landscape Gardening</td>
<td>0 + 6</td>
<td>Horticulture</td>
</tr>
<tr>
<td>8</td>
<td>EXP AEC 424</td>
<td>Farm Business Analysis</td>
<td>0 + 6</td>
<td>Agrl. Economics</td>
</tr>
<tr>
<td>9</td>
<td>EXP AEX 424</td>
<td>Entrepreneurial and Managerial Skills</td>
<td>0 + 6</td>
<td>Agrl. Extension</td>
</tr>
<tr>
<td>10</td>
<td>EXP AHS 424</td>
<td>Sheep and Goat Management</td>
<td>0 + 6</td>
<td>Animal Husbandry</td>
</tr>
</tbody>
</table>

EXP AGR 424 : INTEGRATED FARMING SYSTEMS (0+6)

OBJECTIVES
- To understand the existing system and formulating new IFS model as location specific innovation
- To establish irrigated upland IFS model and wetland model
- To evaluate the IFS model established based on productivity, profitability, employment and resource utilization as holistic farming

Practical
Introduction and concept of farming systems – resource inventory and participatory analysis – selection of crops and raising of selected crops – nursery

**EXP ENT 424 : BIO PESTICIDES AND BIOCONTROL AGENTS PRODUCTION TECHNOLOGY (0+6)**

**OBJECTIVES**

- To study the plants of insecticidal value and practicing various extraction methods.
- To study the mass production techniques of various biocontrol agents.

**PRACTICAL**


**EXP PAT 424 : BIOLOGICAL CONTROL OF PLANT DISEASES (0+6)**

**OBJECTIVES**

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

**PRACTICAL**

Safety procedures for handling equipments – Preparation of culture media – PDA, Kings Band NA – 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

**EXP AGM 424 : COMPOSTING TECHNOLOGIES FOR SUSTAINABLE AGRICULTURE (0+6)**

**OBJECTIVES**

- To study the nature of different type 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

**PRACTICAL**


**EXP SAC 424 : SOIL CONSTRAINTS AND ITS MANAGEMENT FOR SUSTAINABLE CROP PRODUCTIVITY (0+6)**

**OBJECTIVES**

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

**PRACTICAL**

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 an aerial photograph – Assessment of soil physical health – LIC, 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 an 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 judgment on its profitable use.
EXP GPB 424 : HYBRID SEED PRODUCTION TECHNIQUES IN RICE (0+6)

OBJECTIVES
To give practical exposure to the students in hybrid seed production in rice.

PRACTICAL

EXP HOR 424 : COMMERCIAL LANDSCAPE GARDENING (0+6)

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

PRACTICAL
Site analysis – Assessing cliental preference – Design components for landscape gardening – Planning and manual designing of different types of location specific gardens e.g. home garden, institutional garden, public garden, corporate and factory garden – Computer aided designing process – execution of softscape elements – execution of hardscape elements – measurements and materials for landscape project – pricing and cost estimates – Bidding for landscape contracts – Preparation of landscape company profile.

EXP AEC 424 : FARM BUSINESS ANALYSIS (0+6)

OBJECTIVE
The objective of the course is to impart practical exposure to the students on the basic financial and managerial tools which are relevant to farm business.

PRACTICAL
EXP AEX 424 : ENTREPRENEURIAL AND MANAGERIAL SKILLS (0+6)

OBJECTIVES

- To inculcate a superior level of knowledge on entrepreneurial managerial skills through Experiential Learning.
- To train the students on different behavioural skills that would help to improve their employability as successful managers or entrepreneurs.

PRACTICAL

Motivation – concept, Maslow’s hierarchy of needs, exercises on motivational techniques, visit to a firm to study the motivation techniques adopted, Decision Making & Support – concept, principles, tools / methods, Decision support system – importance, methodology, hands on experience, Managerial Skills – concept, types of managerial skills, Transactional Analysis (TA), Survey to study the managerial skills of extension personnel of state department of agriculture, Creativity – concept, types, exercises on improving, Entrepreneurial skills – Concept, Interaction with a leading agripreneur and entrepreneur, Time Management – concept, problems in managing Time, Time management techniques – survey to study the time utilization pattern of farmers and farm women, HRD – concept, principles, types of training, visit to a firm to learn about HRD practices, Delegation – concept, principles, methodology, exercise on delegation, visit to a firm to study the existing pattern of delegation, Analytical skills – reasoning, breaking down problems, exercises on problem solving, Conflict Management – concept, reactions to conflict, visit to a firm and NGO to study conflict management techniques, Negotiation – concept, types, exercise on improving negotiation skills, meeting association leaders to study their negotiation skills, Stress Management – concept, types and causes of stress, general adaptation syndrome, practicing coping strategies, visit to a firm to study coping mechanisms to manage stress, Emotional Intelligence – concept, Emotional Quotient (EQ) – practice to assess EQ, Project Proposal – preparation and presentation

EXP AHS 424 : SHEEP AND GOAT MANAGEMENT (0+6)

OBJECTIVES

- To impregnate the students with holistic knowledge of commercial rearing of sheep and goats.
- To cater “hand on” experience so that students have the opportunity to start their own business to achieve optimum utilization of the livestock resources.

PRACTICAL

Introduction – Housing management – Pen and Run Housing – All slat system – Farming practices – Economic traits – Care and management of young and adult animals – Nutrition – Flushing Vs Steaming up – General farm practices – Breeding Management – Artificial Insemination – Pregnancy Diagnosis – Vaccination schedule – Preparation of project reports – Visit to sheep and goat farms.
PRACTICAL

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

Detailed program of project work

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

Format of Research Project to be executed by the Student Researcher

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

**OPC 426 : OPTIONAL COURSES**

<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>
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<tbody>
<tr>
<td>1.</td>
<td>OPC AGR 426</td>
<td>Indigenous Technology In Agricultural Production</td>
<td>1 +1</td>
<td>Agronomy</td>
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<tr>
<td>2.</td>
<td>OPC ENT 426</td>
<td>Emerging Trends In Insect Pest Suppression</td>
<td>1 +1</td>
<td>Entomology</td>
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<tr>
<td>3.</td>
<td>OPC PAT 426</td>
<td>Emerging Trends In Plant Disease Management</td>
<td>1 +1</td>
<td>Plant Pathology</td>
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<td>4.</td>
<td>OPC AGM 426</td>
<td>Advanced Microbial Biotechnology</td>
<td>1 +1</td>
<td>Agrl. Microbiology</td>
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<td>5.</td>
<td>OPC SAC 426</td>
<td>Farm Advisory on Soil Health, Water quality and Plant Nutrition</td>
<td>1 +1</td>
<td>Soil Science and Agrl.Chemistry</td>
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<td>6.</td>
<td>OPC GPB 426</td>
<td>Plant Tissue Culture</td>
<td>1 +1</td>
<td>Genetics and Plant Breeding</td>
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<td>7.</td>
<td>OPC HOR 426</td>
<td>Supply Chain Management, Processing And Value Addition In Horticultural Crops</td>
<td>1 +1</td>
<td>Horticulture</td>
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<td>8.</td>
<td>OPC AEC 426</td>
<td>Agricultural Project Management</td>
<td>1 +1</td>
<td>Agrl. Economics</td>
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<td>9.</td>
<td>OPC AEX 426</td>
<td>Entrepreneurship Development</td>
<td>1 +1</td>
<td>Agrl. Extension</td>
</tr>
<tr>
<td>10.</td>
<td>OPC AHS 426</td>
<td>Technology of Dairy and Poultry Products</td>
<td>1 +1</td>
<td>Animal Husbandry</td>
</tr>
</tbody>
</table>
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

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.

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
7) ITK practices in sowing methods – manuring – weed management, soil and water management – pest and disease management.
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 rainfall 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

REFERENCE BOOK
OBJECTIVES
To impart knowledge on the novel approaches and recent developments in Insect pest suppression.

THEORY
Unit–I: Industrial perspective of Insecticide development – Past, Present and Future
Indian and Global insecticide industry – Changing scenario in the last two decades – its future direction – Difficulties in new molecule identification and development – Steps in insecticide development – Role of natural active molecules as cue for novel insecticide development – Successful examples which mimic natural active molecules – Carbamates, pyrethroids, nicotinoids, Anticoagulants, Nereistoxin analogues – Their synthesis – Importance of Structure activity relationship – Role and scope of Research and Development in insecticide development.

Unit–II: Improvements in various pest management components

Unit–III: Biotechnology in Insect Pest Management

Unit–IV: Urban and Quarantine Entomology
Unit-V: Veterinary Entomology

Major insect, mite, and tick vectors of domestic animals – Their life cycle, morphology, and behavior – Detection, Evaluation and monitoring the infestation – Classes of insecticides and acaricides used in Livestock pest management – Special formulations – Methods of application – Dipping vats, Rub on pads etc., Traditional practices of utilizing plants in livestock pest management – Integrated control methods.

THEORY LECTURE SCHEDULE

1) Indian and Global insecticide industry. Changing scenario in the last two decades – its future direction – Difficulties in new molecule identification and development – Steps in insecticide development
2) Role of natural active molecules as cue for novel insecticide development – Successful examples which mimic natural active molecules and their synthesis
3) Importance of Structure activity relationship – Role and scope of Research and Development in insecticide development.
7) Genetic improvement of natural enemies – In vitro Mass production of Entomopathogens using cell lines – Genetic Engineering with baculoviruses
8) Transgenic plants with Bt toxin genes – Gene pyramiding – Resistance development – Scope and future of second and third generation transgenic crops – assessing risks and benefits of transgenic crops
9) Mid semester examination
10) Host plant resistance – Molecular breeding and Marker assisted selection – Techniques and Advantages.
12) Termites – Species – biology and problems to buildings and furniture. Bees, ants and wasp colonies.
13) Principles and methods of pest management in residential places and public buildings. Insecticides for domestic use and their safety.
14) Quarantine entomology – Domestic and international quarantine – case histories of exotic insect pests and their status. Related Acts
15) Techniques – fumigation, VHT and other safer techniques of disinfestations – Phytosanitary certificate.
16) Major insect, mite, and tick vectors of domestic animals – Their life cycle, morphology and behavior – Detection, Evaluation and monitoring the infestation
17) Classes of insecticides and acaricides used in Livestock pest management – Methods of application – Dipping vats, Rub on pads etc., – Integrated control methods.

PRACTICAL
Rearing of Test insect Viz., Housefly, Spodoptera, Aphids and Bioassay techniques for screening of insecticides. Understanding the working principle of IR, UV, MS and NMR and their utility in structure determination. Studies on effect of pheromones on mating disruption. Studying the effect of nutrition on induced resistance of crops and Identification and Studies on high performance novel formulations. Evaluation of Bt cotton transgenics in comparison with non – Bt cotton. Identification of various species of Mosquitoes, House flies, Cockroaches, Rodents, bed bugs, human lice and fleas, Termites, Bees, ants and wasp and their management. Techniques of clearing infestation in quarantine stations. Identification of various livestock pests and their management.

PRACTICAL SCHEDULE
1) Rearing of Test insect Viz., Housefly, Spodoptera, Aphids
2) Bioassay techniques for screening of insecticides
3) Determination of Median Lethal Dose (LD₅₀)
4) Understanding the working principle of IR, UV, MS and NMR and their utility in structure determination
5) Studies on effect of pheromones on mating disruption
6) Studying the effect of nutrition on induced resistance of crops
7) Identification and Studies on high performance novel formulations
8) Preparation of silver nano particle mediated nano formulation of botanicals
9) Studies on the effect of CO₂ on stored product pest under air tight conditions
10) Evaluation of Bt cotton transgenics in comparison with non-Bt cotton
11) Identification of various species of Mosquitoes, House flies, Cockroaches, Rodents, bed bugs, human lice and fleas, Termites, Bees, ants and wasp
12) Practicing methods of pest management in residential places and public buildings.
13) Techniques of clearing infestation in quarantine stations
14) Techniques of fumigants usage in quarantine
15) Identification of various livestock pests
16) Management techniques of livestock pests
17) Orientation for final examination.
REFERENCE BOOKS

**OPC PAT 426 : EMERGING TRENDS IN PLANT DISEASE MANAGEMENT (1+1)**

**OBJECTIVES**
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–III : 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.
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 chemicals/fungicides
6) Characteristics of an ideal fungicide, Antibiotics – mode of action – Biochemical changes as induced by chemical fungicides
7) Fungicide formulations – Role of stickers, adjutants and spreaders
8) Fungicide resistance in plant pathogens and its management – FRAC – SBI, MBI fungicides
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
6) Bio agents – formulations, methods of applications
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
13) Techniques in isolation of secondary plant compounds – bioassay to study mode of action/ antimicrobial properties of botanicals.
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.

**REFERENCE BOOKS**

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 for mulations. 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 bioinoculants; Cyano bacterial 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 Butter milk; Yogurt (probiotics, prebiotics, synbiotics); 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 an aerobic digesters: Microbial leaching fores. A brief account of biodegradable plastics and super bug.

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 extra cellular 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 to find 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 fermentation – 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 bioinoculants; Cyanobacterial and algal fuels;

9) Mid Semester examination

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, Angkak; Indian products like Idly, Dosa, Vada.

11) Microbiology of Fermented Dairy Products (Product Characteristics, Processing, Starter culture, Growth, Genetics). Butter milk; 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

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.

REFERENCE BOOKS

3) Vogel, H.C. Todaro, C.L. and Todaro C.C., Fermentation and Biochemical Engineering
6) Reed, G., Prescott and Dunn’s Industrial Microbiology, AVI publication.
7) Casida L.E.J.R., Industrial Microbiology, NewAge (1968)
OBJECTIVES
The major objective of this course is to impart practical knowledge on soil related constraints, irrigation water quality appraisal guidelines and their efficient management, diagnosis of plant nutrient related problems, soil and water pollution and their impact on crop production and techniques for development of commercial fertilizer formulations and 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

PRACTICAL

THEORY 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 and 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 and 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 and 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 and waters for heavy metals  
17) Orientation for final practical examination

REFERENCE BOOKS
OPC GPB 426: PLANT TISSUE CULTURE (1+1)

OBJECTIVES
1. To teach various methods in in-vitro culture of plants
2. To teach commercial application of tissue culture techniques

THEORY

Unit-I

Unit-II

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 – germplasm conservation – synthetic seeds – somaclonal variation and its applications in crop improvement.

PRACTICAL
THEORY LECTURE SCHEDULE
1) Introduction and 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 asexplants.
12) Anther culture, Ovary culture and its application.
13) Organogenesis and somatic embryogenesis.
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.
9) Regeneration via direct organogenesis pathway.
10) Regeneration via indirect organogenesis pathway.
11) Regeneration via direct somatic embryogenesis pathway.
12) Regeneration via indirect somatic embryogenesis pathway.
13) Synthetic seeds.
14) Production of Haploids.
15) Embryo culture.
16) visit to commercial tissue culture laboratory
17) Orientation for final practical examination
REFERENCE BOOKS

OPC HOR 426 : SUPPLY CHAIN MANAGEMENT, PROCESSING AND VALUE ADDITION IN HORTICULTURAL CROPS (1+1)

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 and to impart knowledge on value chain management of horticultural commodities.

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
Packaging of horticultural produce – type of containers and cushioning materials – methods of packing – controlled and modified atmospheric packaging – vacuum and edible packaging.

Unit–IV : Methods of preservation

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 and 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.
10) Methods of packing: controlled and modified atmospheric packaging – vacuum, edible packaging.
11) Principles of preservation – Preservation with sugar, salt – preservatives
12) Drying, dehydration, 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 – principles, methods and 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 and 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) Asessment of physical, physiological and biochemical changes during ripening.
4) Determination of physiological loss in weight and quality.
5) Preharvest treatments to enhance the post harvest life.
6) Storage studies for fresh produce.
7) Packaging studies for fruits and vegetables.
8) Packaging studies for cut flowers and dry flowers.
9) Waxing.
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 practical examination.

REFERENCE BOOKS

OPC AEC 426 : AGRICULTURAL PROJECT MANAGEMENT (1+1)

OBJECTIVE
The objective of this course is 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 –

**Unit–II : Human Resource in Project Management**


**Units – III: Project Management Techniques**


**Unit–IV : Monitoring**


**Unit–V : Evaluation**


**PRACTICAL**


**THEORY LECTURE 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 – Environmental impact study
4) 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 and 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 – Salient aspects of evaluation  
16) Quantitative and qualitative approaches – Participatory monitoring and evaluation  

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) Orientation for final examination  

REFERENCE BOOKS  

**OPC AEX 426 : ENTREPRENEURSHIP DEVELOPMENT (1+1)**

**OBJECTIVES**

- To learn the concepts of entrepreneur, entrepreneurship and dimensions of entrepreneurship development.
- To learn the elements of marketing and training programmes for entrepreneurship development.
- To gain experience in formulation of projects and working out BCR, Break even analysis and financial ratios.
- To visit various small scale agro–based enterprises so as to gain knowledge on their establishment and management.

**THEORY**

**Unit–I : Concept of Entrepreneurship**

Entrepreneur and Entrepreneurship – definition, meaning, characteristics of ideal entrepreneur – types of entrepreneurs.

**Unit–II : Enterprise**

Entrepreneurship and Entrepreneurial motivation – Motivational factors for entrepreneurship – Enterprise – Meaning, definition, characteristics and types of enterprises.

**Unit–III : Setting up Small Scale Enterprises**

Steps in setting up small enterprises – product idea – sources for product ideas, methods and techniques to generate product ideas – SWOT analysis. Importance of technology for an enterprise – Identification and accessing of technology.

**Unit–IV : Marketing and Record Keeping**


**Unit–V : Entrepreneurial Training**

Entrepreneurship Development Training Programme (EDTPs) – Objectives, Importance and models of EDTPs – Organizations in the service of entrepreneurs – Entrepreneurship development programmes for women entrepreneurs, Problems of women entrepreneurs – EDTP for women entrepreneurs.
PRACTICAL

THEORY LECTURE SCHEDULE
1) Entrepreneur and Entrepreneurship – definition, meaning and importance of entrepreneurship in agriculture
2) Characteristics of ideal entrepreneurs, Types of entrepreneurs
3) Entrepreneurial motivation – Definition, motivational factors for entrepreneurship, importance of entrepreneurial motivation
4) Enterprise – Meaning, definition, characteristics of enterprises and types of enterprises.
5) Steps in setting up small scale enterprises
6) Product idea – characteristics of good product idea, sources for product ideas
7) Methods and techniques to generate product ideas, Assessing product ideas – factors in assessing product ideas
8) SWOT analysis – Concept, meaning, advantages, SWOT analysis for agro based industries and products
9) Mid Semester Examination
10) Technology – Definition, characteristics, Importance of technology for an enterprise, Identification and accessing of technology.
12) Types of capital – Fixed capital – Technology fee, land and building, plant and machinery, connection for utilities, office furniture and operative expenses
14) Record keeping – Purpose and importance, Types of business records
15) Entrepreneurship Development Training Programme (EDTPs) – Importance and models of EDTPs
16) Organizations in the service of entrepreneurs, Organizations for women entrepreneurs
17) Entrepreneurship development programmes for women entrepreneurs, problems of women entrepreneurs.
PRACTICAL SCHEDULE

1) Formulation of a project proposal
2) Working out benefit – cost ratio for any agro – based project
3) Working out break – even analysis
4) Working out financial ratio
5) Cost of production of agro – based product
6) Capital budgeting for any agro – based project
7) Preparation of balance sheet
8) Preparation of sample project profile for mushroom reaching
9) Preparation of sample project profile for dairy farming
10) Visit to agro based industry I
11) Visit to agro based industry II
12) Practicing tower building
13) Practicing test for achievement planning
14) Case study of successful women entrepreneurs.
15) Visit to entrepreneurship support agency.
16) Preparation of project report of any agro based Industry
17) Orientation for final practical examination

Reference Books


OPC AHS 426 : TECHNOLOGY OF DAIRY AND POULTRY PRODUCTS (1+1)

OBJECTIVES

- To impart the comprehensive idea of the existing technologies and practices for augmenting milk and poultry products.
- To give “hands on” experience with the different technologies used in dairy and poultry products to develop entrepreneurship skills among the students.

THEORY

Unit–I : Milk Composition

Unit–II : Dairy Products – I
Fat rich Dairy products – Preparation of Cream, Butter, Ghee – Preparation of Ice cream.

Unit–III : Dairy Products – II

Unit–IV : Poultry Meat
Slaughtering techniques of Poultry – Preparation of cut – up parts – Inspection and grading of poultry meat.

Unit–V : Egg and Egg products

PRACTICAL

THEORY LECTURE SCHEDULE
1) Introduction to Dairy and Poultry Industry.
2) Definition and Composition of milk – factors influencing composition of milk.
3) Types of milk.
4) Pasteurization and Homogenization of milk.
5) Preparation of Cream.
6) Preparation of Butter and Ghee.
7) Preparation of Ice cream.
9) Mid Semester Examination.
10) Slaughtering techniques of poultry.
11) Preparation of cut up parts.
12) Inspection and grading of poultry meat.
13) Composition and nutritive value of egg.
14) Factors affecting egg quality.
15) Grading of eggs.
16) Preservation of egg.
17) Value added egg products.

PRACTICAL SCHEDULE
1) Platform test for milk.
2) Determination of Specific Gravity of milk.
3) Estimation of fat percentage and total solids in cow’s milk.
4) Determination of acidity in milk.
5) Detection of adulterants in milk.
6) Demonstration of cream separation.
7) Preparation of Ghee.
8) Preparation of Paneer and Channa.
9) Preparation of Ice cream and judging its quality.
10) Preparation of flavoured milk.
11) Preparation of Whey drinks.
12) Dressing of Poultry.
13) Preparation of cut up parts of poultry meat.
14) Preparation of value added poultry meat products.
15) Candling and grading of eggs.
16) Preservation and value addition of eggs.
17) Orientation for final practical examination.

REFERENCE BOOKS