REGULATIONS

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

A. Eligible Subjects of Study in the Qualifying Examination

HSC/ Equivalent- Academic Stream

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

Subjects of study are grouped below

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

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

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

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

B. HSC/ Equivalent

Biology with three vocational subjects.

C. Eligible Minimum Qualifying Marks

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

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

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


D. Number of Attempts to Pass

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

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Community</th>
<th>Maximum Number of Attempts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Scheduled Caste / Scheduled Tribe</td>
<td>Three</td>
</tr>
<tr>
<td>2</td>
<td>All others Communities</td>
<td>Two</td>
</tr>
</tbody>
</table>
E. Award of B.Sc.(Ag.) Degree

The candidates should have undergone successfully the prescribed course of study in the University. They shall further be required to have completed and passed 165 course credits and shall have earned an overall grade point average (OGPA) of 5.50 out of 10 for all courses completed in B.Sc.(Ag.) degree programme. In addition to the above, students shall in the judgment of the Faculty, possess good conduct and character.

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

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

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

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

5. DEFINITIONS

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

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

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

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

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

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

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

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

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

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

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

6. EXAMINATIONS

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

6.1. Course with both theory and practical

<table>
<thead>
<tr>
<th>Component</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>i) Mid Semester Examination</td>
<td>20</td>
</tr>
<tr>
<td>ii) Practicals, records, term papers and other assignments including field trips, if any, (Written = 25, Record = 5 Specimen collection = 5 and Viva–Voce = 5)</td>
<td>40</td>
</tr>
<tr>
<td>iii) Final Theory Examination</td>
<td>40</td>
</tr>
</tbody>
</table>

Total 100
6.2. Course with only Theory / Practical*  
- i) Mid Semester Examination 40 
- ii) Final Semester Examination 60 

Total 100  

* Except three courses: NSS / NCC, RAWE and Experiential learning the distribution of marks of these courses are furnished in Regulations 6.4 to 6.6.

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

6.4. NSS / NCC (0+1)  
The duration of NCC / NSS training is for four semesters (I,II,III and IV).  

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

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

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

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

Rural Agricultural Work Experience (RAWE)  
Course on Rural Agricultural Work Experience will be offered in the VII Semester:  
The village attachment will be organized by the Department of Agricultural Extension. The components of Agri Clinic / Input Industry / NGO / Financial Institutions / and attachment to Agro based industries will be organized by Department of Agricultural Economics. Orientation programme will be organized in the first week of the semester by both the departments. Crop Production and Crop Protection components of RAWE program will be evaluated by the concerned course teachers based on the skills learned by the students in their village stay programme. The marks awarded by the examiners will be apportioned for the titles listed in table below. The credit load for the departments and appointment of examiners for evaluation will be on a group teaching mode involving the departments taking up the assignment.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Course code</th>
<th>RAWE</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RAE-411</td>
<td>Crop Production (Agronomy (0+2), Plant Breeding (0+1), Soil Science (0+1), Animal Husbandry(0+1))</td>
<td>0+5</td>
</tr>
<tr>
<td>2</td>
<td>RAE-412</td>
<td>Crop Protection (Agronomy (0+1), Entomology (0+1), Plant Pathology (0+1), Micro Biology (0+1))</td>
<td>0+4</td>
</tr>
<tr>
<td>3</td>
<td>RAE-413</td>
<td>Extension Programme – Village stay programme – 6 weeks (Agricultural Extension)</td>
<td>0+4</td>
</tr>
<tr>
<td>4</td>
<td>RAE-414</td>
<td>Rural Economics – Industrial attachment – 12 weeks (Agricultural Economics) Attachment to Industry (Agro Industrial Tie-Up ) – 3 weeks Agri Clinics / Agri Business Centers – 2 weeks NGO Organization / Agri related government institutions – 2 weeks Agricultural Finance Institutions / Banks / RRB / Cooperative Societies / MFI – 3 weeks Seed / Fertilizer / Pesticide / Input Industry – 2 weeks Total - 12 weeks</td>
<td>0+7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Orientation – 1 week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project report presentation and Examination – 1 week</td>
</tr>
<tr>
<td>Total 0+20</td>
</tr>
</tbody>
</table>
Evaluation:

a) RAE-411 Crop Production and RAE-412 Crop Protection

1. Observation note book - 20
2. Field works / Demonstration record - 20
3. Technology learned and commendable Activities - 10
4. Project report - 30
5. Viva-voce - 20

Total 100

b) RAE-413 Agrl. Extension

1. Daily record (Observation note book) - 20
2. Skills learned - 20
3. Commendable Activities - 10
4. Village stay programme record - 30
5. Viva-voce - 20

Total 100

c) RAE-414 Agricultural Economics

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

   Total 40

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

   Total 60

6.5. Experiential learning (0+5) : This course will be offered in the VIII semester. The credit load for the departments involved in experiential learning, the appointment of examiners for evaluation will be on a group teaching mode involving the departments taking up the module courses in experiential learning. The experiential learning examination will be conducted by the University before the commencement of regular final semester examinations. The distribution of marks will be 40 for periodical evaluation and 60 for final examination. The evaluation will comprise of skills learnt, proficiency in project execution, project report and viva-voce

Evaluation Marks

1. Daily Record (Observation note book) 20 By the teacher in-charge
2. Skills learned 20
3. Proficiency in project execution 10
4. Project Report 30 By the Examiners
5. Viva-Voce 20

Total 100
7. MID-SEMESTER EXAMINATION (MSE)

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

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

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

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

<table>
<thead>
<tr>
<th>Marks</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>i) Objective questions</td>
<td>5</td>
</tr>
<tr>
<td>ii) Definition</td>
<td>5</td>
</tr>
<tr>
<td>iii) Short notes</td>
<td>5</td>
</tr>
<tr>
<td>iv) Essay type</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

7.5. If the student is not able to write the MSE due to his or her deputation by the University or due to other genuine reasons as judged by the Dean in consultation with Head of the Department and course teacher, he/she may be permitted to take up a make-up test of the particular examination. Such tests should be completed ordinarily within 15 working days after the respective MSE.

8. FINAL EXAMINATIONS

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

8.2. Theory examinations will be conducted after practical examinations.

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

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

8.5. Practical Examination

Practical examinations will be conducted in the practical classes itself towards the end. Proper maintenance and regular submission of practical records are required. Those who do not bring with them the certified practical records/specimen collection / assignments will not be allowed to appear for the practical examination. The marks awarded for specimen collection and assignments shall be noted in the record, at the time of first appearance and will be taken into account for subsequent appearances. Such marks awarded by the examiner will be furnished to the Head of the Department.

8.6. Two examiners appointed by the University, of whom one will be the course teacher concerned and one teacher nominated by HOD will conduct the practical examination.

9. SUPPLEMENTARY EXAMINATION

9.1. A student who has failed in a course (subject) or awarded EE can take up supplementary examination without undergoing regular classes. A student who has not fulfilled attendance requirement should repeat the course to earn attendance before he/she is permitted to proceed to the next semester.

9.2. A candidate with OGPA of less that 5.50 shall be allowed to appear for the examination of the courses completed earlier in which he/she had obtained GPA of 6.00 or less.

9.3. Students with arrear subjects can reappear for the same at the time of regular semester examination only.

9.4. A continuing candidate cannot appear for more than six subjects in the supplementary examination at a time. The candidate who has completed the tenure of four years in the B.Sc. (Ag.) Degree Programme cannot appear for more than 16 subjects in the supplementary examination at a time.

9.5. a. There will be no supplementary examination for the courses viz., R.A.W.E and Experiential learning. Those who fail in the above subject shall have to repeat the course in the subsequent year/ years.

b. The supplementary viva-voce examination for these courses will be arranged as decided by the Dean for those who would have completed the course requirements but were unable to take up viva-voce due to medical or other compelling circumstances.
9.6. The candidates for the supplementary examinations will submit their applications through the Dean, Faculty of Agriculture who will scrutinize the applications to ensure compliance of regulation 9.2 and 9.4. The attested copy of all grade sheets pertaining to the supplementary examinations should be enclosed along with the applications.

10. ATTENDANCE REQUIREMENT
10.1 One hundred per cent class attendance is expected from each student. A student who fails to secure 75 per cent of attendance prescribed for a course (subject) of study, separately in theory and practical shall not be permitted to appear for both theory and practical examinations in that course (subject) and shall be given ‘E’ (incomplete) and will be required to repeat the course (subject).

10.2 Students abstaining from the classes by prior permission from the Dean, Faculty of Agriculture on Official University business, shall be given due consideration in computing attendance requirements. Such information should be forwarded to the course teacher within three working days.

10.3 However, condonation of attendance deficiency may be considered by the Vice-Chancellor only in case of genuine reasons including indoor hospitalization with evidence in the form of Hospitalization certificate and Discharge summary recommended by the Dean, Faculty. The Vice-Chancellor may decide whether or not a condonation fee is required, based on the reason for condonation fee.

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

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

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

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

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

12. TUITION FEES AND SCHOLARSHIPS
The various fees payable by the students will be decided by the University from time to time.

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

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

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

d) The students who fail to pay the tuition fees within a month of commencement of the semester will not be allowed to attend the classes and their names will be struck off from the rolls. However, if the defaulting students pay the fees along with the fines in addition to a prescribed readmission fee, they will be permitted to attend the classes. The period for which his/her name is struck off from the rolls will be treated as absence for the purpose of calculating the minimum attendance requirements.
e) Students who are away on study tour, camp activities or other extracurricular activities organised by the University or the Faculty at the commencement of the semester may, however, pay their semester tuition fees and other fees within the third working day after they return form such programmes, without fine.

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

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

13. TRANSITORY REGULATIONS

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

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

SEMESTER-WISE DISTRIBUTION OF COURSES (2012-2013)

**SEMESTER – I**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Credit Hours</th>
<th>Theory</th>
<th>Practical</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AGR 111</td>
<td>Principles of Agronomy and Agricultural Heritage</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>AGR 112</td>
<td>Fundamentals of Agricultural Meteorology</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>AGM 113</td>
<td>Agricultural Microbiology</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>SAC 114</td>
<td>General Biochemistry</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>GPB 115</td>
<td>Crop physiology</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>HOR 116</td>
<td>Basic horticulture and plant propagation</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>TAM / ENG 117</td>
<td>Tamil/English Development Education</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>NSS/NCC 101*</td>
<td>National Service Scheme/ National Cadet Corps</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>10</strong></td>
<td><strong>8</strong></td>
<td><strong>18</strong></td>
<td></td>
</tr>
</tbody>
</table>

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

**SEMESTER – II**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Credit Hours</th>
<th>Theory</th>
<th>Practical</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AGR 121</td>
<td>Water Management</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>ENT 122</td>
<td>Insect Morphology ,Systematics and Physiology</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>PAT 123</td>
<td>Principles of Plant Pathology</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>SAC 124</td>
<td>Introduction to Soil Science</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>GPB 125</td>
<td>Genetics and Cytogenetics</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>AEC 126</td>
<td>Principles of Agricultural Economics</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>AEX 127</td>
<td>Fundamentals of Rural Sociology and Educational Psychology</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>COM 128</td>
<td>Introduction to computer and application</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>AEG 129</td>
<td>Farm Power and Machinery</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>14</strong></td>
<td><strong>8</strong></td>
<td><strong>22</strong></td>
<td></td>
</tr>
</tbody>
</table>

**SEMESTER – III**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Credit Hours</th>
<th>Theory</th>
<th>Practical</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AGR 211</td>
<td>Crop Production-I</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
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<td>AGR 212</td>
<td>Agronomy of field Crops- I</td>
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<td>ENT 213</td>
<td>Beneficial Insects and Introductory Nematology</td>
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<td>4</td>
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<td>Manures, Fertilizers and Agro-chemicals</td>
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<td>Principles and methods of Plant Breeding</td>
<td>3</td>
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<td>6</td>
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<td>Production Technology of Fruit and plantation Crops</td>
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<td>Dimensions of Agricultural Extension</td>
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<td>Livestock and Poultry Production</td>
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## SEMESTER – IV

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<td>Applied plant pathology</td>
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<td>Breeding of field and horticultural crops</td>
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<td>HOR 225</td>
<td>Production Technology of Vegetable and Flower crops</td>
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<td>Agricultural Marketing, Trade and Prices</td>
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<td>Extension Methodologies for Transfer of Agricultural Technology</td>
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<td>Fundamentals of Soil and Water Conservation Engineering</td>
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<td>STA 229</td>
<td>Statistics</td>
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Total 13 9 22

## SEMESTER – V

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<td>Diseases of Field Crops</td>
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<td>Principles of Plant Biotechnology</td>
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<td>Production Technology of Spices, Aromatic, and Medicinal Crops</td>
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<td>AEC 317</td>
<td>Introduction to Agribusiness Management</td>
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<td>Entrepreneurship development</td>
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<td>10.</td>
<td>ENG 319</td>
<td>Comprehension and communication skills in English</td>
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## SEMESTER – VI

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<td>AGR 322</td>
<td>Organic Farming</td>
<td>1</td>
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<td>ENT 323</td>
<td>Pests of Crops &amp; Stored Produce and their Management</td>
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<td>Diseases of Horticultural crops and mushroom cultivation</td>
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<td>Soil Chemistry, Soil Fertility and Nutrient Management</td>
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<td>GPB 327</td>
<td>Principles of Seed Technology</td>
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<td>Ornamental and landscape gardening</td>
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<td>Agricultural Finance, Banking and Co-Operation</td>
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### SEMESTER – VII

**Rural Agricultural Work Experience (RAWE)**

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<tr>
<td>1.</td>
<td>RAE-411</td>
<td>Crop Production</td>
<td>(Agronomy (0+2), Plant Breeding (0+1), Soil Science (0+1), Animal Husbandry (0+1))</td>
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<td>2.</td>
<td>RAE-412</td>
<td>Crop Protection</td>
<td>(Agronomy (0+1), Entomology (0+1), Plant Pathology (0+1), Micro Biology (0+1))</td>
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<td>RAE-413</td>
<td>Extension Programme – Village stay programme – 6 weeks</td>
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<td>4.</td>
<td>RAE-414</td>
<td>Rural Economics – Industrial attachment – 12 weeks</td>
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### SEMESTER – VIII

**Module I to VI I**

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<td>2.</td>
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<td><strong>8+10=18</strong></td>
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For eighth semester in experiential learning seven different modules have been evolved for options to be given for students. The module (I to VI) comprises three major courses of three credits each and two minor courses of two credits each. The module VII is comprised of the courses representing the major six areas as suggested by ICAR. Students choosing a module will complete 13 credits. The modules are as listed as follows.

**Module I: Crop Production**

(Department of Agronomy, Division of Animal Husbandry and Department of Horticulture)

<table>
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<tr>
<td>MEL 421</td>
<td>Design and Management of Farming Systems</td>
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<tr>
<td>MEL 422</td>
<td>Dry Farming and Water Shed Management</td>
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<tr>
<td>MEL 423</td>
<td>Forest Resource Management</td>
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<tr>
<td>MEL 424</td>
<td>Invasive Alien Species and Bio-Diversity</td>
<td>1+1</td>
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<tr>
<td>MEL 425</td>
<td>Dairy and Poultry Products Technology</td>
<td>1+1</td>
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**Module II: Commercial Entomology and Pathology**

(Department of Plant Pathology and Entomology)

<table>
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<tr>
<td>MEL 426</td>
<td>Mass Multiplication and Application of Entomophages and Entomopathogens</td>
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<tr>
<td>MEL 427</td>
<td>Biological Control of plant diseases</td>
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<tr>
<td>MEL 428</td>
<td>Mushroom Cultivation</td>
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<tr>
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<tr>
<td>MEL 429</td>
<td>Insects of Urban and Quarantine Importance</td>
<td>1+1</td>
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<tr>
<td>MEL 430</td>
<td>Natural Products in Insect Pest Management and their Formulation Techniques</td>
<td>1+1</td>
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**Module III: Natural Resource Management**

(Department of Soil Science and Agricultural Chemistry, Agricultural Microbiology and Agricultural Economics.)

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<tr>
<td>MEL 431</td>
<td>Remote sensing, GIS and Land Use Planning</td>
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<td>MEL 432</td>
<td>Impact Assessment of Agrochemicals in Ecosystem</td>
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<tr>
<td>MEL 433</td>
<td>Soil Water Plant Health and Management</td>
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<td>Module IV: Crop Improvement</td>
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<td>-----------------------------</td>
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<tr>
<td>(Department of Genetics and Plant Breeding, Horticulture and Microbiology)</td>
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<tr>
<td>S.No.</td>
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<td>Credit hours</td>
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<td>Major</td>
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<tr>
<td>MEL 436</td>
<td>Molecular Plant Breeding</td>
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<td>MEL 437</td>
<td>Plant Tissue Culture</td>
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<td>MEL 438</td>
<td>Plant Genetic Resources</td>
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<td>MEL 439</td>
<td>Microbial and Environmental Technology</td>
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<tr>
<td>MEL 440</td>
<td>Growth and Development of Horticultural Crops</td>
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This module will be taught by the

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### I. AGRONOMY

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<td>Principles of Agronomy and Agricultural Heritage</td>
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<td>Fundamentals of Agricultural Meteorology</td>
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### II. ENTOMOLOGY

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<td>Insect Morphology, Systematics and Physiology</td>
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<td>Beneficial Insects and Introductory Nematology</td>
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### III. PLANT PATHOLOGY

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<td>Principles of Plant Pathology</td>
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<td>2 1 3</td>
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<td>Diseases of Field Crops</td>
<td>1 1 2</td>
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<td>PAT 324</td>
<td>Diseases of Horticultural crops &amp; mushroom cultivation</td>
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### IV. AGRICULTURAL MICROBIOLOGY

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### V. SOIL SCIENCE AND AGRICULTURAL CHEMISTRY

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<td>Introduction to Soil Science</td>
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<td>Manures, Fertilizers and Agro-chemicals</td>
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### VI. GENETICS AND PLANT BREEDING

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<td>Genetics and Cytogenetics</td>
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<td>Principles and methods of Plant Breeding</td>
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<td>GPB 224</td>
<td>Breeding of Field and Horticulture Crops</td>
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<td>5.</td>
<td>GPB 315</td>
<td>Principles of Plant Biotechnology</td>
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<td>6.</td>
<td>GPB 327</td>
<td>Principles of Seed Technology</td>
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### VII. HORTICULTURE

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Theory</td>
</tr>
<tr>
<td>1.</td>
<td>HOR 116</td>
<td>Basic horticulture and plant propagation</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>HOR 216</td>
<td>Production Technology of Fruit and plantation Crops</td>
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<tr>
<td>3.</td>
<td>HOR 225</td>
<td>Production Technology of Vegetable and Flower crops</td>
<td>2</td>
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<tr>
<td>4.</td>
<td>HOR 316</td>
<td>Production Technology of Spices, Aromatic, and Medicinal Crops</td>
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<td>5.</td>
<td>HOR 328</td>
<td>Ornamental and landscape gardening</td>
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### VIII. AGRICULTURAL ECONOMICS

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<tr>
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<tr>
<td>1.</td>
<td>AEC 126</td>
<td>Principles of Agricultural Economics</td>
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<td>2.</td>
<td>AEC 217</td>
<td>Production Economics and Farm Management</td>
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<tr>
<td>3.</td>
<td>AEC 226</td>
<td>Agricultural Marketing, Trade and Prices</td>
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<td>AEC 317</td>
<td>Introduction to Agribusiness Management</td>
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<td>5.</td>
<td>AEC 329</td>
<td>Agricultural Finance, Banking and Co-Operation</td>
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### IX. AGRICULTURAL EXTENSION

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<tr>
<td>1.</td>
<td>AEX 127</td>
<td>Fundamentals of Rural Sociology and Educational Psychology</td>
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<td>2.</td>
<td>AEX 218</td>
<td>Dimensions of Agricultural Extension</td>
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<td>AEX 227</td>
<td>Extension Methodologies for Transfer of Agricultural Technology</td>
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<td>AEX318</td>
<td>Entrepreneurship Development</td>
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### X. ANIMAL HUSBANDRY

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<td>AHS 219</td>
<td>Livestock and Poultry Production</td>
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### XI. COURSES OFFERED BY OTHER DEPARTMENTS

<table>
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<tr>
<td>1.</td>
<td>COM 128</td>
<td>Introduction to computer and application</td>
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<td>2.</td>
<td>AEG 129</td>
<td>Farm Power and Machinery</td>
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<tr>
<td>3.</td>
<td>AEG 228</td>
<td>Fundamentals of Soil and Water Conservation Engineering</td>
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<tr>
<td>4.</td>
<td>AEG 310</td>
<td>Renewable Energy</td>
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<td>5.</td>
<td>STA 229</td>
<td>Statistics</td>
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<td>TAM 117</td>
<td>Tamil / Development of Education</td>
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<td>7.</td>
<td>ENG 319</td>
<td>Comprehension and communication skills in English</td>
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| Total   | 7          | 7        | 14     |

### XII. NSS / NCC

<table>
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<th>Sl. No.</th>
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| Total   | 0          | 1        | 1      |

### SEMESTER- WISE CREDITS

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<td>II</td>
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<tr>
<td>VIII</td>
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| Total    | 82                | 83     | 165       |
OBJECTIVES

Principles of Agronomy and Agricultural Heritage deals with practices of crop production and soil management. This course aims at exposure to the latest concepts of Agronomy on tillage, seeds and sowing, mineral nutrition, irrigation, soil conservation, dry land agriculture, weed management, nutrient management, farming systems, history of agriculture and agricultural development from ancient to modern age.

THEORY

Unit – I : Introduction to Agriculture

Unit – II: History of Agriculture Development and Ancient civilization
History of agricultural development in World and India - Agriculture heritage – Agriculture in ancient India – - Evolution of man and agriculture – Development of scientific Agriculture. Stages of agriculture development - Era of civilization- Importance of Neolithic civilization - Chronological agricultural technology development in India- Kautilya’s Arthasasthra- Sangam literature -Tamil Almanac and rainfall prediction.

Unit – III : Crop Distribution and Production

Unit – IV: Basics of Agricultural operations and Weed management

Unit – V : Integrated nutrient management & Farming systems

PRACTICAL

Visit to college farm – Crop classification and identification of seeds; Identification and study of manures and fertilizers - working out seed rate - Study of seed treatment practices. Study of tillage implements (primary, secondary and special purpose)- Practice of methods of fertilizer applications and its calculations; Different methods of sowing; Study of seeding equipment’s Study of inter-cultivation implements and practice - Participation in ongoing field operations.

THEORY - LECTURE SCHEDULE
1. Agriculture – Definition –Agriculture as Art, Science and Business
2. Importance and scope of agriculture in India and Tamilnadu
4. Agronomy – definition – meaning and scope
5. National and International Agricultural Research Institutes.
6. Indian agriculture- Indian economy – National income – per capita income – Agricultural income in GDP
7. Women in agriculture and empowerment.
8. History of agricultural development in the World and India
9. Agriculture heritage – Agriculture in ancient India and Evolution of man and agriculture
10. Development of scientific agriculture
11. Stages of agriculture development - Era of civilization
12. Importance of Neolithic civilization
13. Chronological agricultural technology development in India
14. Kautilya’s Arthasasthra- Sangam literature
15. Prediction of Monsoon rains - Tamil Almanac.
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. Modern concepts of tillage – main field preparation
24. Seeds - Seed rate – Seed treatment- Different methods of sowing
25. Germination –Factors affecting germination
27. Inter cultivation - Thinning - gap filling and other intercultural operations
28. Weeds – Definition –beneficial and harmful effects of weeds
29. Crop weed competition and management of weeds – IWM
30. Role of manures and fertilizers in crop production – agronomic interventions for enhancing FUE – INM
32. Cropping patterns and cropping system - intensive cropping- sustainable agriculture – IFS
33. Organic agriculture – Natural farming -Dry farming- concepts and principles

PRACTICAL SCHEDULE
1. Visit to college farm to observe wetland farming system, garden land and dry land farming systems
2. Identification of 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
6. Identification of tools and implements
7. Acquiring skill in handling primary and secondary tillage implements
8. Study of labour saving and special purpose implements
9. Seed treatment techniques -Nursery preparation
10. Study on different methods of sowing and seeding implements
11. Methods of application of manures and fertilizers
12. Observing various irrigation methods and herbicide application methods
13. Working out seed rate
14. Practicing thinning, gap filling operations for optimum crop stand and intercultural operations
15. Calculation on plant population and geometry
16. Working out fertilizer requirement of crops

17. Practical Examination

REFERENCES
OBJECTIVES
This course is scheduled to study the problems of plant growth and yield in relation to environmental factors. Climatic factors alone affect the yield of crops to an extent of about 40%. In India the success of agriculture depends mainly on monsoon rains. 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 Agricultural Meteorology
Meteorology - Agricultural Meteorology - Importance and scope in crop production - Coordinates of India and Tamil Nadu - Atmosphere - Composition and vertical layers of atmosphere (stratification) - Climate - Weather - Factors affecting climate and weather - Climatic types - Different agricultural seasons of India and Tamil Nadu - Agro-climatic regions of India and Tamil Nadu.

Unit II: Solar radiation and temperature

Unit III: Atmospheric pressure, Rainfall, and Wind systems of the World

Unit IV: Agro climatic zones and Forecasting
Agro climatic Zones – Agro climatic normals - Weather forecasting – importance, synoptic chart - crop weather calendar - Remote sensing and crop weather modeling - Impact of climate and weather on crop production and pest and diseases.

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

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

THEORY LECTURE SCHEDULE
1. Meteorology - Agricultural Meteorology - Definition, their importance and scope in crop production.
8. Atmospheric pressure, diurnal and seasonal variation - Pressure systems of the world - causes for variation - Isobar - Low, depression, anticyclone, Tornado, hurricane.
9. Mid Semester Examination
10. Wind systems of the world - Inter Tropical Convergence Zones (ITCZ), wind speed in different seasons -. Clouds and their classification - Concepts of cloud seeding – present status.
12. Evaporation - Transpiration, evapotranspiration - Potential evapotranspiration - Definition and their importance in agricultural production. Agro climatic zones of Tamil Nadu - Agro climatic normals for field crops.
13. Weather forecasting - Types, importance, Agro Advisory Services - Synoptic chart - Crop weather calendar.
15. Effect of weather and climate on crop production, soil fertility and incidence of pest and diseases.
16. Climate change, climate variability – definition and causes of climate change including ENSO.
17. Impact of climate change on Agriculture, Forestry, Hydrology, marine and coastal ecosystem.

PRACTICAL SCHEDULE
1. Site selection and layout for Agromet Observatory - Calculation of local time - Time of observation of different weather elements.
2. An introduction to Annamalai University Meteorological Observatory
3. Measurement of air and soil temperature and grass minimum thermometers and thermographs
4. Measurement of solar radiation and sunshine hours
5. Humidity measurements – use of wet and dry bulb, assmann psychrometer
7. Measurement of rainfall - Ordinary and self-recording rain gauges
9. Measurement of atmospheric pressure - barograph
11. Study of Automatic weather station
12. Data analysis for rainfall chart and thermo hygrograph chart data
13. Analysis of weather data
14. Preparation of crop weather calendars and forecast based on agro advisories
15. Preparation of Synoptic charts.
17. Practical Examination.

REFERENCES
OBJECTIVES

To study the fundamental principles, microbial transformations of C, N, P and applied aspects of microorganisms.

THEORY

Unit - I: History and scope of Microbiology
Contributions of Anton Van Leeuwenhoek, Louis Pasteur, John Tyndall, Robert Koch, Edward Jenner, Joseph Lister, Beijerinck, Winogradsky and Waksman; Position of microorganisms in living world; Prokaryotes Vs Eukaryotes; Groups of microorganisms; Bacterial size, shape and arrangement and morphology; functional anatomy of bacteria; Structure and organization of bacterial cell: Invariant and variant components, Structure and organization of microbial cells.

Unit-II: Microbiological Techniques
Microscopy – principles and types; Staining of microorganisms – principles; Sterilization and disinfection techniques; Principles and methods of sterilization – Physical methods – heat, filters and radiation; Chemical methods; Isolation and pure culture techniques – Enrichment culturing, dilution – plating, streak plate, spread plate methods; Preservation of microbial cultures.

Unit-III: Microbial Physiology and Genetics
Bacterial growth, reproduction and factors influencing bacterial growth – Growth curve; Nutritional types and metabolic diversity of bacteria; Principles of energy generation and carbon metabolism; fermentation – respiration in bacteria. Genetic Recombination – Transformation, Conjugation and Transduction.

Unit-IV: Soil Microbiology
Distribution and importance of soil microorganisms in soil fertility – factors affecting the activities of soil microorganisms; Rhizosphere microorganisms and their importance, R:S Ratio; Phyllosphere microorganisms – Plant – microbe and Microbe – microbe interactions in soil.

Unit-V: Microbial transformation of nutrients in soil
Microbial transformation of nutrients in soil – Carbon, Phosphorous and Sulphur cycle; Nitrogen cycle, Biological Nitrogen fixation – Symbiotic and non-symbiotic nitrogen fixing microorganisms, Process of nodulation and nitrogen fixation; Silicate and Zinc solubilizing bacteria – Types and importance of biofertilizers in Agriculture; Mass production and quality control of biofertilizers.

PRACTICAL

Microscopy – Light microscopes; Staining Techniques – Simple and Differential staining; Sterilization – equipment and apparatus used for sterilization; Media preparation; Isolation and enumeration of soil microorganisms; Purification and preservation of microorganisms; morphological and biochemical characters of bacteria.

Quality analysis of soil microbial profile – Organic matter decomposition – measurement of CO₂ evolution; Isolation of N₂ fixing and Phosphate solubilizing microorganisms; Infection by Arbuscular mycorrhizae; Winogradsky column – Mass production of bacterial biofertilizers – Mass production of algal and fungal biofertilizers; Demonstration of antibiosis.

THEORY SCHEDULE

1. Definition and scope of microbiology – Spontaneous generation theory.
3. Position of microorganisms in living world; Prokaryotes Vs Eukaryotes.
5. Functional anatomy and reproduction in bacteria.
7. Morphology of algae and their economic importance.
10. Sterilization- principles – physical and chemical methods.
12. Environmental conditions for growth – Temperature – Psychrophiles, Mesophiles and Thermophiles; air – aerobic and anaerobic; pH – acidic and alkali; salt.
15. Respiration – fermentation.
17. Outline classification of bacteria – Bergey’s Manual of Systematic Bacteriology, Edn.II
18. Mid semester examination
21. Factors affecting the activities of soil microorganisms.
22. Rhizosphere Microorganisms – R:S ratio and importance.
23. Plant growth promoting rhizobacteria; Phyllosphere Microbiology and Methylotrophs.
24. Microbial interaction in soil – neutralism, positive and negative interactions.
25. Microbial transformation of nutrients in soil – Carbon cycle.
27. Microbial transformation of nutrients in soil – Nitrogen.
29. Process and genetics of nodulation and nitrogen fixation.
30. Microbial transformation of nutrients in soil – Phosphorous & Sulphur.
31. Silicate and Zinc solubilizing microorganisms; Mycorrhizae.
32. Types of biofertilizers and importance in agriculture.
33. Production and quality control of biofertilizers
34. Methods of application of biofertilizers.

PRACTICAL SCHEDULE
1. Microscopes – Handling light microscope.
2. Staining techniques – Simple and Differential staining.
5. Enumeration of soil microorganisms – serial dilution plate technique (bacteria, fungi and actinomycetes).
6. Purification and preservation of bacteria and fungi.
9. Conn’s direct microscopic count and Burried slide technique.
10. Organic matter decomposition – measurement of CO₂ evolution
12. Isolation of symbiotic N₂ fixing microorganisms – Rhizobium.
15. Assessment of AM fungi colonization in crop plants.

17. Final Practical Examination

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

THEORY

Unit I: Bio molecules and Proteins, Nature and properties

Unit II: Enzymes and metabolism of carbohydrates

Unit III: Metabolism of proteins

Unit IV : Metabolism of lipids

Unit V : Secondary metabolites

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

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

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

REFERENCES
GPB 115: CROP PHYSIOLOGY (2+1)

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

THEORY
Unit I: Plant Water Relations
Importance of Crop Physiology in Agriculture, Role of water – Water potential and components - Definitions - field capacity, water holding capacity of soil and permanent wilting point, Absorption and translocation of water and solutes, Transpiration - significance - antitranspirants.

Unit II: Nutrio Physiology

Unit III: Carbon Fixation
Photosynthesis - light reaction and Photosynthetic pathways - C3, C4 and CAM - Differences between C3, C4 and CAM pathways - Factors affecting photosynthesis, Photosynthesis and significance of Phloem and xylem loading - Source sink relationship.

Unit IV: Growth Physiology
Growth - Growth analysis - LAI, LAD, SLW, SLA, LAR, NAR, RGR and CGR in relation to crop productivity, - Photoperiodism - Role of phytochrome in flowering and regulation of flowering. Vernalisation – devernalisation - Plant growth regulators and commercial applications - physiological role of auxins and GA Physiological role of Cytokinins, Ethylene and ABA - novel growth regulators and retardants their uses in crop productivity, Post harvest Physiology - Physiology of seed germination, seed and bud dormancy and breaking methods, Parthenocarpy - Physiology of fruit ripening - climacteric and non-climacteric fruits - factors affecting ripening and storage, Abscission – senescence, Shelf life and quality changes – use of PGRS and nutrients.

Unit V: Stress Physiology
Environmental stresses - water stress - physiological changes - adaptation to drought and its amelioration, Temperature stress - Physiological changes - low and high temperature - chilling injury - tolerance – alleviation, Low light and UV radiation stresses - salt stress - physiological changes and alleviation, Global warming – Carbon Sequestration - physiological effects on crop productivity,

PRACTICAL

THEORY SCHEDULE
1. Importance of Crop Physiology in Agriculture.
2. Role of water – process and significance
3. Definition - field capacity, water holding capacity of soil and permanent wilting point.
4. Translocation of water and solutes - phloem and xylem transport.
5. Transpiration - mechanism – significance - guttation - antitranspirants.
7. Mechanism of uptake - physiological role of nutrients.
8. Foliar diagnosis - nutritional and physiological disorders
9. Foliar nutrition- root feeding, trunk feeding and fertigation
10. Photosynthesis - light reaction
11. Photosynthetic pathways - C₃, C₄ and CAM
12. Differences between C₃, C₄ and CAM pathways - Factors affecting photosynthesis.
13. Photorespiration - photorespiration process and significance of photorespiration.
14. Source sink relationship and their manipulations
15. Photoperiodism - short day, long day and day neutral plants.

17. Mid Semester Examination
20. Plant growth regulators - Physiological role of Auxins and GA.
21. Physiological role of Cytokinins, andABA
22. Physiological role of Ethylene
23. Novel growth regulators and retardants and their uses in crop productivity.
24. Seed germination - physiological changes, seed and bud dormancy, breaking methods
25. Abscission - senescence
26. Physiology of ripening- climatic, non climatic and factors affecting ripening and storage
27. Role of PGRS and nutrients in shelf life and quality changes
29. Temperature stress - Physiological changes - low and high temperature – adaptation and amelioration
31. Low light and UV radiation stresses – physiological changes - adaptation and amelioration.
32. Salt stress - physiological changes- adaptation and alleviation
33. Global warming – physiological effects of green house gases
34. Carbon Sequestration - physiological effects on crop productivity

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

17. Final Practical Examination

REFERENCES
HOR 116: BASIC HORTICULTURE AND PLANT PROPAGATION (1+1)

OBJECTIVES

This course will expose the basic and fundamentals 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: Propagation techniques


Unit III: Factors of Horticultural Crop Production

Factors limiting growth and development – climate and soil - light, temperature, wind, humidity, rainfall and frost – soil factors - soil fertility management - physiology of flowering, pollination, fruit set, fruit ripening and senescence – Fruitfulness and causes of unfruitfulness – Growth regulators and growth hormones – Classification and applications.

Unit IV: Cropping systems

Cropping systems - intercropping - multi-tier cropping - planting methods –Crop geometry- intercultural operations – weed, water and fertilizer management – bearing habits – crop regulatory practices for fruit crops and vegetables – training, pruning, and special practices - off season production – rejuvenation of old and senile orchards.

Unit V Protected cultivation and post harvest handling

Basics of protected cultivation- Green house, glass house, Mist chamber- hydroponics -principles of organic horticulture –Pre-harvest operations – maturity indices – climacteric and non-climacteric fruits - harvesting methods - harvesting and post harvest handling – processing, value addition, storage and marketing of horticultural produce.

PRACTICAL


THEORY SCHEDULE

2. Horticultural zones of India & Tamil Nadu - special features of horticultural crops- Institutions involved in horticulture - Nutritive value of horticultural crops.
3. Propagation – sexual and asexual propagation - Seed propagation – dormancy and measures to overcome seed dormancy, apomixes and polyembryony.
5. Specialized plant parts for propagation and micro propagation –clonal orchards.
6. Growth and development of horticultural plants – climatic factors influencing - light, temperature, wind, humidity and rainfall- Soil factors - kind of soil, soil fertility management’
7. Growth regulators and growth hormones – Classification and applications
8. Physiology of flowering, pollination, fruit set, fruit ripening and senescence –Fruitfulness and causes of unfruitfulness
9. Mid Semester Examination
10. Cropping systems – Inter cropping , cover cropping multi-tire cropping - planting methods –high density planting -Crop geometry
11. Inter intercultural operations – weed, water and fertilizer management
12. Bearing habits and crop regulation including training, pruning and special practices.
13. Crop regulatory practices for fruit crops and vegetables- Off season production of horticultural crops through cultural methods and growth regulators.
14. Rejuvenation of old and senile orchards
15. Protected cultivation of horticultural crops
16. Pre harvest operations, climacteric and non-climacteric fruits- maturity indices and harvesting methods

PRACTICAL SCHEDULE
1. Visit to Orchard and study of different features of an orchard
2. Planning, layout and planting of horticultural crops.
3. Machineries, tools and implements used for various horticultural operations.
4. Preparation of potting mixture, potting and repotting of plants
5. Plant propagation structures including mist chamber, shade net, glass houses, poly houses
6. Preparation of growth regulators and method of application in horticultural crops.
7. Demonstration of propagation through layering and cutting.
8. Demonstration of propagation through budding, grafting and top working.
9. Propagation through specialized plant parts
10. Visit to tissue culture laboratory and study of micropropagation protocols and hardening
11. Nutrient and irrigation management practices
12. Bearing habits and training practices in horticultural crops.
13. Pruning practices in horticultural crops.
14. Maturity indices for various horticultural crops
15. Post harvest handling practices viz., grading, sorting and packing techniques.
16. Visit to private orchards and nursery
17. Final Practical examination.

REFERENCES
TAM 117: yf;fpa';fspy; ntshz;ika[k]; mwptpay; jkpH;g; gadhf;fKk;  0+1

brk;Kiwg; gapw;rp ml;:ltz
1. ntshz;ik – brhw; bghUs; tpst;fk; - bjhy;fhg;gpak; fhL;lk; epyg;ghFgL kw;Wk; kz;zwptpay;.
2. r';f;fpa';fspy; ntshz;ikj; bjhHpy; El;g';fs;
3. gjpbdz; fPH;t;fzF E)jy;fspy; ntshz;ik mwptpay; - jpUf;Fws; - ehd;kszpf;foif - dtapit
ehw;gL – d;dh ehw;gL – le;jpizbaGjG – jpizkhiy Ejw;lwkg;G
4. r';f;fpa';fspy; bey; tiffs; - gs;S Ejy;fspy; bey; tiffs;
5. ntshz;ikg; ghBkhHpg;fs; - cHl/ tipj/ ehw;W eLjy/ vU/ ePhg;ghrdk; / fis/ gaph;g;
6. ehl;Lg;gjw;ghly;fs; thHp ntshz;ikr; bra;jpfis mwpyj;
7. mwptpay; jkpHp; tsh;r;rp epjyfs; - jkpHp; ntshz;ik jH;fs; / fl;Liur; RUf;fk; (Abstract)
   vGj;jy;.
8. fUJj;Jg; ghpkhw;wj; jpwd;fs; (Communication skills) nkilg;  ngr;R – nff;ly/ ngRjy; / goj;jy;
   vGjiy - nkk;gLj;Jjw;fhd THp Kiwfsig; gapw;Wtpj;jy;.
9. ilg;gUtj; nh;t
10. bkd; jpwd;fs (Soft skills) nkk;gLj;Jjy;.
11. bkhHpgbah;g;gL - Xh; mwphKf; k; bkhHpgbah;g;gL tiffs mwpyj; - ntshz;
    bra;jpfisj; jkpHhff;fk; bra;jy;
12. fiyr;brhy;yhf;fk; - fiyr;brhw;fs cUthf;Fk; Kiw – fiyr;brhw;fisj; jug;gLj;Jy; - t;lhu
    thF;Fr; brhw;fisj; bjhFj;jy;
13. mwptpay; jkpH; tsh;r;rpapd; fzdqapdd; g;F
14. Ejy; Kd;Diu/ mzpe;Jiu/ Ejy; kjpg;gL PL bra;jy; (kjpg;gLiu)
15. bra;jp tiffs; - bra;jpfj;jhs; - thbdhyp - bjhifyf;fr;rp Mpf jfty; bjhLi;gL Clf;fspy;
   ntshz;ikr; bra;jpfis Vgj; gapw;rp mspijy;.
16. ntshz; bjhHpy;El;g;fs; bjjh;ghdh tspk;guk/ Jz;Lg; gpuRuk; / kog;gpjH;fs/ g[JbkhHgs; / lna;fs; jahhpj;jy;.
17. fye;Juahly/ neh;fhzy/ ehlk; / fpij/ tpy;Yg;ghL Lyk; ntshz;ikr; bra;jpfisg; gug;gj;g;.

ghh;it Ejy;fs;
   • fejrkhk; / y. br. 1974. ntshz;ika[k; g;ghLk; - jkpH;ehL ntshz;ikg; gy;flyf;fHfk/ nfhaKj;Jjh;.
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FHe;ijrkhk; th. br. mwptpay; jkpH;.
   • nrhbyk; jkpH; JH;fs; - brd;idg; gy;flyf; fhfk; - 1975.
   • kPdhl;rp Re;juk/ kh kw;Wk; V. y. tprayl;Rkp. 2002. jfty; bjhlih;gL[ jkpH; bkhHpg;gad;gL nh. Fh; vL; Mgr;brl; ghphzp;lh/ nhf;hit -3.
   • kzpknfjy/ k. 2002. jkpH; bkhHpg; jlj;jpy; ntshz; mwptpaypd; RTLfs; njtp gjpg;gfk; / jkpUrpuhg;gs;sp.
   • kzt K;gjg; .izaj; jkpH;.
   • mid;ipe;jpj mwptpay; jkpH; fhfk; - fy;tp El;gtpay;.
   • cylj; jkpHuuhu;r;rp epWtdk; - jkpHp; kug'r; bry;f'sf;.
   • .uh. re;jpunrfud; bkhHpg; ghik; - ghlg;ghf;j;jpwd; tsh;jjy;.

27
OBJECTIVES
To enable the learner know, understand, apply and value items related to agriculture and help the farmers to implement them.

PRACTICAL
Basic principles of learning - Taxonomy of educational objectives - Transferable skills - Multiple intelligence - Career development - Success story of entrepreneurs - Group learning - Brainstorming, Simulation, Role play, Ice breakers - Transactional communication - Types of ego - Interpersonal communication - Writing - Fax and e-mail, applying for a job, interviews, project report - Strategies and skills - Basic principles of scientific article editing.

LECTURE SCHEDULE
2. Bloom’s classification of educational objectives – Cognitive, Affective, Psychomotor domain(s) – discussion
3. Career development – opportunity for graduates of agriculture and allied sciences – discussion
5. Brainstorming – Demonstration
6. Simulation – Convergent task – demonstration
7. Simulation – Divergent task – demonstration
8. Role – pay – interpersonal communication – Fax, email – Transactional communication – ice breaker

9. Mid Semester Examination
10. Verbal and analytical skills – interactive CD-ROM
11. Writing and Editing – demonstration
12. Writing popular articles
13. Project Report – discussion on a mutilated cloze text
14. Project Report – Role play
15. Scientific articles – Selection, organization and presentation – a discussion
16. Writing a scientific article

17. Final Practical Examination

REFERENCES

101 NATIONAL SERVICE SCHEME (0+1)

I and II Semester

III and IV Semester
preservation of National monuments, cultural heritage and folklore – special camp activities – campus development activities.

101 NATIONAL CADET CORPS (0+1)


REFERENCE:

SEMESTER – II

AGR 121: WATER MANAGEMENT (1+1)

OBJECTIVES

Obtaining knowledge on the principles and practices of irrigation and interaction among the components of soil, moisture, crop complex.

THEORY

Unit – I : History and development of irrigation

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

Unit – II : Soil-plant-water relationship


Unit – III : Crop water requirement

Crop water requirement – Effective rainfall - Potential evapotranspiration (PET) and consumptive use – Definition and estimation – Factors affecting water requirement – Critical stages for irrigation and water requirement of crops – Measurement of irrigation water.

Unit – IV :Micro irrigation and water use efficiency


Unit – V: Quality of water and drainage

Quality of irrigation water – irrigation management under limited water supply – Agronomic practices for use of poor quality water (saline, effluent and sewage water) for irrigation – tank irrigation, well irrigation – on-farm development – command area development –Agricultural drainage, importance and methods of drainage.

PRACTICAL

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

THEORY LECTURE SCHEDULE

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

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

REFERENCES
ENT 122: INSECT MORPHOLOGY, SYSTEMATICS AND PHYSIOLOGY (2+1)

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

THEORY
Unit I: History and Importance

Unit II: Morphology and Behaviour

Unit III: Classification and characters of Apterygota and Exopterygota

Unit IV: Classification and characters of Endopterygota
Distinguishing characters of agriculturally important orders of Endopterygotes - Siphonaptera and Strepsiptera. Distinguishing characters of agriculturally important orders of Endopterygotes up to families of economic importance – Neuroptera (Chrysopidae, Myrmeliontiidae, Mantispidae, Aescaulaphiidae), Coleoptera (Cicindellidae, Carabidae, Dytiscidae, Curculionidae, Apionidae, Staphylinaidae, Coccinellidae, Lampyridae, Hydrophilidae, Scaebraeidae Dynastidae, Cerambycidae, Melolonthidae, Anobiidae, Tenebrionidae, Bruchidae, Meloidae, Cetonidae, Buprestidae, Elateridae and Bostrychidae), Diptera (Cecidomyiidae, Agromyzidae, Tephritidae, Asilidae, Tabanidae, Tachinidae, Hippobosciidae, Culicidae, Sarcophagidae and Muscidae), Lepidoptera (Nymphalidae, Lycaenidae, Pieridae, Papilionidae, Satyriidae, Crambidae, Pyraustidae, Noctuidae, Arctiidae, Bombycidae, Coccothraeidae, Geometridae, Gelechiidae, Pterororidae, Saturniidae, Sphingidae, Lymantriidae and Hesperidae) and Hymenoptera (Tenthredinidae, Apidae, Xylocopidae, Megachilidae, Bombycidae, Sphecidae, Vespidae, Formicidae, Chalcididae, Ichneumonidae, Betylidae, Braconidae, Encyrtidae, Eulophidae and Trichogrammitidae).

Unit V: Anatomy and physiology

PRACTICAL

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

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

PRACTICAL SCHEDULE
1. Practicing the methods of collection, killing, pinning, labelling, display and preservation of insects including immature stages. Preparation of riker mount.
2. Observations on segmentation and external features of grasshopper / cockroach / Blister beetle.
3. Observations on various types of insect head orientation and antennae.
4. Demonstration of mouth parts of cockroach and plant bug and study of mouth parts of female mosquito, honeybee, thrips, antlion grub, housefly and butterfly.
5. Observations on the modifications in legs and wings (wing venation, regions, angles and wing coupling).
6. Observations on various types of abdominal appendages.
8. Observation on Distinguishing characters of Collembola, Odonata, Phasmida and Orthoptera (Families: Acrididae, Tetrigionidae, Gryllidae and Gryllotalpidae).
10. Observation on Distinguishing characters of Heteroptera (Families: Reduviidae, Pentatomidae, Miridae, Coreidae, Pyrrhocoridae, Lygaeidae, Nepidae, Belastomatidae, Gerridae, Cimicidae, Tingidae), Homoptera (Families: Cicadidae, Cicadellidae, Delphacidae, Aphididae, Cercopidae,
Membracididae, Aleyrodidae, Coccidae, Diaspididae, Pseudococcidae, Kerriidae and Psyllidae).


12. Observation on Distinguishing characters of Neuroptera (Families: Chrysopidae, Myrmeliontidae, Mantispidae and Ascalaphidae),


16. Demonstration of digestive system and male and female reproductive systems (grasshopper/cockroach)

17. Final Practical Examination

REFERENCE BOOKS

PAT123 PRINCIPLES OF PLANT PATHOLOGY (2+1)

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

THEORY

Unit I: Plant Pathogenic organisms

Unit II: Pathogenesis
Pathogenesis - Mode of infection – Pre-penetration, penetration and post penetration – Spread and survival of pathogens - Role of enzymes and toxins on disease development

Unit III: General characters and molecular phylogeny of fungi

Unit IV: Phylum : Ascomycota and Basidiomycota
Phylum: Ascomycota, Classes: Taphrinomycetes (Taphrinales), Dothideomycetes (Dothidiales, Capnodiales and Pleosporales) Eurotiomycetes (Eurotiiales), Leotiomycetes (Erysipheles and Helotiales), Sordariomycetes (Hypocreales, Phyllocladiales and Diaporthales) and mitosporic ascomycetes; Phylum: Basidiomycota, Classes: Agaricomycetes (Agaricales, Corticales, Cantharellales
and Polyporales), Pucciniomycetes (Pucciniales) and Ustilaginimycetes (Exobasidiales, Ustilaginales and Tilletiales).

Unit V: Bacteria, Phytoplasma and Viruses


PRACTICAL

Study of important taxonomic characters and symptoms produced by Plasmodiophora, Pythium, Phytophthora, Albugo, Sclerospora, Perenospora, Perenosclerospora, Pseudoperenospora, Plasmopara, Mucor, Rhizopus, Taphrina, Capnodium, Erysiphe, Phyllactinia, Uncinula, Leveillula, Claviceps, Puccinia, Uromycetes, Hemileia, Sphacelotheca, Tolyposporium, Ustilago, Agaricus, Pleurotus, Calocybe, Volvariella, Ganoderma, Colletotrichum, Gloeosporium, Pestalotia, Macrophomina, Botryodiplodia, Pyricularia, Sarocladium, Drechslera (Helminthosporium), Alternaria, Cercospora, Curvularia, Rhizoctonia, Sclerotium, Symptoms of bacterial, Phytoplasma, Fastidious vascular bacteria, Algal parasite, phanerogamic parasites and non-parasitic diseases/disorders.

Note: Students should submit 50 well-preserved specimens

THEORY SCHEDULE

1. Definition of Plant Pathology – History of Plant Pathology
3. Fastidious vascular bacteria – Spiroplasma – Algal and phanerogamic parasites- abiotic disorders
4. Pathogenesis - Mode of infection – pre-penetration, penetration and post penetration
5. Spread and survival of pathogens
6. Role of enzymes on disease development
7. Role of toxins on disease development
8. General characters of fungi- types of Mycelia – modification of mycelia, vegetative reproduction
9. Asexual and sexual reproduction in fungi
10. Fruiting bodies in fungi- Asexual and sexual
11. Nutrition / parasitism in fungi- Types of parasitism –parasite, saprophyte, facultative saprophyte, facultative parasite, obligate parasite, Biotrophs, hemibiotrophs, peritrophs, necrotrophs, and symbiosis
12. Classification of Kingdom – Protozoa - important taxonomic characters and Symptoms and life cycle of Plasmodiophora brassicae and Spongospora subterreneae
13. Classification of Kingdom – Chromista - General characters - Classification of Oomycetes
15. Symptoms and life cycle of Perenosclerospora, Sclerospora, Perenospora, Pseudoperenospora and Plasmopara
16. Classification of Kingdom– Chytridiomycota and Zygomycota - important characters, symptoms and life cycles of Rhizopus and Mucor
17. Mid Semester Examination
18. Classification of Kingdom– Ascomycota- important characters
19. Symptoms and life cycles of Erysiphe, Leveillula, Phyllactinia, Uncinula and Podosphaera
21. Symptoms and important characters of Pyricularia, Sarocladium, Helminthosporium, Alternaria, Cercospora Curvularia, Fusarium and Verticillium
22. Symptoms and important characters of Colletotrichum, Gloeosporium, Pestalotia, Macrohomina, Botryodiplodia, Septoria and Ascochyta
23. Classification of Kingdom - Basidiomycota- important characters
24. Symptoms and life cycles of Puccinia, Uromycetes, and Ustilago
26. Important taxonomic characters of Agaricus, Pleurotus, Volvariella and Calocybe
27. Symptoms and important characters of Corticium, Rhizoctonia and Sclerotium
28. Classification and general characters of phytopathogenic bacteria- Mode of entry and spread
29. Symptoms and characters of Xanthomonas and Pseudomonas /Ralstonia, Erwinia (Pantoea), Agrobacterium, Corynebacterium (Clavibacter,) and Streptomyces
30. Virus - definition, nature and properties of plant virus, Single stranded, Double stranded RNA and DNA viruses and Transmission of plant viruses
31. Common symptoms of virus diseases – bract mosaic, citrus tristeza, tomato Spotted wilt, Sunflower necrosis, papaya ring spot, infectious chlorosis, yellow mosaic, vein clearing, leaf crinkle, leaf curl, bud necrosis, rosette and bunchy top
32. Important characters and symptoms of phytoplasma diseases – Phyllody, witches broom, little leaf, yellow dwarf and sandal spike
33. Important characters and symptoms of Viroid, Fastidious vascular bacteria, Algal and Phanerogamic parasites
34. Symptoms and characters of non-parasitic diseases

PRACTICAL SCHEDULE
1. General characters of fungi – Types of mycelia -Types of vegetative, asexual and sexual spores- asexual and sexual fruiting bodies.
2. Study of important taxonomic characters and symptoms produced by Plasmodiophora, Pythium and Phytophthora.
3. Albugo, Sclerospora, Peronospora, Peronosclerospora Pseudoperonospora and Plasmopara
4. Mucor and Rhizopus.
5. Taphrina, Capnodium Erysiphe, Phyllactinia, Ucinula, Leveillula and Claviceps.
6. Puccinia, Uromyces, and Hemileia
7. Sphacelotheca, Tolyposporium and Ustilago.
8. Study of important taxonomic characters of Agaricus, Pleurotus, Calocybe, Volvariella and Ganoderma.
9. Study of important taxonomic characters and symptoms produced by Colletotrichum, Gloeosporium, Pestalotia, Macrophomina and Botryodiplodia
10. Study of important taxonomic characters and symptoms produced by Pyricularia, Sarocladium Helminthosporium, Alternaria, Cercospora, and Curvularia, Rhizoctonia and Sclerotium.
12. Symptoms and vectors of viral diseases – infectious chlorosis, mosaic, vein clearing, leaf crinkle, leaf curl, bud necrosis, rosette, bunchy top, bract mosaic, citrus tristeza, tomato spotted wilt, sunflower necrosis, papaya ring spot
14. Study of important characters and symptoms produced by algal parasite and phanerogamic parasites
15. Symptoms of non-parasitic diseases
16. Field visit
17. Final practical examination.

Note: Students should submit 50 well-preserved specimens

REFERENCES

SAC 124 INTRODUCTION TO SOIL SCIENCE (2+1)

OBJECTIVES
This course provides knowledge on the fundamentals of soil science and impart skills in collecting and analyzing soils for basic physical, physico-chemical and chemical properties for using it as a medium for plant growth

THEORY
Unit I: Earth, Rocks and Minerals
Soil – Pedological and edaphological concepts – Origin of the Earth – Composition of Earth’s crust - Soil forming rocks and minerals - origin and Classification

Unit II: Soil Formation
Weathering of rocks and minerals - Physical, chemical and biological weathering – Factors of Soil formation - active and passive. Soil forming processes - fundamental and specific soil forming processes- Soil profile description

Unit III: Physical Properties
Soil physical properties – Soil texture- Particle size analysis - textural classes - Soil structure and classification – Soil consistency. Bulk density, particle density and porosity, soil compaction - Soil colour
Unit IV: Physical Properties

Unit V: Chemical Properties, Organic matter and Humus
Soil colloids – Properties, types and significance – Layer silicate clays – their genesis and sources of charges – Ion exchange – CEC, AEC – Factors influencing Ion exchange - significance. Soil reaction, Buffering capacity and EC.

PRACTICAL

THEORY LECTURE SCHEDULE
1. Soil definition – soil as a natural body – Major components of soil by volume pedological and edaphological concepts.
2. Origin or Earth – theories – planetesimal and nebular hypothesis - Composition of Earth’s crust.
3. Rocks – definition, classification – igneous, sedimentary rock- formation and classification - Brief description of important rocks
4. Metamorphic rocks- formation and classification - Brief description of important rocks
5. Minerals – definition, classification - important soil forming primary minerals - ferro and non-ferro magnesium minerals
6. Formation of secondary minerals – silicate minerals-clay minerals and amorphous minerals and non silicate minerals
7. Weathering – types of weathering – physical weathering of rocks – agents of physical weathering and their role
8. Chemical weathering – solution, hydration, hydrolysis, carbonation, oxidation and reduction; Biological weathering – role of flora and fauna in weathering process
10. Factors of soil formation - Active and Passive soil forming factors
11. Fundamental soil forming process – elluviation, illuviation and humification. Specific Soil forming processes – podzolization, laterization, salinization, alkalinization, calcification, decalcification, pedoturbation
18. Mid- Semester Examination
23. Soil colloids – definition – general properties – shape, surface area, electrical charge, adsorption, flocculation, deflocculation, plasticity, cohesion, swelling, shrinkage, Tyndall effect and Brownian movement
24. Secondary silicate clay minerals of different types – kaolinite, illite, montmorillonite and chlorite – properties – allophanes
26. Adsorption of ions – types of ion exchange – cation and anion exchange – cation and anion exchange capacities of soil
28. Soil reaction (pH) – definition, pH scale, factors affecting soil pH, buffering capacity – signification
29. Soil Electrical Conductivity – factors affecting EC – significance
33. Soil classification – order, sub order, great group and family series – nomenclature according to soil taxonomy
34. Important soil groups of India – alluvial soils, black soils, red soils, laterite soils and coastal sands

PRACTICAL SCHEDULE
1. Identification of common rocks and minerals
2. Study of soil profiles & Soil sample collection
3. Preparation of primary and secondary standard solutions
4. Determination of bulk density, particle density and porosity – cylinder, wax coating and core methods.
5. Soil textural analysis – International pipette method (Soil dispersion)
6. International pipette method (clay , clay+silt)
7. International pipette method (Coarse sand and fine sand)
8. Determination of soil colour.
9. Determination of soil moisture – Gravimetric and gypsum block method
10. Determination of soil moisture – Tensiometer, and neutron probe
11. Determination of Infiltration rate and hydraulic conductivity
12. Determination of soil pH and EC
13. Estimation of soil organic carbon
14. Determination of Water soluble cations
15. Determination of Water soluble anions
16. Preparation of interpretative reports of soil analysis and assignments
17. Practical Examination

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

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

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

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

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

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

PRACTICAL

THEORY SCHEDULE
1. Definition of genetics, heredity, inheritance, cytology, cytogenetics; Brief history of developments in genetics and cytogenetics.
2. Physical basis of heredity: Structure and function of cell and cell organelles – Differences between Prokaryotes and Eukaryotes.
3. Pre-Mendelian ideas about heredity – Vapour and fluid theory, Magnetic power theory, Preformation theory, Lamarck’s theory, Darwin’s theory, Germplasm theory and Mutation theory.
6. Chromosomal theory of inheritance. Allelic interactions – Dominance vs. recessive, complete dominance, codominance, incomplete dominance, over dominance.
8. Deviation from Mendelian inheritance – Non allelic interaction without modification in Mendelian ratio – Batson and Punnet’s experiment on fowl comb shape. Non allelic interaction with modification in Mendelian ratio – i.) Dominant epistasis (12:3:1)
10. v) Duplicate recessive epistasis (9:7) vi.) Dominant and recessive epistasis(13:3); Summary of epistatic ratios (i)to (vi).
11. Lethal genes, Pleiotrophy, penetrance and expressivity, phenocopy: Multiple alleles, blood group in humans, coat colour in rabbits, self incompatibility in plants; pseudo alleles, isoalleles.
13. Polygenes – transgressive segregation, comparison of quantitatively and qualitatively inherited characters; modifiers; Types of gene action controlling quantitative traits.
14. Linkage - coupling and repulsion; Experiment on Bateson and Punnet – Chromosomal theory of linkage of Morgan – Complete and incomplete linkage, Linkage group.
15. Crossing over – significance of crossing over; cytological proof for crossing over - Stern’s experiment; Factors controlling crossing over.
16. Strength of linkage and recombination; Two point and three point test cross. Double cross over, interference and coincidence; genetic map, physical map.
17. Mid Semester Examination
20. Types of chromosomes based on position of centromere, based on structure and function.
21. Special chromosomes - polyteny, lampbrush, based on the role in sex determination: autosomes and allosomes, Other types of chromosomes - B, ring and isochromosomes.
23. 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.
24. Polyplody - auto and allopolyploids, their characters; meaning of genome; evolution of wheat, triticale, cotton, tobacco, brassicas.
25. Sex determination: Autosomes and sex chromosomes - chromosomal theory of sex determination - different types – sex determination in human, fowl, butterfly, grasshopper, honey bee, flamea; Genic balance theory of Bridges, quantitative theory, hormonal theory, barr bodies, metabolic differentiation theory; Gynandromorphs – sex reversal in chicken
26. Sex linked inheritance – cris cross inheritance – reciprocal difference; holandric genes; sex influenced and sex limited inheritance.
27. Sex determination in plants – Melandrium, papaya, maize.
28. DNA, the genetic material – Griffith’s experiment, experiment of Avery, McCleod and McCarthy – confirmation by Hershey and Chase; RNA as genetic material – Frankel, Conrat and Singer experiment.
29. Structure of DNA – Watson and Crick model – Central dogma of life
30. Proof for semi conservative method of DNA replication; Models of DNA replication; steps involved in DNA replication.
31. RNA types - mRNA, tRNA, rRNA; genetic code, transcription.
32. Translation – protein synthesis; Regulation of gene expression – operon model of Jacob and Monad; Structural genes and regulator genes.
33. Cistron, muton and recon; Complementation test; exons, introns – split genes – plant genome structure; Mobile genetic elements; Meaning of Developmental genetics, DNA methylation, siRNA, RNA, Functional genomics, Metagenomics, Transcriptomics, Proteomics, Metabolomics and Phenomics.
34. Mutation – characteristics of mutation – micro and macro mutation – CIIB technique - molecular basis of mutation; major physical and chemical mutagens.

PRACTICAL SCHEDULE
1. Use of microscopes and study of cell shapes and cell organelles of active mitotic and meiotic tissues.
2. Principles of killing and fixing; preparation of stains and preservatives.
3. Study of the mitotic phases in root tips of onion / Aloe sp.
5. Procedure for fixing and observing different meiotic phases in the inflorescence of maize.
6. Procedure for fixing and observing different meiotic phases in the inflorescence in pearl millet/ sorghum/ forest tree.
7. Observation of bivalents, trivalents, quadrivalents and chromosome banding.

39
8. Repetition of meiotic studies in maize/sorghum/pearl millet/forest tree and making temporary and permanent slides.
9. Principles of dominance, recessive, back cross, test cross, incomplete dominance, codominance and lethal factor; Chi square test; Monohybrid genetic ratio with dominance, with incomplete dominance and test cross.
10. Dihybrid ratio with dominance, with incomplete dominance and test cross
11. Simple interaction of genes-comb character in fowls; Dominant epistasis.
12. Recessive epistasis, Duplicate and additive epistasis.
13. Duplicate dominant epistasis, Duplicate recessive epistasis, Dominant and recessive epistasis.
14. Multiple alleles and polygenic inheritance
15. Estimation of linkage with 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. Final Practical examination.

REFERENCES

AEC 126: PRINCIPLES OF AGRICULTURAL ECONOMICS (1+1)

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

THEORY
Unit I Nature and Scope of Economics

Unit II Theory of Consumption

Unit III Theory of Production

Unit IV Theory of Distribution

Unit V Macroeconomic Concepts
THEORY SCHEDULE
5. Demand: Definition - kinds of demand, demand schedule, demand curve, law of demand, determinants of demand - extension and contraction - increase and decrease in demand.
7. Engel’s law of family expenditure - consumer’s surplus - definition – importance.
8. Mid Semester Examination.

PRACTICAL SCHEDULE
1. Exercise on Law of Diminishing Marginal Utility
2. Exercise on Law of Equi Marginal Utility
3. Demand schedule - graphical derivation of individual and market demand
4. Indifference curve analysis – properties, budget line and consumer equilibrium
5. Measurement of arc elasticity and point elasticity of demand - Estimation of own price elasticity, income and cross elasticity of demand
6. Estimation of consumer surplus
7. Exercise on law of diminishing marginal returns – relationship between TPP, APP and MPP
8. Cost concepts and graphical derivation of cost curves
9. Analysis of growth in population and food grain production in India
10. Estimation of supply elasticity
11. Market Structure – Price determination
12. Analysis of causes of inflation and control measures. Measurement of inflation –consumer price index and wholesale price index
13. Types and functions of money
14. Approaches to computation of National Income
15. Analysis of trends in National Income and study of structural changes in the economy
16. Exercise on welfare indicators – HDI, PQLI, PPP, Poverty Line, etc

17. Final Practical Examination

REFERENCES
OBJECTIVES
- To learn the concepts related to sociology and psychology
- To learn the application of the concepts in connection with agricultural extension
- To learn the concepts related to learning experience

THEORY
Unit I: Extension Education and Rural Sociology
Extension Education and Agricultural Extension – Meaning, Definition, Scope and Importance. Sociology and Rural Sociology, Meaning, Definition, Scope, Importance of Rural Sociology in Agricultural Extension and Interrelationship between Rural Sociology & Agricultural Extension. Indian Rural Society, Important characteristics, Differences and Relationship between Rural and Urban societies.

Unit II: Sociology

Unit III: Social Organisation

Unit IV: Leadership
Leadership – Meaning, Definition, Classification, Roles of a leader, Different methods of Selection of Professional and Lay leaders. Training of Leaders – Meaning, Definition, Methods of training, Advantages and Limitations in use of local leaders in Agricultural Extension. Psychology and Educational Psychology – Meaning, Definition, Scope and Importance of Educational Psychology in Agricultural Extension.

Unit V: Teaching-Learning Process

THEORY SCHEDULE
1. Extension Education and Agricultural Extension – Meaning, Definition, Scope and Importance.
2. Sociology and Rural Sociology, Meaning, Definition, Scope, Importance of Rural Sociology in Agricultural Extension
3. Interrelationship between Rural Sociology & Agricultural Extension.
4. Indian Rural Society, Important characteristics, Differences and Relationship between Rural and Urban societies.
5. Social Groups – Meaning, Definition, Classification,
6. Motivation – Meaning and Definition Role of Social groups in Agricultural Extension.
7. Social Stratification –Meaning, Definition, Functions.
8. Forms of Social stratification
10. Cultural concepts –Culture, Customs, Folkways, Mores, – Meaning, Definition and their Role in Agricultural Extension
12. Social Values and Attitudes – Meaning, Definition,Types
13. Role of Social Values and Attitudes in Agricultural Extension.
14. Social Institutions– Meaning, Definition, Major institutions in Rural society,
15. Functions and their Role of social institutions in Agricultural Extension.
16. Social Organizations – Meaning, Definition, Types of organizations
17. Mid-semester Examination
18. Role of Social organizations in Agricultural Extension.
19. Social Control – Meaning, Definition, Need of social control and Means of Social control
20. Social change – Meaning, Definition, Nature of Social change,
21. Dimensions of social change and factors of social change
22. Leadership – Meaning, Definition, Classification, Roles of a leader,
23. Different methods of Selection of Professional and Lay leaders.
24. Training of Leaders – Meaning, Definition, Methods of training,
25. Advantages and Limitations in use of local leaders in Agricultural Extension.
26. Psychology and Educational Psychology – Meaning, Definition, Scope and Importance of
27. Educational Psychology in Agricultural Extension.
28. Intelligence – Meaning, Definition, Types, Factors affecting intelligence
29. Importance of intelligence in Agricultural Extension.
30. Personality – Meaning, Definition, Types, Factors influencing the Personality
31. Role of personality in Agricultural Extension.
32. Teaching – Learning process – Meaning and Definition of Teaching, Learning,
33. Learning experience and Learning situation,
34. Elements of learning situation and its characteristics.

REFERENCES

COM 128 INTRODUCTION TO COMPUTER APPLICATIONS (1+1)

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

THEORY
Unit – I: Introduction to Computer

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

Unit – III: MS-Word & Excel

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

Unit – V: Principles of Programming & Internet

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

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

REFERENCE

AEG 129 FARM POWER AND MACHINERY (1+1)

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

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

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

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

Unit -IV: Sowing and plant protection Equipments.


Unit V: Intercultural, Harvesting equipments.


THEORY LECTURE SCHEDULE
1. Working principles of IC engines and CI engines – farm mechanisms.
2. Tractors and power tillers parts and their working principles – maintenance
4. Various primary tillage implements – working principle and uses.
5. Secondary tillage implements - working principle and uses.
7. Sowing methods and sowing equipments.
9. Other plant protection equipment - working principle and uses.
10. Simple problems – area coverage – cost of operation

PRACTICAL SCHEDULE
1. Study of different components of IC engines.
2. Study and working principle of four stroke IC engine.
3. Study and working principle of two stroke IC engine.
4. Study of Tractors and power tillers.
5. Identification of primary tillage implements – indigenous ploughs and mould board ploughs.
6. Identification of disc, rotary and TNAU ploughs.
7. Identification of harrows, ridger and bun former.
8. Identification of puddler leveler and green manure trampler.
9. Seed drill – parts – working principles
10. Identification of paddy harvester and thresher.

REFERENCE BOOKS
SEMESTER – III

AGR 211 CROP PRODUCTION (0+1)

OBJECTIVES
Objective of the course is to gain hands-on training in raising a wet land crop. 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 puddled lowland rice

PRACTICAL
- 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 management and plant protection to nursery
  - Harvesting, threshing, drying and cleaning the produce - Working out cost of cultivation and economics.

PRACTICAL SCHEDULE
**Transplanted rice**:
1. Study of rice ecosystems, climate, weather, seasons and varieties of Tamil Nadu
2. Selection of nursery area, preparation of nursery, application of manures and fertilizer to nursery
3. Acquiring skill in seed treatment, seed soaking and incubation, nursery sowing and management
4. Study and Practice of main field preparation and puddling operations
5. Practicing of field preparatory operations – sectioning of field bunds and plastering, leveling and basal application of fertilizers
6. Practicing transplanting techniques in lowland rice
7. Estimation of plant population and acquiring skill in gap filling and thinning and study of weeds and weed management in rice
8. Estimation of LAI and DMP
9. **Mid-Semester Examination**
10. Study and practice of green manuring and bio-fertilizer application in rice
11. Acquiring skill in nutrient management 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. Recording growth and other related characters of rice and Estimation of yield and yield parameters in rice
15. Harvesting, threshing and cleaning of the produce
16. Working out cost of cultivation and economics
17. **Final Examination**

REFERENCES
OBJECTIVES
Learning about the origin of field crops and its importance. Acquiring knowledge on agronomical aspects of various field crops such as cereals, millets, pulses and oilseeds.

THEORY
Unit – I: Agronomy of cereals
Cereals: Rice, Maize, Wheat, Oat, Barley, Rye and Triticale - Origin, geographic distribution, economic importance, soil and climatic requirements, varieties, cultural practices (from land preparation to harvest) and yield.

Unit – II: Agronomy of major and minor millets
Millets: Sorghum, Pearl millet, Finger millet, Small millets, Foxtail millet, little millet, Kodo millet and common millet - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.

Unit – III: Agronomy of pulses
Pulses: Red gram, Black gram, Green gram, Bengal gram, Horse gram, Cowpea, Soybean and Lentil - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.

Unit – IV: Agronomy of major oilseeds
Oil seeds: Groundnut, sesame, sunflower, coconut, castor, Jatropha - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices, yield.

Unit – V: Agronomy of minor oilseeds
Oil seeds: Mustard, Rapeseed, safflower and Linseed - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices, yield.

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

THEORY LECTURE SCHEDULE
1. Introduction-importance of cereals, millets, pulses and oilseeds
2. Area, production and productivity of major cereals and millets of India and Tamil Nadu.
3. Importance and area, production and productivity of pulses and oilseeds crops of India and Tamil Nadu.
4. Rice- Origin - geographic distribution - economic importance – varieties - soil and climatic requirement
5. Rice - cultural practices –Deficiency symptoms for major and micronutrients- yield - economic benefits
7. Maize - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
8. Wheat - Origin, geographic distribution, economic importance,
9. Wheat- Soil and climatic requirement, varieties, cultural practices and yield.
10. Barley and Oats - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield
11. Rye and Triticale - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
12. Sorghum - Origin, geographic distribution, economic importance, soil and climatic requirement
13. Sorghum- varieties, cultural practices and yield.
14. Pearl millet - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield
15. Finger millet - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
16. Minor millets - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
17. Black gram and Green gram - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield - Agronomy of rice fallow pulses
18. Mid-semester Examination
19. Red gram - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
20. Bengal gram and Horse gram - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield - Agronomy of rice fallow pulses
21. Cowpea and Lentil - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield - Agronomy of rice fallow pulses
22. Soybean - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield.
23. Groundnut - Origin, geographical distribution, economic importance, soil and climatic requirements - varieties, cultural practices yield and economics
24. Sesame- Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield.
25. Sunflower - Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield.
26. Coconut– Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield
27. Castor and Jatropha – Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield
28. Mustard, - Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield
29. Rapeseed - Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield.
30. Safflower - Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield
31. Linseed - Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield

PRACTICAL
1. Identification of cereals, millets, pulses and oilseed 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, pulses and oilseeds
4. Acquiring skill in different seed treatment techniques in important field crops
5. Estimation of plant population per unit area 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 and oilseeds.
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 and millets
12. Study of yield parameters and estimation of yield in cereals and millets
13. Study of yield parameters and estimation of yield in pulses and oilseeds
14. Working out cost and returns of important cereals, millets, pulses and oilseeds crops.
15. Visit to farmers field / research stations to study the cultivation techniques of cereal, millets, pulses and oilseeds
16. Visit to nearby Agricultural Research Station / Farmer’s field
17. Practical Examination

REFERENCES
ENT 213: BENEFICIAL INSECTS AND INTRODUCTORY NEMATOLOGY (0+1)

OBJECTIVES:
- To study the techniques in rearing honey bees, silkworm and lac insects
- To know about minor productive insects and their importance
- To study the basic morphology and biology of important plant parasitic nematodes.

PRACTICAL

Unit I: Apiculture

Unit II: Sericulture

Unit III: Lac Culture and Minor Productive Insects

Unit IV: Nematode Morphology
Nematology - Position of nematodes in animal kingdom- Importance of plant parasitic and entomophilic nematodes. Elementary knowledge on morphology and anatomy of nematodes – segmentation, cuticle, cephalic region, alimentary, excretory, reproductive and nervous system. Sense organs.

Unit V: Nematode Biology, Damage and Extraction
Biology of important plant parasitic nematodes - Meloidogyne, Heteroderda, Globodera, Tylenchulus, Pratylenchus, Rotylenchulus, Aphelenchoide, Radopholus and Ditylenchus. Damages of nematodes in important crops. 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.

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

PRACTICAL SCHEDULE
1. Acquaintance with honey bee species, castes of bees and structural adaptation,
3. Bee pasturage, bee foraging, communication and swarming. Bee enemies and diseases of bees
4. Bee-keeping appliances and seasonal management, site selection for apiary, Bee pollination, bee products and their uses.
6. Mulberry cultivation, Mulberry varieties and Methods of harvesting and preservation of leaves.
9. Mid semester examination
13. Elementary knowledge on alimentary, excretory, reproductive, nervous systems and sense organs.
14. Biology and ecology of important plant parasitic nematodes - Meloidogyne, Heteroderda,
Globodera, Tylenchulus, Pratylenchus, Rotylenchulus, Radopholus, Aphelechhoide, and Ditylenchus. Damages of nematodes in major crops.

15. 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.


17. Practical examination.

REFERENCE BOOKS

SAC 214 MANURES, FERTILIZERS AND AGRO-CHEMICALS (2+1)

OBJECTIVE
To impart knowledge on preparation of organic manures and fertilizers and their usage in Agriculture. The course also provides understanding about the agrochemicals used for crop protection and production.

THEORY
Unit I:

Unit II

Unit III

Unit IV
and malathion. Carbamate insecticides – chemistry, discovery and mode of action, structure, properties and uses of carbofuran

Unit V


THEORY LECTURE SCHEDULE

1. Introduction – definition and differences between manures and fertilizers – classification of manures (bulky and concentrated) with suitable examples – importance of manures in soil fertility management.
5. Green manures – classification with examples – advantages and limitations of green manuring and green leaf manuring.
6. Definitions of penning, sewage, sullage, sludge and poudrette.
7. Concentrated organic manures – oil cakes, blood meal, bone meal, horn meal, fish meal, meat meal and guano.
10. Manufacturing process and properties of major nitrogenous fertilizers viz., ammonium sulphate, urea and calcium ammonium nitrate.
12. Potassic fertilizers – mineral sources – manufacturing process and properties of Muriate of Potash (MOP) and Sulphate of Potash (SOP).
14. Preparation and properties of ammonium sulphate nitrate, ammonium poly phosphates and NPK complex fertilizers.
16. Secondary and micronutrient fertilizers – different sources of these nutrients and their contents – conditions leading to their deficiency.
17. Preparation of micronutrient fortified organic manures and micronutrient chelates.
18. Mid Semester Examination.
19. Fertilizer Control Order (FCO) – its importance and regulations – specifications and fertilizer storage standards of important fertilizers.
22. Agrochemicals – classification based on their use with examples – classification of insecticides based on their chemical nature with examples.
27. Thiophosphoric acid derivatives – thiolo and thiono isomers – structure and activity relationships of thiophosphoric acid derivatives – structure, properties and uses of methyl parathion.
29. Carbamate insecticides – chemistry, discovery and mode of action, structure, properties and uses of carbofuran.
30. Fungicides – definition – systemic and non systemic – classification of fungicides based on chemical nature with examples – structure, properties and uses of copper oxy chloride and zineb.
31. Structure, properties and uses of carbandazim, captan, carboxin and tridemorph.
PRACTICAL CLASS OUTLINES
1. Sampling of organic manures, fertilizers and pesticides for chemical analysis
2. Quick tests for identification of important fertilizers – acidic and basic radicals
3. Estimation of total nitrogen in FYM and Urea
4. Estimation of water soluble P₂O₅ in SSP
5. Estimation of potassium in MOP / SOP
6. Estimation of micronutrients by AAS
7. Safe handling and uses of pesticides
8. Study of pesticide formulations and physical tests for different formulations
9. Estimation of acidity and alkalinity of pesticides
10. Estimation of emulsion stability in EC formulation
11. Determination of purity of Phosphamidon by Iodometry
12. Determination of purity of metasystox by acid-base neutralization method
13. Determination of purity of malathion by Iodometry
14. Determination of copper content in copper oxychloride
15. Determination of sulphur content in sulphur fungicides (elemental sulphur)
16. Compatibility of fertilizers with insecticides and fungicides
17. Practical examination

REFERENCES

GPB 215 PRINCIPLES AND METHODS OF PLANT BREEDING (2+1)

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

THEORY
Unit I: Introduction

Unit II: Breeding methods of self pollinated crops
Backcross breeding, multi lines and multi blends - population improvement approach in self-pollinated crops.

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


Unit IV: Special breeding methods


Unit V: Maintenance breeding

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

PRACTICAL


THEORY SCHEDULE

1. Classification of plants, Botanical description, floral biology, emasculation and pollination techniques in cereals, millets, pulses, oilseeds, fibers and plantation crops.
2. Objectives and role of plant breeding - historical perspective – activities in Plant Breeding.
5. Germplasm: evaluation – use of descriptors, documentation, utilization; Agencies – national and international; germplasm exchange – quarantine.
7. Self incompatibility – classifications – mechanisms – application – measures to over come and limitations.
10. Basic biometrics-nature and significance of qualitative and quantitative variation-phenotypic, genotypic and environmental-heritability and genetic advance
17. Mid Semester Examination
26. Wide hybridization-history-importance-barriers and techniques for overcoming barriers-utilization
28. Somaclonal variation - utilization in crop improvement; In vitro selection techniques — Use of doubled haploids in crop improvement.
31. Maintenance Breeding: General seed production techniques – steps in nucleus and breeder seed production – varietal rundown and renovation.
32. Breeding for biotic and abiotic stresses; Current trends in Plant Breeding - Marker assisted breeding -Transgenic crops - Varietal protection and geographical indications – DUS.
33. Breeding for pest resistance - mechanisms of resistance; Breeding for disease resistance - mechanisms of resistance; Breeding for Abiotic stress – drought and cold. – mechanisms of resistance; Breeding for Abiotic stress – salinity and alkalinity
34. Breeding for quality produce; Ideotype breeding, PPV &FR act, 2001- Plant breeders’ right, Farmers right, Biodiversity act, 2002; Germplasm registration.

PRACTICAL SCHEDULE
1. Emasculation and pollination techniques in rice, maize, pulses, castor and cotton.
2. Pollination and reproduction in plants - Alternation of generation and life cycle.
3. Description and drawing different pollination systems - Mechanisms enforcing self and cross pollination in crops; Pollen morphology - Exine structure of different crops. Fertility and sterility in A, B, R and TGMS lines.
4. Breeder kit and its components – uses; Basic steps of selfing and crossing techniques.
5. Emasculation and pollination techniques in field crops.
6. Emasculation and pollination techniques in horticultural crops.
7. Studies on segregating generations and maintenance of records.
8. Maintenance of A, B and R line and TGMS lines - Hybrid seed production techniques
10. Induction of polyploidy using colchicine.
11. Studies on different wild species in crop plants and wide hybridization.
   Chemical mutagenesis - molar solution preparation - procedure for chemical mutagenesis of seeds and planting materials.
13. Calculation of PCV, GCV, heritability, genetic advance, genetic divergence
14. Layout of different yield trials - Observing the experimental plots; Visit to nucleus and breeder seed production plots.
15. Screening methods – laboratory and field – for biotic and abiotic stresses.
17. Final Practical Examination.

REFERENCES


HOR 216 PRODUCTION TECHNOLOGY OF FRUITS AND PLANTATION CROPS (2+1)

OBJECTIVES

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

THEORY

Unit I: Importance of fruit crops & their cropping systems
   Scope and importance of fruits- classification of fruits – area - production and export potential – nutritive value, planting and cropping systems in fruit crops- Sylvi pastures- Multi tire cropping system - special operations in fruit crops- principles of canopy management and growth regulation - importance of GAP and organic fruit production

Unit II: Crop production technologies in tropical fruit crops
   Climate and soil requirements-varieties-propagation-planting density and systems-cropping systems-after care- training and pruning- water, nutrient and weed management- special horticultural techniques-plant growth regulation- important disorders – maturity indices and harvest- post harvest management of following crops:
   Mango, banana, grapes, citrus (sweet orange, mandarin, acid lime), papaya, sapota, guava

Unit III: Crop production techniques in subtropical and temperate fruit crops
   Climate and soil requirements-varieties-propagation-planting density and systems-cropping systems-after care- training and pruning- water, nutrient and weed management- special horticultural techniques-plant growth regulation- important disorders – maturity indices and harvest- post harvest management of following crops:
   Pineapple, jack, pomegranate, custard apple, aonla, apple, pear, plum, peach.

Unit IV: Importance of plantation crops & their cropping systems
   Scope of and importance of plantation crops – area and production - export potentials -planting and cropping systems in plantation crops- principles of canopy management and growth regulation - importance of GAP and organic plantation production

Unit V: Crop production techniques in the plantation crops
   Climate and soil requirements-varieties-propagation - planting density and systems of planting - cropping systems - after care - training and pruning - water, nutrient and weed management - shade management – intercropping - maturity indices and harvest - post harvest management and processing of following crops:
   Tea, coffee, rubber, 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, acid lime), papaya, sapota, 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, oil palm.
Study of post harvest handling of important plantation crops and visit to plantation and processing units.

THEORY SCHEDULE
1. Scope and importance of fruits – Global and national scenario of fruits - classification of fruits - nutritive value – area, production and export potential.
2. Planting and cropping systems in fruit crops - Sylvi pastures- Multi tire cropping system -special operations in fruit crops- principles of canopy management and growth regulation
3. Importance of GAP and organic fruit production
4. Climate and soil -varieties- propagation methods- planting and cropping systems-after care- training and pruning- water, nutrient and weed management- special horticultural techniques - plant growth regulation- important disorders – maturity indices and harvest- post harvest management of mango
5. -do--- banana
6. -do--- grapes
7. -do--- citrus(sweet orange, mandarin and acid lime)
8. -do--- papaya
9. -do--- sapota
10. -do--- guava
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. Mid Semester Examination
18. Scope and importance – Status of National and International scenario – Area - production-productivity- export potential - Importance of GAP and Organic production of plantation crops - Planting and cropping systems – principles of canopy management and growth regulation
19. Production technology of Coconut – soil, climate, varieties, nursery and planting
20. Production technology of Coconut -Water, weed and nutrient management, intercropping, harvest and post harvest handling
21. Production technology of Arecaanut- soil, climate, varieties, nursery and planting, water, weed and nutrient management, intercropping, harvest and post harvest handling
22. 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
23. Production technology of Tea - soil, climate, varieties, nursery and planting, training and pruning
24. Production technology of Tea - Water, weed and nutrient management - canopy management and shade regulation – harvest, processing, grading, packing and storage of Tea
25. Production technology of Coffee - soil, climate, varieties, nursery and planting, training and pruning
27. Production technology of Rubber - soil, climate, varieties, nursery and planting, training and pruning
28. Production technology of Rubber - Water, weed and nutrient management - canopy management and shade regulation – intercropping, harvest, processing, grading, packing and storage of Rubber
29. Production technology of Cocoa - soil, climate, varieties, nursery and planting, training and pruning
30. Production technology of Cocoa - Water, weed and nutrient management - canopy management and shade regulation –harvest, processing, grading, packing and storage of Cocoa
31. Production technology of Cashew - soil, climate, varieties, nursery and planting, training and pruning
32. Production technology of Cashew - Water, weed and nutrient management - canopy management – intercropping, harvest, processing, grading, packing and storage of Cashew
33. Production technology of Palmyrah - soil, climate, varieties, nursery, planting, nutrient management - canopy management – harvest and processing
34. Value addition in plantation crops

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

REFERENCES

AEC 217 PRODUCTION ECONOMICS AND FARM MANAGEMENT (1+1)

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

THEORY
Unit I Nature and Scope

Unit II Factor-Product Relationship

Unit III Factor- Factor Relationship

Unit IV Product-Product Relationship

Unit V Farm Planning and Budgeting

PRACTICAL

THEORY SCHEDULE
1. Production economics: Meaning - definition – nature and scope. Farm Management: Definition - objectives of farm management - Production economics Vs Farm management
2. Farm management decisions - decision making process - scope of farm management
5. Classical production function and three stages of production – elasticity of production
6. Types of Production functions: Linear, cobb-douglas and quadratic
7. Cost concepts and cost curves: total, average and marginal cost concepts and curves, economics of scale.
8. Determination of optimum input and output: input approach and output approach - physical and economic optimum.
9. Mid semester examination
11. Returns to scale – elasticity of factor substitution- iso-cost line – principle of factor substitution and least cost combination of inputs – expansion path - effect of input price changes on the least cost combination
14. Farm planning: Importance – characteristics of good farm plan – farm planning procedure
16. Linear programming : Assumptions – linear programming model – graphical solution - advantages and limitations
17. Risk and uncertainty: Definition – types of risk and uncertainty – safeguards against risk and uncertainty

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

AEX 218 DIMENSIONS OF AGRICULTURAL EXTENSION (1+1)

OBJECTIVES
- To learn the concepts related with the Agricultural Extension and Rural Development.
- To know the past and present programmes in agriculture and rural development.
- To know the functioning of various development agencies.

THEORY

Unit I: MEANING AND IMPORTANCE OF EXTENSION EDUCATION
- Extension – meaning – Agricultural Extension – definition, scope, Education – concepts, types.
- Extension Educational Process – difference between formal education and extension education.
- Extension Education – objectives, principles and philosophy of extension - teaching, teaching-learning process.

Unit II: RURAL DEVELOPMENT IN INDIA
- Rural Development – meaning – definition, concept, objectives, importance and problems in Rural development. Rural Development in India – Community Development and Agricultural Extension Service in India – Stages of Rural Development – Pre-independence era, Post independence era.

Unit III: RURAL DEVELOPMENT PROGRAMMES AND EXTENSION SYSTEMS IN INDIA

Unit IV: UNDERSTANDING PANCHAYAT RAJ SYSTEM IN INDIA

Unit V: GENDER DIMENSIONS IN AGRICULTURE

PRACTICAL

THEORY SCHEDULE
1. Extension-Meaning-Agricultural Extension-Definition, scope of Agricultural Extension
3. Extension Education-Objectives, principles and philosophy of Extension
4. Rural Development-Meaning-Definition, concept, objectives, importance and problems in rural development.
5. Rural Development in India-Community Development and Agricultural Extension Service in India-Stages of Rural Development.
6. IRDP and other poverty alleviation programmes viz., SGSY, PMEY.
7. Extension and development programmes like ATMA, ATIC, IVLP, WDP.
8. Integrated Tribal Development Agency and Rural Youth Programmes.
9. Mid Semester Examination
11. Panchayat Raj system-Meaning-Democratic Decentralisation
12. Need for Democratic Decentralisation-philosophy and objectives of Democratic Decentralisation
13. Three tiers of Panchayat Raj system-Powers, Functions and Organizational set up.
14. Gender Dimensions-mainstreaming gender in Agriculture for developmental programmes
15. Importance and role of women in agriculture
16. Women development programmes in the context of rural development.
17. New dimensions added to women welfare-National mission for women for holistic development of women.

**PRACTICAL SCHEDULE**
1. Visit to a village/Gram panchayat union office to study the organizational setup and programmes implemented.
2. Visit to Block Development Office to study organizational set up and programmes implemented.
3. Visit to JDA’s office to understand the reorganized extension system, organizational setup and functions of State Department of Agriculture at district level.
4. Visit to AO office to study about organizational setup and its functions
5. Visit to block level ADA office to study organizational setup and the extension programmes implemented at block level.
6. Visit to Seed Farm to study organizational setup and their programme.
7. Visit to District Rural Development Agency (DRDA) to study organizational setup and the rural development schemes implemented.
8. Visit to NGO to study about their role in rural development activities.
9. Visit to ATMA village to study the ATMA projects implemented in the village.
10. Visit to an NGO to study the women development programme activities.
11. Visit to Agriculture Marketing society to study their activities.
12. Visit to a village to study rural development programmes implemented in the village
13. Visit to a village to identify the agricultural problems.
14. Visit to a village to develop extension strategies to solve the problems identified.
15. Study the activities of SHGs and their extension approaches.
16. Visit to Nationalized Bank to study about functions and its activities
17. Visit to Primary Agricultural Co-operative Bank to study about functions and its activities

**REFERENCES**

**AHS 219 LIVESTOCK AND POULTRY PRODUCTION (2+1)**

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

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

**Unit – II Management of Cattle**

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

Unit – V Livestock Products Technology

PRACTICALS

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

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

REFERENCES:

SEMESTER – IV

AGR 221 CROP PRODUCTION (0+1)

OBJECTIVES

- Participatory learning of the practice of raising any garden land crop (maize / sorghum / pearl millet / finger millet / cotton / sunflower / sesame)
- He / she will do all field operations in the allotted land from field preparation to harvest and processing.

PRACTICAL SCHEDULE FOR IRRIGATED DRY CROP

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

PRACTICAL SCHEDULE

1. Study of ecosystems, climate, weather, seasons and varieties of Tamil Nadu
2. Selection of field for cultivation.
3. Acquiring skill in seed treatment practices.
4. Study and Practice of main field preparation.
5. Practicing application of manures and fertilizers.
6. Practicing sowing and acquiring skill in pre-emergence application of herbicides.
7. Estimation of plant population and acquiring skill in gap filling and thinning.
8. Working out LAI and DMP.
9. Mid-Semester Examination
10. Observation on nutritional deficiency symptoms and corrective measures.
11. Study of weeds and weed management.
12. Recording growth parameters.
14. Observation of insect pests and diseases and their management and estimation of yield and yield parameters.
15. Harvesting, threshing and cleaning of the produce.
16. Working out cost of cultivation and economics.
17. Practical Examination

REFERENCES
OBJECTIVES
This course is designed to study the importance, origin, soil, climate, cultural practices and post harvest technology of sugars, fibres, forages, green manures, tubers and narcotics as listed below.

THEORY

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

Unit – II: Major and minor fibre crops
Fibre crops: Cotton, Jute and Mesta - Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices, yield.

Unit – III: Forage crops
Forage Crops: Fodder Sorghum, Maize, Pearl millet, Guinea grass, Cumbu Napier grass, Water grass, Buffalo grass, Elephant grass, Kolukkattai grass, Lucerne, Berseem, Desmanthus, Stylosanthis and Cowpea - Economic importance, soil and climatic requirement, varieties, cultural practices and yield.

Unit – IV: Green manures
Green Manure crops: Daincha, Sunnhemp Sesbania, Glyricidia, Kolingi- Origin, geographic distribution, economic importance, soil and climatic requirement, Varieties, cultural practices, yield.

Unit-V: Tuber crops and Narcotics
Tuber crops-Potato, sweet potato, tapioca and turmeric,
Narcotics-Tobacco and betel vine,

PRACTICAL
Identification of sugar, fibre, forage and narcotics - nursery preparation and management for sugarcane and tobacco – main field preparation; Seed treatment techniques - Sowing and manuring – Seeding equipment’s - Estimation of population – After cultivation practices - Study of growth and yield parameters and yield estimation, harvesting of above crops; Fodder preservation techniques - Silage and hay making, Cost and returns – Visit to institutes and industries – Farmers’ fields.

THEORY LECTURE SCHEDULE
1. Introduction – importance of sugar crops, fibres, tuber crops narcotics and green manures.
2. Area, production and productivity of sugar crops (sugarcane, sugar beet and sweet sorghum) in India and Tamil Nadu.
3. Sugarcane - Origin, geographical distribution, economic importance, soil and climatic requirements.
5. Sugarcane – Crop logging, maturity and ripening, sugar and gur manufacture - Value addition and byproduct utilization.
7. Sweet Sorgumh - Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices, yield and by product utilization.
9. Cotton- soil and climatic requirements, cultural practices, yield and quality parameters.
12. Jute- soil and climatic requirements, varieties, cultural practices and yield.
14. Mesta- soil and climatic requirements, varieties, cultural practices and yield.
15. Sunnhemp - Origin, geographical distribution, economic importance.
16. Sunnhemp-soil and climatic requirements, varieties, cultural practices and yield.
17. Forage crops - Cumbu Napier Hybrid grass: Economic importance, soil and climatic requirement, varieties, cultural practices and yield.
18. Mid-semester Examination
19. Forage crops - Guineo grass: Economic importance, soil and climatic requirement, varieties, cultural practices and yield.
20. Forage crops – Fodder Sorghum, Maize, Oats and Cowpea: Economic importance, soil and climatic requirement, varieties, cultural practices and yield.
21. Forage crops – Cenchrus and Lucerne: Economic importance, soil and climatic requirement, varieties, cultural practices and yield.
22. Forage crops - Hedge lucerne: Economic importance, soil and climatic requirement, varieties, cultural practices and yield.
23. Berseem and Desmodium Economic importance, soil and climatic requirement.
24. Berseem and Desmodium - varieties, cultural practices and yield.
27. Sesbania sp., Kolingi and Glyricidia - varieties, cultural practices and yield.
28. Tuber crops- Potato and sweet potato - Origin, geographical distribution, economic importance, soil and climatic requirements, varieties and cultural practices.
29. Tapioca and turmeric - Origin, geographical distribution, economic importance, soil and climatic requirements.
30. Narcotics - Tobacco - Origin, geographical distribution, economic importance, soil and climatic requirements.
31. Tobacco varieties and cultural practices.
32. Tobacco yield and curing methods.
33. Betel vine - Origin, geographical distribution, economic importance, soil and climatic requirements.
34. Betel vine - varieties, cultural practices and yield.

PRACTICAL SCHEDULE
1. Identification of sugar crops, fibre, forage, green manure and narcotics in the crop cafeteria.
4. Acquiring skill in field preparation, sowing and manuring of crops under pure and intercropping situations.
5. Acquiring skill in different seed treatment techniques and foliar nutrition of crops.
6. Estimation of plant population per unit area of sugar, fibres, narcotics and tuber crops.
8. Study on growth parameters of sugar, fibre, forage crops, Green manures and narcotics.
10. Study on yield parameters and estimation of yield in medicinal and aromatic crops, tuber crops and narcotics.
11. Visit to Sugarcane Research Station to study cultivation of sugarcane and its by products.
12. Visit to betelvine field and acquiring skill on cultivation practices.
13. Observation on harvest symptoms of sugar crops.
14. Observation on harvest symptoms of fibre crops, narcotics and tuber crops.
15. Working out input requirements and cost of cultivation for important sugar crops.
16. Working out input requirements and cost of cultivation for important fibre crops, narcotics and tuber crops.
17. Practical Examination

REFERENCES
OBJECTIVES

The subject covers the basic aspects of plant disease management through physical, chemical and biological methods devising for effective management techniques to reduce the losses.

THEORY

Unit I: Principles of Plant Disease Management

- History of Disease management – Definition for Plant Diseases – Causes of Plant Diseases – Classification of Plant Diseases
- Principles of Plant Diseases Management – Prophylaxis & Immunization – Prophylaxis: Avoidance, Exclusion, Eradication and direct Protection

Unit II: Epidemiology and Resistance


Unit III: Biological and chemical control


Unit IV: Nematology

- History of economically important plant nematodes up to genera level with the help of keys and description. Symptoms caused by nematodes with examples. Study of White tip of paddy, ear cockle of wheat, root knot of tomato and brinjal. Interaction between plant parasitic nematodes and disease causing fungi, bacteria and viruses.

Unit V: Management of nematodes

- Cultural methods (crop rotation, fallowing, soil amendments, other land management techniques), physical methods (soil solarisation, hot-water treatment) Biological methods, Chemical methods (fumigants, non fumigants) of nematode management. Resistant varieties.

PRACTICAL

- Classification and grouping of fungicides. Preparation of Bordeaux Mixture (1%) and Bordeaux Paste (10%) and delivery system.- Mass multiplication of biocontrol agents -methods of application.
- Preparation of leaf extracts, oil emulsion of neem and antiviral principles.-Survey and Assessment of important plant diseases. Methods of nematode survey – sampling methods, collection of soil and plant samples; Extraction of nematodes from soil and plant tissues following combined Cobb’s decanting–sieving and Baermann funnel technique, counting and estimation of plant parasitic nematodes; Preparation of temporary and permanent mounts; Experimental techniques used in pathogenicity studies with root knot nematode.

THEORY SCHEDULE

1. History and definition for plant disease management – Causes of plant diseases –Classification of plant diseases.
2. Principles of Plant Disease Management – prophylaxis and immunization- prophylaxis: avoidance, exclusion, eradication and direct protection
4. Eradication and various methods of eradications including cultural methods
5. Epidemiology of plant diseases
7. Biological control – definition - mechanism of action
8. Mass production of Trichoderma viride, methods of application
10. Biotechnological approaches in plant diseases management
11. Meristem tip culture, somoclonal variation, coat protein mediated resistance and genetic engineering.
12. Diseases management through host plant resistance – cross protection.
13. Types of resistance – Vertical and horizontal resistance
14. Direct protection – chemical - Chemicals : Fungicides – Definition – classification of fungicides based on mode of action, general uses and chemical nature
15. Copper, sulphur and mercury fungicides - classification, and uses
16. Quinone, Heterocyclic nitrogen compounds,Organo tin compounds, Benzene compounds fungicides - classification, and uses
17. Mid semester examinations
18. Systemic fungicides etc.- classification, and uses.
19. Fungicide formulations
20. Antibiotics- classification, and uses.
21. Methods of application: seed, soil, foliar and post harvest treatments Special methods: swabbing, Pseudostem injection etc.,
22. Phytoxicity and Compatibility of fungicides
23. Precautions and safety measures in handling of fungicides.
24. History of phytenematology - Economic importance
25. General characteristics of plant pathogenic nematodes - Nematode general morphology and biology.
26. Identification of economically important plant nematodes up to generic level with the help of keys and description
27. Symptoms caused by nematodes with examples.
28. Study of white tip of paddy, ear cockle of wheat, root knot of tomato & brinjal
29. Interaction between plant parasitic nematodes and disease causing fungi, bacteria and viruses.
30. Different methods of nematode management
31. Cultural methods (crop rotation, fallowing, soil amendments, other land management techniques)
32. Physical methods (soil solarisation, hot water treatment)
33. Biological methods
34. Chemical methods (fumigants, non fumigants) -Resistant varieties

PRACTICAL SCHEDULE
1. Mass multiplication of *Trichoderma viride* and methods of application
2. Mass multiplication of *Pseudomonas fluorescens,Bacillus subtilis* and methods of application
3. Preparation of leaf extracts, oil emulsion of neem and antiviral principles.
4. Survey and assessment of important plant diseases
5. Meristem tip culture and AVP Preparation
6. Classification and grouping of fungicides.
7. Preparation of Bordeaux mixture (1%) , Bordeaux paste (10%), and delivery system and calculation of recommended dose of fungicides.
8. Methods of application of fungicides as seed treatment.
9. Methods of application of fungicides to soil and foliar applications.
10. Field visit
11. Demonstration and production of immunized seedlings in citrus.
12. Methods of survey – sampling methods, collection of soil and plant samples
13. Extraction of nematodes from soil and plant tissues following combined Cobb’s decanting–sieving and Baermann funnel technique
14. Counting and estimation of plant parasitic nematodes; Preparation of temporary and permanent mounts
15. Experimental techniques used in pathogenicity studies with root knot nematode.
16. Preparation of temporary and permanent mounts
17. Final practical examinations

REFERENCES

GPB 224 BREEDING OF FIELD AND HORTICULTURAL CROPS (2+1)

OBJECTIVES
• To impart knowledge about specific breeding techniques followed in crop improvement of various Field crops and Horticultural crops.

THEORY
Unit I: Breeding of Grain Crops
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: Breeding of pulses
Redgram, Bengal gram, Green gram, Black gram, Grain and fodder Cowpea, Soybean, Horse gram and Lablab

Unit III: Breeding of oilseeds and Fibres
Groundnut, Gingelly, Mustard, Castor, Sunflower, Safflower, Niger, Coconut and Oilpalm; Cotton, Jute and Mesta

Unit IV: Breeding of sugar crops, Fumitories, Masticatories and Fodder crops
Sugars: Sugarcane, Sugar beet; Potato, Tapioca, Tobacco, Betelvine; Guinea grass, Napier, Pearl millet – Napier, Cenchrus sp., Paragrass, Lucerne, Stylosanthes, Desmanthus, Desmodium, Siratro and Subabul.

Unit V: Breeding of Horticultural crops
Bhendi, Brinjal, Tomato, Chillies, Cucumber Guava, Banana, Citrus, Papaya, Mango, Chrysanthemum, Jasmine, Rose and Marigold,

PRACTICAL
Observation of plant morphology and floral biology – Anthesis and Pollination – selfing and crossing techniques – distant hybridization – study of wild species in the above crops.

THEORY SCHEDULE
1. Rice.
2. Rice.
3. Rice.
4. Wheat, Grain and fodder Maize
5. Grain and fodder Sorghum,
6. Pearl millet.
7. Finger millet, Foxtail millet, Kodo millet,
8. Little millet, Proso millet and Barn yard millet.
9. Redgram
10. Bengal gram
11. Greengram,
12. Blackgram, Grain and fodder Cowpea
13. Soybean, Horsegram, lab-lab
14. Groundnut
15. Gingelly and Mustard
16. Castor and Sunflower
17. Safflower, Niger
18. Mid-Semester examination
19. Coconut
20. Oilpalm
21. Cotton
22. Jute, Mesta,
23. Sugarcane,
24. Potato, Tapioca
25. Tobacco, Betelvine
26. Guinea grass, Napier,
27. Pearl millet – Napier, Cenchrus sp., Paragrass.
28. Lucerne, Stylosanthes, Desmanthus, Desmodium, Siratro, Subabul
29. Bhendi, Brinjal,
30. Tomato,
31. Chillies, Cucumber
32. Breeding for fruit crops-Guava, Banana, citrus
33. Breeding for fruit crops-Papaya, Mango
34. Breeding for flower crops - Chrysanthemum
35. Jasmine, Rose, Marigold
PRACTICAL SCHEDULE

1. Rice.
2. Wheat and Maize.
4. Redgram and Bengal gram.
5. Green gram, Black gram and Cowpea; Soybean, Horse gram and Lab-lab.
7. Safflower, Niger, Mustard. Castor, Coconut and Oilpalm
8. Cotton, Jute and Mesta.
10. Guinea grass, fodder Sorghum, fodder maize fodder pearl millet, Pearl millet – Napier hybrids, Cenchrus.
11. Lucerne, fodder cowpea, Desmanthus, desmodium, stylo, siratro, subabul ; Green manures – daincha, sunnhemp.
12. Chillies, bhendi, brinjal
13. Tomato, cucumber
14. Guava, banana, citrus
15. Papaya, mango,
16. Chrysanthemum, jasmine, rose, marigold
17. Final Practical Examination

REFERENCES


HOR 225 PRODUCTION TECHNOLOGY OF VEGETABLE AND FLOWER CROPS (2+1)

OBJECTIVE

The students will be educated on the cultivation aspects of major vegetable and flower crops

THEORY

Unit I: Importance of vegetables, production & post harvest practices
Importance of vegetable growing –area and production of vegetables in India and Tamil Nadu- Nutritive value of vegetables –classification of vegetables –types of vegetable growing –vegetable forcing – precession farming in vegetable cultivation. Importance of post harvest technology in vegetables -Pre cooling, grading, packing, packaging materials - Pre storage treatments- methods of storage - low temperature storage, CAS, hypobaric storage, irradiation and low cost storage structures – value addition.

Unit II: Production techniques of important tropical vegetable crops
Climate and soil – varieties and hybrids – seeds and sowing – nutrient management – irrigation and fertigation management – weed management – cropping systems in vegetable crops - vegetable production under protected structures – maturity indices – harvest of following vegetable crops: Tomato, chilli, brinjal, bhendi, onion, gourds, and dolichos bean, cassava, sweet potato, Elephant foot yam, radish, amaranthus and moringa

Unit III: Production techniques of important temperate vegetable crops

Unit IV: Importance and production technology of commercial loose flowers
Unit V: Production technology of cut flowers

PRACTICAL

THEORY SCHEDULE
1. Importance of vegetable growing in India and Tamil Nadu and classification of vegetables.
2. Types of vegetable growing and cropping systems.
3. Precession farming in vegetable cultivation.
4. Post harvest technology and value addition in vegetables.
6. Chillies
7. Bhendi and Onion.
8. Pumpkin, Ash gourd and Bottle gourd.
10. Dolichos bean and cassava
11. Sweet Potato, Elephant foot yam and Radish
12. Amaranthus and Moringa.
14. Carrot and beetroot
15. Cabbage, Cauliflower and Knolkhol.
16. Potato
17. Protected cultivation of tomato, capsicum and cucumber
18. Mid Semester Examination
19. Value addition of important vegetables (Tomato, Chilli, Onion, Peas, Potato and Cassava).
20. Importance, scope and future prospects - area and production and commercial floriculture industry
21. Export potential of commercial flowers.
22. Protected cultivation – Importance and constraints in flower production
24. Jasmine
25. Chrysanthemum
26. Tuberosa
27. Crossandra
28. Marigold
30. Gladiolus
31. Carnation
32. Cut Chrysanthemum
33. Gerbera
34. Anthurium and Tropical orchids

PRACTICAL SCHEDULE
1. Nursery management and layout of kitchen garden.
2. Practices in manuring, fertilizer application and irrigation in vegetables.
4. Identification of physiological disorders in major vegetable crops.
5. Identification and description of varieties and hybrids in major vegetable crops.
7. Visit to greenhouse/ polyhouse units.
8. Visit to vegetable processing unit
9. Identification and description of varieties in rose and jasmine
10. Identification and description of varieties in chrysanthemum.
11. Identification and description of varieties of crossandra and marigold
12. Identification and description of varieties of tuberose
13. Identification and description of varieties of cut rose, anthurium, carnation and gerbera.
14. Media preparation and potting of cut flowers
15. Visit to floriculture industries
16. Visit to floral concrete and oil extraction units

17. Practical Examination

REFERENCES

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

OBJECTIVES
The objective of this course is to provide knowledge to the students on the theory and practice of Agricultural Marketing and exports and imports with special reference to Indian scenario.

THEORY
Unit I Agricultural Marketing – Nature and Scope

Unit II Marketing Functions and SCP Paradigm

Unit III Marketing Efficiency and Marketing Institutions

Unit IV Trade in Agricultural Products
Theories of Trade: Absolute and comparative advantage - status of agricultural exports / imports in India and their share. Barriers to trade – tariff and non tariff measures. Role of institutions like UNCTAD and WTO in promoting trade in agricultural products. Free Trade Agreements - implications of AoA - market access, domestic support and export subsidies. New EXIM policy of India – advantages of AEZs.. Export promotion organization: APEDA, MPEDA, NHB, commodity boards .

Unit V Agricultural Prices and Risk Analysis
Price characteristics of agricultural products. Objectives of price policy – role of CACP – Concept of

PRACTICAL
Farm Survey - preparation of survey schedules - farmers’ marketing practices - regulated market and its role in marketing of farm produce - cooperative marketing society – farmers’ market - estimation of marketed and marketable surplus - identification of marketing channels - price spread estimation for agricultural / horticultural / livestock products - role of Food Corporation of India (FCI)/Civil Supplies Corporation in marketing of agricultural produce - Central Warehousing Corporation (CWC) / State Warehousing Corporation (SWC) and their role in storage of farm produce – Functions of NAFED and TANFED - Agmark Laboratory/Grading institutions - Commodity Boards - export oriented units - analyzing the implications of trade liberalization - time series analysis of prices - trend and seasonal variations, cyclical and irregular variations - index numbers.

THEORY SCHEDULE
4. Marketing functions- buying and selling- packaging and transportation – grading and standardization- storage and warehousing – processing and value addition
5. Market SCP paradigm. Market Structure, Conduct & Performance - definitions- components and their dynamics
8. Factor market- marketing of various agricultural inputs-channel of distribution - input market promotional activities by firm.
9. Mid Semester Examination
14. Institutions for promoting trade in agricultural commodities – national and international- GATT, UNCTAD and WTO. Agreement on Agriculture – market access, domestic support and export subsidy.
15. New EXIM policy of India - Role of agri. export zones – export promotion Councils – APEDA, MPEDA and ITPO.

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

**REFERENCES**


**AEX 227 EXTENSION METHODOLOGIES AND TRANSFER OF AGRICULTURAL TECHNOLOGY (1+1)**

**OBJECTIVES**

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

**THEORY**

**Unit I: COMMUNICATION**


**Unit II: PROGRAMME PLANNING AND TRAINING**

Programme planning – meaning, definition, principles, steps in programme development process, monitoring and evaluation of extension programmes. Types of training, training to farmers, farm women and rural youth, FTC & KVK.

**Unit III: EXTENSION TEACHING METHODS**


**Unit IV: MODERN COMMUNICATION GADGETS**

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

**Unit V: DIFFUSION AND ADOPTION**

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

**PRACTICAL**


**THEORY SCHEDULE**

1. Communication-meaning, definition, functions, elements and their characteristics.
2. Types and barriers of communication and models of communication.
3. Programme planning-definition, scope, principles, importance, steps, evaluation, keys for evaluation.
4. Training-types, institutions training for farmers, farm women and rural youths and importance
5. Extension teaching methods-definition, meaning, functions, selection and classification.
Individual contact methods—farm and home visit, office call, telephone call and personal letter-observation and result demonstration.

Group contact methods—method demonstration, meeting, lecture, debate, workshop, seminar, forum and conference

Group contact methods—symposium, panel, brainstorming, buzz session, role playing and simulation games.

Mid Semester Examination.

Mass contact methods—campaign, exhibition, farmers day and field trips - purpose, procedures, advantages and limitations.

Mass contact methods—written communication—circular letter, leaflet, folder, pamphlet-purpose, procedures, advantages and limitations.

Audio visual aids—definition, scope and importance, classification—merits and demerits-factors influencing planning and selection.

Modern communication gadgets—computer networks, internet, video and teleconferencing.

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

Diffusion—meaning, definition, elements. Innovation—adoption, meaning, definition.

Attributes of innovation and stages of adoption

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

### PRACTICAL SCHEDULE

1. Understanding the communication pattern in State Department of Agriculture/Horticulture.
2. Study on communication pattern in KVK.
4. Preparation and practicing of posters, charts, graphs.
5. Preparation and practicing of circular letter, folders and leaflets.
6. Visit to the Department of Agricultural Engineering to study the transfer of technology efforts in farm mechanization.
7. Visit to village and fixing the priorities and selecting a most important problem for preparation of a project.
8. Visit to ATMA implemented village.
9. Studying the role of print media communication in publishing the activities of agriculture and allied fields.
10. Practicing skill on photo journalism
11. Internet, E-Mail communication Practices
12. Visit to All India Radio, to study it’s role in agricultural development.
13. Script writing for Radio and Television
14. Preparation of interview schedule to study the spread and acceptance of farm technologies at village level.
15. Data collection
16. Tabulation
17. Presentation of reports.

### REFERENCES

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

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

THEORY
Unit I: Surveying
Surveying and Levelling – Chain, Compass and Plane Table survey – levelling – Land measurement and computation of area – Simpson’s rule and Trapezoidal rule.

Unit II: Soil erosion

Unit III: Soil conservation

Unit IV: Irrigation and drainage

Unit V: Wells and Pumps

PRACTICAL

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

PRACTICAL SCHEDULE
1. Study of survey instruments - chains - compass - plane table (only demo) - dumpy level.
2. Chains and cross staff surveying - linear measurement - plotting and finding areas.
4. Compass - Radiation, intersection.
5. Levelling – fly levels – determination of difference in elevation.
6. Contouring – area and volume computation.
7. Design of contour bund and graded bund.
8. Visit to erosion affected areas.
9. Problems on water measurement.
12. Layout of Sprinkler and Drip systems.
13. Study of different types of wells and its selection.
14. Study of reciprocating pump & centrifugal pump
15. Study of submersible pumps & jet pumps
16. Selection of pumps.

REFERENCES
STA 229: STATISTICS (1+1)

OBJECTIVES
1. Statistics plays a major role in all fields of science. When elementary topics like primary data collection, presentation of data, diagrams and graphs etc are taught to the student of agriculture, first they learn the basic concepts of Statistics.
2. By learning sampling methods, test of significance, correlation and regression they come to know practically how to select samples using various methods of sampling and how to test certain hypothesis based on student’s ‘t’ Statistic and, Chi-square Statistic. Using Regression analysis, they may be able to predict the future using the past data.
3. By learning basic principles of design of experiments and basic designs they can conduct practically certain Agricultural experiments with their knowledge of Statistics.

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

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

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

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

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

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

THEORY LECTURE SCHEDULE
1. Different kinds of data, primary and secondary data, qualitative and quantitative data, presentation of data.
2. Bar diagrams, Component Bar diagram, Percentage Bar diagrams, Pie diagram, Pictograms, Uses.
3. Histogram, Frequency curve, Frequency polygon, Ogive curves, uses.
4. Mean, Median, Mode.
5. Range, Standard deviation, (raw data), Co-efficient of variation.
6. Standard deviation (grouped data)
7. Types of sampling, SRS (WR) and (WOR), stratified random sampling, Systematic sampling.
8. Test of significance, test based on t, mean and difference of means.
9. Mid semester examination.
10. $X^2$ – test, test for association of attributes 2x2 contingents only, limitations of chi-square test. Correlation, scatter diagram and Karl person’s Co-efficient of correlation.
11. Regression, Simple linear regression, Prediction using the equation.
12. Design of experiments, Basic principles, randomization, replication and local control.
13. Basic designs.
14. Completely randomized design (CRD).
15. Randomized complete block design (RBD).
16. Latin square design (LSD).
17. Analysis of the above design.

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

REFERENCE BOOKS

SEMESTER V
AEG 310 - RENEWABLE ENERGY (1+1)

OBJECTIVES
• This subject will enable the student,
• To gain knowledge on the various renewable energy sources like solar, wind, biogas and biomass.
• 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: Energy scenario
Introduction - energy crisis - energy sources classification - availability - renewable energy sources - significance - potential and achievements in India.

Unit II: Energy conversion techniques and Biogas production
Methods of energy conversion – thermo chemical and biochemical conversion methods- combustion, pyrolysis and gasification - applications- biogas and ethanol production- applications.
Biogas technology - Science of production - feed stocks - factors affecting biogas production- types and capacity of biogas plants- KVIC, Janata and Deenbandhu model biogas plants- construction and working principles- comparison features of biogas plants. Applications of biogas – biogas requirements-biogas appliances-environmental considerations – enrichment and uses of biodigested slurry(BDS).

Unit III: Thermal Biomass conversion:

Unit IV: Solar energy and its applications

Unit V: Wind energy and bio-fuels

THEORY SCHEDULE
1. Energy crisis-renewable energy sources- significance- potential and achievements in India.
2. Methods of energy conversion – thermo chemical conversion methods-principles of combustion, pyrolysis and gasification and applications-biochemical conversion methods – biogas and ethanol production-principles-applications.
3. Biogas technology-science of production of biogas-feed stocks used - factors affecting biogas
production- types of biogas plants- capacity determination.
4. Biogas plants - construction and working principles – KVIC, Janata and Deen bandhu model biogas plants- performances.
5. Applications of biogas – biogas requirements for cooking , lighting and engine operation and electricity production- biogas appliances-environmental considerations - enrichment and uses of biodigested slurry(BDS).

PRACTICAL
1. Study of constructional details of KVIC & JANATHA type and Deen Bandu type bio gas plants,
2. Study of constructional details of different types of Gasifier and Briquette preparation from biomass.
3. Study and find the efficiency of solar cooker
4. Study and find the Performance of a solar still
5. Study and find the Performance of a solar dryer.
6. Study about the working of solar photovoltaic pumping system.
7. Study and performance evaluation of Domestic Solar water heater.
8. Study of Solar Lantern and solar street light
9. Study of different types of wind mills
10. Study the processing of Bio diesel production from Jatropha.

REFERENCES

AGR 311 FARMING SYSTEMS AND SUSTAINABLE AGRICULTURE (1+1)

OBJECTIVES
Learning the concepts of cropping and farming systems as vital tool in enhancing agricultural productivity and intensive farming. Acquiring scientific knowledge and technical knowhow in sustainable agriculture, low input farming and natural resource management.

THEORY
Unit I: Cropping systems- concepts
Cropping systems - Definition - Principles - Concepts - Classification – mono cropping – intensive cropping - cropping systems of India and Tamil Nadu - Interaction between different cropping systems – Cropping system management – Resource management – land, nutrient, water and weed - Indices for evaluation of cropping systems - Land use - yield advantages - Economic evaluation

Unit II: Farming systems-concepts

Farming systems - Definition - Principles - Concepts - Enterprises selection and management - interaction between different enterprises with cropping – scope and advantages of Integrated Farming system – evaluation indicators of integrated farming system - Integrated farming system models for different agro eco-systems

Unit III: Sustainable agriculture

Concept of sustainability and sustainable development-emerging issues- Sustainable agriculture-concept themes- differences between conventional, sustainable, and alternate agriculture- Various alternate agricultural systems-limitations- Modernization of agriculture and its relation to sustainability. Factors affecting ecological balance and ameliorative measures.

Unit IV: LEISA

Strategies for realizing sustainable agriculture- low vs. high external input agriculture (LEIA vs. HEIA) -Natural resource management as a part of sustainable resource management –crop production practices- animal production practices- Basic ecological principles of LEISA – promising LEISA techniques and practices – improved manure handling – crop residue management.

Unit V: Resource management


PRACTICAL

Preparation of cropping scheme - working out input requirements for crops, cropping systems - preparation of calendar of operations for wetland, irrigated upland and dry land cropping system - visit to cropping system experiments – working out indices for evaluation of cropping systems – visit to different units: dairy, goat, poultry, fishery. Mushroom, sericulture and biogas - study on evaluation indicators on farming system - preparation of integrated farming system models for different eco-systems - on farm field visit - analysis of farming system models

THEORY - LECTURE SCHEDULE

1. Cropping system: Definition, Principles and basic concepts- Classification of cropping system - Mono cropping, intensive cropping, multiple cropping, mixed cropping.
2. Major cropping systems prevailing in India and Tamil Nadu for different agro eco-systems - Complementary and competitive interaction in different cropping system – light, nutrient, water and weed.
3. Cropping system management : agronomic requirement for crops and cropping system – selection of crops and varieties, tillage and land shaping, plant population and crop geometry.
5. Farming system: definition, principles and concepts, factors influencing choice and size of enterprises - Scope and advantages of integrated farming system Allied enterprises for wetland, irrigated upland and dryland – selection and management.
8. The concept of sustainability and sustainable development-emerging issues- Sustainable agriculture-concept themes-environmental health, economic profitability, and social and economic equity.

Mid-Semester Examination

4. Low vs. high external input agriculture (LEIA vs. HEIA) - Basic ecological principles of LEISA – promising LEISA techniques and practices.
5. Improved manure handling – crop residue management – strategic use of chemical fertilizers and pesticides.

PRACTICAL SCHEDULE
1. Visit to cropping system experiments in wetland, irrigated upland
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
6. Visit to dairy, goat, fishery and poultry units
7. Innovative methodologies in rural areas.
8. Organic recycling in various farming situations.
9. Preparation and evaluation of integrated farming system models : wetland eco-system
10. Preparation and evaluation of integrated farming system models : irrigated upland and dryland eco systems
11. On-farm visit to cropping fields and integrated farming system units
12. Low input concepts for sustainable agriculture
13. Resource management in farming systems
14. Inter disciplinary approach in farming system
15. Climatic normal for farming vs livestocks.
16. Studies on biofertilizers and raising green manure crops and cover crops

REFERENCES
-- construction and operation - oilseed processing – methods and machineries used – ghani, rotary and expeller - filter press – construction and operation – solvent extraction process.

Unit V: Value addition and byproducts utilization

Value addition and by products utilization of cereals- millets – pulses and oilseeds – nutritive value of rice, millets and pulses- fortified food products.

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 conveyer and bucket elevator, study of improved grain storage structures - exercises on location analysis and preparation of plant layout for food processing industry – visit to food processing industry.

THEORY SCHEDULE

2. Engineering properties of grains – mass, volume, density, bulk density, true density, porosity, surface area and sphericity – applications and effect of moisture content on properties.
3. Threshing – threshers for different crops – factors affecting threshing
5. Types of screens - air screen cleaner- reciprocating and rotary types-
6. Construction and working principles of spiral separator, magnetic separator, specific gravity separator, colour sorter and inclined belt separator.
7. Construction and working of maize sheller, husker sheller, hand and power operated groundnut decorticator
9. Mid Semester Examination
10. Storage of food grains – factors affecting storage, traditional methods - types - bag and bulk storage and silos.
16. Storage-different types of storage structures-indigenous and modern storage structure
17. Value addition and byproducts utilization of cereal, millets, pulses and oilseeds.

PRACTICAL SCHEDULE

1. Determination of physical properties of grain
2. Determination of moisture content by direct and indirect methods
3. Study of types of threshers and components.
4. Performance evaluation of grain winnower.
5. Performance evaluation of graders.
6. Performance evaluation of maize sheller / husker sheller for maize.
8. Determination of oil extraction efficiency of power ghani and work out the economics.
10. Experiment on shelling of paddy using rubber roll sheller.
11. Visit to traditional rice mill to study the parboiling and milling operation
12. Visit to Modern rice mill to study the parboiling and milling operation
13. Visit to Dhul mill to study the milling of pulses.
15. Study of improved grain storage structures
16. Visit to Central warehousing corporation to study the storage and fumigation methods
17. Final Practical Examination.

REFERENCES
ENT 313 INSECT ECOLOGY, INTEGRATED PEST MANAGEMENT AND INSECTS OF ECOLOGICAL IMPORTANCE (2+1)

OBJECTIVES
- To study the influence of ecosystems on insect populations.
- To know about various pest management methods.
- To study the importance of pollinators, weed killers, scavengers and other vectors

THEORY

Unit I: Insect Ecology

Unit II: Integrated Pest Management and its Components
IPM - Introduction, definition, importance, Economic Threshold Level, Economic Injury Level, 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, Types of parasitism, Important families of predators and parasitoids, Microbial control - groups of microbial agents and their actions on insects, Traps in IPM, Push and Pull techniques, Semiochemicals in IPM – Pheromones, Allomones, Kairomones and Synomones and their role in pest management, Insect growth regulators in IPM – Moult inhibitors and JH mimics, Biotechnology in IPM and Sterile male technique and gamma radiation in IPM.

Unit III: Bio intensive Insect Pest Management
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. Botanical insecticides in IPM – antifeedants and repellants. Formulation techniques of botanicals. Traditional methods in IPM.

Unit IV: Chemical methods of Insect Pest Management and its Ecological Perspectives

Unit V: Integrated Pest Management Strategies and Insects of Ecological Importance
Integrated pest management strategies in different agro ecosystems – Rice, cotton, sugarcane and coconut. Insects of Ecological Importance - pollinators, weed killers and scavengers and their importance. Role of insects on diseases of human beings - household pests, vectors of human diseases and insects causing annoyance and pests on animals – cattle and poultry.

PRACTICAL

Assignment: Each student has to submit five 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
6. Definition of IPM. Concepts, Scope and limitations of IPM. Concepts of Economic Injury Level (EIL) and Economic Threshold Level (ETL).
7. Definition and examples of Cultural, Physical and Mechanical methods of pest management
10. Biological methods- classical biological control, merits and limitations, Parasitoids and Predators – definition - difference between a predator and a parasitoid - Types of parasitoids - Types of parasitism.
11. Important families of predators and parasitoids and their role in pest management.
12. Microbial control – definition, Important groups of microbial agents, Mode of action and symptoms of pathogenicity. Their role in pest management.
15. Pheromones in IPM – Sex pheromones, Alarm pheromones, trail pheromones and aggregation pheromones
17. Mid Semester Examination
19. Mass multiplication and application techniques of important groups of Parasitoids and Predators.
20. Mass multiplication and application techniques of important Entomopathogenic Viruses, Bacteria, Fungi and nematodes.
22. Role of birds in insect and rodent management.
24. Formulation techniques of Botanicals. Traditional methods in IPM.
27. Hazards of insecticides - Symptoms of poisoning, first aid and antidotes.
29. Newer insecticides in pest management. Insecticide resistance and residue management.
30. Integrated pest management strategies for Rice, cotton, sugarcane and coconut.
31. Important species of pollinators – Bee pollination, caprification.
32. Important species of weed killers and scavengers and their importance.
33. Harmful insects on Animals - Cattle and poultry pests
34. Household pests, vectors of human diseases and insects causing annoyance.

PRACTICAL SCHEDULE
2. Observation on types of damage and major symptoms caused by insect pests.
3. Practicing various sampling techniques and assessment of insect population and their damage in field/horticultural crops.
4. Practicing Pest surveillance through light traps/ pheromone traps and forecasting of field incidence.
5. Practicing common Cultural, Mechanical and Physical methods in pest management.
6. Analysing distinguishing characters of few resistance varieties of important crops.
7. Observation on models of traps in pest management – Pheromone traps, light traps, sticky traps and other traps.
8. Identification of different types of parasitoids, predators and entomopathogens.
12. Identification of different groups of pesticide formulations.
13. Recognizing label information, Precautions in pesticide applications, First aid and antidotes informations. Identification of types of Pesticide application equipments and practicing of application of insecticides.
15. Identification of Important species of pollinators, weed killers and scavengers, Cattle, poultry and household pests.
17. Final Practical examination

REFERENCE BOOKS

PAT 314 DISEASES OF FIELD CROPS (1+1)

OBJECTIVES
The subject covers etiology, symptoms, mode of spread, survival, epidemiology and management of the diseases of the cereals, millets, pulses, oil seeds and cash crops.

THEORY
Unit I: Diseases of Cereals and Millets
Rice, Wheat, Barley, Oats and Maize. Sorghum - Bajra, Pearl millet and minor millets.

Unit II: Diseases of Pulses
Pigeonpea, Urdbean, Mung Bean, Chickpea, Soybeans, Field Bean and Cowpea.

Unit III: Diseases of Oilseeds
Groundnut, Mustard, Sesame, Sunflower, Safflower, Castor, Linseed and Jatropha

Unit IV: Diseases of cash crops
Cotton, Jute, Sugarcane, Sugar beet, Tobacco and Mulberry.

Unit V: Fungal spoilage of grain
Spoilage of grain during storage and their managementS.

PRACTICAL
Study of symptoms and host-parasite relationship of rice, wheat, barley, oat, maize and sorghum, pearl millet, ragi and minor millets, Pigeonpea, urdbean, mungbean, chickpea, field bean - groundnut. Gingelly, castor, sunflower, linseed, safflower mustard, cotton, jute, sugarcane, sugar beet, tobacco, jatropha and mulberry.

THEORY SCHEDULE
1. Fungal, bacterial, viral and phytoplasma diseases of rice.
2. Diseases of wheat, barley and oats
3. Diseases of maize
4. Diseases of sorghum and pearl millet
5. Diseases of ragi (finger millet), minor millets
6. Diseases of pulses pigeonpea, urdbean, mungbean
7. Diseases of pulses - chickpea, field bean and soybean
8. Mid semester examinations
9. Diseases of groundnut
10. Diseases of gingelly and castor
11. Diseases of linseed and mustard
12. Diseases of sunflower, safflower & jatropha
15. Diseases of tobacco and mulberry
16. Spoilage of grains by field fungi and managements
17. Fungal spoilage of grains during storage and managements

PRACTICAL SCHEDULE
Study of diseases symptoms and host-parasite relationship of:
1. Rice
2. Wheat
3. Maize
4. Sorghum
5. Pearl millet
6. Ragi
7. Minor millets.
8. Field visit
9. Pigeonpea
10. Urdbean, mungbean, chickpea, field bean and soybean
11. Groundnut
12. Gingelly
13. Castor and sunflower linseed, safflower and Mustard
15. Sugarcane and sugar beet
16. Tobacco, jatropha and mulberry.
17. Final Practical examinations
Assignment: Students should submit 50 well preserved diseased specimens

REFERENCES

GPB 315: PRINCIPLES OF PLANT BIOTECHNOLOGY (2+1)

OBJECTIVES
- To teach various aspects of plant tissue culture
- To familiarize recent strides in molecular genetics, gene transformation and immunotechnology
THEORY

Unit I: Basics in Plant Tissue Culture


Unit II: Molecular Genetics


Unit III: Recombinant DNA Technology

Recombinant DNA, vectors: plasmids, phagemids, cosmids, BAC and YAC. DNA manipulation enzymes - polymerase, restriction endonucleases and ligases - construction of recombinant DNA molecules - Bacterial transformation. Transgenic plants for biotic and abiotic stress resistance and quility improvement – current status at national and international level. Detection of Gmos – biosafety and bioethics.

Unit IV: Genetic Transformation


Unit V: Immunotechnology and Bioprospecting


PRACTICAL


THEORY SCHEDULE

1. History and concepts in plant tissue culture- totipotency, dedifferentiation and redifferentiation
2. Nutritional requirements for plant tissue culture
3. Morphogenesis- direct and indirect organogenesis and embryogenesis
4. Callus and suspension culture, shoot tip and meristem tip culture
5. Anther and pollen culture and ovule culture – production of haploides
6. Embryo, endosperm and protoplast culture.
7. Micropropagation of commercially viable crops – Banana and ornamental plants.
8. Mesistem culture and production of virus free plants – Disease detection and indexing – PCR and ELISA.
9. Protoplast isolation and fusion – production of somatic hybrids
10. Synthetic seeds, somaclonal variation and application.
13. Transgenic plants engineered for quality traits – enhancement of nutrition quality, shelf life.
14. Structure of nucleic acids
15. Central dogma of life DNA replication
16. Protein synthesis

18. Mid- Semester examination
20. Polymerase chain reaction
21. Blotting techniques
22. DNA sequencing methods

86
23. Recombinant DNA, Vectors – plasmids, phagemids, BAC, YAC.
24. DNA manipulation enzymes – polymerase, restriction endonucleases and ligases.
25. Construction of recombinant DNA molecules and bacterial transformation
28. Agrobacterium mediated gene transfer
29. Detection of GMOs Indian regulatory guidelines, biosafety and bioethics
30. DNA markers – hybridization and PCR markers
31. DNA fingerprinting of varieties and gene tagging
32. Marker assisted selection and its application in crop improvement.
34. Discovery of novel compounds from plants- importance of secondary metabolites - Callus and cell suspension culture, bio reactors for plant cell culture.

PRACTICAL SCHEDULE
1. Laboratory organization and sterilization techniques
2. Preparation of MS medium and Inoculation of explant - shoot tip
3. Micro propagation of Banana
4. Meristem culture of tapioca
5. Transformation of tobacco and analysis of transgenic plants – PCR.
6. Visit to Bt cotton field and strip assay for detecting Cry protein.
7. Extraction of genomic DNA
8. Isolation of plasmid DNA from bacteria
9. Quantification of DNA by spectrophotometer
10. Genomic DNA visualization using agarose gel electrophoresis
11. DNA fingerprinting using RAPD primers
12. Hybrid identification using SSR marker
13. Restriction digestion and ligation
14. Competent cell preparation
15. Bacterial transformation and blue white colony screening
16. Analysis of PCR products in agarose gel electrophoresis
17. Practical Examination.

REFERENCES

HOR 316 PRODUCTION TECHNOLOGY OF SPICE, AROMATIC AND MEDICINAL CROPS (1+1)

OBJECTIVES
This subject deals with scope and importance of spice, aromatic and medicinal crops, their cultivation aspects and post harvest management practices.

THEORY
Unit I: Scope and importance of spice, Aromatic and Medicinal Crops

Unit II: Crop production techniques in spice crops
Crops: Black pepper, cardamom, turmeric, ginger, garlic, coriander, fenugreek, cumin, fennel, clove, nutmeg, cinnamon, tamarind and vanilla.

Unit III: Production technology of medicinal crops

Unit IV: Production technology of aromatic crops

Unit V: Post harvest technology of Spice, Aromatic and Medicinal Crops

PRACTICAL
Identification of spices, medicinal and aromatic crops – propagation - seed treatment – sowing - planting - training and pruning – shade management - fixing maturity standards – harvesting - visit to spice gardens. Study of post harvest handling and processing of. Crops: Black pepper, cardamom, turmeric, ginger, garlic, coriander, fenugreek, cumin, fennel, clove, nutmeg, cinnamon tamarind and vanilla. senna, periwinkle, glory lily, ashwagandha, phyllanthus, medicinal coleus, aloe, medicinal dioscorea, medicinal solanum, ocimum, davana, mint, lemon grass, citronella, geranium, eucalyptus, palmarosa and vetiver – visit to commercial medicinal and aromatic plants fields and processing units

THEORY SCHEDULE
1. Spice, Aromatic and Medicinal Crops – scope and importance – History of medicinal plant cultivation in India - Current status of area and production —Nutraceutical value–classification of spices-
2. Global scenario on commercial spices production – export potential - importance of GAP and organic spice production.
4. Do--turmeric, ginger, garlic, fenugreek and fennel
5. Do--, cumin, clove and nutmeg
6. Do-- cinnamon tamarind and vanilla.
7. Importance of post harvest technology, maturity indices, harvesting and post harvest handling of spices.
8. Mid Semester Examination.
9. Varieties -- soil and climate – propagation- sowing and planting, nutrient, water and weed management - harvest, and processing – post harvest handling of Senna, periwinkle
10. Ashwagandha, Medicinal coleus, aloe -
11. Gloriosa, Isabgol, Medicinal Solanum and Medicinal Dioscorea
12. Methods of extraction of secondary metabolites from medicinal plants
13. Ocimum, davana and Mint -
14. Citronella, Lemon grass and Vetiver
15. Geranium and Palmarosa -Eucalyptu
16. Methods of distillation of essential oil from aromatic crops
17. Post harvest processing and value addition in medicinal crops.

PRACTICAL SCHEDULE
1. Turmeric and ginger – processing and curing
2. Pepper – description of varieties, study of different shoots, propagation and varieties
3. Cardamom - description of varieties, propagation, shade management and processing
5. Clove and Nutmeg - description of varieties, propagation, training, pruning and processing
6. Cinnamon and Tamarind - description of varieties, propagation, training, pruning and processing
7. Visit to tree spice gardens
8. Study of post harvest handling and processing in spices
9. Identification of medicinal and aromatic plants – study on economic parts used and their products
10. Propagation techniques of senna and periwinkle, glory lily, aswagandha and phyllanthus.
11. Propagation techniques of medicinal coleus, isabgol and aloe.
12. Propagation techniques of medicinal Dioscorea, and Solanum
13. Identification of species/varieties and propagation techniques of ocimum, eucalyptus
15. Identification of varieties and propagation techniques of lemon grass, palmarosa, vetiver, citronella and geranium
16. Visit to commercial medicinal and aromatic plants fields and processing units

17. Final Practical Examination

REFERENCES

AEC 317 INTRODUCTIONS TO AGROBUSINESS MANAGEMENT (1+1)

OBJECTIVES
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.

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

Unit II Management

Unit III Management Functions I

Unit IV Management Functions II

Unit V Management Functions III

PRACTICAL
Exercise on operations management in agribusiness firms - logistics management - inventory management - inventory types, costs and economic order quantity - ABC analysis - procurement systems and vendor rating methods - exercise on supply chain management. Market research and

THEORY SCHEDULE
2. Agribusiness management - special features of agribusiness - importance of agribusiness in Indian economy.
5. Planning – definition – types of plans (purpose or mission, goals or objectives, strategies, policies, procedures, rules, programmes, budget)
7. Organizing – principles of organizing – organisation structure – formal and informal Organisation
9. Mid Semester Examination
14. Leadership – definition – styles – difference between leadership and management
16. Functional areas of business – operations, human resources, finance and marketing – scope and meaning
17. Laws and policies related to agri-business.

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

REFERENCES

AEX 318: ENTREPRENEURSHIP DEVELOPMENT (1+1)
OBJECTIVES

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

THEORY

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

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

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

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

Unit V: Government Schemes for Entrepreneurship

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

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

REFERENCES

ENG 319 COMPREHENSION AND COMMUNICATION SKILLS (1+1)

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

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

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

Unit – III

Unit – IV

Unit – V

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

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

Prescribed Text book
Chennai.

REFERENCES
Delhi
Cambridge
New Delhi.
Company, New Delhi

SEMESTER VI

AGR 321: 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 advancements in the field of weed science.

THEORY
Unit I: Weed biology and ecology
Weeds: Introduction, Definitions; harmful and beneficial effects, classification, propagation and
dissemination; Seed dormancy- Crop weed competition and allelopathy.

Unit II: Principles of weed control
Concepts of weed prevention, control and eradication; Methods of weed control: physical,
cultural, chemical, biological and biotechnological methods. Integrated weed management.

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

Unit IV: Herbicides physiology
Introduction to selectivity of herbicides; Herbicide absorption and translocation; Compatibility of
herbicides with other agro chemicals, Herbicide residue management and Herbicide resistance

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

PRACTICAL

Identification of weeds; Survey of weeds in crop fields and other habitats; Preparation of herbarium of weeds; Calculations on weed control efficiency and weed index; Herbicide label information; Computation of herbicide doses; Study of herbicide application equipment and calibration; Demonstration of methods of herbicide application; Preparation of list of commonly available herbicides; Study of phytotoxicity symptoms of herbicides in different crops; Biology of nut sedge, bermuda grass and parthenium; Economics of weed control practices; Tours and visits of problem areas.

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, dormancy, germination, establishment and perennation of weeds in different ecosystems.
5. Seed dormancy
6. Crop weed interactions - Critical crop weed competition, competitive and allelopathic effects of weeds and crops.
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.
13. Herbicide persistence and degradation in plants and soils-Herbicide residue and management.
14. Herbicide resistant weeds and their impact on weed management.
15. Success of Herbicide Resistant Crops (HRC) in Indian and World agriculture.
16. IWM in crops and cropping systems-Agricultural Crops, Horticultural Crops.
17. Invasive alien weeds.

PRACTICAL SCHEDULE
1. Identification, classification and characterization of terrestrial weeds
2. Identification, classification and characterization of Aquatic weeds
3. Identification, classification and characterization of problem and parasitic weeds
4. Weed survey and weed vegetation analysis- density, frequency, SDR and IVI
5. Study on biology of nut sedge, bermuda grass, Parthenium and Celosia;
6. Practicing Skill development on cultural and non chemical weed management
7. Identification, classification and characterization of herbicides
8. Practicing Skill development on herbicide application techniques
9. Practicing Skill development on spray equipment’s and spray fluid calibration
10. Practicing Skill development on herbicide weed management in lowland, upland and rainfed ecosystems
11. Calculation of herbicide quantity and recommendation for different eco systems
12. Study on phytotoxicity symptoms of herbicides in different crops;
13. Calculations on weed control efficiency
14. Calculations on weed index
15. Herbicide residue determination by bioassay techniques
16. Economic analysis of different weed management methods in crops and cropping systems
17. Practical Examination

REFERENCES
OBJECTIVES
Organic agriculture course aims at incurring knowledge on various aspects of organic farming with relevance to its advantages and short comings against conventional high input agriculture, its importance in the present world scenario and its impact on environment and soil health.

THEORY
Unit – I: Importance of organic farming

Unit – II: Organic sources

Unit – III: Indigenous practices of organic farming

Unit – IV: Organic certification
Organic certification – NPOP guidelines - Certification agencies in India – crop production standards - Quality considerations - labeling and accreditation process - marketing and export opportunities – APEDA.

Unit – V: Bio-intensive nutrient management

PRACTICAL
Raising of field crop – experiencing organic farming practices – soil, seed, nutrient, weed, water, pest and diseases, post-harvest management - hands on experience on bio composting, vermicomposting, ITK based biological preparations, bio-inoculants - quality analysis of inputs and products - grading, packaging, post-harvest management – visit to organic farms, market outlets and organic certification centers

THEORY LECTURE SCHEDULE
2. Introduction to bio-diversity; importance and measures to preserve bio-diversity.
3. Pre-requisites and basic steps for organic farming; conversation to organic farming – planning and processes in practices -- Integration of animal components. Green revolution-definition-impacts- Natural resources and its management.
4. 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.
5. Off-farm resources; coir pith, pressmud, oilcakes, flyash, bio compost, minerals, bone meal, bio fertilizers, traditional preparations.
7. Soil and crop management in organic farming ;Inter cropping and companion planting, crop rotation , green manures and cover crops, mulching.
9. Mid-Semester Examination
11. Organic certification – NPOP guidelines - Certification agencies in India.
13. Labeling and accreditation process - marketing and export opportunities – APEDA
15. Phosphate rich organic manure (PROM).

PRACTICAL
2. Raising of green manures ( Sunnhemp / Daincha / Fodder cowpea).
3. Incorporation of green manure – seed treatment and raising of field crop (Rice / Maize/ Cowpea / Cotton / Gingelly).
4. Preparation of Panchagavya and Dasagavya
5. Preparation of amirdhakaraisal and vermicompost
6. Quantification of nutrients from organic sources and application of manures and bio-fertilizers.
7. Exposure visit to an organic farm to learn ITK based preparations.
8. Organic crop production and weed management.
9. Exposure visit to bio-pesticide and pheromone manufacturing units.
10. Organic crop production and pest management.
11. Exposure visit to bio-control agent (Pseudomonas, Trichoderma etc.,) production units
12. Organic crop production and diseases management.
13. Exposure on macro quality analysis of crop produces in laboratories
14. Hands on training on grading, packaging and post-harvest management.
15. Exposure visit to organic market out lets.
17. Practical Examination

REFERENCES

ENT 323 PESTS OF CROPS AND STORED PRODUCE AND THEIR MANAGEMENT (2+1)

OBJECTIVE
- To study the bionomics, symptoms of damage and management strategies of major pests

THEORY
Bionomics, Symptoms of damage and Integrated management strategies for major insect and non-insect pests of following crops.

Unit I: Pests of Cereals, Millets and Pulses
Rice, Wheat, Maize, Sorghum, Cumbu, Ragi, Tenai, Redgram, Green gram, Black gram, Bengal gram, Cowpea and Soybean.

Unit II: Pests of Oilseeds, Cotton, Sugarcane, Green Manures, Forage Crops and Tobacco

Unit III: Pests of Vegetables, Tubers, Spices and Plantations
Brinjal, Bhendi, Tomato, Cruciferae, Cucurbits, Moringa and Amaranthus, Potato, Sweet potato, Yam and Tapioca, Chillies, Onion, Garlic, Ginger, Turmeric, Coriander, Curry leaf, Coconut, Arecaanut, Coffee, Tea, Cashew, Rubber, Cocoa, Cardamom, Pepper and Betelivine.

Unit IV: Pests of Fruits, Ornamentals and Medicinal Plants
Mango, Sapota, Citrus, Banana, Grapevine, Guava, Jack, Custardapple, Pomegranate, Pine apple, Papaya, Ber, Apple, Rose, Jasmine, Crossandra, Chrysanthemum, Tuberoses, Gloriosa, Coleus, Phyllanthus and Aswaganda.

Unit V: Pests of Tree, Lawn, Stored Products, Mushroom and green house crops

PRACTICAL
Identification of symptoms of damage and life stages of important pests of different field and horticultural crops - cereals, millets, pulses, oilseeds, cotton, sugarcane, green manures, forage crops, tobacco, vegetables, tubers, spices, plantation crops, fruits, ornamentals, medicinal plants, trees, lawn, cut flowers and stored products. Identification of common phytophagous mites, plant parasitic nematodes, rodents and bird pests.

Assignment: Student has to rear and submit five insect pests of field and horticultural crops.

THEORY LECTURE SCHEDULE
1. Pests of Rice - Leaf feeders and Borers
2. Pests of Rice – Sap feeders and Root feeders
3. Pests of Wheat, Maize, Sorghum, Cumbu, Ragi and Tenai
4. Pests of Redgram, Green gram, Black gram, Bengal gram, Cowpea and Soybean
5. Pests of Groundnut and Castor
6. Pests of Sesame, Sunflower, Safflower, Linseed, Jatropha and Mustard
7. Pests of Cotton - Leaf feeders and borers
8. Pests of Cotton - Sap feeders and Root feeders
9. Pests of Sugarcane - Leaf feeders and borers
10. Pests of Sugarcane - Sap feeders and Root feeders
12. Pests of Brinjal, Bhendi and Tomato
13. Pests of Crucifers and Cucurbits
14. Pests of Moringa and Amaranthus
15. Pests of Potato, Sweet potato, Yam and Tapioca
16. Pests of Chillies, Onion, Garlic, Ginger, Turmeric, Coriander and Curry leaf
17. Mid Semester Examination
18. Pests of Coconut and Arecanut
19. Pests of Coffee and Tea
20. Pests of Cashew, Rubber and Cocoa
22. Pests of Mango, Sapota, Guava and Citrus
23. Pests of Banana, Grapevine, Jack and Custardapple
24. Pests of Pomegranate, Pine apple, Papaya and Ber, Apple
25. Pests of Rose, Jasmine, Crossandra and Chrysanthemum
27. Pests of Neem, Teak, Tamarind, Sandalwood, Eucalyptus and Casurina
28. Pests of lawn and cut flowers
29. Pests of stored grains, dry fruits and nuts
30. Pests of mushroom
31. Pests of green house crops, Locusts and their management.
32. Insect vectors of plant diseases
33. Non insect pests – Plant Mites, Plant Nematodes
34. Non insect pests - Rodents, birds, other Vertebrates.

PRACTICAL SCHEDULE
1. Identification of Pests of Rice
2. Identification of Pests of Wheat, Maize, Sorghum, Cumbu, Ragi and Tenai
3. Identification of Pests of Redgram, Green gram, Black gram, Bengal gram, Cowpea and Soybean
4. Identification of Pests of Groundnut, Castor, Sesame, Sunflower, Safflower, Jatropha and Mustard
5. Identification of Pests of Cotton
6. Identification of Pests of Sugarcane
8. Identification of Pests of Brinjal, Bhendi, Tomato, Crucifers, Cucurbits, Moringa and Amaranthus
9. Identification of Pests of Potato, Sweet potato, Yam and Tapioca
10. Identification of Pests of Chillies, Onion, Garlic, Ginger, Turmeric, Coriander, Curry leaf, Coconut and Arecanut
11. Identification of Pests of Coffee and Tea
13. Identification of Pests of Mango, Sapota, Guava, Citrus, Banana, Grapevine, Jack, Custardapple, Pomegranate, Pine apple, Papaya, Ber and apple
14. Identification of Pests of Rose, Jasmine, Crossandra, Chrysanthemum, Tuberose, Gloriosa, Coleus, Phyllanthus and Aswagamtha, Neem, Teak, Tamarind, Sandalwood, Eucalyptus, Casurina, lawn and cut flowers
15. Identification of Pests of stored grains, dry fruits, nuts, mushroom and green house crops.
17. Practical examination

REFERENCE BOOKS
PAT 324: DISEASES OF HORTICULTURAL CROPS AND MUSHROOM CULTIVATION (2+1)

OBJECTIVES
The subject covers the etiology, symptoms, mode of spread, survival and integrated management of important diseases due to fungi, bacteria, viruses, phytoplasma, phanerogamic parasites and non-parasitic causes of the horticultural crops and also cultivation of edible mushrooms.

THEORY
Unit I: Fruit crops
Mango, Banana, Citrus, Grapes, Guava, Sapota, Pomegranate, Annona, Papaya, Jack, Pineapple, Ber, Aonla, Apple, Pear, Peach, Plum.

Unit II: Vegetable crops
Brinjal, Tomato, Bhendi, Cucurbits, Crucifers, Beans, Peas, Potato, Sweet Potato, Beet Root, Raddish, Yam, Colacasia and Cassava.

Unit III: Spices and condiments
Onion, Garlic, Chillies, Cardamom, Pepper, Betel Vine, Turmeric, Ginger, Fenugreek, Coriander, Clove, Nutmeg and Cinnamon

Unit IV: Plantation crops, flower crops, medicinal plants
Tea, Coffee, Cocoa, Rubber, Coconut, Arecanut, Vanilla, Jasmine, Rose, Crossandra, Chrysanthemum, Tuberose, Carnation, Lillium, Marigold, Gloriosa, Stevia, Coleus and Aloe.

Unit V: Mushroom cultivation and post harvest diseases
Importance of Mushroom – Cultivation of Pleurotus, Calocybe, Agaricus and Volvariella – Post harvest diseases of fruits and vegetables

PRACTICAL
Study of symptoms and host parasite relationship of the following crops: mango, banana, Citrus, Grapes, Guava, sapota, pomegranate, annona, jack, papaya, pineapple, ber, aonla, apple, pear, plum, peach, tomato, brinjal, bhendi, cucurbits, crucifers, beans, peas, potato, cassava, sweet potato, yam, colacasia, onion, garlic, chillies, pepper, betel vine, turmeric, ginger, cardamom, fenugreek, coriander, clove, nutmeg, cinnamon tea, coffee, rubber, coconut, arecanut, vanilla, rose, jasmine, crossandra, chrysanthemum, tuberose, marigold, lillium and carnation. Post harvest diseases of fruits and vegetables. -Mushroom cultivation: Pleurotus and Calocybe -Field visits

THEORY SCHEDULE
Etiology, symptoms, mode of spread, survival, epidemiology and management of diseases of the following crops:
1. Mango
2. Banana
3. Citrus and grapes
4. Guava, sapota, pomegranate, annona and jack.
5. Papaya, pineapple, ber and aonla.
6. Apple, pear, plum and peach.
7. Post harvest diseases – Apple, mango, banana, citrus, grapes, papaya
8. Brinjal and bhendi
9. Tomato
10. Cucurbits
11. Cabbage, cauliflower, radish and beetroot
12. Potato, sweet potato, and cassava
13. Yam, colacasia, bean and peas
14. Onion and garlic.
15. Post harvest diseases – Tomato, potato
16. Chillies, carrot and onion
17. Mid Semester Examinations
18. Pepper and betelvine
19. Fenugreek, cinnamon, nutmeg, clove and coriander
20. Turmeric and ginger.
21. Tea
22. Coffee.
23. Coconut and Areca nut
24. Rubber
25. Cocoa, vanilla and cardamom
27. Crossandra and chrysanthemum.
28. Marigold, carnation, lilium and tuberose
29. Medicinal plants – Gloriosa, 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 diseases symptoms and host parasite relationship of:
1. Mango and banana.
2. Citrus and grapes.
3. Guava, sapota, pomegranate, annona, jack, papaya, pineapple, ber and aonla.
4. Apple, pear, plum, peach.
5. Tomato and brinjal.
6. Cucurbits and crucifers.
7. Bean, peas and potato.
8. Cassava, sweet potato, yam and colocasia.
9. Post harvest diseases of fruits and vegetables
10. Onion, garlic, chillies, pepper and betel vine
11. Turmeric, ginger, cardamom, fenugreek, coriander, Clove, Nutmeg, and Cinnamon
12. Tea, coffee and rubber.
13. Coconut, arecanut and vanilla.
14. Rose, jasmine, crossandra and chrysanthemum, Tuberose, Marigold, Lilium and Carnation
15. Mushroom cultivation: Pleurotus and Calocybe
16. Field visit
17. Final Practical Examinations

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

REFERENCES

AGM 325 ENVIRONMENTAL SCIENCE (1+1)

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

THEORY
Unit – I: Introduction to Ecology and Environment

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

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

Unit – IV: Solid and Liquid waste management

Unit – V: Environmental protection

PRACTICAL

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

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

SAC 326 SOIL CHEMISTRY, SOIL FERTILITY AND NUTRIENT MANAGEMENT (2+1)

OBJECTIVES
To gain knowledge on plant nutrients and basic principles of soil fertility. This course will also impart knowledge on soil fertility evaluation, use of commercial fertilizers, importance of organic manures for sustainable agriculture. Further it aims to gain analytical knowledge on soil available nutrients.

THEORY
Unit -1
Nutrient elements- sources-Arnon’s criteria of essentiality –essential, functional and beneficial elements- forms of nutrient in soil-nutrient availability and transport mechanism-nutrient deficiencies and toxicities- symptoms and management

Unit- 11
Nutrients – sources - transformation- fixation- losses- availability of nitrogen, phosphorus, potassium, calcium, magnesium and sulfur

Unit-111
Nutrients- sources- transformation-fixation-losses-availability of zinc, iron, manganese, copper, molybdenum and boron

Problem soils- definition- classification- acid soil, salt affected soil, calcareous soil- field diagnosis-characteristics –nutrient availability- reclamation measures- physical, chemical and biological methods

Unit- 1V
Soil fertility- definition- types- factors influencing soil fertility- concepts- soil fertility evaluation methods- visual, chemical and biological methods - soil productivity- definition- factors influencing soil productivity

Soil testing- definition- objectives- functions of STL- chemical methods employed in nutrient estimation in soil-Soil test based fertilizer recommendation- INM, IPNS, STCR, SSNM, RTNM

Unit- V
Fertilizer- definition- classification- sources- properties- reactions in soils of nitrogen, phosphorus and potassium fertilizers

Irrigation water- classification – water quality indices- quality appraisal- effect of poor water on soils and crops- management of poor quality waters

Nutrient use efficiencies (NUE) - definition- various NUE indices- NUE for macro and micronutrient fertilizers- factors influencing NUE- enhancement technique of NUE (soil, cultural and fertilizer strategy)

PRACTICAL
Soil nutrient analysis- available macro and micronutrients in soils- assessment of irrigation water- pH, EC, anions and cations- lime and gypsum requirement –plant analysis – N,P and K

THEORY SCHEDULE
1. Nutrient elements- essential nutrients- criteria of essentiality –beneficial and functional nutrients - functions, deficiency and toxicity symptoms
2. Ionic forms of plant nutrients in soil –Movement of ions from soil to roots – mass flow, diffusion, root interception and contact exchange
4. Transformations in soils - mineralization - amination, ammonification and nitrification, immobilization
5. Transformation of nitrogen- losses – ammonia volatilization, nitrate leaching and denitrification and nitrogen fixation
7. Factors affecting phosphate fixation in soil – methods to reduce phosphate fixation (organic matter additions, placement of P fertilizers etc.) – quantity and intensity
10. Calcium – sources and content – forms of calcium in soil – factors affecting the availability of calcium
17. Saline sodic, sodic and calcareous soils – field diagnosis- characteristics – formation and nutrient availability in these soils
18. Mid Semester Examination
19. Reclamation measures of acid- lime requirement and saline soils
20. Reclamation measures of saline sodic, sodic- gypsum requirement and calcareous soil
21. Soil fertility and productivity- definition- types- factors influencing soil fertility and crop productivity
22. Concepts and approaches of soil fertility – Liebig’s Law, Mitcherlich law and Bray’s nutrient mobility concept
24. Chemical methods of soil fertility evaluation- total and available nutrient analysis
25. Biological methods of soil fertility evaluation – microbiological methods – Sackett and Stewart techniques, Methlich technique, Cunninghamella plaque method and Mulder’s Aspergillus niger test
26. Pot culture test – Mitscherlich’s pot culture method – Jenny’s pot culture test – Neubauer’s seedling method – sunflower pot culture technique for boron – A-value
27. Soil testing- definition- objectives- functions of STL- chemical methods employed in nutrient estimation in soil
28. Soil test based fertilizers recommendation – critical nutrient concept (Cate and Nelson) – critical levels of nutrients in soils – INM, STCR, IPNS,SSNM and RTNM
30. Irrigation water- classification – quality appraisal
31. Water quality indices
32. Effect of poor water on soils and crops- management of poor quality waters
33. Nutrient use efficiencies (NUE) - definition- various NUE indices
34. Factors influencing NUE. Enhancement technique of NUE (soil, cultural and fertilizer strategy)

PRACTICAL SCHEDULE
1. Soil nutrient analysis – Available N status in soil
2. Soil nutrient analysis – Available P status in soil
3. Soil nutrient analysis – Available Kand
4. Soil nutrient analysis -Available S status in soil
5. Soil nutrient analysis – DTPA extractable micronutrients in soil
6. Estimation of organic carbon in soils
7. Assessment of quality of irrigation water (a) pH (b) EC
8. Estimation of carbonates, bicarbonates in irrigation water
9. Determination of calcium and magnesium in irrigation water by EDTA method
10. Estimation of K and Na and chlorides in irrigation water
11. Estimation of sulphate in irrigation water
12. Interpretation of irrigation water analysis data
13. Lime requirement of acid soil
14. Determination of gypsum requirement of alkali soil
15. Estimation of N in plant samples
16. Estimation of P and K in plant samples
17. Practical Examination

REFERENCE BOOKS

GPB 327 PRINCIPLES OF SEED TECHNOLOGY (2+1)

OBJECTIVES
- To help the students to understand the basic principles of seed production.
- To teach the importance of seed testing, seed certification and seed policies which help the student to set up private seed production form in their own area.
- To create interest in seed business which in turn improves their economic status in future.

THEORY
Unit I- Introduction to seed production
- Seed- grain , seed production – grain production difference, classes of seeds- factors affecting seed production-deterioration of crop varieties-factors affecting deterioration and their control-production of nucleus and breeder seed- varietal release and notification

Unit II- Seed Production
- Principles and methods of seed production. self and cross pollinated crops- Rice, maize, redgram, black gram, ground nut, sunflower, castor, cotton, tomato, brinjal, bhendi, onion and gourds

Unit III-Post harvest management
- Seed drying. Seed processing - planning and layout of seed processing unit – equipments – air screen cleaner cum grader- grading-upgrading equipments - seed treatments -seed quality enhancement.

Unit IV-Seed Storage and Marketing
- Seed packing-stages of storage-factors affecting seed longevity- general principles of seed storage – seed marketing- marketing structure and organization, factors affecting seed marketing-seed policies and demand-forecasting-planning.

Unit V-Seed Legislation

PRACTICAL
- Identification of seed and seed structure-seed quality analysis in Field and Horticultural crops-principles and procedures –seed sampling –physical purity analysis-germination analysis-analysis moisture tests-viability test-seed health test- vigour tests – seed dormancy and breaking methods-seed quality enhancement-grow out test and electrophoresis for varietal identification-planting ratios, isolation distance, rouging etc. – visit to seed production plots-visit to seed processing plants – visit to seed testing laboratories- varietal identification in seed production plots.

THEORY LECTURE SCHEDULE
1) Seed definition-characteristics of quality seeds –difference between seed-grain, seed production-grain production
2) Classes of seeds- generation system of seed multiplication
3) Factors affection of seed production-genetic and agronomic principles of seed production
4) Seed Deterioration- factors affecting deterioration and their control.
6) State and central varietal release methods and notification
7) Principles and methods of seed production in variety and hybrids
8) Seed production in cereals-rice, maize
9) Seed production in Pulses- redgram, black gram
10) Seed production in oilseeds- ground nut and sunflower
11) Seed production in castor and cotton
12) Seed production in vegetables- tomato, brinjal, bhendi.
13) Seed production in onion and gourds
14) Seed drying-forced air drying and heated air drying-moisture equilibrium between seed and air
15) Planning and layout of seed processing plant.
16) Seed processing equipment – Air screen cleaner cum grader and its working principles
17) Seed upgrading, various upgrading equipments and its uses.
18) Mid Semester examination
19) Seed treatments-types and methods
20) Seed packing-stages of storage-factors affecting seed longevity
21) General principles of seed storage.
22) Seed marketing- marketing structure and organization
23) Factors affecting seed marketing and seed policies
24) Seed demand and forecasting – seed planning
26) Seed Act and Seed Rules
27) Central Seed Committee, Cental Seed Certification Board, State Seed Certification Agency.
28) Central and State Seed Testing Laboratories
29) Establishing Seed Testing Laboratory – Seed testing procedures( purity, germination, moisture content, vigour test, testing for seed borne disease/ pest) for quality assessment.
30) Seed Law Enforcement – duties and powers of seed inspectors, offences and penalties.
31) Seed Control Order, 1983 and New Seed Bill, 2004
32) World Trading Organisation and Plant Breeders Rights
33) Varietal identification through grow out test
34) Varietal identification through electrophoresis

PRACTICAL SCHEDULE
1) Identification of seed and seed structure
2) Seed quality analysis in field crops and horticultural crops-principles and procedure
3) Seed sampling and physical purity analysis
4) Germination testing and seedling evaluation
5) Moisture testing methods
6) Viability testing methods
7) Seed health testing
8) Seed vigour testing
9) Seed dormancy and dormancy breaking treatments
10) Seed quality enhancement treatments (egg flotation for rice, cotton delinting, procedure for pelleting, hardening, fortification and coating)
11) Grow out test and electrophoresis for varietal identification
12) Seed certification
13) Visit to seed production plots
14) Visit to seed processing plants
15) Visit to seed testing laboratories
16) Varietal identification in seed production plots
17) Final Practical Examination

REFERENCE:

HOR 328: ORNAMENTAL AND LANDSCAPE GARDENING (1+1)

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

**THEORY**

**Unit I Ornamental Gardening**

Ornamental Gardening- Definitions, scope, importance and opportunities - History of gardening – India and Global context – Gardens in Timeline from the Ancient times (Egypt, Iraq, Greek, Roman and Persic gardens, Medieval Europe) to the Twentieth Century - Styles (or) Types of gardening - garden components.

**Unit II Softscape elements in Garden**


**Unit III Hardscape elements in Garden**

Containers, soil, media - Different Hardscape elements in gardens and their position, materials required, establishment and maintenance - Planter boxes, Pavements, Decks, Garden Benches, Fountains, Cascades, Jacucci, Gazeeboo, Statues, Birds bath, Fences, - water proofing techniques.

**Unit IV Principles of Landscape Designing**

Principles and elements of landscape design- Concepts in landscape designing - symbols - Site analysis – Cliental preference – Bubble graph – Garden plan- Elevation diagram – Perspective diagram - layout of garden designs – Formal and informal gardens –Matching the plant materials to design criteria - Garden designing softwares and tools.

**Unit V Special type of gardens**

Special type of gardens - water garden, Sunken garden, Marsh or bog garden and rock garden-Terrace garden, Paved garden, roof garden, Vertical garden, Meditation and Yoga garden- Landscape design for specific areas- planting avenues, schools, villages, beautifying railway stations, dam sites, hydroelectric stations, Traffic island, High way, Theme parks, Gated communities, river banks, planting material for play grounds - Contemporary gardens -Xeriscaping- Culture of bonsai - art of making bonsai.

**PRACTICAL**

Identification and description of native and ornamental landscape plants - annuals, herbaceous perennials, climbers, creepers, foliage & flowering shrubs, trees, palms, ferns, ornamental grasses; cacti succulents - Matching the garden plants with design criteria - functional uses of plants in the landscape. Matching the garden plants with design criteria - functional uses of plants in the landscape - Site analysis - Planning and designing gardens – Bubble graph - layout of Garden plan –Designing of house garden, roadside planting, avenues for new High way, Theme parks, Gated communities, traffic islands-preparation of land for lawn and planting. Identification description and design of Hardscape elements - Planter boxes, Pavements, Decks, Garden Benches, Fountains, Cascades, Jacucci, Gazeeboo, Statues, Birds bath, Fences - Special tools and implements used in landscape designing and execution -Visit to nearby gardens and nurseries - Use of softwares in garden designing – Calculation of Materials required and cost estimation for landscape plan.

**THEORY SCHEDULE**

1. Ornamental Gardening- Definitions, scope, importance and opportunities
2. History of gardening – India and Global context – Gardens in Timeline from the Ancient times (Egypt, Iraq, Greek, Roman and Persic gardens, Medieval Europe) to the Twentieth Century
3. Styles (or) Types of gardening - garden components.
5. Propagation methods, growth habit, foliage and flower features, pruning, training and growth regulation of softscape elements - Creepers, Climbers, Annuals, Topiary, Trophy, Carpet beds.
7. Turf management- Functional utility in garden, turf grasses, establishment and maintenance.
8. Containers, soil & media for planting of ornamental plants.
9. Mid-semester
10. Different Hardscape elements in gardens and their position, establishment, materials required and maintenance - Planter boxes, Pavements, Decks, Garden Benches and Fences.
11. Different Hardscape elements in gardens and their position, establishment, materials required and maintenance - Fountains, Cascades, Jacucci, Gazeeboo, Statues and Birds bath and Water proofing techniques.
13. Site analysis and Cliental preference in landscape design planning Symbols in garden designing - Bubble graph.
14. Garden plan - Elevation diagram – Perspective diagram - layout of garden designs – Formal and informal gardens- Matching the plant materials to design criteria and Garden designing softwares and tools.
15. Special type of gardens - water garden, Sunken garden, Marsh or bog garden and rock garden- Terrace garden, Paved garden, roof garden, Vertical garden, Meditation and Yoga garden-
16. Landscape design for specific areas- planting avenues, schools, villages, beautifying railway stations, dam sites, hydroelectric stations, High way, Theme parks, Gated communities, river banks, planting material for play grounds.
17. Contemporary gardens -Xeriscaping- Culture of bonsai - art of making bonsai.

PRACTICAL SCHEDULE
1. Special tools and implements used in landscape designing and execution.
2. Identification and description of native and ornamental landscape plants - annuals, herbaceous perennials, climbers, creepers, foliage & flowering shrubs.
3. Identification and description of native and ornamental landscape plants - trees, palms, ferns, ornamental grasses; cacti succulents
4. Matching the garden plants with design criteria.
5. Identifying functional uses of plants in the landscape design.
6. Landscape Site analysis.
7. Planning and designing gardens – Bubble graph - layout of Garden plan
8. Designing of house garden, roadside planting, avenues for new High way, Traffic islands, Theme parks, Gated communities,
9. Identification of Lawn grasses
10. Preparation of land for lawn and planting.
11. Identification description and design of Hardscape elements - Planter boxes, Pavements, Decks, Garden Benches.
12. Identification description and design of Hardscape elements - Fountains, Cascades, Jacucci, Gazeeboo, Statues, Birds bath, Fences.
13. Visit to nearby gardens and nurseries –
14. Use of softwares in garden designing –
15. Calculation of Materials required for landscape plan.
17. Practical Examination

REFERENCE BOOKS

AEC 329 AGRICULTURAL FINANCE, BANKING AND CO-OPERATION (1+1)

OBJECTIVES
The objective of this course is to provide knowledge to the students about sources of agricultural finance, activities of bank and success models of cooperative sectors.

THEORY
Unit I Agricultural Finance – Nature and Scope
Agricultural finance - importance – nature and scope - definition. Agricultural credit – meaning, definition, need, classification. Sources of credit – role of institutional and non-institutional agencies - advantages and disadvantages. Rural indebtedness. History and development of rural credit in India.

Unit II Financial Institutions
Institutional agencies – commercial banks - nationalization, AD Branches – area approach – priority sector lending, regional rural banks, lead bank, Kissan credit card (KCC) scheme, scale of finance. DIR Scheme – relief measures and loan waiver scheme. Higher financial institutions – RBI, NABARD, AFC, ADB, World Bank, Insurance and credit guarantee corporation of India. Rural credit policies. Microfinance - its role in poverty alleviation – Self-
Help Groups – Non-Governmental Organizations.

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

Unit IV Banking and Insurance

Unit V Farm Financial Analysis

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

THEORY SCHEDULE
2. Source of credit – institutional and non-institutional agencies – types, roles, advantages and disadvantages. Rural indebtedness. History and development of rural credit in India.
3. Institutional agencies - commercial banks - nationalization of commercial banks – their role in rural credit. AD Branches – area approach. Priority sector lending, Regional rural banks.
4. Role and functions of lead bank – Preparation of district credit plan. Kisan credit card scheme. DIR scheme – relief measures and loan waiver scheme. Rural credit policies.
5. Higher financial institutions - RBI, NABARD, AFC, ADB, World Bank, Insurance and Credit Guarantee Corporation of India – Role and its functions in rural credit.
8. Co-operative credit institutions – structure - short term and long term credit – its functions - Strength and weakness of co-operative credit system.
9. Mid Semester Examination
10. Policies for revitalizing co-operative credit - salient features of Vaidyanathan Committee on revival of rural co-operative credit institutions. Special co-operative institutions – LAMPS, FSS - objectives, role and functions.
11. Reorganization of co-operative credit structure in Andhra Pradesh and single window system. Successful co-operative credit systems in Gujarat, Maharashtra, Punjab, etc.
insurance schemes.

PRACTICAL SCHEDULE
1. Visit to a farm to study the credit needs, problems and suggestions in the use of farm credit.
2. Visit to primary agricultural co-operative Bank (PACB) to study its role, functions and procedures for availing loan.
3. Visit to District central co-operative Bank (DCCB) to study its role, functions and procedures for availing loan – Fixation of Scale of Finance.
4. Visit to Land development Bank to study long term credit.
5. Visit to a Commercial bank branch to study its role, functions and procedures for availing loan and lead bank to study the district credit plan, primary co-operative bank for agricultural and rural development.
6. Visit to NABARD to study Potential Linked Credit Plan.
7. Project preparation and appraisal – undiscounted methods.
10. Exercise on preparation of repayment plans.
11. Visit to Self-Help Group to study its characteristics, roles and functions.
12. Analysis of different crop insurance products / visit to crop insurance implementing agency.
13. Visit to RRB to study its role, functions & procedures for availing loans.
15. Preparation of cash flow statement.
16. Financial ratio analysis.
17. Final Practical Examination.

REFERENCES

SEMESTER – VII
RAE 411 CROP PRODUCTION

OBJECTIVES
To gain knowledge about crop production technologies adopted in farmers field and to gain information of allied activities during the village stay programme.

Crop Production Components
- Study of cropping pattern, cropping systems, latest technologies in farm level, Production and productivity of different crops including Cereals, pulses, oil seeds, etc.,
- Study of soil type, fertility and soil related problems in relation to crop production.
- Study on irrigation practices followed.
- Identification of major crop varieties.
- Identification of live stock breeds, common diseases, preventive measures to control diseases and there by ensuring knowledge on clean milk production.

RAE 412 CROP PROTECTION

OBJECTIVES
To gain knowledge about crop protection practices including IPM and latest technologies at farm level during village stay programme.

**Crop Production Components**
- Weeds: Identification and management practices
- Insects: Identification and management practices
- Diseases: Identification and management practices
- Knowledge on plant protection chemicals
- Integrated pest management practices for major field and horticultural crops.

**RAE 413 RURAL AGRICULTURAL WORK EXPERIENCE (RAWE) (0+4)**

**OBJECTIVES**
- To obtain first hand experience about village situation.
- To gain knowledge about cropping pattern and adoption of latest technologies.
- To gain knowledge about preparation of individual farm plan

**STUDYING VILLAGE SCENARIO**
- Study of rural situation – village settlement pattern, demography, climate, land utilization pattern, resources inventory, infrastructural facilities, rural institutions, organizations, groups, customs, beliefs and value systems
- Study of cropping pattern, cropping systems, extent of adoption of latest technologies and constraints
- Studying the existing indigenous technical knowledge and its importance for technology generation.
- Knowing the communication pattern in villages
- Conducting need based skill demonstrations in the village

**STUDYING INDIVIDUAL FARM HOLDINGS**
- Contacting individual farmers to assess the differential farming system practiced by marginal, small, medium, big farmers and Farm Women
- Preparation of Individual farm plan

**RAE 414 RURAL ECONOMICS – INDUSTRIAL ATTACHMENT**

**OBJECTIVES**
The objective of this course is to impart the experiential learning, skill development, hands on training and gain practical knowledge about various industries/ institutes to create self employment opportunities for farm graduates. The students will gain knowledge about Agri clinics, Rural Banks, Micro Financial Institutions (MFI) and Various Input Industries

**PROGRAMME**
The Department of Agricultural Economics will allot the student to various agro industrial units, / Agri Clinics, / Agri Business Centers / NGO Organization / Agri related government institutions / Agricultural Finance Institutions / Input Industry

**SEMESTER VIII**

**MODULE I**

**CROP PRODUCTION**

**MEL 421 DESIGN AND MANAGEMENT OF FARMING SYSTEMS (2+1)**

**OBJECTIVES**
Acquiring knowledge on ecological principles concepts of farming systems and cropping systems management and pathways towards sustainable coproduction of food and bioenergy. Getting focus on sustainable integrated farming systems from a systemic perspective. Understanding of principles for designing farming systems in adaptation to climate change targeting sustainable local food systems.

**THEORY**

**Unit - I: Cropping and farming systems management**
- Cropping system – farming system – scope – importance – ecological principles – approaches and perspectives of farming system’s – Environmental conservation- practice in rural innovation –
methodologies – farming transitions – food networks for sustainable farming systems – bioenergy production

Unit - II: Assessment and formulation of farming system

Unit- III: Linking environment sustainability and farming

Unit – IV: Sustainable farming towards climate change

Unit- V: Livestock Component
Basic management of Dairy Farm, Poultry Farm, Piggery Unit, Goat Farm, Duck Farm, Turkey Farm and Japanese Quail Farm - Prospects and constraints of integrating animal components in farm.

PRACTICALS
Cropping system and farming system and it’s importance-Hygienic milking procedures – dipping in goats – vaccination schedule for cattle and poultry-complementarity among farming components-value addition in farm produces.

THEORY LECTURE SCHEDULE
1. Scope and importance of cropping system.
2. Ecological principles – approaches and perspectives of farming system’s.
3. Practice in rural innovation – methodologies.
5. Bioenergy production.
8. Environmentally sustainable practices – Complexity and interaction between farming components.
11. Ill effects on non-target organisms.
12. Impact of Agro inputs – GMO’s on farm productivity.
14. GMO and farming.
15. WTO and Agro industries.
16. Natural resource management.
17. Crop production and animal production practices- principles and practices of LEISA techniques.

18. Mid semester Examination
19. Livestocks management in the changing climate.
20. Cold chain and rural management entrepreneurship and food sovereignty.
22. General challenges to deal with globalization, climate change, biodiversity loss.
23. Conflicts over land and water.
25. Integrated modelling in farming systems research in adaptation to climate change.
27. Business options – food processing and value addition.
29. Management of Poultry Farming.
30. Management practices of piggery.
31. Goat farming and its management
32. Duck farming and integrated farming systems.
33. Management of Turkey for meat production.
34. Japanese quail production.
PRACTICAL SCHEDULE
1. Preparation of cropping schemes for different agro climatic zones.
2. Innovative methodologies in rural areas.
3. Linking farming systems with bio energy productions.
4. Environmental conservation through system approach.
5. Modernization of agriculture in farming systems.
7. Organic recycling in various farming situations.
8. Studying components of IFS and Introduction strategies in farming systems
9. Climatic normal for farming vs livestocks
10. Modeling in farming systems management
11. Value chain through food processing in farming situations
12. Low input concepts for sustainable agriculture and resource management in farming systems.
13. Inter disciplinary approach in farming system
15. Dipping for goats.
16. Vaccination schedule for cattle and poultry.
17. Final practical examination

REFERENCES

MEL 422 DRY FARMING AND WATERSHED MANAGEMENT(2+1)

OBJECTIVES
Understanding of different soil moisture conservation technologies for enhancing the agricultural productivity through holistic approach of watershed management and to study the principles of dry farming.

THEORY
Unit -I: Principles of dry farming
Dry land farming and rainfed farming - Significance of dry farming in India- History of dry land agriculture- Distribution of Arid and semi-arid regions in World, India and Tamil Nadu – Major crops of Dry land in India and Tamil Nadu - Characteristics - constraints

Unit- II: Drought and moisture conservation
Drought – Definition - Types and effects of Drought on crop production - Drought management - Contingent crop planning – Mid season correction – Mulching – anti-transpirants - Soil moisture conservation techniques and approaches - Water harvesting, storage and recycling - Integrated dry land technologies – Mechanization - Watershed management

UNIT- III: Soil conservation
Soil conservation: definition, methods of soil conservation; agronomic measures - contour cultivation, strip cropping, cover crops; vegetative barriers; improved dry farming practices; mechanical measures - bunding, gully control, bench terracing; role of grasses and pastures in soil conservation; wind breaks and shelter belts.

UNIT- IV: Water shed development
Watershed management: definition, objectives, concepts, approach, components, steps in implementation of watershed; development of cropping systems for watershed areas.

UNIT- V: Drainage
Drainage considerations and agronomic management; rehabilitation of abandoned jhum lands and measures to prevent soil erosion.

PRACTICAL
Study of drought management technologies in dryland agriculture – Preparation of contingency crop plan for aberrant rainfall situations – Visit to watershed area to study the impact of various soil and moisture conservation methods. Field studies of different soil conservation measures. Run-off and soil loss measurements-Laying out run-off plot and deciding treatments-Identification of different grasses
and trees for soil conservation-Visit to a soil conservation research centre, demonstration and training centre.

THEORY LECTURE SCHEDULE
1. Significance and scope of dry farming in India and History of dryland agriculture.
2. Dry farming and rainfed farming- definition- aridity- drought .
3. Importance of drought on crop production.
4. Distribution of arid and semi-arid regions in World, India and Tamilnadu.
5. Dry farming regions – climatic characteristics.
6. Major crops of dryland in India and Tamilnadu.
8. Characteristics of dryland farming and major constraints for crop production.
10. Crop substitution - importance.
11. Soil moisture constraints and their management.
14. Mid-season correction, mulching, anti transpirants, in-situ soil moisture conservation techniques and approaches.
15. Water harvesting, storage and recycling.
16. Integrated dryland technologies and farm mechanization.
17. Watershed: definition, principles, classification and management.
18. Mid-Term Examinations
20. Soil moisture constraints and their management.
27. Watershed management micro and macro watershed – definition.
33. Jhum/shifting cultivation – Jhum cultivation in India – basic concepts.
34. Harmful effects – ecological problems due to Jhum cultivation - Jhum cultivation in modern day – lay out of Jhum cultivation.

PRACTICAL SCHEDULE
1. Mapping of Arid and semi-arid region of World
2. Mapping of Arid and semi-arid region of India
3. Rainfall analysis and crop planning
4. Study of dry land farming system
5. Preparation of cropping scheme for different dry farming situations
6. Demonstration of mulching and seed coating
7. Demonstration of spraying of anti transpirants and growth retardants
8. Acquiring skills in land shaping methods for in situ moisture conservation
9. Drought management technologies in dry land agriculture - Preparation of contingency crop plan for aberrant rainfall situations
10. Preparation and methodology for implementation of water shed projects
11. Preparation of model watershed programme
12. Identification of common tree species for wind breaks
13. Identification of common pasture grasses and legumes
14. Assessment of biomass production under watershed area
15. Visit to an Institute related to dry land agriculture
16. Visit to watersheds of NWDPRA / CWDP – Input analysis
17. Final Practical Examination

REFERENCES
2. Dhruvanarayana VV. 2003. Soil and Water Conservation Research in India. ICAR.

MEL 423 FOREST RESOURCE MANAGEMENT (2+1)

OBJECTIVES
A detailed studies on forests, silviculture, scientific forests management on forests utilization and forests management.

THEORY

Unit-I: Importance of forest and its classification
Forest definition- Role of forests- Status of forests- global forest scenario- Status and classification of Indian forests - National forest policy— Forest management – concepts – forest menstruation - felling and conservation.

Unit-II: Social Forestry

Unit-III: Silviculture and its classification

Unit-IV: Forest Management and forest menstruation

Unit-V: Forest Plantation and JFM
Plantation forest management – clonal technologies – seed orchards.

PRACTICALS
Nursery layout – Nursery technologies of important species – Clonal propagation – Volume estimation – Felling and transportation – Visit to forest plantation and forest depot – visit to saw mill – wood seasoning and preservation plant – visit to important forest based industries – Joint Forest Management.

THEORY LECTURE SCHEDULE
1. Forest definition- Role of forests- Status of forests.
2. Global forest scenario- Status and classification of Indian forests.
4. Forest menstruation - felling and conservation.
6. Revised classification Indian forests types – moist tropical forests – tropical wet evergreen, semi evergreen and moist deciduous forests – littoral and swamp forest.
7. Dry tropical forests – tropical dry deciduous forest, thorn forests and dry evergreen forests
8. Montance sub tropical forests.
9. Montance temperate forests and Sub alpine – alpine shrub – forests types occurring in each state.
10. Social Forestry- concept- Definition
11. Classification- Objectives- Joint Forest Management (JFM).
15. Detailed silviculture including their distribution, economic value, phelology silviculture character, regeneration and management of broad leaved species Shorea robusta, Tectona grandis, Dalbergia sisoo, Acacias.
16. Detailed silviculture including their distribution, economic value, phelology silviculture character, regeneration and management of Banbusa spp, Alibizzia spp, Bombex cieba, B. malabaricum.
17. Detailed silviculture including their distribution, economic value, phelology silviculture character, regeneration and management of Eucalyptus spp, Casuarina spp, Prosopis juliflora, P. spicigera.
19. Mid – Semester Examination
20. Detailed silviculture including their distribution, economic value, phelology silviculture character, regeneration and management of Azadirachta indica, Tamarindus indicus, Santalum album and Morus alba.
22. Felling of trees – definitions – types – felling series in clear felling systems – felling series in regular shelter wood systems, irregular forests and coppice with standard system
23. Timber volume of normal growing stock – relation between increment and growing stock
24. Forest utilization – forest products – uses of forest products
25. Categorization of forest products – different non-timber produces – availability – collection and uses
26. Minor forest produce – availability – collection and uses – marketing
27. Wood science – definition – concepts – production, conception and trade in wood
28. Wood seasoning – principles and procedures – production capacity and raw material for wood based industry
29. Wood technology and techniques in wood based industry – Economics of investment and production
30. Forest plantations – objectives – functions – suitable species for raising forest plantations
31. Raising and maintaining forest plantation species – Cashew, Eucalyptus spp, Acacia spp, fuel wood spp – working out economics
32. Raising fuel wood plantations – raising high productivity pulp wood plantation working our economics
33. Propagation techniques – seed – vegetative propagation – clonal orchards
34. Identifying plus trees – marking – establishing seed orchards – seed collection – storage
35. Joint forest management – salient features – benefits – progress in JFM in various status

PRACTICAL SCHEDULE
1. Identification and description of seeds and seedlings of important silviculture tree species.
3. Collection of seed, seed purity – seed viability.
6. Nursery methods for important silviculture tree species – Mother bed – raised bed and sunken bed.
7. Raising tree saplings through seed.
8. Raising seedlings by vegetables method
9. Production of seedlings for woodlots – Avenue plantation.
10. Calculation of timber volume – using formulation
11. Visit to saw mill.
13. Visit to forest plantation and forest timber depot.
15. Identification & collection of non-timber forest produce and marketing
16. Working out economics of important silviculture tree species.
17. Final Practical Examination

REFERENCE BOOKS

MEL 424 INVASIVE ALIEN SPECIES AND BIO-DIVERSITY (1+1)

OBJECTIVES
A basic understanding about the invasive alien species and the concepts of biodiversity conservation.

THEORY
Unit-I: Importance of Invasive alien species
Invasive alien species and GISP - definition, characteristics, losses caused by invasive weed species, Weed shift - WTO, SPS agreement - Factors favouring invasiveness, Process of invasive traits of weeds - Threat to biodiversity from IAS - Pest Risk Assessment, Prediction and prevention of IAS.

Unit II: Management of Invasive alien species
Impact of agro inputs, biotechnology, GMO’s and invasive alien species on farm productivity, Environmental pollutants abatement and farming, Restoration of degraded & wastelands, Safe guarding non-target organisms from inputs of crop protection.

Unit III: Biodiversity and its conservation
Introduction, Definition, genetic, species and ecosystem diversity, Value of biodiversity, consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-spots of biodiversity.

Unit IV: Bio-security

Unit V: Bio refineries

PRACTICALS

THEORY LECTURE SCHEDULE
1. Invasive alien species - definition, characteristics.
2. Invasive alien species and GISP.
4. Factors favouring invasiveness.
5. Process of invasive traits of weeds and threat to biodiversity from IAS.
6. Pests, risk assessment, prediction and prevention of IAS.
7. Impact of agro inputs, biotechnology, GMO’s and invasive alien species on farm productivity.
8. Restoration of degraded & wastelands, Safe guarding non-target organisms from inputs of crop protection.
9. Mid semester Examination
10. Introduction, Definition, genetic, species and ecosystem diversity.
11. Value of biodiversity, consumptive use, productive use, social, ethical, aesthetic and option values.
12. Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-spots of biodiversity.
16. Bio polymers from transgenic plants, Bioinformatics for crop improvement.

PRACTICAL SCHEDULE
1. Invasive alien weeds
2. Invasive alien pests
3. Threats from invasive alien species
4. Weed Risk Assessment
5. Awareness modules for IAS
6. Education programme modules for IAS
7. Bio-assay techniques for herbicide residues
8. Bio-assay techniques for organic residues
10. Phyto sanitation for processed and export commodities
11. Evolving data and work sheet for product and process patents
12. Protocols and implications of patents
13. IPR issues
REFERENCES

MEL 425 DAIRY AND POULTRY PRODUCTS TECHNOLOGY (1+1)

OBJECTIVES
Raising knowledge on production practices of animal components of farming systems.

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
Composition of egg – Grading of egg – Factors affecting egg quality – Preservation of egg – Value added egg products

PRACTICALS

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.
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.
15. Grading of eggs.
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 Ice cream and judging its quality.
11. Preparation of flavoured milk.
12. Dressing of Poultry.
13. Preparation of cut up parts of poultry meat.
15. Candling and grading of eggs.
16. Preservation of eggs and value added egg products.
17. Final Examination

REFERENCES:
2. CBS Publishers and Distributors, New Delhi – 2
   London.

MODULE II
COMMERCIAL ENTOMOLOGY AND PATHOLOGY

MEL 426 MASS MULTIPLICATION AND APPLICATION OF ENTOMOPHAGES AND ENTOMOPATHOGENS 2+1

OBJECTIVE:
To know the mass production procedure of parasitoids, predators and pathogens and their application techniques

THEORY
Unit I: History and Status of biological control
   Biological control – importance – history, Classical biological control. Examples of successful instances of exploitation of biological control in India. Role of biological control in IPM.

Unit II: Predators

Unit III: Parasitoids
   Insect parasitoids of agricultural and horticultural importance, types of parasitoids and parasitism, biology – life cycle - host selection behavior of important parasitoids. Mass production techniques of Trichogrammatids, Chalcids, Bethylids, Ichneumonids and Braconids.

Unit IV: Entomopathogens
   Entomopathogens of agricultural and horticultural importance. Symptomatology and host range of entomopathogenic bacteria, fungi, viruses, protozoa, rickettsiae, spiroplasma and entomophilic nematodes. Mass production of entomopathogens - virus, bacteria, fungi and entomophilic nematodes. Microbial insecticides - Formulations techniques, quality control and registration procedures.

Unit V: Application techniques
   Field application of entomophages and enomopathogens – formulation - doses – techniques of release/ application – field efficacy, conservation and augmentation – ecological manipulation - dirty field technique, compatibility of entomophages and enomopathogens and marketing issues.

PRACTICAL
Identification of important entomophages and enomopathogens. Mass production techniques of predators - Cryptolaemus, Cyrtorhinus and Chrysopa, parasitoids – Trichogrammatids, Chalcids, Bethylids, Ichneumonids and Braconids and entomopathogens - bacteria, fungi and virus. Insectary facilities and equipments required for mass multiplication. Diagnosis of insect diseases (fungal, bacterial
and viral). Identification of important spider groups. Bio assay to test the efficacy of entomophagous, enomopathogens and haemocytometer techniques to standardize the microbial load in a formulation.

Assignment: Each student has to submit a report on economics of mass multiplication of entomophages/enomopathogens.

THEORY LECTURE SCHEDULE
1. Biological control – importance and history.
2. Classical biological control and its principles.
3. Status of biological control in India, Examples of successful instances of exploitation of biological control in India.
4. Role of biological control in IPM.
5. Insect predators of agricultural and horticultural importance.
10. Role of spiders in agro-ecosystems
11. Important species of spiders, its biology and predatory potential.
12. Insect parasitoids of agricultural and horticultural importance
13. Types of parasitoids and parasitism
14. Biology and life cycle of important groups of insect parasitoids and host selection behaviour.
16. Production techniques of Chalcids.
17. Mid semester examination
18. Production techniques of Bethylids.
19. Production techniques of Ichneumonids.
20. Production techniques of Braconids.
21. Entomopathogens of agricultural and horticultural importance.
22. Symptomatology and host range of entomopathogenic bacteria and fungi
23. Symptomatology and host range of entomopathogenic viruses, protozoa, rickettsce and spiroplasma
24. Symptomatology and host range of entomophilic nematodes.
25. Mass production of NPV.
27. Mass production of entomopathogenic fungi.
29. Formulations techniques, of microbial insecticides
30. Quality control and registration procedures of microbial insecticides.
31. Field application of entomophagous
32. Techniques of release – field efficacy, Conservation and augmentation - dirty field technique
33. Compatibility of entomophagous and enomopathogens with other methods of IPM
34. Marketing issues of biocontrol agents

PRACTICAL SCHEDULE
1. Identification of important parasitoids.
2. Identification of important predators.
3. Identification of important entomopathogens.
7. Mass production of Trichogrammatids.
10. Mass production of entomopathogenic bacteria
11. Mass production of NPV.
13. Diagnosis of insect diseases (fungal, bacterial and viral).
14. Identification of important spider groups.
15. Bio assay to test the efficacy of entomophagous and enomopathogens
16. Haemocytometer techniques to standardize the microbial load in a formulation.
17. Practical examination.

REFERENCE BOOKS
OBJECTIVES
To study the significance of biological agents and to study the method of isolation of the antagonistic organism and mechanisms of action involved in it. Also the subject covers the mass multiplication methods, bio-formulation development and delivery methods.

THEORY
Unit – I: Fungal bio control agents
Biological control of plant diseases – significance of fungal biocontrol agents – mechanism of disease control by biocontrol agents. Methods of isolation of *Trichoderma* from soil

Unit – II: Bacterial bio control agents
Biological control of plant pathogens with plant growth promoting rhizobacteria (PGPR) – significance of PGPR in disease management – mechanism of disease control by PGPR.

Unit – III: Mass multiplication of biocontrol agents
Methods of isolation of *Trichoderma viride, Pseudomonas fluorescens, P. putida, Bacillus* spp. from soil, plant roots and seeds. Assessment and survival of bio control agents in plants and soil ecosystems – Mass production technology of bio control agents.

Unit – IV: Formulations and delivery

Unit – V: Cost analysis and establishment of lab
Fermentation systems – commercial aspects of mass production of PGPR – including establishing bio control agent laboratory.

PRACTICAL

THEORY LECTURE SCHEDULE
1. Introduction to biological control of plant diseases
2. Significance of fungal bio -control agents
3. Mechanisms of disease control by the agents
4. Isolation methods of *Trichoderma* spp. from soil
5. Isolation methods of *Trichoderma* spp. from soil
6. Mass multiplication procedures
7. Mass multiplication procedures
8. Bio control by PGPR
9. Significance of PGPR
10. Mechanisms of disease control by PGPR
11. Mechanisms of disease control by PGPR
12. Methods of isolation of *Pseudomonas fluorescens*
13. Methods of isolation of *P.putida*
14. Methods of isolation of *Bacillus* spp
15. Assessment of survival of PGPR
16. Mass production technology of PGPR
17. Mid Semester Examinations
18. Mass production of PGPR
19. Selection of substrates for mass production
20. Selection of substrates for mass production
21. Bioformulation development
22. Bioformulation development
23. Methods of delivery system
24. Methods of delivery system
25. Quality parameter studies
26. Quality parameter studies
27. Fermentation systems
28. Fermentation systems
29. Commercial aspects of mass production of PGPR
30. Commercial aspects of mass production of PGPR
31. Establishment of PGPR lab
32. Establishment of PGPR lab
33. Plant diseases controlled by bio control agents
34. Plant diseases controlled by bio control agents

PRACTICAL SCHEDULE
1. Introduction to bio control of plant diseases
2. Isolation of bio control agents from soil
3. Isolation of bio control agents from soil
4. Preparation of selective media
5. Isolation of bacterial antagonists
6. Isolation of bacterial antagonists
7. Isolation of fungal antagonists
8. Isolation of fungal antagonists
9. Maintenance of pure culture
10. Antibiotic production by PGPR
11. Antibiotic production by *Trichoderma Spp*
12. Management of microbial contaminants
13. Fermentation technology
14. Formulation development
15. Assessment of population in the formulations & Packing and storage methods
16. Visit to commercial bio control units
17. Final Practical Examinations

REFERENCE BOOKS

MEL 428 MUSHROOM CULTIVATION (2+1)

OBJECTIVES
The subject cover various techniques involved in cultivation, maintenance, cropping pattern, harvest, pest and disease problems with their management and also nutritional value and preservation of edible mushrooms.

THEORY
UNIT-I: Importance of mushroom
Mushroom science: Importance, related fields and their contribution global production-morphology and life cycle: *Pleurotus, Calocybe, Agaricus* and *Volvariella*, poisonous mushrooms and mushroom poisoning.

UNIT – II: Techniques in mushroom breeding
Genetics and breeding of cultivated mushrooms: homothallism and heterothallism, primary and secondary control systems, parasexuality, homokaryotic fruiting. Approaches to breeding: selection, mutation and hybridization – tissue culture, single and multispor isolate – biotechnological methods for strain improvement – laboratory techniques, equipments, culture media, sterilization, pure culture techniques – preservation of cultures. Spawn types – mother spawn and bed spawn.

UNIT – III: Cultivation and Constraints

UNIT – IV: Mushroom usage
Uses of mushroom as food, nutritional and pharmaceutical values. Post-harvest technology: methods of preservation and value addition. Mushroom recipes: cooking methods, value added products, pickling, sauce, ketchup and chutney, instant food mixes, extruded and bakery products, quality and sensory evaluation.
UNIT – V: Cast analysis and project preparation

PRACTICAL

THEORY LECTURE SCHEDULE
1. Introduction to Mushroom technology
2. Morphology and life cycle of Pleurotus
3. Morphology and life cycle of Calocybe
4. Morphology and life cycle of Agaricus
5. Morphology and life cycle of Volvariella
6. Poisonous mushrooms
7. Morphology and life cycle of genetics and breeding of cultivated mushrooms
8. Biotechnological methods for strain improvement
9. Laboratory techniques ,preservation of cultures
10. Spawn types, mother spawn and bed spawn
11. Cultivation of oyster mushroom
12. Cultivation of oyster mushroom
13. Cultivation of milky mushroom
14. Cultivation of paddy straw mushroom
15. Cultivation of paddy straw mushroom
16. Cultivation of button mushroom
17. Mid Semester Examinations
18. Outdoor visit
19. Ectomycorrhizal mushroom
20. Problems in cultivation :weeds, diseases, pests and abiotic disorders
21. Uses of mushroom as food [nutritional value]
22. Uses of mushrooms as medicine
23. Post harvest technology, method of preservation and value addition
24. Mushrooms recipes
25. Mushrooms recipes
26. Cost analysis in mushroom production
27. Project preparation
28. Project preparation
29. Principles of enterprise management
30. Market survey
31. Market survey
32. Export procedures
33. Agricultural finance: source of finance and acquisition
34. Agricultural finance: source of finance and acquisition

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

REFERENCE BOOKS

MEL 429 INSECTS OF URBAN AND QUARANTINE IMPORTANCE 1+1

OBJECTIVE
To study the importance and management of urban and quarantine pests.

THEORY
Unit – I: Scenario of Public Health Pests
Public health pests – Rural, municipal and metropolitan cities, problems and challenges, agencies involved in public health pest management operations, global perspectives.

Unit – II: Major pests in human habitations

Unit – III: Minor pests in human habitations

Unit – IV: Quarantine entomology

Unit – V: Urban Pest Management

PRACTICAL
Assessing pest status in dwellings (labs, canteen or hostel), implementation of pest control against flies, mosquitoes, bed bugs, cockroaches and rodents. Pre- and post-construction termite proofing methods, control of silverfishes in the library. Bird repellents. Removal of Bees, ants and wasp colonies and bats. Appliances for domestic pest control. Setting up of urban pest control centres.

Assignment: Each student has to prepare and submit a report on problems of vector borne diseases/functioning of quarantine centres.

THEORY LECTURE SCHEDULE
1. Public health pests in rural, municipal and metropolitan cities and their problems and challenges.
2. Agencies involved in public health and pest management operations.
3. Mosquitoes – species - biology - breeding sites
4. Mosquitoes as vectors – transmission of malaria, dengue fever, filariasis and chikungunya.
9. Mid semester examination
10. Sand flies, bed bugs, human lice and fleas – breeding sites - outbreaks – disease vectoring
11. Termites – biology, breeding sites and problems to buildings and furniture.
12. Bird menace in buildings, Bees, ants and wasp colonies and bats – their hardships and dust mites and their allergic problems.

13. Domestic and international quarantine, restrictions in the movement of agricultural produce.


16. Principles and methods of pest management in residential places and public buildings


PRACTICAL SCHEDULE
2. Identification of species and assessing the population of mosquitoes.
3. Practicing of pest management against mosquitoes.
4. Practicing of pest management against housefly.
5. Practicing of pest management against bed bugs.
6. Practicing of pest management against cockroaches.
7. Practicing of pest management against rodents in urban situations.
8. Identification of castes of termites, its habitat and Practicing of pre- and post-construction termite proofing methods.
9. Practicing of pest management against silverfish in the library.
10. Acquainting bird and bat repellent methods.
11. Acquainting the method of removal of Bees, ants and wasp colonies.
12. Identification of appliances for domestic pest control.
13. Setting up of urban pest control centres.
14. Techniques to detect pest infestations in quarantine centres.
15. Identification of fumigants.
17. Practical examination.

REFERENCE BOOKS

MEL 430 NATURAL PRODUCTS IN INSECT PEST MANAGEMENT AND THEIR FORMULATION TECHNIQUES 1+1

OBJECTIVES
To study the value of insecticides from plant and animal origin
To know the formulation techniques of natural products

THEORY
Unit I: Scenario on Natural products

Unit II: Secondary plant compounds

Unit III: Insecticides of plant and animal origin

**Unit IV: Mode of action of insecticides of Plant and animal Origin**


**Unit V: Extraction methods and Formulation techniques of natural products**


**PRACTICAL**


**THEORY LECTURE SCHEDULE**

1. Insecticides of plant and animal origin – importance – history - Vrkshayurveda.
2. Global Scenario on utilization of Natural Products in IPM.
3. Merits and demerits of natural products and Current Status of natural products in pest management.
5. Activities of some plant compounds - Toxic amino acids, Proteinase inhibitors, Alkaloids, Cynogenic glycosides, Phenols, Tannins, Flavonoids, Glucosinolates, Toxic lipids, Terpenoids, Saponins, Phytohaemagglutinins etc.
6. Secondary plant compounds of important insecticidal plants.
8. Natural Products as Allelo-Chemicals, contact insecticides and Fumigants in Pest Management
9. Mid semester examination
10. Insecticides of animal origin and animal feces in pest management.
11. Modes of action – Antifeedant - Block sensory inputs from chemo receptors and mid gut enzymes. Effect on gustatory receptors, metabolism and mounting.
15. Biotechnology a tool for Natural Product Synthesis.
16. Natural products and Endogenous Development.

**PRACTICAL SCHEDULE**

1. Identification of plants of insecticidal value.
2. Sample collection procedures.
3. Preparation of plants for extraction.
4. Practicing shoklet method of extraction.
5. Practicing solvent method of extraction at room temperature
6. Practicing water extraction method.
7. Practicing traditional methods of extraction.
8. Identification of animal products with insecticidal value
10. Bio-assay for anti-feedant
12. Bio-assay for insecticidal
14. Calculation for desire concentration and field application.
15. Natural products in field and storage pest control
16. Safety studies to non target organisms.

17. Practical examination

REFERENCE BOOKS

MODULE – III
NATURAL RESOURCE MANAGEMENT

MEL 431 REMOTE SENSING, GIS AND LAND USE PLANNING (2 +1)

OBJECTIVES:
The Course aims to understand the methodological approaches in soil resource appraisal through modern tools of remote sensing techniques, concepts of Geographic Information System (GIS), Global Positioning System (GPS) and integration of GIS to prepare effective alternate land use plan based on resource database.

THEORY
UNIT – I - Concepts of Land Use Planning
Land use planning – Concepts and objectives – Methodological approaches – Information needed – collection techniques –Modern techniques for Land use planning – GIS and Land use planning – Watershed level planning – Regional level planning

UNIT – II Remote Sensing Concepts

UNIT – III– Geographic information system and its application

UNIT – IV - Soil Information System and soil physical constraints

UNIT – V - Sustainable land management techniques

PRACTICAL
### THEORY LECTURE SCHEDULE
1. Land use planning – Concepts and methodological approaches
2. Land use planning Techniques – Watershed level planning and regional level planning
3. Soil survey – importance – methods of soil survey
4. Types of soil survey – soil survey interpretation
5. Remote sensing – Concepts – Satellites and Sensors
6. Interaction of electromagnetic radiation
7. Remote sensing platforms and sensors
8. Satellite data acquisition - data products
9. Elements of image interpretation
10. Digital image processing
11. Remote sensing applications in agriculture
12. Soil mapping and Land use mapping
13. GIS – principles and components
14. Applications of GIS in agriculture
15. GPS-principles, concepts and functions
16. Use of GPS in agriculture
17. Soil information system – concepts and application
18. MID SEMESTER EXAMINATION
19. Land evaluation – land capability, land suitability
20. Fertility capability –
21. Land productivity
22. Soil quality
23. Pedo transfer functions
24. Sandy soil problems and management technologies, heavy clay soils – constraints and management technologies
25. Eroded soils – constraints and management technologies
26. Water logged and ill drained soils – constraints and management technologies
27. Sustainable land management – concept & principles, decision support system for land management
29. Management of degraded lands
30. Waste lands - types
31. Management of wastelands
32. Integrated soil fertility management - concepts
33. Site specific nutrient management-Site specific crop management
34. Use of decision support system models

### PRACTICAL SCHEDULE
1. Morphological evaluation of soils
2. Soil map and soil survey report preparation -I
3. Soil map and soil survey report preparation - II
4. Land capability classification
5. Land irrigability classification
6. Storie index rating
7. Fertility capability classification
8. Crop suitability classification
9. Satellite data products
10. Aerial photograph interpretation for soils
11. Visual interpretation of imageries for soils and land use
12. Digital image processing
13. Preparation of land use map
14. Thematic map preparation using GIS
15. Computation of soil and run off losses
16. Field visit to waste lands and land-use appraisal
17. Practical Examination

### REFERENCES
OBJECTIVES
This course aims to know the Chemistry, production techniques formulations, compatibility of Agro chemicals, impact assessment of agrochemicals on different ecosystems and human health. It also provides skills on preparation and use of indigenous pesticides for pest control and information on registration and quality control of agrochemicals.

THEORY
Unit – I - Chemistry of insecticides and fungicides
Agrochemicals – Definition- Synonyms and historical background – Usage in India – Chemistry and production techniques of insecticides and fungicides.

Unit – II - Chemistry of herbicides
Chemistry and production techniques of herbicides and other agrochemicals registered in India – Chemistry of formulations – Compatibility of different Agrochemicals – Significance.

Unit – III - Fate of agrochemicals in soil, plant and environment
Methodology for conducting bioefficacy studies – Toxicology studies – Assessment of residues in soil, water and plant – Impact assessment of agrochemicals in different Ecosystems- Techniques in residue Analysis.

Unit – IV - Safe use of pesticides
Acceptable daily intake (ADI) and Maximum (Permissible) residue limit (MRL) – Occupational exposure of agrochemicals – Safety precautions in handling and storage – Contamination and disposal of agrochemicals- Functioning of multinational companies.

Unit –V - Traditional preparations in pest control and insecticide act
Plant extracts for ecofriendly pest control – Allelopathy and weed control Insecticides act – Registration requirements of different Agrochemicals- Quality control of agrochemicals.

PRACTICAL
Analysis of pesticides – Physical tests – Acidity / alkalinity – Estimation of active ingredients in agrochemicals – Extraction and clean up procedures for determining residues from soil, water and plant samples – Determination of residues through bioassay and instrumentation techniques – visit to pesticide formation unit and pesticide testing laboratory.

LECTURE SCHEDULE
1. Agrochemicals definition, synonyms, historical background and usage in India
2. Chemistry and production techniques of OP compounds
3. Chemistry and production techniques of carbamates
4. Chemistry and production techniques of synthetic pyrethroids
5. Chemistry and production techniques of novel insecticides and house hold pesticides
6. Chemistry and production techniques of preventive and eradicant fungicides available in market only
7. Chemistry and production techniques of systemic fungicides (only new classes)
8. Chemistry and production techniques of systemic fungicides continued
9. Chemistry and production techniques of herbicides (only registered products and new classes.
10. Chemistry of Agrochemical formulations
11. Agrochemical combinations and their significance
12. Compatibility of different agrochemicals
13. Material required and preparation techniques for agrochemicals
14. Methodology for evaluation of bioefficacy of agrochemicals
15. Toxicological properties of agrochemicals
16. Assessment of residues in soil and water and plant
17. Fate of agrochemicals in soil and water
18. MID SEMESTER EXAMINATIONS
19. Fate and metabolism of agrochemicals in plant
20. Impact assessment of agrochemicals in environment
22. Instrumentation techniques for residue determination
23. Recent advances in residue determination
24. ADI and MRL of agrochemicals
25. Evaluation procedures for occupational exposure of agrochemicals
26. Safety precautions in handling and storage of agrochemicals
27. Contamination and disposal of agrochemical
28. Functioning of multinational companies
29. Chemistry of plant extracts
30. Allelopathy and weed control
31. Insecticides act and its applications
32. Registration requirements of different agrochemical formulations
33. Quality control of agrochemicals
34. Good laboratory practices

PRACTICAL SCHEDULE
1. Formulation analysis – Physical tests
2. Formulation analysis – Physical tests (contd…)
3. Estimation of acidity / alkalinity
4. Analysis of a.i. content of phosphamidan by titrmetry
5. Analysis of a.i. content of carbendazim by HPLC
6. Analysis of a.i. content of atrazine by GC
7. Principles of residue analysis of agrochemicals
8. Bioassay techniques to assay herbicide residues
9. Thin layer chromatography
10. Extraction and clean up of butachlor in soils
11. Extraction and clean up of mancozeb in plant
12. Determination of butachlor through GC
13. Determination of mancozeb through mancozeb in plant
14. Determination of paraquat residues in water
15. Visit to Pesticide formulation unit
16. Visit to Pesticide Testing Laboratory
17. Practical Examination

REFERENCES

MEL 433 SOIL, WATER, PLANT - HEALTH AND MANAGEMENT (2+1)

OBJECTIVES
The major objective of this course is to impart practical knowledge on soil related constraints, irrigation water quality appraisal guidelines & their efficient management, diagnosis of plant nutrient related problems, soil & water pollution and their impact on crop production and techniques for development of commercial fertilizer formulations & organic preparations.

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

UNIT – II - Irrigation water quality appraisal and its management

UNIT – III - Diagnostic Techniques for nutrient disorders

UNIT – IV Soil and water pollution
UNIT V - Commercial fertilizer formulations and organic preparations


PRACTICALS


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)
6. Management of chemical constraints (Salt affected soils)
7. Irrigation water resources – Groundwater potential and utilisation
8. Irrigation water characteristics and problems arising due to poor quality water
9. Water quality guidelines and their management
10. Diagnostic key for identifying nutrient deficiency and toxicity
11. Plant sampling for diagnosing nutrient disorders for field crops
12. Plant sampling for diagnosing nutrient disorders for Horticultural crops
13. Establishment of DRIS
14. Interpretation and reporting of results of plant analysis
15. Pollution, types & extent of pollution
16. Assessment of industrial chemical contamination in soil and water
17. MID SEMESTER EXAMINATION
18. Remediation of polluted soils
19. Mine spoils – Mining industries and their ill effects
20. Mine spoils – strategies for Rehabilitation
22. Preparation of enriched organic manures – Enriched FYM, enriched micronutrients
23. Composting of agricultural and industrial wastes – Definition, principles – Types of composting
24. Composting of coirpith, pressmud and Biocompost
25. Composting of sugarcane trash, water hyacinth
26. Vermicompost Technology – Vermiwash, Vermicasting
27. Humic acid formulation (Extraction)
28. Effect of enriched organic manures and compost on soil and plant
29. Preparation of Fertilizer mixtures and their importance
30. Preparation of crop specific nutrient mixtures
31. Recent developments in plant nutrient formulations – Tablets - granules
32. Preparation of nutrient mixtures for foliar application
33. Preparation of indigenous nutrient mixtures - Panchakavya
34. Preparation of indigenous nutrient mixtures – Dasakavya

PRACTICAL SCHEDULE

1. Key to identify physical constraints (Soil aggregate analysis, Shear strength)
2. Key to identify chemical constraints (EC, pH, ESP, SAR, CaCO₃)
3. Techniques for Reclamation of Acid soil (Lime Requirement)
4. Techniques for Reclamation of Sodic soil (Gypsum requirement)
5. Techniques for Reclamation of Saline soil (leaching requirement)
6. Methods of fertilizer application ( for different crops & problems)
7. Assessing nutrient efficiency for enhanced productivity in problem soils
8. Interpretation of irrigation water quality (pH, EC, SAR, RSC, Potential salinity & Potential alkalinity hazards)
9. Diagnosis of plant nutrient deficiency and Toxicity symptoms
10. Diagnosis of physiological disorders in crop plants
11. Quick test / Tissue test for plant nutrient status and prescription.
12. Analysis of polluted soils & waters for heavy metals
13. Preparation of nutrient enriched organic manures
14. Preparation of different types of composts
15. Formulation of micronutrient mixtures
16. Preparation of nutrient mixtures for foliar spray (Panchakavya & Dasakavya)
17. Practical Examination

REFERENCES

MEL 434 MICROBIAL AND ENVIRONMENTAL BIO-TECHNOLOGY (1+1)

OBJECTIVES
The emphasis of the course will be on bioremediation of soil, bioenergy, biocomposting and microbial insecticides.

THEORY
Unit - I: Bioremediation
Bioremediation of soil polluted with pesticides, fertilizers – Heavy metal pollution – Biotransformation – Hydrocarbon pollution – Super bug – Hydrocarbon extraction - Biomining of metals, Keratin degradation and Rhizoremediation.

Unit- II: Microbial food from wastes

Unit-III: Bioenergy

Unit-IV: Microbial Insecticides
Microbial agents for the control of pests and diseases, Target pest and suitable microbial insecticides, Mode of action of Bacillus thuringiensis and Nuclear Polyhedro Viruses, Advantages and limitations of microbial insecticides, Compatibility of microbial and chemical pesticides, Mass production of microbial insecticides. Fermentation - Formulation- Carrier material – Quality control.

Unit-V: Biocomposting

PRACTICAL

THEORY SCHEDULE
1. Bioremediation of pesticides, fertilizers and heavy metals.
2. Biotransformation – Hydrocarbon pollution and Hydrocarbon extraction.
4. Substrates for Single cell protein – Agro industrial, Agricultural and Domestic wastes.
5. Microorganisms uses as Single cell protein – Yeasts, Algae, Bacteria and Fungi.
7. Bioethanol production.
9. Mid semester Examination
10. Microbial Insecticides – Target pests and Suitable insecticides, Mode of infection of BT and NPV.
11. Advantages and limitations of pesticides.
13. Formulation and application of pesticides.
15. Aerobic and anaerobic method of composting.
17. Selection of microbial consortia for composting – Quality standards.

PRACTICAL SCHEDULE
1. Physical and chemical characterization of compost waste materials.
2. Quantitative and Qualitative enumeration of microbes in waste materials.
5. Assessment of maturity of compost by physical and chemical methods.
6. Vermiculture of recycling solid wastes.
7. Alcohol production from sugarcane industrial wastes (Molasses).
8. Production of biogas from Agricultural wastes.
9. Production of biogas from alternate feed stocks.
10. Production of Single cell protein using *Spirulina* sp.
16. Mass production of *Bacillus thuringiensis*.
17. Final practical examination

REFERENCE

MEL 435 NATURAL RESOURCES ECONOMICS AND MANAGEMENT (1+1)

OBJECTIVES
To introduce the economics principles related to natural resource and environmental policy issues and to teach the economics of why environmental problems occur and alternative instruments of environmental policies.

THEORY
Unit- I Natural Resource Economics: Meaning


Unit II Resource management
Theory of optimal extraction renewable resources – theory of optimal extraction exhaustible resources – economic models of forestry and fishery. Transaction costs – Coase's theorem and its critique - public goods – common property and open access resource management - collective action.

**Unit III Agricultural Externalities**

**Unit IV Types of Pollution**

**Unit V Government role**
Environmental Protection – role of government in resource management – environmental management – motivation and collective social action to plan and implement strategies for environmental management.

**PRACTICAL**

**THEORY SCHEDULE**
1. Concepts, Classification and problems of natural resource economics
2. Economy - environment interaction, The Material balance principle, Entropy law
3. Resources scarcity limits to growth - measuring and mitigating natural resource scarcity
5. Theory of optimal extraction renewable resources - Theory of optimal extraction exhaustible resources
6. Economic models of forestry and fishery - transaction costs
7. Coase's theorem and its critique - public goods – common property and open access resource management –
8. Collective action, - agricultural externalities – definition – evolution

**9. Mid –Semester examination**
10. Regulation of externalities without direct intervention - policy tools.
11. Multidimensional problems of externality -Environment valuation technique
12. Environment impact assessment -Methods of valuation of natural resources
13. Environmental pollution – causes
15. Rural and urban waste management - global warming - environmental act and related issues.
16. Role of government in resource management - Environmental management - motivation and collective social action to plan and
17. Implement strategies for environmental management.

**PRACTICAL SCHEDULE**
1. Resource inventory assessment techniques
2. Visit to industries to study pollution abatement techniques.
3. Working out depletion rate of land and water
4. Working out depletion rate of fisheries and minerals
5. Visit to areas of resource degradation due to air, land and water pollution and assessment (Contd.,)
6. Visit to areas of resource degradation due to air, land and water pollution and assessment
7. Willingness to pay concept and its quantification
8. Assessment of environmental impact
9. Hedonic pricing analysis
10. Discussions on environment and poverty
11. Social benefit cost analysis
12. The context and relevance of the Pollutor Pays Principle (PPP)
13. User Pays Principle (UPP)
14. The economic principle of optimality to environmental sustainability in agricultural resource use.
15. Discounting techniques
16. Environmental planning
17. Role of pollution regulation agencies and strategies followed in India.

REFERENCES

MODULE - IV
CROP IMPROVEMENT

MEL 436 MOLECULAR PLANT BREEDING (2+1)

OBJECTIVES
- To teach the recent strides in molecular genetics
- To teach various gene transformation techniques

THEORY

Unit I: Classical Plant Breeding methods for crop improvement

Unit II: Molecular Genetics

Unit III: Genetic Markers Morphological (Phenotypic markers)
- Biochemicals markers (Isozymes) and DNA based molecular markers – polymorphism – molecular basis of DNA markers – PCR-sequencing – primers – amplification of DNA by PCR – polyacrylamide gel electrophoresis – non PCR based markers (RFLP AND VNTR) – PCR based markers (RAPD, AFLP, STS, SSR, SNP etc) – ideal DNA markers – molecular markers advantages and disadvantages – application of markers in comparison with other markers.

Unit IV: Markers assisted selection
- Genotype identification and genetic diversity – molecular marker based gene mapping and tagging of agronomically important traits – mapping populations (F2s, back crosses, RILs, NILs AND DHs) – STATISTICAL TOOLS in marker analysis – MAS of desirable genotypes for qualitative and quantitative traits – QTLs – QTL analysis for crop improvement – candidate genes – gene pyramiding – Genomic and genoinformatics for crop improvement – integrating functional genomics and proteomics information on agronomically important traits.

Unit V: Recombinant DNA Technology

PRACTICAL
- Genetic linkage mapping through classical plant breeding-Molecular laboratory and equipment needs-Preparation of reagents for plasmid DNA isolation-Extraction of genomic DNA and RNA-Isolation of plasmid DNA-Quantification of DNA-Restriction enzyme digestion of DNA-Preparation of competent cells and bacterial transformation RFLP-Agarose gel electrophoresis-DNA amplification using PCR and RAPD AFLP - SSR and SNP-QTL analysis –Gene transfer using particle bombardment (gene gun method)

THEORY LECTURE SCHEDULE
1. Introduction and selection of crops
2. Hybridization and selection
3. Heterosis breeding
4. Mutation breeding
5. Population improvement
6. DNA structure and types of DNA
7. Central dogma of life and DNA replication
8. Protein synthesis
9. Operon concept – Lac-operon
10. Fine genetic analysis – rII locus
11. DNA isolation and quantification
12. Gene sequencing
13. Morphological and biochemical markers
14. Molecular markers and advantages
15. RFLP and VNTR markers
16. PCR based markers (RAPD, AFLP)
17. STS, SSR, SNP

18. Mid-Semester examination
19. Marker assisted selection and crop improvement
20. Molecular genetic diversity
21. Gene mapping and tagging
22. Mapping population (F2, Backcross, RILs, NLS, DHs)
23. Statistical tools in molecular marker analysis
24. QTL
25. Gene pyramiding
26. Genomics and genoinformatics
27. Proteomics
28. Restriction enzymes
29. Restriction mapping
30. Gene transformation techniques
31. Vectors for plant gene transformation
32. Transgenic plants
33. GMOs
34. Bio-safety

PRACTICAL SCHEDULE
1. Genetic linkage mapping through classical plant breeding
2. Molecular laboratory and equipment needs
3. Preparation of reagents for plasmid DNA isolation
4. Extraction of genomic DNA and RNA
5. Isolation of plasmid DNA
6. Quantification of DNA
7. Restriction enzyme digestion of DNA
8. Preparation of competent cells and bacterial transformation
9. RFLP
10. Agarose gel electrophoresis
11. DNA amplification using PCR
12. DNA amplification using RAPD
13. AFLP
14. SSR
15. SNP
16. QTL analysis
17. Gene transfer using particle bombardment (gene gun method)

REFERENCES
MEL 437 PLANT TISSUE CULTURE (2+1)

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

THEORY

Unit I

Unit II

Unit III

Unit IV

Unit V

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

THEORY LECTURE SCHEDULE
1. Introduction and totipotency
2. History about plant tissue culture
3. Organization of tissue culture laboratory
4. Tissue culture laboratory equipments
5. Sterilization techniques and methods
6. Composition of tissue culture medium and preparation
7. Role of hormones in culture medium
8. Callus culture and callus induction
9. Isolation of single cell and cell suspension culture
10. Shoot regeneration techniques, concepts and application of somatic embryogenesis
11. Concepts and application of somatic embryogenesis
12. Synthetic seed technology and its advantage
13. Anther culture and its application
14. Pollen culture and its application
15. Ovary culture and its application
16. Ovule culture and its application
17. Mid-Semester Examination
18. Haploid production and doubled haploids and its significance
19. Embryo culture and its application
20. Embryo rescue techniques
21. Endosperm culture and its application
22. Meristem culture and rooting of shoots.
23. Maintenance and recovery of virus free stocks
24. Somaclonal variation and its molecular basis
25. Isolation of resistant mutants.
26. Somatic hybridization – Protoplast isolation and protoplast culture
27. Protoplast fusion (PEG) – Electrofusion technique
28. Selection of hybrid cells and regeneration
29. Cytoplasmic hybrids and applications of somatic hybridization
30. Invitro pollination methods
31. Micropropagation and its significance
32. Micropropagation in Banana and Rose
33. Production of secondary metabolites
34. Cryopreservation of plant parts.

PRACTICAL SCHEDULE
1. Tissue culture laboratory and equipment needs.
2. Sterilization techniques
3. Preparation of culture medium
4. Cell suspension culture and callus induction
5. Somatic embryogenesis
6. Synthetic seeds
7. Anther and pollen culture
8. Ovary and ovule culture
9. Embryo rescue techniques
10. Embryo culture
11. Endosperm culture
12. Meristem culture
13. Protoplast culture and somatic hybridization
14. Micro propagation in banana
15. Cryopreservation of plant parts
16. visit to commercial tissue culture laboratory
17. Final Practical examination.

REFERENCES

MEL 438 PLANT GENETIC RESOURCES (2 + 1)

OBJECTIVES
• To understand the origin and diversity of important crops and the importance of the conservation
• To understand on patent systems and international agreements on Agriculture
• To understand the classification of varieties using descriptors and utilizing germplasm in breeding programmes.

THEORY
Unit – 1 : Origin of species, and diversity conservation
Plant Genetic Resources (PGR) and their importance - Agrobiodiversity and Centres of origin - Primary and secondary centres – Vavilov’s contribution to plant genetic resource conservation - PGR base for reconstruction and reconstellation of new cultivars - Exploration and collection: exploration missions - understanding the distribution, ecology, botany and genetic makeup of each crop species

Unit – 2 : Collection of Germplasm and Conservation
Collection- Patterns of variation and genetic makeup - sample size and collecting efficiency - Collection records: field and laboratory - Entering the collected material into the gene bank - Handling the site data - Conservation: ex situ conservation (long term and medium term repositories - merits and demerits of ex situ conservation - In situ conservation - conservation of wild relatives and land races - conservation in home gardens - community based plant conservation - botanical gardens and field gene
banks - seed saver programmes - National parks - Biosphere reserves - Relation of in situ conservation to nature conservation and agricultural production

Unit – 3 : Characterization and Documentation of Germplasm

Documentation: initial data verification and reorganization - passport data - tasks of the documentation - requirements for documentation - existing data and data to be collected - data processing and information supply - Characterization: taxonomic - using plant descriptors - biochemical: using isozymes and DNA markers

Unit – 4 : Evaluation of Germplasm and Crop Genetic Network

Evaluation: primary and secondary evaluations - Crop Genetic Resources network: International and National - Role of International Agricultural Research Centres (IARCs) in PGR conservation - National and Regional PGR centres - Intellectual Property Rights (IPR) and PGR - Plant Breeders rights - Farmers rights - PGR in strengthening Plant Breeding research system - Central data bases and their features - The core collection concept - PGR management - conventional and recent approaches - molecular markers in germplasm management - tracing the pedigree - identifying the duplicates - Utilization - types of collection

Unit – 5 : Patent Systems and Regulatory Bodies

PGR exchange - national and international formalities - Plant quarantine check – Implications of World Trade Organisations (WTO), General Agreement on Trade and Tariff (GATT), Trade Related Intellectual Property Rights (TRIPs), Plant Variety Protection (PVP) and Convention on Biological Diversity (CBD) on PGR

PRACTICAL

Methodologies for germplasm conservation - Exploration and collection: understanding the distribution, ecology, botany and genetic makeup of each crop species - Route map - Collection: sample size and collecting efficiency - Collection records: field and laboratory - Entering the collected material into the gene bank - Handling the site data - Conservation: ex situ conservation (long term and medium term repositories) - In situ conservation of germplasm; various approaches - Documentation: initial data verification and reorganization - passport data - requirements for documentation - data processing and information supply - Characterization: taxonomic - using plant descriptors - biochemical: using isozymes and DNA markers - Evaluation: primary and secondary evaluations - Crop Genetic Resources Network: International and National - Role of International Agricultural Research Centres (IARCs) in PGR conservation - National and Regional PGR centres visit - Intellectual Property Rights (IPR) and PGR - Plant Breeders - rights - Farmers rights - PGR in strengthening Plant Breeding research system - Central data bases and their features - The core collection concept - PGR management - conventional and recent approaches - molecular markers in germplasm management - tracing the pedigree - identifying the duplicates - Utilization - types of collection - PGR exchange - national and international formalities - Plant quarantine check.

LECTURE SCHEDULE

1. Plant Genetic Resources (PGR) and their importance
2. Agrobiodiversity and Centres of origin
3. Primary and secondary centres – Vavilov’s contribution to plant genetic resource conservation
4. PGR: base for reconstruction and re-constellation of new cultivars
5. Exploration and collection: exploration missions - understanding the distribution, ecology,
6. Botany and genetic makeup of each crop species
7. Collection: Patterns of variation and genetic makeup
8. Sample size and collecting efficiency.
9. Collection records: field and laboratory
10. Entering the collected material into the gene bank , Handling the site data.
11. Conservation: ex situ conservation (long term and medium term repositories)
12. Merits and demerits of ex situ conservation
13. In situ conservation - conservation of wild relatives and land races conservation in home gardens - community based plant conservation
14. Botanical gardens and field gene banks: seed saver programmes - National parks
15. Biosphere reserves
16. Relation of in situ conservation to nature conservation and agricultural production
17. Mid Semester Examination
18. Documentation: initial data verification and reorganization
19. Passport data - tasks of the documentation - requirements for documentation
20. Existing data and data to be collected
21. Data processing and information supply
22. Characterization: taxonomic - using plant descriptors
23. Biochemical: using isozymes and DNA markers
24. Evaluation: primary and secondary evaluations
25. Crop Genetic Resources Network: International and National
26. Role of International Agricultural Research Centres (IARCs) in PGR conservation
27. National and Regional PGR centres - Intellectual Property Rights (IPR)
28. PGR - Plant Breeders rights - Farmers rights
29. PGR in strengthening Plant Breeding research system - Central data bases and their features
30. The core collection concept - PGR management - conventional and recent approaches
31. Molecular markers in germplasm management - tracing the pedigree - identifying the duplicates
32. Utilization types of collection - PGR exchange - national and international formalities - Plant quarantine check
33. Implications of World Trade Organizations (WTO), General Agreement on Trade and Tariff (GATT), Trade Related Intellectual Property Rights (TRIPs),
34. Plant Variety Protection (PVP) and Convention on Biological Diversity (CBD) on PGR

PRACTICAL SCHEDULE
1. Methodologies for germplasm conservation
2. Exploration and collection: understanding the distribution, ecology, botany and genetic makeup of each crop species
3. Collection: sample size and collecting efficiency interference of new cultivars - Collection records: field and laboratory - Entering the collected material into the gene bank
4. Handling the site data
5. Conservation: ex situ conservation (long term and medium term repositories)
6. In situ conservation of germplasm: various approaches
7. Documentation: initial data verification and reorganization - passport data - requirements for documentation
8. Data processing and information supply
9. Characterization: taxonomic - using plant descriptors
10. Biochemical: using isozymes and DNA markers
11. Evaluation: primary and secondary evaluations
12. Crop Genetic Resources Network: International and National - Role of International Agricultural Research Centres (IARCs) in PGR conservation
13. National and Regional PGR centres
14. Intellectual Property Rights (IPR) and PGR - Plant Breeders rights - Farmers rights - PGR in strengthening Plant Breeding research system
15. Central data bases and their features - The core collection concept - PGR management - conventional and recent approaches
16. Molecular markers in germplasm management - tracing the pedigree - identifying the duplicates
17. Utilization types of collection - PGR exchange - national and international formalities - Plant quarantine check

REFERENCES

MEL 439 MICROBIAL AND ENVIRONMENTAL TECHNOLOGY (1+1)

OBJECTIVES

138
The emphasis of the course will be on bioremediation of soil, bioenergy, biocomposting and microbial insecticides.

**THEORY**

**Unit - I: Bioremediation**
- Bioremediation of soil polluted with pesticides, fertilizers – Heavy metal pollution – Hydrocarbon pollution – Super bug – Hydrocarbon extraction.
- Biomining of metals, Keratin degradation and Rhizoremediation.

**Unit - II: Microbial food from wastes**
- Substrates for Single Cell Protein production – Agricultural wastes – Agro industrial wastes – Domestic wastes.
- Microorganisms used as Single cell protein – Yeasts, Algae, Molds and Bacteria – Nutritive value – Mass production of *Spirulina* – Uses.

**Unit - III: Bioenergy**
- Biogas production, Methanogenesis – Microbiology of methane formation in anaerobic digester. Feedstocks – animal wastes and alternative feed stocks, Types and operation of biogas plants – Applications of Biogas.

**Unit - IV: Microbial Insecticides**

**Unit - V: Biocomposting**

**PRACTICAL**

**THEORY SCHEDULE**
1. Bioremediation of pesticides, fertilizers and heavy metals.
2. Biotransformation – Hydrocarbon pollution and Hydrocarbon extraction.
5. Microorganisms used as Single cell protein – Yeasts, Algae, Bacteria and Fungi.
7. Mid semester Examination
8. Microbial Insecticides – Target pests and suitable insecticides, Mode of action of *Bacillus thuringiensis* and Nuclear Polyhedro Viruses. Advantages and limitations of microbial insecticides. Compatibility of microbial and chemical pesticides. Mass production of microbial insecticides.
11. Formulation and application of pesticides.

**PRACTICAL SCHEDULE**
1. Physical and chemical characterization of compost waste materials.
2. Quantitative and qualitative enumeration of microbes in waste materials.
5. Aerobic and anaerobic method of composting – Quality standards.
10. Aerobic and anaerobic method of composting – Quality standards.
17. Aerobic and anaerobic method of composting – Quality standards.
OBJECTIVES
Growth is an outward expression of different physiological processes that continuously proceed in plants. This course outlines the different growth functions, flowering, fruit development and senescence in plants which will help the students to assess the time and methods of application of different horticultural practices.

THEORY

Unit-I : Growth and growth analysis

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

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

Unit-IV: Role of plant growth regulators in Horticultural crops

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

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

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

REFERENCE BOOKS
MODULE V
COMMERCIAL HORTICULTURE

MEL 441 NURSERY MANAGEMENT OF HORTICULTURAL CROP (2+1)

OBJECTIVES
This course deals with different methods of plant propagation and strategies for nursery management of various fruit crops. Knowledge of tools and implements is essential to carry out all scientific horticultural operations and also nursery management practices. The above themes are discussed elaborately in this course and the basic knowledge gained will be useful for the career development.

THEORY
Unit-I: Methods of Propagation
Propagating - overview - sexual and asexual methods of propagation - advantages and disadvantages of seed and vegetative propagation - Methods of dormancy alleviation and seed treatment methods.

Unit-II: Principles and Methods of Seed Propagation
Seed propagation - seed dormancy, internal and external factors - nursery techniques - apomixis - monoembryony, polyembryony principles - utilization Pro-trays, Nursery beds, Community Nursery Development - Propagation of Transplanted vegetables and Annual flowering seeds - Maintenance of young seed propagated plants.

Unit-III: Propagation Structures
Propagation structures - mist chamber - green houses - glass houses - pit nursery tools and implements - use of growth regulators in seed and vegetative propagation - physiological and anatomical basis of vegetative propagation.

Unit-IV: Asexual Propagation Techniques

Unit-V: Nursery Management
Selection of Land for Nursery Establishment - Nursery layout and planning - Mother plant Nursery - Collection of Mother Plants - Marking techniques and labeling of Mother plants - Pruning and training of Mother plants for propagation - Nursery Materials, Inputs, management and pricing - Cost Estimate and Budgeting.

PRACTICAL
Potting medium - tools, implements and containers for propagation of nursery beds - propagation structures - potting - repotting - mist chambers and pit nursery raising of rootstocks and scion preparation - different techniques and practices of cutting, layering, grafting and budding - use of specialized organs - rejuvenation - visit to private nurseries and tissue culture laboratory - working out economics.

THEORY LECTURE SCHEDULE
1. Study of sexual and asexual methods of propagation.
2. Advantages and disadvantages of seed and vegetative propagation.
3. Seed dormancy - factors affecting dormancy - Internal and external factors affecting dormancy
4. Types of dormancy
5. Methods of dormancy alleviation and treatments.
6. Apomixis and its application in Nursery production
7. Mono and Polyembryony and its application in Nursery production
8. Pro-trays, Nursery beds,
9. Community Nursery Development -
10. Propagation of Transplanted vegetables and Annual flowering seeds
11. Maintenance of young seed propagated plants
12. Study of propagation structures and mist-chambers.
13. Construction of green houses and glass houses controlling system.
14. Study about pit nursery techniques
15. Important tools and implements.
16. Use of growth regulators in seed and vegetative propagation
17. Mid-semester
18. Types of cuttings and techniques of preparation
19. Types of layering and techniques of preparation
20. Grafting and budding methods and techniques of preparation
22. Influence of root stock on scion-bud wood selection and certification
23. Study about propagation by specialized plant parts - bulbs and tubers.
24. Study about propagation by specialized plant parts - Runners, suckers and other organs.
25. Study about micropropagation techniques including Tissue Culture.
26. Selection of Land for Nursery Establishment
27. Nursery layout and Planning
28. Mother plant Nursery
29. Collection of Mother Plants
30. Marking techniques and labeling of Mother plants
31. Pruning and training of Mother plants for propagation
32. Nursery Materials, Inputs, management and pricing
33. Cost Estimate and Budgeting.
34. Project preparation for establishment of Commercial Nursery

PRACTICAL SCHEDULE
1. Preparation of nursery beds, seed treatment and sowing.
2. Identification of various tools and implements.
4. Preparation of pot mixture and study of various containers.
5. Study of special structures for propagation.
7. Mist propagation techniques.
8. Practice in propagation by cuttings.
11. Practicing grafting methods.
12. Use of growth regulators in propagation.
13. Practices in separation and description of plant parts used for propagation.
14. Rejuvenation, top working and bridge grafting.
15. Practice in micropropagation and Hardening methods.
16. Visit to tissue culture laboratory and controlled green houses.
17. Visit to private nurseries

REFERENCE BOOKS

MEL 442 PROTECTED CULTIVATION OF HORTICULTURAL CROPS (2+1)

OBJECTIVES
This course aims to understand the role of climatic and edaphic factors affecting plant growth and development and to study the various modes of protected cultivation, its scope and constraints. It highlights various measurements to control light, temperature, relative humidity and CO2 and recent advances in control of substrate factors like pH, EC and soil microbes. It elaborates the production system so as to acquire knowledge on the cost of establishment and procedures for commencing hi-tech projects.
THEORY

Unit-I: Scope and Constraints of Protected Cultivation
Profiles of crop production system - Protected Cultivation - Overview - Importance.
Scope and constraints under Indian Conditions - Modes of protected cultivation Planning of Green House - styles - design - Green House covering materials.

Unit-II: Environmental Control in Green Houses

Unit-III: Irrigation and Fertilizer Management
Green House - Irrigation - Types - planning, designing, Installation, operation and maintenance - Fertilizer Sources - Fertigation, Water soluble fertilizers - application method - Fertilizer programmes for vegetables and flowers - Hydroponic systems Nutrient Film Technique (NFT).

Unit-IV: Cultural Management Under Protection
Plug production - modular containers - Media - automatic mixers - fillers mechanical seeder, seed pelleting - priming - root trainers - Insects and disease control system - Fogging system - Smoke generator - thermal fogging for insect and disease control.

Unit-V: Quality Management and Marketing

PRACTICAL
Components of polyhouse - working out the efficiency of thermo control systems media for high tech culture - soilless culture - Nutrient Film Technique (NFT) fertigation programme for various crops - description of roofing material - visit to polyhouses - description of cold fogger - ultra low to high capacity foggers - micro mist systems - description of ventilation equipments - survey of exportable horticultural produces - packaging techniques for various commodities - packaging materials for processed and fresh products - post harvest handling of exportable commodities.

THEORY LECTURE SCHEDULE
1. Introduction to protected cultivation - advantages and disadvantages.
2. Modes of protected cultivation
3. Present status of green house cultivation in India - Constraints and scope
4. Site selection for green house and structural designs
5. Arrangement of green houses - styles - single and multispan
6. Green house roofing materials
7. Green house media, natural and synthetic and sterilization
8. Green house - beds and benches construction and space use efficiency
9. Temperature control - heating - cooling - lighting
10. Cooling methods, ventilations - Evaporate cooling - Air conditioning
11. Light - measurement - Units - sources and quality.
12. Light manipulation - colour and duration - configuration
13. Types of irrigation in green house - purpose and advantage
15. Operation and maintenance of irrigation system
16. Fertigation - advantages - water soluble fertilizer

17. Mid Semester Examination.
18. Fertilizer methods and fertilizer requirement for various green house crops.
19. Hydroponics - definition and methods and scope - Nutrient film techniques -
20. Nutrient solution - aggregate hydroponics
21. Bedding industry - plug production - modular containers
22. Mechanical fillers - media and seeders.
23. Seed priming, pelleting, coating and growth chambers
24. Liners, microliners - root trainers and fertilizer requirment of lines and microliners.
25. Training and pruning methods of green house flower and vegetables.
26. Insect and disease control methods - vaporization - thermal fogging - Smoking
27. Post harvest management of green house crops - Harvest index
29. Cold storage - cool chain concept.
30. Containers for packing - dry packing - net packing
32. Grade standards - International - National - Organizations.
33. Procedures for starting export oriented Units
34. Commodity boards - Promotional schemes - Role of Corporates.

**PRACTICAL SCHEDULE**
1. Study of various modes of protected cultivation  
2. Components of poly house and structural designs and styles  
3. Estimating the cost of low cost green house of IARI model  
4. Designing covering material  
5. Designing of ventilation - passive and active  
6. Designing of cooling system  
7. Establishing evaporative cooling system  
8. Designing an irrigation system  
9. Estimation of light requirement for various purposes  
10. Working out the space use efficiency of beds on benches  
11. Study of fertilization methods and Fertilizer calculation  
12. Economics of green house cultivation of Rose  
13. Economics of green house cultivation of Gerbera and Carnation  
14. Economics of green house cultivation of Anthurium and Orchids  
15. Procedures for starting export oriented Units  
16. Grade standards and preservative solution for various cutflowers  

**17. Practical Examination**

**REFERENCE BOOKS**

**MEL 443 POST HARVEST TECHNOLOGY OF HORTICULTURAL CROP (2+1)**

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

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

**THEORY**

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

**Unit-II : Post harvest treatments and storage**

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

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

**Unit – V: Value added products and quality control**

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

THEORY LECTURE SCHEDULE
1. Importance and scope of post harvest technology of horticulture crops.
2. Post harvest losses,
3. Maturity indices
4. Pre and post harvest physiological changes during development, maturity and ripening of fruits.
5. Post harvest treatments - pre-cooling, washing,
7. Irradiation of fruits and vegetables
8. Fumigation.
9. Storage methods, controlled atmospheric storage –
10. Modified atmospheric storage
11. Sstorage disorders.
12. Handling of cut flowers
13. Cold chain maintenance
14. Methods to extend the shelf life of flowers.
15. Packaging methods of fruits and vegetables

17. Mid Semester Examination
18. Controlled and modified atmospheric packaging.
19. Vacuum and edible packaging.
20. Role of NHB, APEDA
21. plant Quarantine and other certifying agencies governing internal and foreign trade of harvested produce.
22. Importance and scope of vegetable preservation industry in India
24. Preservation with sugar and salt
25. Preservation with chemicals and bio-preservatives.
26. Sterilization – pasteurization –
27. Dehydration.
28. Principles of preservation by fermentation
29. Canning.
30. Value added products from spices
31. By-product utilization from processing industry.
32. Quality control standards – Role of BIS, AGMARK,
33. Codex Alimentarius
34. Fruits products order (FPO)

PRACTICAL SCHEDULE
1. Practice in Judging the maturity of horticultural produce
2. Use of polyethylene bags in prolonging shelf life of perishables.
3. Wax coating and packaging studies for fruit,
4. Wax coating and packaging in vegetables
5. Post harvest packaging in cut flowers.
6. Identification and study of working of equipments used in processing units.
7. Preparation of squash
8. Preparation of RTS and syrup.
9. Preparation of Jam
10. Preparation of Jelly and marmalade
11. Preparation of Sauce
12. Preparation of ketch-up
13. Preparation of pickles
14. Dehydration of Vegetables and Fruits
15. Visit to food processing units
16. Comparative study of ambient and refrigerated storage

17. Practical Examination

REFERENCE BOOK

MEL 444 MICROBIAL AND ENVIRONMENTAL TECHNOLOGY (1+1)

OBJECTIVES
The emphasis of the course will be on bioremediation of soil, bioenergy, biocomposting and microbial insecticides.

THEORY
Unit - I: Bioremediation
Bioremediation of soil polluted with pesticides, fertilizers – Heavy metal pollution – Biotransformation – Hydrocarbon pollution – Super bug – Hydrocarbon extraction - Biomining of metals, Keratin degradation and Rhizoremediation.

Unit- II: Microbial food from wastes

Unit-III: Bioenergy

Unit-IV: Microbial Insecticides
Microbial agents for the control of pests and diseases, Target pest and suitable microbial insecticides, Mode of action of Bacillus thuringiensis and Nuclear Polyhedro Viruses, Advantages and limitations of microbial insecticides, Compatibility of microbial and chemical pesticides, Mass production of microbial insecticides. Fermentation - Formulation- Carrier material – Quality control.

Unit-V: Biocomposting

PRACTICAL

THEORY SCHEDULE
1. Bioremediation of pesticides, fertilizers and heavy metals.
2. Biotransformation – Hydrocarbon pollution and Hydrocarbon extraction.
4. Substrates for Single cell protein – Agro industrial, Agricultural and Domestic wastes.
5. Microorganisms uses as Single cell protein – Yeasts, Algae, Bacteria and Fungi.
7. Bioethanol production.
9. Mid semester Examination
10. Microbial Insecticides – Target pests and Suitable insecticides, Mode of infection of BT and NPV.
11. Advantages and limitations of pesticides.
13. Formulation and application of pesticides.
15. Aerobic and anaerobic method of composting.
17. Selection of microbial consortia for composting – Quality standards.

PRACTICAL SCHEDULE
1. Physical and chemical characterization of compost waste materials.
2. Quantitative and Qualitative enumeration of microbes in waste materials.
5. Assessment of maturity of compost by physical and chemical methods.
6. Vermiculture of recycling solid wastes.
7. Alcohol production from sugarcane industrial wastes (Molasses).
8. Production of biogas from Agricultural wastes.
9. Production of biogas from alternate feed stocks.
16. Mass production of Bacillus thuringiensis.

17. Final practical examination

REFERENCE

MEL 445 SEED PRODUCTION OF HORTICULTURE CROPS (1+1)

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

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

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

Unit – III: Seed Production
   Principles and methods of seed production in self and cross pollinated crops – varieties and hybrids of Tomato, Brinjal, Chillies, Bhendi, Amaranthus, Gourds, Cabbage, Cauliflower, Radish, Carrot, Onion,
Unit - IV: Post Harvest Technology
Harvesting and post harvest technology – methods of harvesting – drying- principles of seed processing – dormancy – methods of seed treatment

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

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

THEORY LECTURE SCHEDULE
1. Seed structure and texture – Monocot – Dicot seeds and their importance
2. Characteristics of good quality stttes – seed multiplication system
3. Influence of agro climatic condition of seed production – selection of seed production area.
4. Varietal release – state and central variety releasing committee
5. Different classes of seeds
7. Seed production methods in varieties and hybrids of Tomato and Brinjal
8. Seed production methods in varieties and hybrids of Chillies and Bhendi
9. Seed production methods in varieties and hybrids of Amaranthus
10. Seed production methods in varieties and hybrids of Gourds
11. Seed production methods in varieties and hybrids of Cabbage and Cauliflower
12. Seed production methods in varieties and hybrids of Onion
13. Seed dormancy-Classification - treatment to overcome dormancy
14. Seed treatment
15. Seed certification – organizations involved in certification
16. Seed certification procedure

PRACTICAL SCHEDULE
1. Seed structure of monocot & Dicot seeds
2. Seed identification of improved varieties of hybrid of vegetable crops
3. State and central variety release
4. Visit to seed production plots
5. Supplementary pollination
6. Planting ratio and planting design for horticultural crops
7. Isolation and rogueing
8. Physiological and harvestable maturity – indices of maturity
9. Harvesting and seed extraction
10. Visit to seed processing unit
11. Seed certification
12. Visit to state seed certification agency
13. Seed storage of horticultural crops
14. Packaging materials
15. Godown sanitation
16. Practical Examination.

REFERENCE BOOK

MODULE VI
AGRI-BUSINESS PROCESS DEVELOPMENT
MEL 446 PROJECT FORMULATION, EVALUATION AND MONITORING (2+1)
OBJECTIVES

The objective of this course is to provide knowledge to the students on project selection, formulation, financial feasibility analysis, monitoring and evaluation techniques with special reference to agricultural sector.

THEORY

Unit I: Introduction to Project Management


Unit II: Organizational Project Management


Unit III: Project management Techniques


Unit – IV: Monitoring


Unit – V: Evaluation


PRACTICAL


THEORY LECTURE SCHEDULE

1. Introduction - Project Definition
2. Project Characteristics – Project Performance dimensions
4. Project Classification
5. Project Identification – Formulation.
6. Feasibility Study - Economic and Market Analysis - Environmental Impact Study
10. Detailed Project Report
11. Project Organization Design
13. Team Building – Communication
15. Project Management - Bar Chart - Milestone Chart
16. Networks - PERT - Network Diagram
17. Mid-Semester Examination
18. Computation of EST & LST - Network Revision
19. Time-Cost Relationship of an Activity
20. Project Crashing - Project Control.
22. Monitoring and progress reporting – monitoring techniques
23. Indicators for monitoring
24. Types of monitoring
25. Monitoring risk uncertainties
27. Comparison of appraisal, monitoring and evaluation
28. Types of Evaluation
29. Designing monitoring and Evaluation system
30. Salient aspects of evaluation
31. Quantitative and Qualitative approaches
32. Participatory monitoring and Evaluation
33. Social audit
34. Evaluation report

PRACTICAL SCHEDULE
1. Developing skills in identification of projects
2. Formulation of projects
3. Measuring of cost and benefit of projects
4. Appraisal of project using undiscounted and discounted techniques
5. Use of sensitivity analysis
6. Selection methods among mutually exclusive projects
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 Relationship of an Activity
14. Developing network techniques for project management
15. Use of management tools in project monitoring
16. Analyzing risk in projects

REFERENCE BOOKS
OBJECTIVES
The objective of this course is to provide knowledge to the students on efficient management strategies for food processing industries and policies related to food processing industries.

THEORY
Unit-I: Food Processing Industries an Overview
Food processing industries - definition - scope - management - organized - unorganized - indigenous - history of food processing industries in India - international scenario of food processing industries.

Unit-II: Classification Food Processing Industries
Classification food processing industries - agriculture - horticulture - medicinal - aromatics - plantation - animal husbandry and fisheries - dairy, fruits and vegetable processing - grain processing - meat and poultry processing - fisheries and - consumer foods including packaged foods, beverages and packaged drinking water.

Unit-III: Marketing and scope of the Processed foods
Raw material procurement, problems, marketing of the processed foods, distribution logistics, promotional tools, pricing techniques, branding, problems in marketing, failures and reasons, success stories of food industry – strategies to the followed – Government policies.

Unit-IV: Food Safety and Training

Unit-V: Policies Related to Food Processing Industries

THEORY SCHEDULE
1. Food Processing Industries - definition - scope - management organized - unorganized patented - packaged - aerated - alcoholic beverages - nutritive foods
2. Indigenous - patented - packaged - aerated - alcoholic beverages - nutritive foods
3. History of food processing industries in India
4. International scenario of food processing industries
5. Classification food processing industries - agriculture
6. Horticultural food processing industries
7. Medicinal - aromatics - plantation
8. Animal husbandry and fisheries
9. Dairy, fruits and vegetable processing
10. Grain processing
11. Meat and poultry processing - fisheries
12. Raw material procurement, problems
13. Marketing of the processed foods
14. Distribution logistics, Promotional tools
15. Pricing techniques, Branding
16. Consumer foods including packaged foods
17. Mid Semester Examination
18. MOFPI - policies
19. National and international policies
20. Food processing institutes in India
21. Institutions - IICPT
22. Council of scientific and industrial research
23. FAQ- SPS
24. ISO
25. FPO, codex alimentaries
26. HACCP
27. Value addition
28. Minimization of wastage -
29. National and international subsidies
30. Management of food safety and training
31. Total quality management
32. Food processing machineries
33. Organic food product manufacturing and management
34. Certification and marketing

PRACTICAL
Programmes and policies of MOFPI – IICPT - cereal processing, pulses processing, oil seed processing, live stock processing, sugar and horticulture processing, by product processing industries. Setting up of new processing plant – modernization / expansion / up gradation – integrated cold chain - Food parks - National Institute of Food Technology Entrepreneurship and Management - National Meet and Poultry Processing Board - Indian Grape Processing Board, Pune. Visit to herbaceuticals and various preliminary processing industries. Study on cattle feed manufacturing, honey processing, bakery, alcohol, non traditional industries. Organic certification and export procedures. Market potential for food processing industries - food safety rules and regulations - Value addition - Minimization of wastage - AEZ in India – Floriculture -

PRACTICAL SCHEDULE
1. Management of cereal processing industries, pulses
2. Setting up of new processing plant
3. Modernization / expansion / up gradation
4. Integrated cold chain - Food parks
5. National Institute of Food Technology Entrepreneurship and Management
6. National Meet and Poultry Processing Board
7. Indian Grape Processing Board, Pune.
8. Visit to herbaceuticals processing industries / Visit to export commodities processing industries
9. Management of cattle feed manufacturing industries
10. Role of non traditional industries
11. HACCP - Food processing training institutes
12. Case studies in food processing industries
13. Organic certification& export procedures
14. Market survey of food processing industries
15. Food safety measures followed in food processing firms
16. Food safety regulations - Value addition - Minimization of wastage
17. AEZ in India – Floriculture

REFERENCE BOOKS

MEL 448 CYBER EXTENSION (2+1)

OBJECTIVES
- To learn the basic concepts and definitions of cyber extension, its scope and importance.
- To learn the advanced developments in the field of communication and its applicability in agricultural extension.
- To have an access to the recent developments in the area of agricultural communication like E-mail, Internet, E-journals, e-choupal, digital library etc.

THEORY
Unit I: Introduction to cyber extension
Cyber extension - definition - importance and scope - role of cyber extension in agricultural development - advantages and limitations of cyber extension

Unit II: internet techniques:
World Wide Web (WWW) - Internet and search engines types and uses web search strategies - major subject directories - developing websites - E-mail - Telnet - File Transfer Protocol (FTP).

Unit III: success stories on information projects:
Agriportal - Informatics network - e choupal - warana wired village project - ikisan project - MSSRF information village project - Information Kiosks.
Unit IV: communication shops and websites
Communication shops - digital library - information technology centers – Database - E-journals - Websites for agricultural development

Unit V: information marketing:
Information marketing - Success stories - Online consultancy - Agriculture Knowledge networking system - cyber laws.

PRACTICALS
Use of internet – E-mail- search engines – Telnet – multimedia module development – data bases – e-journals – video conferencing – on line services - creation of websites - networking - visit to cyber extension centers - study of information marketing.

THEORY LECTURE SCHEDULE
1. Cyber extension-Introduction - concepts and definitions
2. Scope and importance of cyber extension
3. Role of cyber extension in agricultural development
4. Applicability of cyber extension in transfer of technology
5. Advantages and limitations of cyber extension
6. World Wide Web (WWW) – meaning and importance
7. Internet – meaning – Internet in agricultural extension
8. Search engines – types and uses
9. Search tools – various kinds and uses
10. Subject directories – kinds and type
11. Websites - various kinds of websites on agriculture and transfer of technology
12. E-mail-meaning, principles and applicability
13. Telnet-meaning and descriptions
14. File transfer protocols-meaning and its application
15. Strategies followed on web search and down loading
16. Agriportal – meaning and application
17. Mid semester Examination
18. Information network-concepts, principles and use
19. E-choupal-meaning principles and application
20. Warana wired village project-objectives and impact
21. i Kisan project-objectives, scope and importance
22. MSSRF information village project-objectives and impact
23. Information kiosk-definition and application
24. Communication shops-meaning, principles and applicability
25. Digital library-meaning principles and functions
26. Data bases-bibliographic and non-bibliographic data bases and advantages
27. E-journals – meaning and availability of various E-journals and procedural details
28. Information marketing-meaning, principle and application
29. Success stories in information marketing
30. On-line consultancy services – meaning - principle and availability in various fields
31. Agriculture knowledge networking systems – applicability, advantages and limitations
32. Cyber laws-meaning
33. Various kinds of laws on cyber extension
34. Applications of cyber laws - practical difficulties

PRACTICAL SCHEDULE
1. Practice in searching and downloading of information through internet
2. Access to various kinds of available websites on agriculture and rural development
3. Creation of website on agricultural communication
4. Brain storming session on applicability of internets in transfer of technology
5. Visit to MSSRF Village Resource Centre (VRC)
6. Access to e-mail-exchange of messages,
7. Access to multimedia
8. Creation of multimedia modules
9. Access to data bases
10. Access to e-journals, availability in Internet
11. Visit to digital library
12. Access to various virtual extension services
13. Techniques of marketing the agricultural products through telnet
14. Access to video conferencing through telnet
15. Access to various on-line consultancy services
16. Access to global agriculture knowledge network
17. Access to various CD-ROMS on agriculture

REFERENCES

MEL 449 GOVERNMENT POLICIES AND PROGRAMMES RELATED TO AGRICULTURE (1+1)

OBJECTIVES
To create the awareness on the objectives of the Government's price policy for agricultural produce and it aims at ensuring remunerative prices to the growers for their produce with a view to encourage higher investment and production.

THEORY
Unit I: Agricultural Crop Development Programmes

Unit II: Agricultural Technology and Environmental Programmes

Unit III: Horticultural and Area Development Programmes
National Horticulture mission – Agricultural labour welfare board schemes – Agricultural Innovative Programme – Hill Area Development Programme (HADP) – Western Ghat Development Programme (WGDP) – Holistic village Adoption scheme – Dry land Development programmes – SHG’s and NGO’s in Agricultural Development

Unit IV: Agricultural Policy

Unit V: Specific Agricultural Policy

PRACTICAL
THEORY SCHEDULE
1. Programmes – Definition, Concept - History of Agricultural Development Programmes
2. Integrated Cereals Development Programme (ICDP) - Development of Pulses – Oil seed production programme – Intensive Cotton Development Programme (ICDP)
3. Procurement and Distribution of paddy and millet seeds – Seed processing units - Vermi composting of Agricultural waste and organic farming.
4. Crop Insurance scheme - Agricultural watershed – IAMWARM - mechanization scheme
5. Reclamation of Alkali soil – Drip and Sprinkler Irrigation scheme - Integrated scheme for oil seeds, pulses, oil palm and maize (ISOPOM)
6. Demonstration of System of Rice Intensification (SRI) techniques scheme, - National Horticulture mission
7. Agricultural labour welfare board schemes - Agricultural Innovative Programme – Hill Area Development Programme (HADP) – Western Glat Development Programme (WGDP)
9. Mid-Semester Exam
12. Agricultural price policy - Agricultural credit and marketing policy
13. Agricultural Research and Education Policy - Agricultural Cooperative and Trade Policy
15. Agricultural Export-Import Policy
16. Dairy, Poultry and Fishery Policy
17. Processing and Post Harvest Policy

PRACTICAL SCHEDULE
1. Pros and Cons Agricultural Development Programmes after 1947
2. Food security and Poverty Reduction schemes
3. Organic Farming and Environmental Management
4. Dry land Development Programmes and Hill area Development Programmes
5. National Horticulture Mission
6. Crop insurance scheme
7. (SRI Scheme) Visit to SRI field
8. (Agricultural Price Policy) Visit to Regulated Market
9. (Agricultural Credit & Marketing Policy) Visit to Cooperative marketing society
10. (Agricultural Research & Education Policy) Visit to NGO
11. Agricultural Import and Export Policy (Visit to EXIM Bank)
12. Food security policy
13. Visit to BDO office to review the policies
14. Visit to Agri office
15. Visit to ADA office
16. Recent Government policy
17. Recent Government policy

REFERENCES
1. www.agricultural government policies.com

MEL 450 VIDEO PRODUCTION (1+1)

OBJECTIVES
- To learn about video production in agriculture
- To know about the techniques of video recording and editing
- To gain experience on photography and video production

THEORY
Unit I: SCOPE AND IMPORTANCE OF VIDEO PROGRAMME:
Video Production - introduction - video as a tool in communication. Video production in agriculture - Significance of Video Production in transfer of technology - Scope and importance in agricultural extension. Limitations of video in agricultural communication.
Unit II: PHOTOGRAPHY:
Photography techniques - types of video cameras - various parts of video camera - types of CDs - Digital video

Unit III: PROCEDURE OF VIDEO PROGRAMME:
Selection of messages - Preparation of script for video programmes - various formats. Straight talks, folk songs, debate, panel etc. Camera angles.

Unit IV: TECHNIQUES OF RECORDING AND EDITING:
Techniques of video recording, selection of location, selection of artists – Editing – Different types of lights and lighting requirements for video production.

Unit V: VIDEO PRODUCTION FACILITIES AND RESEARCH STUDIES
Success stories - video production facilities - video libraries, participatory video - Recent research studies in video production technology for technology transfer in agriculture.

PRACTICALS
Photography - practising the art of photography and developing skills - Selection of theme for video production - Identification of location - Selection of artists - Script writing - Selection and finalizing visuals - Video production and Adding titles - Production of Video Programme in Agriculture.

THEORY LECTURE SCHEDULE
1. Video production-introduction and importance, Video production in agriculture
2. Significance of video production in transfer of technology
3. Scope and importance of video communication in agricultural extension, Limitations of video in agricultural communication
4. Types of cameras and films
5. Photography techniques
6. Qualities of a good photograph, tips for taking good photographs - mistakes and their corrections
7. Types and Parts of the video camera and their functions
8. Compact Discs, Digital video techniques,
9. Mid semester Examination
10. Selection of messages for video production, Preparation of script for video programmes.
11. Format of video programme-straight talks, folk songs, Debates and panel discussion
12. Different camera angles, Techniques of Video Recording, Selection of location, selection of artists
13. Editing of recorded programme
14. Different types of Lights, Lighting requirements for Video Production
15. Success stories
16. Video production facilities, Video libraries, Participatory Video
17. Recent research studies in video production technology for transfer of technology in Agriculture

PRACTICAL SCHEDULE
1. Practising the art of photography
2. Developing skills in photography
3. Identification of mistakes in photography and their rectification
4. Selection of theme for video production
5. Identification of location
6. Selection of artists
7. Script writing for video programme
8. Script writing for video programme
9. Selection and finalising the visuals
10. Visit to digital video center
11. Video production – shooting
12. Video production – shooting
13. Adding titles
14. Recording
15. Editing
16. Production of video programme in agriculture
17. Production of video programme in agriculture

REFERENCES

MODULE VII

MEL 451 CLIMATE CHANGE AND BIO DIVERSITY MANAGEMENT (2+1)

OBJECTIVE
Basic understanding of the impact of climate change on the farm front and strategies to manage agro-bio diversity thereof

THEORY
Unit I: Climate change
Climate change-causes and impact of climatic changes on agriculture-mitigation strategies-climate resilient farming- biosecurity in the context of climate change-disaster mitigation.

Unit II: Dry land farming and drought

Unit-III: Importance of forest and its classification
Forest definition- Role of forests-Status of forests- global forest scenario- Status and classification of Indian forests - National forest policy— Role of forests- Forest management – concepts – forest menstruation - felling and conservation.

Unit-IV:

Unit-V: Biodiversity and its conservation
Introduction – Definition : genetic, species and ecosystem diversity - Biogeographical classification of India - Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and - option values - Biodiversity at global, National and local levels- India as a mega-diversity nation - Hot-spots of biodiversity- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts- Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

PRACTICAL
Study of drought management technologies in dryland agriculture – Preparation of contingency crop plan for aberrant rainfall situations – Visit to watershed area to study the impact of various soil and moisture conservation methods. Nursery layout – Nursery technologies of important species – Clonal propagation – Volume estimation Felling and transportation -Visit to forest plantation and forest depot - Hot-spots of biodiversity-Conservation of biodiversity.

THEORY LECTURE SCHEDULE
1. Climate change- causes
2. Impact of climatic changes on agriculture-
3. Mitigation strategies
4. Climate resilient farming
5. Biosecurity in the context of climate change-disaster mitigation.
6. Dryland farming and rainfed farming - Significance of dry farming in India
7. Major crops of Dry land in India and Tamil Nadu - Characteristics – constraints
8. Drought – Definition - Types and effects of Drought on crop production
9. Drought management - Contingent crop planning
10. Mid season correction – Mulching – anti-transpirants
11. Soil moisture conservation techniques and approaches
12. Water harvesting, storage and recycling
13. Integrated dry land technologies – Mechanization
14. Watershed management
15. Forests – definition – status of Forests, Global, National and state
17. Status and classification of Indian forests - National forest policy

18. Mid-Term Examinations
20. Forest menstruation - felling and conservation.
21. Social Forestry- concept - Definition- Classification.
22. Objectives Joint Forest Management (JFM)
23. Agroforestry- Definition- concepts.
28. Value of biodiversity
29. Consumptive use, productive use, social, ethical, aesthetic and - option values –
30. Biodiversity at global, National and local levels- India as a mega-diversity nation –
31. Hot-spots of biodiversity-
32. Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts-
33. Conservation of biodiversity :  
34. In-situ and Ex-situ conservation of biodiversity.

PRACTICAL SCHEDULE
1. Climate change- mitigation strategies
2. Disaster mitigation
3. Mapping of Arid and semi-arid region of World and India
4. Rainfall analysis and crop planning
5. Study of dryland farming system
6. Preparation of cropping scheme for different dry farming situations
7. Demonstration of mulching and seed coating
8. Demonstration of spraying of antitranspirants and growth retardants
9. Acquiring skills in landscaping methods for in-situ moisture conservation
10. Drought management technologies in dryland agriculture - Preparation of contingency crop plan for aberrant rainfall situations
11. Identification and description of seeds and seedlings of important silviculture tree species.
12. Nursery methods for important silviculture tree species – Mother bed – raised bed and sunken bed.
13. Production of seedlings for woodlots – Avenue plantation and calculation of timber volume – using formulation
14. Working out economics of important silviculture tree species
15. Visit to forest plantation and forest timber depot.
16. Biodiversity conservation
17. Final Practical Examination

REFERENCES
2. Climate change and bio diversity. 2008. Institute of chartered financial analyst of India.

MEL 452 AGRICULTURAL PROJECT MANAGEMENT (2+0)

OBJECTIVES
The objective of this course is to provide knowledge to the students on project selection, formulation, financial feasibility analysis, monitoring and evaluation techniques with special reference to agricultural sector.

THEORY
Unit I: Introduction to Project Management
Project – definition - characteristics - project cycle - classification, identification – formulation. feasibility study - economic and market analysis - environmental impact study - financial analysis - risk and uncertainty - project appraisal - detailed project report.

Unit II: Organizational Project Management
Unit III: Project Management Techniques

Unit – IV: Monitoring
Monitoring – introduction – basic elements – importance - monitoring and progress reporting - monitoring techniques - indicators for monitoring - Types of monitoring - monitoring risk uncertainties

Unit – V: Evaluation

THEORY LECTURE SCHEDULE
1. Introduction - project definition
2. Project characteristics – project performance dimensions
3. Project life cycle – conceptualization – planning – execution phases
4. Project classification
5. Project Identification – formulation.
6. Feasibility study - economic and market analysis - environmental impact study
8. Risk and Uncertainty – economic benefit – management aspects
10. Detailed project report
11. Project organization design
12. Human resource management - role management
13. Team building – communication
15. Project management - bar chart - milestone chart
16. Networks - PERT - Network Diagram
17 Mid-Semester Examination
18. Computation of EST & LST - network revision
19. Time-Cost Relationship of an activity
20. Project crashing - project control.
21. Monitoring – introduction – basic elements - importance
22. Monitoring and progress reporting – monitoring techniques
23. Indicators for monitoring
24. Types of monitoring
25. Monitoring risk uncertainties
27. Comparison of appraisal, monitoring and evaluation
28. Types of evaluation
29. Designing monitoring and evaluation system
30. Salient aspects of evaluation
31. Quantitative and qualitative approaches
32. Participatory monitoring and Evaluation
33. Social audit
34. Evaluation report

REFERENCE BOOKS
OBJECTIVE
To Study the novel approaches and recent developments in pest and disease management.

THEORY
Unit I: Botanicals in Insect Pest Management

Unit II: Novel actions and Improved Formulations of insecticides

Unit III: Biotechnology in insect pest management
Genetic improvement of natural enemies – mass production and in vitro production of entomopathogens in cell lines – genetic engineering with baculoviruses - transgenic plants with BT toxin genes – assessing risks and benefits of transgenic crops

Unit IV – Biotechnological approaches for plant disease management
Biotechnological tools – Tissue culture – Protoplast fusion – Meristem tip culture –Gene cloning – Genetic engineering etc.- Transgenic plants in crop protection – Molecular and Biochemical diagnostics – Improving antagonistic potential of biological agents through genetic engineering

Unit – V – Integrated Disease Management
Third generation fungicides – Plant products in disease management – Role of inorganic nutrients and resistance inducing chemicals in disease management - Conventional disease management strategies –Perspectives of using natural products in plant disease management

PRACTICAL

Tissue culture techniques - Diagnostic tests for identification of diseases - Genetic engineering .Formulation of biological agents - Preparation of natural / animal products formulations - Testing antimicrobial properties of natural products - Biochemical changes as induced by natural products / chemicals - Practical Examinations

THEORY LECTURE SCHEDULE
1. Insecticides of plant origin, Current Status of botanicals in pest management.
2. Improved Extraction methods of insecticides of plant origin against Traditional methods - Arkam, Cold infusion, Asavam, Ksharam, Kashayam, Phaandam.
3. Characterization of secondary plant compounds.
8. Transgenic plants with BT toxin genes – assessing risks and benefits of transgenic crops
9. Mid semester examination.
10. Biotechnological tools
11. Tissue culture, Protoplast fusion & Meristem tip culture
12. Gene cloning – Genetic engineering
13. Transgenic plants in crop protection, Molecular and Biochemical diagnostics, Improving antagonistic potential of biological agents through genetic engineering
14. Third generation fungicides
15. Plant products and animal products in disease management
16. Role of inorganic nutrients and resistance inducing chemicals in disease management
17. Conventional disease management strategies and Perspectives of using natural products in plant disease management
PRACTICAL SCHEDULE
1. Identification of plants of insecticidal value.
2. Sample collection procedures, Preparation of plants for extraction.
3. Practicing shoxlet method of extraction, solvent method of extraction at room temperature, practicing water extraction method.
4. Acquainting traditional methods of extraction.
7. Identification of improved formulations of insecticides.
8. Cell line culture of NPV and impact of bioinoculants on insect incidence
9. Tissue culture techniques
10. Diagnostic tests for identification of diseases
11. Genetic engineering
12. Formulation of biological agents
13. Preparation of natural / animal products formulations
14. Testing antimicrobial properties of natural products
15. Biochemical changes as induced by natural products
16. Biochemical changes as induced by chemicals
17. Practical examination

REFERENCE BOOKS

MEL 454 GERMLASM CONSERVATION (1 + 1)

OBJECTIVES
- To understand the origin and diversity of important crops and the importance of the conservation
- To understand on patent systems and international agreements on Agriculture
- To understand the classification of varieties using descriptors and utilizing germplasm in breeding programmes.

THEORY
Unit – 1 : Origin of species, and diversity conservation
Plant Genetic Resources (PGR) and their importance - Agrobiodiversity and Centres of origin - Primary and secondary centres – PGR base for reconstruction and reconstellation of new cultivars.

Unit – 2 : Collection of Germplasm and Conservation
Collection- Patterns of variation and genetic makeup - sample size and collecting efficiency - Collection records: field and laboratory - Entering the collected material into the gene bank - Handling the site data - Conservation: Relation of in situ conservation to nature conservation and agricultural production

Unit – 3 : Characterization and Documentation of Germplasm
Documentation: initial data verification and reorganization - passport data - tasks of the documentation - requirements for documentation - Characterization: taxonomic - using plant descriptors - biochemical: using isozymes and DNA markers

Unit – 4 : Evaluation of Germplasm and Crop Genetic Network
Evaluation: primary and secondary evaluations - National and Regional PGR centres - Intellectual Property Rights (IPR) and PGR - Plant Breeders rights – Farmers rights – PGR in strengthening Plant Breeding research system - Central data bases and their features - The core collection concept - PGR management - conventional and recent approaches - molecular markers in germplasm management - tracing the pedigree - identifying the duplicates - Utilization - types of collection

Unit – 5 : Patent Systems and Regulatory Bodies
PGR exchange - national and international formalities - Plant quarantine check – Implications of World Trade Organisations (WTO), General Agreement on Trade and Tariff (GATT), Trade Related
Intellectual Property Rights (TRIPs), Plant Variety Protection (PVP) and Convention on Biological Diversity (CBD) on PGR

PRACTICAL
Methodologies for germplasm conservation - Exploration and collection: understanding the distribution, ecology, botany and genetic makeup of each crop species - Route map - Collection: sample size and collecting efficiency - Collection records: field and laboratory - Entering the collected material into the gene bank - Handling the site data - Conservation: ex situ conservation (long term and medium term repositories) - In situ conservation of germplasm: various approaches - Documentation: initial data verification and reorganization - Passport data - - requirements for documentation - data processing and information supply - Characterization: taxonomic - using plant descriptors - biochemical: using isozymes and DNA markers - Evaluation: primary and secondary evaluations - Crop Genetic Resources Network: International and National - Role of International Agricultural Research Centres (IARCs) in PGR conservation - National and Regional PGR centres visit - Intellectual Property Rights (IPR) and PGR - Plant Breeders - rights - Farmers rights - PGR in strengthening Plant Breeding research system - Central data bases and their features - The core collection concept - PGR management - conventional and recent approaches - molecular markers in germplasm management - tracing the pedigree - identifying the duplicates - Utilization - types of collection - PGR exchange - national and international formalities - Plant quarantine check.

LECTURE SCHEDULE
1. Plant Genetic Resources (PGR) and their importance- Agrobiodiversity and Centres of origin
2. PGR: base for reconstruction and re-constellation of new cultivars
3. Collection: Patterns of variation and genetic makeup
4. Sample size and collecting efficiency.
5. Collection records: field and laboratory
6. Entering the collected material into the gene bank, Handling the site data.
7. Mid Semester Examination
8. Documentation: initial data verification and reorganization
9. Passport data - tasks of the documentation - requirements for documentation
10. Biochemical: using isozymes and DNA markers
11. Evaluation: primary and secondary evaluations
12. National and Regional PGR centres - Intellectual Property Rights (IPR)
13. PGR - Plant Breeders rights - Farmers rights- PGR in strengthening Plant Breeding research system - Central data bases and their features
14. The core collection concept - PGR management - conventional and recent approaches
15. Molecular markers in germplasm management - tracing the pedigree - identifying the duplicates
16. Utilization - types of collection - PGR exchange - national and international formalities - Plant quarantine check
17. Implications of World Trade Organizations (WTO), General Agreement on Trade and Tariff (GATT), Trade Related Intellectual Property Rights (TRIPs) - Plant Variety Protection (PVP) and Convention on Biological Diversity (CBD) on PGR

PRACTICAL SCHEDULE
1. Methodologies for germplasm conservation
2. Exploration and collection: understanding the distribution, ecology, botany and genetic makeup of each crop species
3. Collection: sample size and collecting efficiency interference of new cultivars - Collection records: field and laboratory - Entering the collected material into the gene bank
4. Handling the site data
5. Conservation: ex situ conservation (long term and medium term repositories)
6. In situ conservation of germplasm: various approaches
7. Documentation: initial data verification and reorganization - passport data - requirements for documentation
8. Data processing and information supply
9. Characterization: taxonomic - using plant descriptors
10. Biochemical: using isozymes and DNA markers
11. Evaluation: primary and secondary evaluations
12. Crop Genetic Resources Network: International and National - Role of International Agricultural Research Centres (IARCs) in PGR conservation
13. National and Regional PGR centres
14. Intellectual Property Rights (IPR) and PGR - Plant Breeders rights - Farmers rights - PGR in strengthening Plant Breeding research system
15. Central data bases and their features - The core collection concept - PGR management - conventional and recent approaches
16. Molecular markers in germplasm management - tracing the pedigree - identifying the duplicates
17. Utilization - types of collection - PGR exchange - national and international formalities - Plant quarantine check

REFERENCES

MEL 455 MANAGEMENT OF COMMERCIAL ORCHARDS (1+1)

OBJECTIVES
This course deals with the planning, establishment, maintenance, harvest, post-harvest packaging , pricing , cost economics and budgeting of commercial orchards.

THEORY
Unit I: Planning and Execution of an Orchard

Unit II: Crop Management Practices
Irrigation management- Canopy management practices- Training, & pruning- Floor management - Inter-cultivation practices - green manures, vegetable and flower crops – Weed management- Pest and Disease management – Crop regulation practices- Senile Orchard management – Rejuvenation pruning – Top working.

Unit III: Orchard tools& implements and post harvest Management.
Orchard Tools and Implement-Requirement, Usage, Maintenance – Machinery for major operations like Spraying, Harvesting, Pruning etc.,-Maturity indices – Harvesting –Post harvest management practices- Packing- Storage-Transportation- Cold chain management.

Unit IV Farm planning
Importance – characteristics of good farm plan – farm planning procedure – Budgeting: definition and types – complete budgeting – partial budgeting – enterprise budgeting – cash flow budgeting – limitations of budgeting

Unit V Farm Records
Farm records and accounts – analysis of farm records and accounts – balance sheet – income statement – cash flow statement

THEORY LECTURE SCHEDULE
1. Introduction –Site Analysis and selection, Orchard Planning, Soil and Water analysis and Land preparation- Orchard lay Out
2. Season of planting - Selection of Nursery stock
3. Planting Systems - Soil hybridization Techniques - Soil Sterilization
4. Planting Techniques- Staking- Irrigation management
5. Crop management practices- Training, & pruning
6. Floor management - Inter-cultivation practices - green manures, vegetable and flower crops – Weed management
7. Pest and Disease Management.
8. Crop regulation practices- Senile Orchard management – Rejuvenation pruning – Top working
9. Orchard Tools and Implement-Requirement, Usage, Maintenance – Machinery for major operations like Spraying, Harvesting, Pruning etc.,
10. Mid-Semester Maturity indices – Harvesting – Post harvest management practices- Packing- Storage- Transportation- Cold chain management.
11. Maturity indices – Harvesting – Post harvest management practices- Packing- Storage- Transportation- Cold chain management.
12. Importance – characteristics of good farm plan – farm planning procedure
13. Budgeting: definition and types
15. Farm records and accounts – analysis of farm records and accounts
16. Balance sheet – income statement
17. Cash flow statement

PRACTICALS

PRACTICAL SCHEDULE
1. Site Analysis and selection – Orchard Planning-
2. Land preparation - Pit making –
3. Planting medium preparation - Soil Hybridization-
4. Selection of Nursery stock –
5. Planting Systems - Orchard lay out – Soil Sterilization –
6. Planting Techniques- Staking-
7. Training, & pruning- Training, & pruning –
8. Orchard Tools and Implement-Requirement, Usage, Maintenance.
9. Visit To commercial orchards
10. Problems on factor-product relationship-
11. Computation of cost concepts
12. Determination of least-cost combination
13. Determination of optimum product combination
14. Cost of cultivation and cost of production of agricultural crops
15. Cost of cultivation and cost of production of horticultural crops
16. Cost of cultivation and cost of production of livestock products
17. Preparation of complete and partial budgets - preparation of farm plan – graphical
18. Solution to linear programming problem.

MEL 456 SOIL, WATER, PLANT- HEALTH AND MANAGEMENT (1 + 1)

OBJECTIVES
The main objectives 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 and role of microbes on soil , water and plant health management.

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

Unit-IV: Microorganisms on soil management
Role of microbes as bio inoculants in Agriculture, Types of Biofertilizers and mass production, Inoculant for bio composting, Method of biocompost production, biogas production, Mass production of Cyanobacteria.

Unit- V: Plant microbe interaction

PRACTICALS

Isolation of symbiotic N\textsubscript{2} fixing microorganisms, Isolation of phosphate solubilizing microorganisms, Mass production and quality control of biofertilizers, Assessment of VAM fungi colonization in crop plants, Mass production of VAM fungi, Aerobic method of composting of organic wastes, Production of biogas from agricultural wastes and Mass production of Cyanobacteria.

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
5. Management of chemical constraints
6. Irrigation water characteristics and problem arising due to poor quality water
7. Water quality guidelines and their management
8. Mid Semester Examination
9. Diagnosis key for identifying nutrient deficiency and toxicity
10. Plant sampling for diagnosing nutrient disorders for field crops and horticultural crops
11. and Interpretation and reporting of results of plant analysis
12. Role of microbes as bioinoculants in Agriculture, Types of Biofertilizers and mass production.
17. Plant growth regulators and phytotoxin production by microorganisms.
18. Use of soil microorganisms for pest and disease control – Biopesticides and mass production.

PRACTICAL SCHEDULE
1. Key to identify physical constraints ( Soil aggregate analysis, Shear strength)
2. Key to indentify chemical constraints ( pH, EC, ESP, SAR, CaCO\textsubscript{3})
3. Techniques for reclamtion of acid soil ( Lime requirement)
4. Techniques for reclamtion of saline soil ( Lime requirement)
5. Techniques for reclamtion of sodic soil (Gypsum requirement)
6. Interpretation of irrigation water quality ( pH, EC, SAR, RSC, Potential salinity and potential alkalinity hazard)
7. Assessing nutrient efficiency for enhanced productivity in problem soils
8. Diagnosis of plant nutrient deficiency and toxicity symptoms
9. Quick test / Tissue test for plant nutrient status and prescription
10. Isolation of symbiotic N\textsubscript{2} fixing microorganisms and phosphate solubilizing microorganisms.
12. Assessment of VAM fungi colonization in crop plants.
15. Production of biogas from agricultural wastes.
17. Practical Examination

REFERENCES
6. USDA Handbook No. 60. 1954. *Diagnosis and improvement of Saline and Alkali Soils*. Oxford & IBH.