

**UNIVERSITY OF MYSORE**

**Academic Regulations for Specialized Programme**

**in**

**B. Sc. (Hons.) Advanced Agriculture**



**OFFERED AT**

**FORTUNA ADVANCED INSTITUTE OF RESEARCH AND  
STUDIES (FAIR)**

**Venue: # 2707 / 3, Devi Nagaraj, 1<sup>st</sup> Main Road, Deveerammanahalli  
Nanjangud, Mysore – 571301**

**2020-21**

# ACADEMIC INFORMATION AND REGULATIONS GOVERNING UNDER-GRADUATE DEGREE PROGRAMME

## B. Sc. (Hons.) Advanced Agriculture

### SEMESTER SYSTEM

**1.0 TITLE:** The Academic Information and Regulations shall be called "University of Mysore, Mysore, Academic Information and Regulations Governing Under-graduate Degree Programmes under Semester System." These shall come into effect from the Academic year 2020-21.

### 2.0 DEFINITIONS

**2.1 Academic Year:** An academic year is the period during which a cycle of study is completed. It shall consist of two semesters.

### 2.2 Semester

**2.2.1 Semester Duration:** Each semester shall consist of 115 working days including the examination days (95 full working days as instructional days and 20 full working days for practical exam and final theory external examination days).

**2.3 Curriculum:** A series of courses designed to provide learning opportunities to meet the requirements for awarding a degree.

**2.4 Course:** A Course is a unit of instruction or segment of subject matter as specified in course calendar to be covered in a semester. It has a specified number, title and credits.

**2.5 Credit Hours (Course Credits):** A measure of quantity of work done in a course. One credit represents one hour of lecture or two hours of laboratory or field work per week through a semester.

**2.6 Course Load per Semester:** Normally, a student shall register for a minimum of 18 credits and a maximum of 26 credits. However, the Minimum / Maximum course load may be exempted by the concerned Dean when the student has only a few courses to complete. In addition, the student shall be permitted to register a maximum of extra 13 credits as supplementary course credits. However, the total credits including supplementary course credits shall not exceed a maximum of 39 credits.

The supplementary credits shall be registered along with the regular courses at the time of registration. The students are permitted to add supplementary courses till the end of 6 weeks from the start of the semester.

**2.6 (a)** Post final year UG students may register the courses along with I, II, III or IV year students or in combination with any of these batches, however, the total number of credit hours should not exceed 26 in a semester.

**2.7 Grade Point of a Course:** A measure of quality of work done in a course to meet the requirement in a semester. It is computed by dividing the percentage of marks obtained in a course by ten. It shall be expressed on a 10 point scale up to second decimal place.



**2.8 Course Credit Point:** A course credit point is a product of course credit and grade point secured by a student in a course which shall be expressed up to second decimal place.

**2.9 Grade Point Average (GPA):** It is a measure of quality of work done in a semester. It is a quotient of the total course credit points secured by a student in various courses registered divided by the total course credits during that semester. It shall be expressed up to the second decimal place.

**2.10 Cumulative Grade Point Average (CGPA):** It is the cumulative performance of a student in all the courses taken during a period covering all the proceeding semesters. CGPA is computed by dividing the total course credit points by the total number of credits completed up to the end of a specified semester. It shall be expressed up to the second decimal place.

**2.11 Overall Grade Point Average (OGPA):** It is a measure of overall performance of a student on completion of the degree programme. It is computed by dividing the total number of course credit points earned by a student over the semesters by the total number of credit hours rounded off to the second decimal place.

**2.12** To qualify for the degree, the students shall complete all the prescribed courses with an Overall Grade Point Average (OGPA) of not less than 6.00 out of 10.00.

### 3.0 UNDERGRADUATE DEGREE PROGRAMME

Degree Programme	Duration	Place
B. Sc. (Hons.) Advanced Agriculture	4 Years / Semesters	Nanjangud, Mysore District

#### 3.1 Medium of Instruction

The medium of instruction in the University of Mysore, Mysore shall be English.

B. Sc. (Hons.) Advanced Agriculture degree Programme will be offered at Nanjangud, Mysore District only.

All the examinations including the supplementary examinations shall be in the same medium of instruction in which the student had taken the course.

#### 3.2 Eligibility for Admission:

**3.2.1 Candidates to be eligible for admission to the undergraduate programme in the Institute shall satisfy the following requirements:**

A pass in two years PUC examination of different States of India or an equivalent examination with the combination/s as given below:

B. Sc. (Hons.) Advanced Agriculture - PCMB, PCM, PCB combination or Inter (Agri.).



Remedial courses in Mathematics and /or Biology need to be completed during the course of the study, if Mathematics and / or Biology is / are not taken in the qualifying examination. There is a provision for admitting Non-resident Indians (NRIs) / Children of NRIs under the special quota irrespective of the place where they had their previous education, details of which can be obtained from the Office of the Dean, Fortuna Advanced Institute of Research and Studies, Nanjangud, Mysore District.

### **3.3 Mode of Admission**

Admission for the seats shall be made strictly according to the merit, which shall be determined as under..

The admission of candidates is subject to the following conditions;

- a) Seats being vacant,
- b) Verification of original marks card and other details furnished in the application,
- c) Payment of prescribed fee to the Institute on or before the notified date,
- d) Production of Medical Fitness Certificate at the time of Registration.

### **4.0 REGISTRATION**

#### **4.1 Registration for the First Semester After Selection**

- 4.1.1 Candidates on receipt of admission notice from the Institute, shall pay the prescribed fee on or before the last day specified in the admission notice and shall attend the classes from the first day of the semester / from the day of admission.
- 4.1.2 Admission is incomplete without registration of required courses relevant to the degree programme. Hence, all students admitted to different degree programmes should go through the process of Registration in Person on the notified date. After the notified date, the students are allowed to register upto a maximum of six working days with prescribed penal fee. After the sixth working day, the Dean of the Institute may permit the students to register within another six working days on genuine grounds and on payment of prescribed late fee notified by the University from time to time.
- 4.1.3 Orientation programme shall be conducted by the Dean for the benefit of newly admitted students.
- 4.1.4 Candidates admitted to Under-graduate programme shall not be permitted to discontinue the semester. The admission of such candidates shall stand cancelled automatically.
- 4.1.5 Student who registers for first semester should complete at least one gradial course for which grade is done on 10 point scale earning a grade point of at least 5.00 out of 10.00 other than SA (Shortage of Attendance) or F (Fail), failing which his / her admission shall be cancelled. Non-credit courses wherein grading is done as 'S'(Satisfactory) or 'NS' (Not-Satisfactory) are excluded from the purview of this regulation. However, in genuine cases of hospitalization resulting in immobilization, a student can be exempted provided he / she produces sufficient proof. The genuineness of such cases shall be examined by a Committee comprising of the Dean as Chairman with two Heads of the Departments / Professors as members who will recommend to the Chairman of the Institute.

#### **4.2 Registration for Second and Subsequent Semesters**

- 4.2.1 Registration shall commence two weeks in advance of the date of the closure of the current



semester.

- 4.2.2 The last date for registration for the semester shall be the first day of that semester. However, the students intending to register only for supplementary examination are allowed to register for the semester and then register for supplementary examinations. In case, in the subjects where the announcement of results is delayed, the students shall be permitted to register upto one day prior to the date of supplementary examination with the permission of the Dean.
- 4.2.3 After the last date, students are allowed to register up to six working days on payment of prescribed fee for register within another six working days on genuine grounds and on payment of prescribed late fee notified by the late registration. After the sixth working day, the Dean of the Institute may permit the students to Institute from time to time.
- 4.2.4 The attendance shall be counted from the date of commencement of the semester.
- 4.2.5 Students failing to register for courses in a semester within the time allowed shall be deemed to have discontinued during that semester.
- 4.2.6 A student shall produce the Identity Card at the time of registration. Only under exceptional circumstances a student may be permitted by the Dean to register in absentia.
- 4.2.7 Students shall clear all the dues to the Hostel(s) and Library before registration.
- 4.2.8 A student may be permitted to add a permissible course in the registration card within 15 days from the date of commencement of the semester at student's own risk provided the total number of credits is within the prescribed limit.
- 4.2.9 No Student shall be permitted to drop a course after a period of six weeks from the date of commencement of the semester.

## **5.0 CURRICULA**

An enrolled student in order to earn the Bachelor's Degree shall complete the prescribed credits, with a minimum OGPA of 6.00 out of 10.00. The total credits, courses and course contents are as prescribed by the Institute from time to time.

- a) Major subjects relevant to the degree programme
- b) Basic courses
- c) Related subjects
- d) Internship / Placement Training / In-plant Training / RAWEP / EL or HoT/Student Ready Programme.

## 6.0 EXAMINATION AND EVALUATION

- 6.1 The evaluation of student's performance shall be made separately for each course registered by the student.
- 6.2 Each course shall carry a maximum of 100 marks. There shall be an external examination to the extent of 50 per cent of marks.
- 6.3 The evaluation of the student in each course will be referred to as grading under ten point scale and shall be measured by the quality of performance in that course by assigning course grade points.
- 6.4 Student obtaining grade point of less than 5.00 in a course will be declared as failed in that course. The grade of such student will be indicated as F. The courses with Grade Point of 5.00 or more will be treated as cleared.
- 6.5 The student shall repeat the course(s) in which he / she has obtained grade till a minimum grade point of 5.00 is obtained either by registering as a regular course or by taking supplementary examination.

### 6.6 Attendance

One hundred per cent class attendance is expected in each course registered by the student in a semester. A student, who fails to attend 80 per cent of the classes conducted in a course (theory and practical put together) shall not be permitted to appear for the final examination in the concerned course. However, 10 per cent condonation may be granted, under exceptional circumstances by the Dean.

- 6.6.1 For calculation of attendance, the number of classes attended during the instructional period shall be considered. In case of newly admitted students, the attendance is calculated from the date of registration.

A student putting in more than the minimum of 80 per cent attendance, shall be awarded marks proportionately out of 5 marks set apart for attendance.

The grade of the student who fails to attend 80 per cent of the classes in a course shall be indicated as "SA" and such student shall be required to repeat the course.

### 6.7 Distribution of Marks

Each course shall carry a maximum of 100 marks. The distribution of marks is as indicated below:

#### 6.7.1 Courses with Theory and Practical Components

1. Mid-term	*30
2. Practical Examination	10
3. Assignments / Reports / Records	05
4. Final Examination (Externals)	50
5. Attendance	05
<b>Total</b>	<b>100</b>

\*(Five marks may be allocated for collection / submission of specimens in the courses wherever necessary).



### 6.7.2 Courses with only Theory Component

1. Interim Examination	20
2. Mid-term Examination	25
3. Final Examination (External)	50
4. Attendance	05
<b>Total</b>	<b>100</b>

### 6.7.3 Courses with only Practical Component\*

1. Practical Work	60
2. Records and Assignment	10
3. Final Examination	25
4. Attendance	05
<b>Total</b>	<b>100</b>

#### Note:

\*All the examinations for the courses only with Practical component are internal examinations. The scheme of evaluation for practical work will be decided by the respective Heads of Departments.

All the examinations will include syllabi covered from the beginning till the date of respective examination. The schedule of both theory and practical examinations in each course shall be notified by the Dean.

### 6.8 Evaluation of Internal Examinations

The course Teacher shall set the question papers for all the internal examinations and evaluate the same.

The valued answer paper(s) shall be returned to the students within three weeks from the date of examination and the student shall collect the valued answer papers within this period.

### 6.9 Conducting of Missed Internal Examination

- 6.9.1 Student absenting from examination by prior permission on official University business shall be given due consideration in completing attendance requirements and may be permitted by the Dean to make up examination that is missed.
- 6.9.2 Students who miss examination in a course due to unavoidable circumstances like hospitalization / death of parents / own marriage / attending interview / attending court cases may be permitted on production of proof, by the concerned Dean to take the missed examination, on the recommendation of the course teacher and the Head of the Department on payment of prescribed fee to the Institute for each missed examination. Students who miss the examination(s) on account of their participation on official Institute business as specified under 6.9.1 are exempted from payment of prescribed fee. A student who deliberately misses the examination shall not be allowed to appear for the missed examination.

- 6.9.3 There shall be no missed examination for final (external) theory examination except for the students who go on University nomination for sports / cultural events. For such students, the prescribed missed examination fee is exempted and the final external theory examination shall be conducted by the Institute Examination Centre, within a period of 45 days. The Dean shall inform the Controller of Examinations to facilitate him / her to obtain three question papers pertaining to such course/s and to make arrangements to conduct the examination/s within time.
- 6.9.4 Portion for the missed examination will include all the portions covered upto the date of the missed examination.
- 6.9.5 The student who misses an examination should fulfill the requirements as under 6.9.1 and 6.9.2.
- 6.9.6 Missed examination shall be conducted within three weeks from the date the regular examination was scheduled. The course teacher shall notify the date of missed examination and the students failing to take the missed examination on the notified date and time, will have no further claim for another examination in the course even with medical certificate.
- 6.9.7 A student is eligible to get only one missed internal examination in a course in a semester. However, any student who represents Institute for sports / cultural events is eligible to take the internal / external examination/s missed by him / her due to the aforesaid reasons, without payment of missed examination fee.

## **7.0 MODALITIES FOR CONDUCTING EXTERNAL EXAMINATIONS**

- 7.1 The existing staff pattern for External Examination Cell at the College level shall be continued and they shall be entrusted with the responsibility of Coordinating with the Institute Examination Centre and also conducting External Examinations for UG Students.
- 7.2 The Examination Coordinator concerned shall provide the panel of External Examiners / Question Paper Setters (at least 3 names) for each course within one month from the commencement of the Semester to the Dean.
- 7.3 The Dean shall appoint the External Examiners / Question Paper Setters course wise.
- 7.4 The External Examiners shall be requested to provide key answers for objective type questions and important points around which the answers revolve around for subjective type questions, while obtaining question papers.
- 7.5 The Dean/ Examination Coordinator shall make arrangements to conduct the External Examinations in the Institute.
- 7.6 The Dean shall finalize and notify the Schedule of External Examinations at least three weeks before the commencement of the External Examinations.
- 7.7 The Dean/ Coordinator shall appoint invigilators (teachers) and supporting staff at least three weeks before the commencing of the External Examination.
- 7.8 The Dean shall obtain the question papers from the External Examiners/Question



Paper Setters and make required number of copies of question papers, bundle and seal them. Also, the Dean shall keep ready the required number of blank answer booklets and attendance sheets.

7.9 The Examination Coordinator shall handover sealed covers containing question papers, blank answer booklets, blank additional sheets, attendance sheets and other examination materials Dean/Coordinator one week before the commencement of the External Examinations.

7.10 The duration of final external examinations is 105 minutes (i.e., 50 minutes for Part-A and 55 minutes for Part-B of question paper).

7.11 Discrepancies in question paper, if any, shall be verified by the Dean / Coordinator in presence of the course teacher and the HoD concerned and shall be reported to Dean.

7.12 The invigilators shall conduct the examinations as per the existing guidelines/academic regulations. After the examination, the invigilators shall hand over the answer booklets arranged ID No.-wise (as per the attendance sheet) to the Dean.

7.13 The internal marks of each course shall be collected by the Examination Coordinator from the course teacher concerned and sent to the Dean within one week from the commencement of the next semester. The internal marks shall also be submitted to the Dean.

7.14 The Internal and the External Examination marks shall be compiled by Examination Coordinator and the results shall be finalized by the commencement of the next semester.

7.15 Students intending to apply for re-totalling of marks, obtain photocopies of evaluated answer booklets and re-evaluation, shall pay the prescribed fee within the stipulated time as per the existing academic regulations and shall register their request for the same with the Coordinator concerned. After the registration of the request, the Coordinator concerned shall prepare the list of students who have requested for the above mentioned cause course wise and shall intimate the Examination Coordinator once in 15 days through the Dean for processing further.

7.16 The supplementary examinations shall be conducted along with the final external examinations as and when the later courses are offered.

7.17 There shall be a final external examination in each course covering the theory and practical component to the extent of 50 marks as per the Guidelines issued by the Institute from time to time (excluding courses with only practical component and non- gradial courses).

7.18 The external examinations shall be scheduled during the last 20 days of the semester and shall be notified by the Dean.

7.19 Mitigation of the problem 'Setting of Questions outside the Syllabus by the External Examiners'; in the event of setting questions outside the course syllabus by the External Examiner. The Dean shall constitute a committee consisting himself/herself as the Chairperson with the concerned HOD, the course teacher and another nominee of Dean as Members and the Examination Coordinator as member convenor. The above Committee shall examine the extent of questions set outside the course syllabus.

7.20 It is mandatory on the part of both the course teacher and Head of the Department of concerned to scrutinize the question paper immediately after commencement of the final external examination of UG course.

7.21 Discrepancy in objective type questions and answers choices of the MCQs/True or



False/Match the columns in Part-A of the question paper shall be given weightage @ 0.5 marks for that question, when indicated by the course teacher and the Head of the Department.

7.22 Discrepancy in the question paper (Part-B), wherein if the question paper contains questions outside the syllabus accounting to less than 50% of the maximum marks on the question paper, it shall be set right by borrowing the questions from the unused II set of the question paper sent by the question paper setter and available at Dean's office.

7.23 In the event of the question paper containing questions outside the syllabus accounting to 50% or more of the maximum marks of the question paper, the Controller of Examinations concerned shall arrange for re-examination in the concerned course after obtaining a separate question paper either from the same Examiner or another Examiner.

## **8.0 FINALISATION OF GRADES AND SUBMISSION OF GRADE REPORTS**

8.1 The Controller of Examinations shall announce the grades. The Controller of Examinations will arrange for sending the grade report of each student to the Institute office.

8.2 The course grade report once filed by the teacher with the Academic Unit shall be final. However, in case of discrepancy in reporting the grade point arising out of the genuine mistake, the course grade shall be revised within a period of one year.

### **8.3 Revision of Grade Point**

- i) The representation either from the teacher or from the student, should be submitted to the Dean of the Institute through the Head of the Department concerned within one year from the date of filing of the grade report in the Academic Unit.
- ii) Such representation shall be considered by a committee consisting of the Dean or Examination Coordinator. / Head of the Department and another Professor of the College to be nominated by the Dean. In case, the Head of the Department himself / herself has offered the course, the Dean shall nominate some other Head of the Department. The final decision shall be taken by the Dean based on the recommendation of the committee and the same will be implemented by the Institute.

8.4 The various courses taken by a student along with the credits and the grade points obtained shall be shown on the transcript. Based on the total credits completed the Cumulative Grade Point Average (CGPA) shall be calculated and indicated.

## **9.0 FAILURE (FAIL, 'F' GRADE) AND CONDUCT OF SUPPLEMENTARY EXAMINATION**

9.1 Students with Grade Point of less than 5.00 in a course will be declared as Failed (F).

9.2 Students who score less than 20 out of 50 marks in the external examination will also be declared as 'Failed'. Such students only are eligible for supplementary examination.

9.3 Students who clear the external examination by securing a minimum of 20 marks out of 50, but fail to secure a minimum Grade Point of 5.00 in a course will also be declared as 'Failed'.

9.4 Students who fail in a course are eligible to take supplementary examination or shall register for the course as a regular course whenever offered.



- 9.5 Students who are eligible and opt to register for supplementary examination in a course(s) shall pay the prescribed fee for each course.
- 9.6 The supplementary examination will be conducted as and when notified by the Dean.
- 9.7 Supplementary examinations shall be conducted along with the final external examinations as and when the later courses are offered. The supplementary examination shall carry a maximum of 50 marks with duration of 1 hour and 45 minutes. However, the marks earned by the students for attendance/Internal examination / class performance as part of the regular course will be carried over for finalizing the grade point.
- 9.8 Students who secure 'F' Grade in the main examination shall clear the course through supplementary examination, or by repeating the course again as regular course.
- 9.9 If a student misses the supplementary examination, no missed examination shall be given.
- 9.10 No supplementary examination will be conducted in courses having only practical components. Such of the courses having practical component and non-gradual courses shall be repeated as regular courses.
- 9.11 Students should clear a Supplementary Course through Supplementary Examination in three (3) attempts.

**9.12 Registration of Supplementary Examinations by the Post Final Year Students**

The Post final year students can register any course/courses offered in any semesters (odd or even) for supplementary examinations during 1st semester. However, while registering during 2nd semester of the Post final year, students shall register for supplementary examining for the courses offered during even semesters.

- 9.12.1 The calendar of events of final year students of I Semester shall be applicable to post final year students. Hence, post final year students shall be allowed to register for Supplementary Examinations along with final year students.
- 9.12.2 The post final year students shall register for Supplementary Examinations within three weeks of commencement of I Semester for final year students.
- 9.12.3 The Supplementary Examinations for post final year students shall be conducted only during I Semester of every academic year as special one time provision. However, such students who could not complete in the onetime provision can take Supplementary Examinations along with regular final external examinations during subsequent semesters.
- 9.12.4 The post final year students may register for a maximum of 26 credit hours in a Semester.
- 9.12.5 The Supplementary Examinations for post final year students shall be scheduled between 8th and 10th week of the semester depending upon the number of students and courses.
- 9.12.6 There shall be no missed examinations for supplementary courses registered by post final year students.
- 9.12.7 The academic regulations pertaining to declaration of results and other guidelines remain unchanged for post final year students.

## 10.0 RURAL AGRICULTURAL WORK EXPERIENCE PROGRAMME (RAWEP)

Rural Agricultural Work Experience Programme shall be carried out as mentioned in the course curriculum of Undergraduate Degree Programme.

10.1 The seventh semester of the Degree Programme is set apart for rural Work Experience/Placement Training/In-plant Training/ Practical Training in villages.

10.2 Students who have completed all the courses till the end of VI Semester with a minimum CGPA of 5.00 and without securing shortage of attendance (SA) Grade in any of the courses are eligible to register for RAWEP.

**Note :** Students who register for the above courses in anticipation of obtaining the eligibility at the end of VI Semester may do so at their own risk.

Registration of RAWEP and similar courses will automatically be cancelled if the student is found ineligible, subsequently and the fee paid for the Semester shall be forfeited.

10.3 Rural Agricultural Work Experience Programme shall be carried out as & Mentioned in the respective Course Curriculum of Undergraduate Degree Programme.

### 10.4 Schedule of Activities

Sl. No.	Activities	Period
1.	On campus orientation-General	1 Week
2.	Data collection using PRA tools & secondary Sources	2 Weeks
3.	On campus orientation-Subject matter areas	2 Weeks
4.	Placement in RSKs	12 Weeks
5.	ABI Placement	2 Weeks
6.	Group discussion and Final Examination	2 Weeks

### 10.5 Orientation

The Dean of the college will organize the orientation before the placement training involving Heads of Departments and teachers' in-charge of the programme. The Research and Extension staff on the campus will also be involved.

### 10.6 Advisory Committee

There shall be an Advisory Committee consisting of Dean of the college as Chairman and Heads of Departments / teachers as members. The Committee is responsible to guide the teacher's in-charge of the programme and the students for effective implementation. The committee shall meet periodically and review and monitor the programme.

### 10.7 Supervision and Guidance

A team of teachers drawn from all the Departments of the college are responsible for providing



day to day guidance to all students, supervise the work and evaluate their performance. Each Division / Department will nominate at least one teacher exclusively for this programme.

### 10.8 Placement Training

The unit of operation and modalities of implementation shall be decided by the Advisory committee.

### 10.9 Practical Extension work

As a part of this programme, the students will camp for twelve weeks at one RSK in one central village and work in satellite villages. The detailed modalities shall be worked out by the Advisory Committee.

### 10.10 Evaluation Pattern

The performance of the students in each of the courses shall be evaluated as under:

SL. No.	Particulars	Marks
1	Attendance / Diligence	05
2	Work dairy	05
3	Practical Record / Project Reports	20
4	Performance during Placement	20
5	Group Discussion / Presentation	20
6	Final Examination	30
<b>Total</b>		<b>100</b>

- A student shall obtain a minimum of 50 marks to pass the course.
- The procedure for evaluation of the students' performance in respect of Educational tour outside Karnataka and the Study tour as part of the Rural Agricultural Work Experience programme / In-plant training programme.
- Since RAWWE programme consists of only practical components, there shall be no supplementary examination. The failed student can register for the course whenever it is offered.

### 11.0 EDUCATIONAL TOUR

- One Educational Tour for 15 days during break period after the V Semester shall be conducted and grading shall be done as Satisfactory / Non Satisfactory.
- Any student, who fails to complete educational tour, shall repeat the tour at his / her own cost.

### 12.0 MAINTENANCE OF SATISFACTORY STANDING IN COURSES

- An enrolled student, in order to earn a Bachelor's Degree in the concerned field shall creditably have completed the prescribed course credits in the University including approved transfer of credits, as specified in regulation 15 and shall have earned a minimum OGPA of 6.00. In addition, the student shall, in the judgment of the faculty, possess good moral character and a high standard of honesty.
- A student who completes the prescribed number of course credits for a particular degree programme, but fails to obtain an OGPA of 6.00 shall be required to improve the OGPA by

repeating the course(s) wherein the student has secured a grade point of less than 6.00, either by registering as regular course(s) or by taking supplementary examination in such course(s) with the permission of the Dean, subject to the following conditions:

- a) A student may be permitted to repeat the course(s) where he/she has obtained grade point(s) of less than 6.00 when it is certain that the student will not be able to make the minimum OGPA of 6.00 even after it is assumed, that the student will secure the highest grade point in the remaining courses the student has to complete. This shall be done only on the request of the student and at the student's own risk.
- b) If a student repeats a course in which the student had secured a Grade Point of less than 6.00, the Grade Point obtained by the student earlier gets cancelled.
- c) On repetition, if a student gets 'F' Grade in any course(s), the student shall repeat the course either as a regular course or take supplementary examination in the course(s) as per the regulations provided therein.
- d) Irrespective of the improvement in the OGPA, consequent upon repetition of the course(s), the OGPA of the student shall be restricted to 6.00 only.
- e) In the transcript, only the repeat grade will be mentioned but with 'RE' symbol indicating that the course was repeated by the student.

### **13.0 TIME LIMIT FOR COMPLETION OF DEGREE PROGRAMME**

A student admitted to an under-graduate degree programme in the Institute should complete the degree programme within a maximum time limit of an equal number of academic years over and above the normal period prescribed (i.e. within a period of 16 semesters) for completion of a given under-graduate programme in the Institute failing which the admission of the student shall stand cancelled automatically.

### **14.0 INSTITUTE SCHOLARSHIPS**

14.1 The Scholarships to be awarded to Under-graduate students of the Institute shall be classified as: Merit Scholarships. The regulations governing the award of this scholarship for Institute are mentioned here under:

14.2 Number: There shall be two annual Merit Scholarships for each class at each of the Institute.

14.3 Value: Each Merit Scholarship will be of the value as specified from time to time and will be tenable for a period of 12 months.

#### **14.4 Procedure for the Award**

i) Merit Scholarships for the first year UG students shall be decided on the basis of marks secured in Part-II of the qualifying examination for admission.

ii) The award of Merit Scholarship for the students of second and subsequent years shall be on the basis of the Cumulative Grade Point Average (CGPA) secured by the students up to the end of the previous academic year. In case of two or more students securing the same CGPA, 3rd decimal of CGPA shall be considered for awarding scholarship.

14.5 No student holding a Scholarship shall remain absent for any period without permission.

Absence for any period will count for the absence of the day and the student will forfeit the scholarship amount for the number of days he/she remains absent without permission.

14.6 The scholarship will be terminable at any time, if the conduct, progress of attendance of



the student is found to be unsatisfactory and if he / she commits indiscipline or indulges in malpractice in examination or deliberately stays away from the class or other Institute Activities except for reasons considered as valid by the Institute.

## **15.0 CONDUCT OF EXAMINATIONS AND PREVENTION OF MALPRACTICES**

15.1 In these Regulations, unless the context otherwise requires:

- a) 'Examination' means and includes all internal Examinations, External Examinations and Supplementary Examinations under the semester System.
- b) 'Co-coordinator of Examination' means the teacher nominated By the Dean of the College.
- c) 'Assistant Co-ordinator of Examination' means the teachers nominated by the Dean to assist the Co-ordinator of examination in conducting the External examinations.
- d) 'Authorities' means the Professor, Associate Professor, Assistant Professor or a person of equivalent cadre.
- e) 'Teacher' means the Professor Associate Professor, Assistant Professor or a person of equivalent cadre.
- f) 'Invigilators' means the teachers directly in-charge of invigilation work in the examination hall.

15.2 Whenever examination papers for internal examinations have got to be typed, one member of the teaching staff of the concerned Department shall be personally present with the typist and also at the time of duplicating. All care should be taken to safeguard the secrecy of the question papers.

15.3 The Examination Coordinator invigilator shall make proper seating arrangements in the examination hall to ensure prevention of malpractices.

15.4 Students coming 10 minutes after commencement of the examination shall not be allowed to enter the examination hall. No student shall be allowed to leave the examination hall within 10 minutes from the time of commencement of the examination.

15.5 The Invigilators shall announce that no student should have in his/ her possession or accessible to papers, books, notes, electronic gadgets (including mobile phones, tablets, iPods, MP3 players, Bluetooth, digital notepads, pen cameras, spectacle cameras, button cameras, smart electronic watches etc.,) which might possibly be of assistance to him / her or found giving or receiving assistance or copying from any paper, book or note or allowing another candidate to copy from his/her answer books, writes either on blotting paper or any other unfair means.

15.6 The Invigilator shall direct the students to search their pockets, desks and benches and hand over to him / her any paper, book, notes, electronic gadgets (including mobile phones, tablets, iPods, MP3 players, Bluetooth, digital notepads, pen cameras, spectacle cameras, button cameras, smart electronic watches etc.,) which may be found therein, before commencement of the examination.

- i) When the Invigilator notices any student indulging in anyone or all of the malpractices indicated in the aforesaid regulations he shall invariably demand a written explanation or statement from the concerned student.



- ii) If the student refuses to give his/her statement, the student shall be asked to record in writing his/her refusal to give the statement, if the student refuses to do even that, the fact shall be noted and reported to the Dean by the Invigilator/Teacher.
  - iii) The invigilator shall, however, write his remarks on the answer paper and affix his/her signature and the student shall be sent out of the hall and shall not be allowed to take further examinations in that course during the semester.
- 15.7 All cases of malpractices should immediately be brought to the notice of the Dean concerned that shall send a report thereon to the Authorities for such necessary action as they deemed fit.
- 15.8 All cases of malpractices referred to the Authorities shall be examined by a Committee constituted by the Dean for the purpose. The decision of the Committee shall be subject only to the review of the Dean.
- 15.9 The committee may debar the guilty candidate for a period not less than one semester.
- 15.10 The student shall bear in mind that all the examinations under semester system are Institute Examinations and should conduct himself / herself accordingly.
- 15.11 The student shall produce the Identity Card issued by the concerned Dean whenever demanded by the Invigilator.
- 15.12 No student shall enter the examination hall with papers, books or notes or electronic gadgets (including mobile phones, tablets, iPods, MP3 players, Bluetooth, digital notepads, smart electronic watches etc.) which might possibly be of assistance such other material which might possibly be of assistance in writing answers.
- 15.13 Carrying or using of electronic gadgets by students (including mobile phones, tablets, iPods, MP3 players, Bluetooth, digital notepads, smart electronic watches etc.) during examinations is strictly prohibited. If the above said electronic gadgets are brought to the examination halls with or without any ulterior motive, even in switch off mode, such gadgets shall be confiscated and treated as malpractice.
- 15.14 Any student possessing or having access to papers, books, notes which might be of assistance in the examination or allowing any other student to copy from his/her answer book, writes either on blotting papers or any other paper, the answer to questions set in the paper during the examination or using or attempting to use any other unfair means and not informing the Invigilator about the notes or points pertaining to the examinations found to have been written on the desks or tables or any part of his/her body, shall be debarred for a period of not less than one semester.
- 15.15 Any student found guilty of misconduct in the examination hall shall be debarred for a period of not less than two semesters.
- 15.16 Every student shall search his/her pockets, desks and benches and hand over to the Invigilator any paper, book or notes which the student may have therein, before starting of the examination.
- 15.17 No student shall write answers on any paper other than the one supplied to him/her.
- 15.18 Any student found guilty of an offence as referred in the above regulations shall give a written explanation or statement to the Invigilator in-charge of the examination hall when demanded. If the student refuses to give the explanation or statement, the Invigilator should record in writing the student's refusal to give such an explanation.



15.19 Any student, who does not comply with the procedure indicated in the above said regulations shall be deemed to have committed an offence referred to in regulation 15.15 and shall bear the consequent penalty.

#### **16.0 CONDUCT OF TEACHING AND MAINTENANCE OF DISCIPLINE AMONG THE STUDENTS IN THE INSTITUTE**

- 16.1 Every student of the Institute shall conform to the rules of good conduct and respect the authority of the constituted bodies of the Institute.
- 16.2 Every student of the Institute shall have a Student Identification Card with a recent photograph affixed and duly signed by the Dean. The same shall be shown to the Institute officials on demand. The Student Identification Card is valid for a semester. The validity of the Identification Card shall be renewed every semester.
- 16.3 Students shall do everything possible to protect and make proper use of the Institute property and other public property. Any student who attempts to deface/destroy the Institute or other public property shall be liable for appropriate punishment. In addition, the cost of the damage (as assessed by the Institute) so caused by the students(s) to the Institute or other public property shall be recovered from the Caution Deposit fund of the student(s) or as ordered by the University.
- 16.4 Proper decorum shall be maintained by all the students in the classroom, hostels, library, farms, in the transport vehicles, during the education and sports tours and on and off the Institute campus. No student shall disturb the normal work of the Institute by disorderly conduct, boisterous behavior and unauthorized assembly.
- 16.5 Ragging in any form in the Institute premises is strictly prohibited. Students found guilty of ragging are liable for disciplinary action.
- 16.6 Every student shall be punctual to the classes. Coming late to the class should be avoided and the Class Teacher has the right to refuse admission to late-comers in the interest of class discipline.
- 16.7 Absenting to a class or examination en mass for whatever reason shall be considered as an act of indiscipline.
- 16.8 No student shall be in a class during the assigned hour unless the student has registered for that course or has the express permission of the Class Teacher.
- 16.9 Possession and consumption of alcoholic drinks or drunkenness or drug addiction or gambling on the campus is strictly prohibited and the same shall be considered as an act of indiscipline.
- 16.10 The recipients of the scholarships/fee concession/other benefits from the University or from other institutions with the University's approval will lose the benefits if they are found to involve in any of the acts of indiscipline cited above.
- 16.11 Celebration of festivals on days other than the authorized days and unruly behavior on such occasions will be considered as an act of indiscipline.
- 16.12 Violation of any of the above regulations is an act of indiscipline and it shall be brought to the notice of the Dean.
- 16.13 The Dean shall examine the act of indiscipline of the student and shall take immediate action



- such as administering a warning, fine, expulsion from hostel or suspension from attending the classes for a period not exceeding one month pending enquiry by a disciplinary committee.
- 16.14 The disciplinary proceedings may be instituted through the Disciplinary Committee which can recommend punishment in the form of a warning/expulsion from the Institute for a semester / year or for good.
- 16.15 A student who has been found guilty by the Head of the Institute or the Disciplinary Committee and has been fined / suspended/expelled from the Institute or Hostel shall not be permitted to hold any office, elective or otherwise, of student associations for a period of two years from the date of completion of the punishment.
- 16.16 If a student is taken into police custody on a criminal or other complaint for a period of 24 hours or more, he/she shall be deemed to have been suspended from the College for a period of one month from the date on which he/she was taken into Police custody without causing enquiry.
- 16.17 The UG students shall not carry or use electronic gadgets like mobile phones, tablets, iPods, MP3 players, bluetooth, digital notepads, smart electronic watches etc., during the class hours and practical classes. If found such gadgets, even in switch off mode, such things shall be confiscated by the teachers / Dean with a penalty of Rest. 2000 per student per incidence.

## **17.0 GOLD MEDAL**

The following conditions shall be applicable for award of Donor's Gold Medal:

The students to be eligible for Gold Medal/Awards Instituted by Donors should have secured an Overall Grade Point Average (OGPA) of not less than 8.50 out of 10.00 in the subjects/degree for which the award is instituted.

The student should not have obtained 'F' Grade or 'SA' symbol or Transfer of Credit in any of the courses(s) registered as a part of the degree programme in the subject for which the award is

## **18.0 CONVOCATION**

18.1 The Institute shall confer degree to all the students who complete their degree requirements in all respects in a particular academic year. However, at the time of taking their transcript and provisional degree certificate, they should fill in the convocation application and pay the prescribed fee and exercise their option whether they will be taking the degree in the Annual Convocation in Person or In Absentia. In case a candidate desires to change his option, he may do so within one month from the date of notification of the Convocation.

18.2 If a person has applied for a particular Convocation to take the degree 'In Person: but fails to attend the Convocation, he/she has to apply again by paying the penal fee in addition to the prescribed fee.

## **19.0 EXPERIENTIAL LEARNING / HANDS ON TRAINING COURSES**

19.1 The eighth semester of the UG degree programme is set apart for Experiential Learning / Hands on Training component.

19.2 Students who have completed all the scheduled and registered courses till the end of VI semester with a minimum CGPA of 5.00 and without securing Shortage of Attendance (SA)



Grade in any of the subjects are eligible to register for EL / HoT courses.

19.3 B.Sc. (Hons.) Advanced Agriculture degree students have to register for 20 credits with the major load (15 credits) being from one module and the rest of the credits (05) from another Module among the courses offered in different Modules.

19.4 The student who registers for EL / HoT courses (20 or 25 credits) is not permitted to register for any other course, except the supplementary examination.

19.5 There shall be an Advisory Committee at the college level with the concerned Dean as Chairperson and Heads of Department/ course teachers as members for addressing the problems and issues, if any that may arise, for effective functioning of the EL/ HoT courses. nominated by the Dean to oversee implementation of the programme.

19.7 There will be no external examination in the EL / HoT courses. The student has to secure 50 per cent marks for a pass in the course.

**19.8 Evaluation:** The performance of the student is evaluated separately in each of the EL/HoT courses. The marks allocated for different activities are as under:

Sl. No.	Particulars	Marks
1.	Attendance	05
2.	Practical work & work done report	35
3.	Class presentations	05
4.	Project Reports & its presentation	25
5.	Final Examination	30
<b>Total</b>		<b>100</b>

**Note:** The scheme of evaluation for practical work shall be notified by the course teacher(s) in the beginning of the semester.

19.9 The last week of the semester is devoted for presentation of project report and final examination.

19.10 The student has to secure a minimum of 80 per cent attendance for a pass in the course.

19.11 Since EL/HoT courses consist of only practical components, there shall be no supplementary examination. A student who fails in a course shall register for the same whenever it is offered.

#### **19.12 Missed Examination**

19.12.1 Students absenting from the examination in the EL / HoT courses by prior permission of the Dean, on official Institute business, shall be given due consideration in completing attendance requirements and be permitted to make up the examination that is missed.

19.12.2 Students who miss examination in a course due to unavoidable circumstances like hospitalization/death of parents/own marriage/ attending interview/attending court cases may be permitted on production of proof, by the concerned Dean to take the missed examination, on the recommendation of the course teacher and the Head of the Department on payment of prescribed fee to the Institute for each missed examination. A student who deliberately misses the examination shall not be allowed to appear for the missed examination.

19.12.3 Missed examination shall be conducted within three weeks from the schedule date of the regular examination. The course teacher shall notify the date of missed examination and the students failing to take the missed examination on the notified date and time, will have no further claim for another examination in the course even with medical certificate.

19.12.4 The course teacher(s) shall file the grade report to the Examination Coordinator of the institute within 4 weeks from the closure of the semester.

## **20.0 MODALITIES FOR ALLOTMENT OF EL/HoT COURSES**

- The modules and the courses in each degree programme, as major and/or minor, will be notified by the Dean of the Institute, depending on the availability of facilities and the felt need.
- There shall be a maximum of 20 students per course, with a maximum of 15 students who take the course as a major and a maximum of 5 students who take it as a minor course. However, number of students per course is subject to change based on the total number of students under each degree programme.
- In case of limitation of infrastructure and facilities, the maximum number may be restricted to 15 students per course, with the proportion of students for major and minor to be retained as above.
- The student will be permitted to choose a module and course (both as major and minor) based on his/her preference and CGPA.
- The process for allotment of EL/HoT courses shall start in the last month and completed before the closure of the VII Semester.



**DETAILS OF COURSES OFFERED SEMESTER WISE DURING FOUR  
YEARS DEGREE PROGRAMME**

**B. Sc. (Hons.) Advanced Agriculture**

**I Semester Curriculum**

Sl. No.	Course No.	Course Title	T+P	Contact hours	Credit
1.	BCM. 111	Plant Biochemistry	1+1	3	2
2.	CSC. 111	Computer Science and Agr-informatics	1+1	3	2
3.	ENG. 111	Comprehension and Communication Skills in English	1+1	3	2
4.	AGR. 111	Fundamentals of Agronomy	2+1	4	3
5.	AEC. 111	Fundamentals of Agricultural Economics	2+0	2	2
6.	AEG. 111	Introductory Soil and Water Conservation Engineering	1+1	3	2
7.	AEX. 111	Rural Sociology, Education Psychology and Constitution of India	0+2	4	2
8.	AMB. 111	Fundamentals of Microbiology	1+1	3	2
9.	FSN. 111	Principles of Foods Science and Nutrition	2+0	2	2
10.	FES. 111	Introduction to Forestry	1+1	3	2
11.	PED. 111*	Physical Education and Yoga Practices	0+1	2	1
12.	KAN. 111* KAN.112	Kannada - I	0+1	2	1
<b>Total</b>			<b>12+11</b>	<b>34</b>	<b>23</b>

\* Non-gradual Courses

**Note:**

- 1) KAN. 111 for Kannada speaking students
- 2) KAN. 112 for Non- Kannada speaking students

## II Semester Curriculum

Sl. No.	Course No.	Course Title	T+P	Contact hours	Credit
1.	AGR. 121	Water Management	1+1	3	2
2.	AEC. 121	Agricultural Finance and Co-operation	1+1	3	2
3.	AET. 121	Fundamentals of Entomology	2+1	4	3
4.	AEX. 121	Fundamentals of Agricultural Extension Education and Rural Development	1+1	3	2
5.	GPB. 121	Fundamentals of Cytogenetics	1+1	3	2
6.	HRT. 121	Fundamentals of Horticulture and Fruit crops production	1+1	3	2
7.	PBT. 121	Fundamentals of Plant Biotechnology	2+1	4	3
8.	SAC. 121	Fundamentals of Soil Science	2+1	4	3
9.	AGR.122	Introductory Agrometeorology and Climate Change	1+1	3	2
10.	PED. 112*	Physical Education and Yoga Practices	0+1	2	1
11.	KAN. 121* KAN.122	Kannada - II	0+1	2	1
12.	NSS. 111*	National Service Scheme	0+1	2	1
<b>Total</b>			<b>12+12</b>	<b>36</b>	<b>24</b>

\* Non-gradual Courses

Note:

- 1) KAN. 121 for Kannada speaking students
- 2) KAN. 122 for Non- Kannada speaking students



### III Semester Curriculum

Sl. No.	Course No.	Course Title	T+P	Contact hours	Credit
1.	AGR. 211	Crop Production Technology - I	2+1	4	3
2.	AGR.212	Practical Crop Production Technology –II (Irrigated)	0+1	2	1
3.	AEG. 211	Farm Machinery and Power	1+1	3	2
4.	AET. 211	Insect Ecology, Principles of Pest Management and Natural Enemies	2+1	4	3
5.	AEX. 211	Communication and Diffusion of Agricultural innovations	1+1	3	2
6.	CPH. 211	Fundamentals of Crop Physiology	2+1	4	3
7.	HRT. 211	Production Technology of Vegetable Crops	1+1	3	2
8.	GPB. 211	Fundamentals of Genetics	1+1	3	2
9.	PAT. 211	Fundamentals of Plant Pathology	2+1	4	3
10.	SAC.211	Soil Chemistry	1+1	3	2
11.	NSS. 112*	National Service Scheme	0+1	2	1
<b>Total</b>			<b>13+11</b>	<b>35</b>	<b>24</b>

\* Non-gradual Courses

#### IV Semester Curriculum

Sl. No.	Course No.	Course Title	T+P	Contact hours	Credit
1.	AST. 221	Agricultural Statistics	2+1	4	3
2.	AEG.221	Renewable Energy and Green Technology	1+1	3	2
3.	AET. 221	Insect Pests of Horticultural crops and their Management	1+1	4	2
4.	CPH. 221	Applied Plant Physiology and crop Modeling	1+1	3	2
5.	HRT. 221	Production Technology of Flower Crops and Landscaping	1+1	3	2
6.	GPB. 221	Fundamentals of Plant Breeding	2+1	4	3
7.	PAT. 221	Principles of Plant Disease Management	1+1	3	2
8.	AEC. 311	Agricultural Marketing, Trade and Prices	2+1	4	3
9.	AGR.221	Crop Production Technology - II	1+1	3	2
10.	AMB. 221	Soil and Applied Microbiology	1+1	3	2
11.	FES. 221	Environmental studies and Disaster Management	2+0	2	2
<b>Total</b>			<b>15+10</b>	<b>35</b>	<b>25</b>



## V Semester Curriculum

Sl. No.	Course No.	Course Title	T+P	Contact hours	Credit
1.	AGR.311.	Practical Crop Production – I (Rainfed)	0+1	2	1
2.	AGR. 312	Experimental Techniques in Agricultural Research	0+1	2	1
3.	AET. 311	Insect Pests of Field Crops & Stored Grains and their Management	1+1	3	2
4.	ASC. 311	Livestock, Poultry & Fish Production Management	2+1	4	3
5.	FSN. 321	Food Processing, Food Safety Standards and Value Addition	1+1	3	2
6.	GPB. 311	Crop Breeding	1+1	3	2
7.	HRT. 311	Production Technology of Plantation Crops, Spices, Medicinal and Aromatic Plants	1+1	3	2
8.	PAT.311	Diseases of Field Crops and their Management	2+1	4	3
9.	SST. 311	Principles and Practices of Seed Production	1+1	3	2
10.	SAC. 311	Problematic Soils and their Management, Geo-informatics	1+1	3	2
11.	API. 311	Introduction to Apiculture	1+1	3	2
12.	CPH. 222	Nanotechnology in Agriculture	0+1	2	1
<b>Total</b>			<b>11+12</b>	<b>35</b>	<b>23</b>

## VI Semester Curriculum

Sl. No.	Course No.	Course Title	T+P	Contact hours	Credit
1.	AGR. 321	Farming Systems, Organic Farming and Precision Agriculture	2+1	4	3
2.	AGR. 322	Rainfed Agriculture and Watershed Management	1+1	3	2
3.	AEC. 321	Farm Management, Production and Resource Economics	1+1	3	2
4.	AEX. 321	Entrepreneurship Development and Business communications	1+1	3	2
5.	AEG. 321	Protected cultivation and Secondary Agriculture	1+1	3	2
6.	GPB. 321	Intellectual Property Rights (IPR)	1+0	1	1
7.	HRT. 321	Post Harvest Management and Value Addition of Fruits and Vegetables	1+1	3	2
8.	PAT. 321	Diseases of Horticultural Crops and their Management	1+1	3	2
9.	SST. 321	Post Harvest Seed technology and Quality Assurance	1+1	3	3
10.	SAC. 321	Manures, Fertilizers and Soil Fertility Management	2+1	4	3
11.	SER. 321	Introduction to Sericulture	1+1	3	2
<b>Total</b>			<b>13+10</b>	<b>33</b>	<b>24</b>



### VII Semester Curriculum

Sl. No.	Course No.	Course Title	T+P	Contact hours	Credit
1.	RAWE	Rural Agricultural Work Experience	0+20	40	20
<b>Total</b>			0+20	40	20

### VIII Semester Curriculum

Sl. No.	Course No.	Course Title	T+P	Contact hours	Credit
1.	EL / HoT	Experimental Learning / Hands on Training	0+20	40	20
<b>Total</b>			0+20	40	20

### Semester wise Total Credits

Semester	Total Credits
I	23
II	24
III	24
IV	25
V	23
VI	24
VII	20
VIII	20
<b>Grand Total</b>	<b>183</b>

**ABSTRACT OF COURSES TO BE TAUGHT FOR COMPLETION  
OF B. Sc. (Hons.) ADVANCED AGRICULTURE**

<b>Sl. No.</b>	<b>Particulars</b>	<b>Theory + Practical</b>	<b>Total</b>
<b>I.</b>	<b>Basic Sciences and Humanities</b>	<b>5+4</b>	<b>9</b>
<b>II.</b>	<b>Agricultural and Allied Subjects</b>	<b>71+56</b>	<b>127</b>
<b>III.</b>	<b>Student "Ready" Programme</b>		
	a) <b>RAWE – Rural Agricultural Work Programme</b>	<b>0+20</b>	<b>20</b>
	b) <b>EL/ HoT- Experimental Learning / Hands on Training</b>	<b>0+20</b>	<b>20</b>
<b>IV.</b>	<b>Non-Gradial Courses</b>		
	a) <b>Physical Education</b>	<b>0+2</b>	<b>2</b>
	b) <b>National Service Scheme</b>	<b>0+2</b>	<b>2</b>
	c) <b>Kannada</b>	<b>0+2</b>	<b>2</b>
	d) <b>Educational Tour</b>	<b>0+1</b>	<b>1</b>
	e) <b>Remedial Courses 2 (1+1) / (2+0)</b>		
<b>Grand Total</b>			<b>183</b>



**DETAILS OF COURSES OFFERED DEPARTMENT WISE DURING FOUR YEARS DEGREE PROGRAMME**

**B. Sc. (Hons.) Advanced Agriculture**

Sl. No.	Course No.	Course Title	Credit hours
<b>BASIC SCIENCES AND HUMANITIES</b>			
1.	BCM. 111	Plant Biochemistry	1+1
2.	CSC.111	Computer Science and Agr-informatics	1+1
3.	ENG.111	Comprehension and Communication Skills in English	1+1
4.	AST. 221	Agricultural Statistics	2+1
5.	PED. 111*	Physical Education and Yoga Practices	0+1
6.	NSS. 111*	National Service Scheme	0+1
7.	KAN. 111* KAN.112	Kannada - I	0+1
8.	KAN. 121* KAN.122	Kannada - II	0+1
<b>Total</b>			<b>5+4=9</b>

\* Non-gradual Courses

Note:

1. PED. 111 (0+1) spread over one year
2. NSS. 111 (0+1) spread over one year

**AGRONOMY**

1.	AGR.111	Fundamentals of Agronomy	2+1
2.	AGR. 121	Water Management	1+1
3.	AGR.122	Introductory Agrometeorology and Climate Change	1+1
4.	AGR. 211	Crop Production Technology - I	2+1
5.	AGR.212	Practical Crop Production Technology –II (Irrigated)	0+1
6.	AGR.221	Crop Production Technology - II	1+1
7.	AGR.311.	Practical Crop Production – I (Rainfed)	0+1

8.	AGR. 312	Experimental Techniques in Agricultural Research	0+1
9.	AGR. 321	Farming Systems, Organic Farming and Precision Agriculture	2+1
10.	AGR. 322	Rainfed Agriculture and Watershed Management	1+1
<b>Total</b>			<b>10+10=20</b>

### AGRICULTURAL ECONOMICS

1.	AEC. 111	Fundamentals of Agricultural Economics	2+0
2.	AEC. 121	Agricultural Finance and Co-operation	1+1
3.	AEC. 311	Agricultural Marketing, Trade and Prices	2+1
4.	AEC. 321	Farm Management, Production and Resource Economics	1+1
<b>Total</b>			<b>6+3=9</b>

### AGRICULTURAL ENGINEERING

1.	AEG. 111	Introductory Soil and Water Conservation Engineering	1+1
2.	AEG. 211	Farm Machinery and Power	1+1
3.	AEG.221	Renewable Energy and Green Technology	1+1
4.	AEG. 321	Protected cultivation and Secondary Agriculture	1+1
<b>Total</b>			<b>4+4=8</b>

### AGRICULTURAL ENTOMOLOGY

1.	AET. 121	Fundamentals of Entomology	2+1
2.	AET. 211	Insect Ecology, Principles of Pest Management and Natural Enemies	2+1
3.	AET. 221	Insect Pests of Horticultural crops and their Management	1+1
4.	AET. 311	Insect Pests of Field Crops & Stored Grains and their Management	1+1
<b>Total</b>			<b>6+4=10</b>

### AGRICULTURAL EXTENSION

1.	AEX. 111	Rural Sociology, Education Psychology and Constitution of India	0+2
2.	AEX. 121	Fundamentals of Agricultural Extension Education and Rural Development	1+1
3.	AEX. 211	Communication and Diffusion of Agricultural innovations	1+1



4.	AEX. 321	Entrepreneurship Development and Business communications	1+1
<b>Total</b>			<b>3+5=8</b>

### AGRICULTURAL MICROBIOLOGY

1.	AMB. 111	Fundamentals of Microbiology	1+1
2.	AMB. 221	Soil and Applied Microbiology	1+1
<b>Total</b>			<b>2+2=4</b>

### ANIMAL SCIENCE

1.	ASC. 311	Livestock, Poultry & Fish Production Management	2+1
<b>Total</b>			<b>2+1=3</b>

### APICULTURE

1.	API. 311	Introduction to Apiculture	1+1
<b>Total</b>			<b>1+1=2</b>

### CROP PHYSIOLOGY

1.	CPH. 211	Fundamentals of Crop Physiology	2+1
2.	CPH. 221	Applied Plant Physiology and crop Modeling	1+1
3.	CPH. 222	Nanotechnology in Agriculture	0+1
<b>Total</b>			<b>3+3=6</b>

### FOOD SCIENCE AND NUTRITION

1.	FSN. 111	Principles of Foods Science and Nutrition	2+0
2.	FSN. 321	Food Processing, Food Safety Standards and Value Addition	1+1
<b>Total</b>			<b>3+1=4</b>

### FORESTRY AND ENVIRONMENTAL SCIENCE

1.	FES. 111	Introduction to Forestry	1+1
2.	FES.221	Environmental studies and Disaster Management	2+0
<b>Total</b>			<b>3+1=4</b>

## GENETICS AND PLANT BREEDING

1.	GPB. 121	Fundamentals of Cytogenetics	1+1
2.	GPB. 211	Fundamentals of Genetics	1+1
3.	GPB. 221	Fundamentals of Plant Breeding	2+1
4.	GPB. 311	Crop Breeding	1+1
5.	GPB. 321	Intellectual Property Rights	1+0
<b>Total</b>			<b>6+4=10</b>

## HORTICULTURE

1.	HRT. 121	Fundamentals of Horticulture and Fruit crops production	1+1
2.	HRT. 211	Production Technology of Vegetable Crops	1+1
3.	HRT. 221	Production Technology of Flower Crops and Landscaping	1+1
4.	HRT. 311	Production Technology of Plantation Crops, Spices, Medicinal and Aromatic Plants	1+1
5.	HRT. 321	Post Harvest Management and Value Addition of Fruits and Vegetables	1+1
<b>Total</b>			<b>5+5=10</b>

## PLANT BIOTECHONOLOGY

1.	PBT. 121	Fundamentals of Plant Biotechnology	2+1
<b>Total</b>			<b>2+1=3</b>

## SEED SCIENCE AND TECHNOLOGY

1.	SST. 311	Principles and Practices of Seed Production	1+1
2.	SST. 321	Post Harvest Seed technology and Quality Assurance	1+1
<b>Total</b>			<b>2+2=4</b>

## PLANT PATHOLOGY

1.	PAT. 211	Fundamentals of Plant Pathology	2+1
2.	PAT. 221	Principles of Plant Disease Management	1+1
3.	PAT.311	Diseases of Field Crops and their Management	2+1
4.	PAT. 321	Diseases of Horticultural Crops and their Management	1+1
<b>Total</b>			<b>6+4=10</b>



## SERICULTURE

1.	SER. 321	Introduction to Sericulture	1+1
<b>Total</b>			<b>1+1=2</b>

## SOIL SCIENCE AND AGRICULTURAL CHEMISTRY

1.	SAC. 121	Fundamentals of Soil Science	2+1
2.	SAC.211	Soil Chemistry	1+1
3.	SAC. 311	Problematic Soils and their Management, Geo-informatics	1+1
4.	SAC. 321	Manures, Fertilizers and Soil Fertility Management	2+1
<b>Total</b>			<b>6+4=10</b>

### ABSTRACT – COURSES TO BE COMPLETED FOR B. Sc. (Hons.) ADVANCED AGRICULTURE

Sl. No.	Particulars	Theory + Practical	Total
<b>I.</b>	<b>Basic Sciences and Humanities</b>	<b>5+4</b>	<b>9</b>
<b>II.</b>	<b>Agricultural and Allied Subjects</b>	<b>71+56</b>	<b>127</b>
<b>III.</b>	<b>Student “Ready” Programme</b>		
	c) RAWE – Rural Agricultural Work Programme	0+20	20
	d) EL/ HoT- Experimental Learning / Hands on Training	0+20	20
<b>IV.</b>	<b>Non-Gradiual Courses</b>		
	f) Physical Education and Yoga practices	0+2	2
	g) National Service Scheme	0+2	2
	h) Kannada	0+2	2
	i) Educational Tour	0+1	1
	j) Remedial Courses 2 (1+1) / (2+0)		
<b>Grand Total</b>			<b>183</b>

**Note: 1.** Physical Education and Yoga practices spread over for one year

**2.** National Service Scheme spread over for one year.

## BASIC SCIENCES AND HUMANITIES

BCM.111

PLANT BIOCHEMISTRY

1+1

**Unit-I:** Introduction and importance, Plant cell- Structure and organellar functions.

Biomolecules–Structure, properties and reactions: amino acids, peptides and proteins, lipids, carbohydrates, nucleotides and nucleic acids.

**Unit-II:** Enzymes- Factors affecting the activities, classifications, immobilization and other industrial applications.

**Unit-III:** Metabolism – Basic concepts. glycolysis, citric acid cycle, pentose phosphate pathway, n-oxidation of fatty acids, electron transport and oxidative phosphorylation.

**Unit-IV:** General reactions of amino acids degradation. Metabolic regulation. Secondary metabolites - terpenoids, alkaloids, phenolics

### List of Experiments/ Practices

- Protein denaturation- heat, pH, precipitation of proteins with heavy metals
- Estimation of crude protein
- Estimation of protein by Lowry method
- Enzymes assays
- Extraction of nucleic acids
- Extraction of oil from oil seeds
- Estimation of crude fat
- Estimation of iodine number and saponification value of oil
- Quantitative and qualitative determination of sugars
- Paper chromatography for the separation of sugars
- Determination of phenols, chlorophyll and ascorbic acid.

### Reference:

1. Arun Kumar, V., N. Senthil Kumar and K. Siva Kumar, Plant Biochemistry- 2010, APH Publishing Corporation, New Delhi.
2. Keith Wilson and John Walker, 2010, Principles and Techniques of Biochemistry and Molecular Biology, 7th Edition, Cambridge University Press
3. Albert Lehninger, David Nelson and Michael Cox, 2017, Principles of Biochemistry by Seventh Edition, Macmillan Publishers.



**Unit-I:** Introduction to Computers, organization and architecture of Computers, Memory Concepts, Units of Memory, Operating System, definition and UNIX, WINDOWS.

**Unit-II:** Basic Computer networks, Internet and World Wide Web (WWW), Editing and Formatting a document, Database, concepts and types, creating database. Introduction to Computer C-Programming language, concepts and standard input/output operations. Introduction to ICT and uses in agriculture. Introduction to Computer-controlled devices (automated systems) for Agri-input management, Smartphone apps in Agriculture

**Unit-III:** Introduction to Bioinformatics and Omics database NCBI, searching and accessing genome sequences and protein sequences. Introduction to Bioinformatics and Omics database NCBI, searching and accessing genome sequences and protein sequences.

**Unit-IV:** Introduction to GIS and its applications in Agriculture. Introduction to MIS and Decision Support System and its applications in Agriculture.

#### List of Experiments/ Practices

- Introduction of different operating systems such as DOS and WINDOWS.  
Creating Files & Folders
- Introduction of programming languages. Use of MS-WORD and MS Powerpoint for creating, editing and presenting a scientific Document
- MS- EXCEL - Creating a spreadsheet, use of statistical tools, writing expressions, creating graphs, analysis of scientific data.
- MS- ACCESS: Creating Database, preparing queries and reports, demonstration of Agri-information system.
- Demonstration of HTML page design of e- Agriculture.
- Omics database of NCBI searching and accessing genome sequences and protein sequences, alignment of two genome sequences and alignment of two protein sequences.

**Unit-I:** Reading Comprehension, Vocabulary- Antonym, Synonym, Homophones, Homonyms, often confused words. Exercises to help the students in the enrichment of vocabulary based on TOEFL and other competitive examinations.

**Unit-II:** Functional grammar: Articles, Prepositions, And Verb, Subject verb Agreement, Transformation, Synthesis, Direct and Indirect Narration.

**Unit-III:** Writing Skills: Paragraph writing, Précis writing, Report writing, Proposal writing and Letter Writing.

**Unit-IV:** Interview Skills. Resume /CV Preparation and Job applications. Synopsis Writing.

#### List of Experiments/ Practices

- Listening Comprehension: Listening to short talks, lectures, speeches (scientific, commercial and general in nature).
- Oral Communication: Phonetics, stress and intonation, Conversation practice.
- Presentation skills and Public speaking.
- Reading skills: Reading and comprehension of general and technical articles
- Precise writing, summarizing, abstracting, Group discussion.



**Unit-I:** Introduction to Statistics and its Applications in Agriculture, Classification & Frequency Distributions of data, Diagrammatic Representation of Data: Bar & Pie diagrams, Graphical Representations of Data: Histogram, Frequency Polygon, Frequency curve and Cumulative frequency curve (Ogives). Measures of Central Tendency: Concepts & Definition, Characteristics of ideal Average, Arithmetic Mean, Median, Mode, Quartiles, Deciles & Percentiles (both for Ungrouped and Grouped data), Geometric Mean and Harmonic Mean (Ungrouped data). Measures of Dispersion: Concepts & Definition, Types of Measures of Dispersion: Range, Quartile deviation, Absolute Mean Deviation from mean and median, Standard Deviation and Variance, and Co-efficient of dispersion (both for Ungrouped and Grouped data). Moments, Measures of Skewness and Kurtosis (both for Ungrouped and Grouped data). Concept of Set Theory: , Permutation & Combinations. Theory: of Probability: Concept & Definition, Addition and Multiplication rules (without proof). Theoretical Probability distributions: Binomial, Poisson and Normal Distribution, their Properties & Applications.

**Unit-II:** Simple Correlation Analysis: Definition, Measures of Correlation: Scatter diagram, Karl Pearson product moment and Spearman's rank correlation coefficients and their properties. Simple Linear Regression Analysis: Definition, Fitting of simple linear regression equations Y on X and X on Y, Properties of regression coefficient, interrelation between correlation and regression. Introduction to Sampling Theory: Sampling versus Complete Enumeration, Methods of Sampling, Type of Sampling- Simple Random Sampling (with and without replacement), Use of Random Number Tables for selection of Simple Random Sample, Concept of Sampling distribution and standard error, concept of systematic stratified and cluster sampling along with their advantage & disadvantages.

**Unit-III:** Test of Significance: Introduction, Null & Alternative hypothesis, Types of Errors, Level of significance, degrees of freedom, Critical & Acceptance regions. Large sample tests: Z-Test for Means - One and Two sample Means for Known and Unknown population variance. Small sample test: Student t-test for Means - One and Two sample means, Paired t-test and F-test for two population variances. Chi-Square test: Test for Goodness of Fit, Test for independence of attributes for  $r \times c$  contingency table,  $2 \times 2$  contingency table with Yates correction, and test for single population variance.

**Unit-IV:** Introduction to Analysis of Variance and its Assumptions, Analysis of Variance for One & Two Way Classification. Concept of design of experiments: Basic Principle of Experimental Design: Randomization, Replication & Local control, Basic Designs: CRD, RCBD and LSD, their advantages and disadvantages.

#### List of Experiments/ Practices

- Construction of Frequency Distribution tables. Diagrammatic presentation of data: Bar diagrams & pie diagrams
- Graphical Representation of Data: Histogram, Frequency polygon, Frequency curve and Cumulative frequency curve (Ogives).
- Computation of Measures of Central Tendency: Arithmetic Mean, Median, Mode, Quartiles, Deciles & Percentiles (both for Ungrouped and Grouped data), Geometric Mean and Harmonic Mean (Ungrouped data).
- Computation of Measures of Dispersion: Range, Quartile deviation, Absolute Mean Deviation, Standard Deviation and Variance and Co-efficient of dispersion (both for Ungrouped and Grouped data).
- Computation of Moments, Measures of Skewness and Kurtosis (both for Ungrouped and



Grouped data), Problems on permutation and combination.

- Problems on Simple Probability, Addition and Multiplication rules. Computation of probabilities using Binomial, Poisson and Normal Distributions
- Computation of Correlation Coefficient: Karl Pearson product moment and Spearman's rank correlation coefficients.
- Fitting of Simple linear Regression Equations Y on X, & X on Y.
- Use of Random Number Tables for selection of Simple Random Sample. Problems on Large sample tests: Z-Test for Means - One and Two sample means for known and unknown population variance.
- Problems on Chi-Square test: Test for Goodness of Fit, Test for independence of attributes for  $r \times c$  contingency table,  $2 \times 2$  contingency table with Yates correction and test for single population variance.
- Problems on Analysis of Variance for One & Two Way Classified data. Problems on CRD, RCBD and LSD.

**Reference:**

1. Chandel, S.R.S. 1998. Handbook of Agril. Statistics. Achal Prakashan Mandir, Kanpur.
2. Gupta S.P. 2002. Statistical Methods. Sultan Chand & Sons, New Delhi.
3. Agarwal B.L. 1991. Basic Statistics Wiley Eastern, New Delhi.

**PART I**

**Unit-I:** Teaching of skills of Football – demonstration, practice of the skills, correction, involvement in game situation (For girls teaching of Badminton) Teaching of different skills of Football – demonstration, practice of the skills, correction, involvement in game situation (For girls teaching of Badminton)

**Unit-II:** Teaching of advance skills of Football – involvement of all the skills in game situation with teaching of rules of the game Teaching of skills of Basketball –demonstration, practice of the skills, correction of skills, involvement in game situation

**UNIT III:** Teaching of skills of Basketball – demonstration, practice of the skills, involvement in game situation Teaching of skills of Basketball – involvement of all the skills in game situation with teaching of rule of the game Teaching of skills of Kabaddi – demonstration, practice of the skills, correction of skills, involvement in game situation Teaching of skills of Kabaddi – demonstration, practice of the skills, correction of skills, involvement in game situation Teaching of advance skills of Kabaddi – involvement of all the skills in game situation with teaching of rule of the game

**UNIT IV:** Teaching of skills of Ball Badminton – demonstration, practice of the skills, correction of skills, involvement in game situation Teaching of skills of Ball Badminton – involvement of all the skills in game situation with teaching of rule of the game Teaching of some of Asanas – demonstration, practice, correction and practice Teaching of some more of Asanas – demonstration, practice, correction and practice Teaching of skills of Table Tennis – demonstration, practice of skills, correction and practice and involvement in game situation Teaching of skills of Table Tennis – demonstration, practice of skills, correction and practice and involvement in game situation

**UNIT I:** Teaching of skills of Hockey – demonstration practice of the skills and correction. Teaching of skills of Hockey – demonstration practice of the skills and correction. And involvement of skills in games situation Teaching of advance skills of Hockey – demonstration practice of the skills and correction. Involvement of all the skills in games situation with teaching of rules of the game teaching of skills of Kho-Kho – demonstration practice of the skills and correction. Teaching of skills of Kho-Kho – demonstration practice of the skills and correction. Involvement of the skills in games situation

**UNIT II:** Teaching of advance skills of Kho-Kho – demonstration practice of the skills and correction. Involvement of all the skills in games situation with teaching of rules of the game. Teaching of different track events – demonstration practice of the skills and correction. Teaching of different track events – demonstration practice of the skills and correction with competition among them. Teaching of different field events – demonstration practice of the skills and correction.

**UNIT III:** Teaching of different field events – demonstration practice of the skills and correction. Teaching of different field events – demonstration practice of the skills and correction with competition among them. Teaching of different asanas – demonstration practice and correction. Teaching of different asanas – demonstration practice and correction.

**UNIT IV:** Teaching of different asanas – demonstration practice and correction, Teaching of different asanas – demonstration practice and correction. Teaching of weight training – demonstration practice and correction. Teaching of circuit training-demonstration practice and correction, Teaching of calisthenics – demonstration practice and correction.



**PART I**

**Unit I:** Introduction and basic components of NSS: Orientation: history, objectives, principles, symbol, badge; regular programmes under NSS, organizational structure of NSS, code of conduct for NSS volunteers, points to be considered by NSS volunteers awareness about health. NSS programmes and activities: Concept of regular activities, special camping, day camps, basis of adoption of village/slums, conducting survey, analysing guiding financial patterns of scheme, youth programme/ schemes of GOI, coordination with different agencies and maintenance of diary.

**Unit II:** Understanding youth: Definition, profile, categories, issues and challenges of youth; and opportunities for youth who is agent of the social change. Community mobilization: Mapping of community stakeholders, designing the message as per problems and their culture; identifying methods of mobilization involving youth adult partnership.

**Unit III:** Social harmony and national integration: Indian history and culture, role of youth in nation building, conflict resolution and peace- building Volunteerism and shramdan: Indian tradition of volunteerism, its need, importance, motivation and constraints; shramdan as part of volunteerism

**Unit IV:** Citizenship, constitution, human rights, human values and ethics: Basic features of constitution of India, fundamental rights and duties, human rights, consumer awareness and rights and rights to information, human values and ethics. Family and society: Concept of family, community (PRIs and other community based organisations)

and society

**PART II**

**Unit I:** Importance and role of youth leadership: Meaning, types and traits of leadership, qualities of good leaders; importance and roles of youth leadership Life competencies: Definition and importance of life competencies, problem-solving and decision-making, inter personal communication

**Unit I:** Youth development programmes: Development of youth programmes and policy at the national level, state level and voluntary sector; youth-focused and youth-led organisations

**Unit II:** Health, hygiene and sanitation: Definition needs and scope of health education; role of food, nutrition, safe drinking water, water born diseases and sanitation (Swachh Bharat Abhiyan) for health; national health programmes and reproductive health. Youth health, lifestyle,

**Unit III:** HIV AIDS and first aid: Healthy lifestyles, HIV AIDS, drugs and substance abuse, home nursing and first aid Youth

**Unit IV:** yoga: History, philosophy, concept, myths and misconceptions about yoga; yoga traditions and its impacts, yoga as a tool for healthy lifestyle, preventive and curative method.

**PART I**

**Unit I:** Vocational skill development: To enhance the employment potential and to set up small business enterprises skills of volunteers, a list of 12 to 15 vocational skills will be drawn up based on the local conditions and opportunities. Each volunteer will have the option to select two skill-areas out of this list

**Unit II:** Issues related environment: Environmental conservation, enrichment and sustainability, climatic change, natural resource management (rain water harvesting, energy conservation, forestation, waste land development and soil conservations) and waste management

**Unit III:** Disaster management: Introduction and classification of disaster, rehabilitation and management after disaster; role of NSS volunteers in disaster management. Entrepreneurship development: Definition, meaning and quality of entrepreneur; steps in opening of an enterprise and role of financial and support service institution.

**Unit IV:** Formulation of production oriented project: Planning, implementation, management and impact assessment of project Documentation and data reporting: Collection and analysis of data, documentation and dissemination of project reports

**PART II**

**Unit I:** Youth and crime: Sociological and psychological factors influencing youth crime, cyber crime, peer mentoring in preventing crime and awareness for juvenile justice

**Unit II:** Civil/self defence: Civil defence services, aims and objectives of civil defence; needs and training of self defence

**Unit III:** Resource mobilization: Writing a project proposal of self fund units (SFUs) and its establishment

**Unit IV:** Additional life skills: Positive thinking, self-confidence and esteem, setting life goals and working to achieve them, management of stress including time management.

KAN . 111

ಕನ್ನಡಪಠ್ಯಕ್ರಮ (ಕನ್ನಡವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ)

0 + 1

ಆ . ಕಾವ್ಯ - ಕಥೆಜನಪದಗೀತೆಗಳು - ಜನಪದರು ; ಶರಣರವಚನಗಳು - ಜೇಡರದಾಸಿಮಯ್ಯ , ಬಸವಣ್ಣ , ಆಯ್ದಕ್ಕಿಲಕ್ಕಮ್ಮ ; ಹೊಸಬಾಳಿನಗೀತೆ- ಕುವೆಂಪು ; ತಿಳಿದವರೇಹೇಳಿ - ವೈದೇಹಿ ; ಜೀತ-ಡಾ || ಬೆಸಗರಹಳ್ಳಿರಾಮಣ್ಣ ; ಒಂದುಖಾಸಗಿಪತ್ರ - ವಿನಯಾಒಕ್ಕುಂದ .

ಆ . ಕೃಷಿಬರಹ

ಆಧುನಿಕಪೂರ್ವಕನ್ನಡಕೃಷಿಸಾಹಿತ್ಯಪರಿಚಯ - ಡಾ | ಜಿ.ವೀರಭದ್ರಗೌಡ , ಕನ್ನಡದಲ್ಲಿಕೃಷಿವಿಜ್ಞಾನಸಾಹಿತ್ಯದಲಗಮಮತ್ತುವಿಕಾಸ - ಡಾ | ಜಿ . ಬಾಲಕೃಷ್ಣ , ಎಲ್ವಾರ್ಟೆನ್ಅಲ್ಲ : ಲಕ್ಷ್ಮಣಯ್ಯ - ಡಾ | ಟಿ.ಎಸ್.ಚನ್ನೇಶ್ , ಅಹಾರವೆಂಬಆಯುಧ - ನಾಗೇಶಹೆಗಡೆ

ಇ . ಪ್ರಾಯೋಗಿಕ

ಅನುವಾದ , ಪಾರಿಭಾಷಿಕಪದರಚನೆಯವಿಧಾನಗಳು .

ಕನ್ನಡೇತರ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ / For Non Kannada Speaking Students



KAN . 112

0 + 1

Development of listening and speaking skills with Kannada structure pattern - Introducing each other - Conversation between friends Enquiring about family - Plan to go for a movie -Routine activities of a student - In a book shop - Introducing College/University Conversation between a farmer and a Scientist - Data collection in a village - Conversation on going on a tour.

Development of writing and reading skills with Kannada structure pattern - Kannada Script practice and reading.

### ಕನ್ನಡ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ

KAN . 121

0 + 1

ಆ . ಕಾವ್ಯ - ಕಥೆ- ಜನಪದ - ಸಂಸ್ಕೃತಿ ಮತ್ತು ಕನ್ನಡಪ್ರಜ್ಞೆ - ಸಂಕೀರ್ಣ

ಬೇವಿನಹಟ್ಟಿ ಕಾಳಮ್ಮನಸಾಲು- ಜನಪದ , ಗೋವಿನಹಾಡು- ಜನಪದ ,  
ಕರ್ನಾಟಕ ಜಾನಪದ ಲೋಕದೃಷ್ಟಿ - ಪುರುಷೋತ್ತಮ ಬಿಳಿಮಲೆ , ಕೆರೆಗೆಹಾರ- ಜನಪದ ,  
ನೇರಂಬಜೀವದ್ರವ - ಜಿ.ಬಾಲಕೃಷ್ಣ , ಸೂಫಿಕತೆಗಳು , ಕನ್ನಡದ ಶುದ್ಧತೆ - ಕೆ.ವಿ.ನಾರಾಯಣ ,  
ವಚನಕಾರರು ಮತ್ತು ಭಾಷೆ , ಕದಂಬರ ಕನ್ನಡಲಿಪಿ - ಷಶೆಟ್ಟರ್ , ಅವನತಿ -  
ಪೂರ್ಣಚಂದ್ರತೇಜು ಇಲ್ಲಿಯಾರೂ ಮುಖ್ಯರಲ್ಲ , ಯಾರೂ ಅಮುಖ್ಯರಲ್ಲ ... - ಕೃಪಾಕರಸೇನಾನ ,  
ಕೃಷಿಗಾದೆಗಳು - ಜನಪದ , ಕೃಷಿಗಾದೆಗಳ ಅವಲೋಕನ - ಜಿ . ವೀರಭದ್ರಗೌಡ ,

ಈ ಪ್ರಾಯೋಗಿಕ ಕನ್ನಡದಲ್ಲಿ ಕೃಷಿಸಾಹಿತ್ಯ ಪ್ರಕಾರಗಳು ಮತ್ತು ಅವುಗಳ ರಚನಾ ಸ್ವರೂಪ , ವ್ಯವಹಾರ

ಕನ್ನಡೇತರ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ / For Non Kannada Speaking Students

KAN. 122

0+1

Development of listening and speaking skills with Kannada structure pattern - Conversation between a Doctor and a Patient; About Children's Education; Halebid-Belur, Discussing about Examination and Future Plan

Development of writing and reading skills with Kannada structure pattern : Translation of simple sentences English into Kannada. Selected lesson for reading (Nada Geete, Kannada Habbagalu, PrekshaniyaSthalagalu, Kannada Kavi, Kannada Vignani).

## AGRICULTURAL AND ALLIED SUBJECTS

### AGRONOMY

AGR. 111

FUNDAMENTALS OF AGRONOMY

2+1

**Unit-I:** Agronomy and its scope, Agriculture as an art, science and business of crop production, Factors affecting crop production.

**Unit-II:** History of agriculture development in India and Karnataka, Importance and scope of agriculture, classification of crops, Seeds and sowing, Soil and its components, properties, fertility and productivity and their management, Tillage and tillth, Crop density and geometry.

**Unit-III:** Crop nutrition - manures and fertilizers, nutrient use efficiency, Growth and development of crops, ideotypes, Cropping systems and its principles, Crop adaptation and distribution, crop management technologies in problematic areas, Harvesting and threshing of crops.

**Unit-IV:** Weeds- importance, classification, crop weed competition, concepts of weed management- principles and methods, herbicides- classification, selectivity and resistance, allelopathy.

#### List of Experiments/ Practices

- Identification of crops, seeds and fertilizers, Classification of field crops, tillage implements
- Study and practice of different methods of ploughing,
- Study of different methods of sowing, Study of seed drills, intercultural implements
- Study of fertilizers, manures and green manures
- Calculation of fertilizers and seed rates, Study on seed germination and plant population, Preparation of FYM and compost, Participation in ongoing field operations,
- Study of agro- climatic zones of Karnataka and India. Study and identification of dry land and waste land weeds.
- Study and identification of garden land, wet land and aquatic weeds. Calculation of herbicide doses and their spray.

#### Reference:

1. ICAR. 2010. Handbook of Agriculture (6th edition), Indian Council of Agricultural Research, New Delhi.
2. Reddy, T. Yellamanda & Reddy, G.H Sankara, 2015. Principles of Agronomy Kalyani Publishers,
3. Balasubramaniyan, P. and Palaniappan, S.P., 2016. Principles and Practices of Agronomy (2nd edition), Agrobios (India), Jodhpur
4. Reddy, T. Yellamanda and Reddy, G.H. Sankara, 2016. Principles of Agronomy (2nd edition), Kalyani Publishers, Ludhiana
5. Reddy, S.R., 2012. Principles of Crop Production (4th edition), Kalyani Publishers, Ludhiana.
6. Panda, S.C., 2006. Agronomy Agribios Publication, New Delhi.
7. Reddy, S.R. Principles of Agronomy Kalyani Publishers, Ludhiana, India.
8. Sankaran, S and Subbiah Mudliyar, V.T., 1991. Principles of Agronomy. The Bangalore Printing and Publishing Co. Ltd., Bangalore.
9. Vaidya, V.G., Sahasrabudhe, K.R. and Khuspe, V.S. Crop production and field experimentation. Continental Prakashan, Vijaynagar, Pune.
10. Rao V.S. (2006), Principles of Weed Science. Oxford and IBH Publishing Co., New Delhi.



**Unit-I:** Definition of irrigation, water resources; soil water relations; Basic terms in water management and irrigation. Study of soil moisture constants and hydrodynamic relation. Measurement of soil moisture-direct and indirect methods; Expression of soil moisture and their mutual relations, Plant water relationship –critical stages. Meaning and impact of water stress, water availability and its relationship with nutrient availability and losses

**Unit-II:** Water management of crops – its definition, meaning, measurement and relevance in crop production, concept of evapotranspiration and its management, factors affecting water management, study of water requirement of field and horticultural crops

**Unit-III:** Methods of irrigation – surface, subsurface, sprinkler and drip, constraints and advantages of different methods. Efficiency of irrigation and methods to measure them, Quantitative estimation of irrigation water – direct and indirect methods, Weeds importance, classification, crop weed competition, concepts of weed management principles and methods, herbicides- classification, selectivity and resistance, allelopathy.

**Unit-IV:** Expression of flowing water and mutual relations, Concept of water use efficiency and methods to improve water use efficiency, Assessment of irrigation requirement, Scheduling of irrigation – Approaches and methods, Suitability of water for irrigation, Concept of drainage and methods.

#### **List of Experiments / Practices**

- Soil moisture determination by direct and indirect methods, Study and installation of tensiometer and soil moisture gauges,
- Determination of maximum water holding capacity, field capacity, permanent wilting point and bulk density
- Determination of infiltration rate and capillarity in soil, Study of methods of flow measurement
- Determine the use of weirs, orifices, Parshall flume and water meters, Surface & subsurface irrigation methods, Micro irrigation methods, Water requirement of different crops, On-farm irrigation structures, Drainage structures, Practice of numerical examples.

#### **Reference:**

1. Irrigation Water Management by Dilip Kumar Muzumdar
2. Principles and Practices of Water Management by A. M. Michel
3. Irrigation and Drainage by Lenka D.

**Unit-I:** Meaning and scope of agricultural meteorology; Earth atmosphere- its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze; Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, long wave and thermal radiation, net radiation, albedo.

**Unit-II:** Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature, Energy balance of earth; Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud; Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification.

**Unit-III:** Artificial rainmaking. Monsoon- mechanism and importance in Indian agriculture, Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-wave. Agriculture and weather relations; Modifications of crop microclimate, climatic normal's for crop and live stock production.

**Unit-IV:** Weather forecasting- types of weather forecast and their uses. Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture and mitigation strategies.

#### **List of Experiments / Practices**

- Visit of Agro meteorological Observatory, site selection of observatory, exposure of instruments and weather data recording.
  - Measurement of total, shortwave and long wave radiation, and its estimation using Planck's intensity law.
  - Measurement of albedo and sunshine duration, computation of Radiation Intensity using BSS.
  - Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis.
  - Measurement of soil temperature and computation of soil heat flux. Determination of vapor pressure and relative humidity.
  - Determination of dew point temperature.
  - Measurement of atmospheric pressure and analysis of atmospheric conditions.
- Measurement of wind speed and wind direction, preparation of windrose.
- Measurement, tabulation and analysis of rain. Measurement of open pan evaporation and evapotranspiration.
  - Computation of PET and AET.

#### **Reference:**

1. Lal, D.S. 2005 Climatology, Sharda Pustak Bhawan, Allahabad..
2. Varshneya, M.C. and Balakrishna, Pillai, 2003. Text book of Agricultural Meteorology. ICAR, New-Delhi.
3. Sahu, D.D., 2007. Agrometeorology and Remote sensing: Principles and Practices , Agrobios (India) , Jodhpur.
4. Reddy, S.R., 2016. Introduction to Agriculture and Agrometeorology. Kalyani Publishers, Ludhiana.



**Unit I:** Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Kharif crops.

**Unit II:** Cereals – rice, maize, wheat, sorghum, pearl millet and finger millet, Nutri-millet /small millets: kodo millet, foxtail millet, Proso millet, little millet, baranyard millet

**Unit III:** Pulses- chickpea, peas, pigeonpea, mungbean, urdbean, cowpea, horsegram and lentil.

**Unit IV:** Forage crops: sorghum, cowpea, cluster bean, napier, berseem, lucerne and oat.

### List of Experiments / Practices

- Study of area, production and productivity of cereals, pulses and forage crops in Karnataka, India and world
- Raising of important cereals pulses and forage crops in the crop museum, Rice nursery preparation, transplanting of Rice, effect of seed size on germination and seedling vigour crops
- Effect of sowing depth on germination of crops
- Identification of weeds in crops, top dressing and foliar feeding of nutrients
- study of yield contributing characters and yield calculation of crops
- study of crop varieties and important agronomic experiments at experimental farm.
- study of forage experiments, morphological description of crops, visit to research centres of related crops. Green leaf manuring
- use of bio-fertilizers in rice, Fertilizer management in cereals, pulses and forage crops, fertilizer management of paddy, preservation of fodder and silage making.

### Reference:

1. Singh, Chhidda, Singh, Prem and Singh, Rajbir. 2003. Modern Techniques of Raising Field Crops, Oxford & IBH Publishing Co., New Delhi.
2. Panda, S.C.2012. Modern Concepts and Advance Principles in Crop Production. Agrobios (India), Jodhpur
3. Singh, S.S.and Singh, Rajesh. 2013. Crop Management Under Irrigated and Rainfed Conditions. Kalyani Publishers, New Delhi.
4. Singh, S.S.and Singh, Rajesh. 2015. Principles and Practices of Agronomy (5th Re-set), Kalyani Publishers, New Delhi, Kalyani Publishers, Ludhiana.
5. Rathore, P.S. 2000. Techniques and Management of Field Crop Production, Agrobios (India), Jodhpur.

**List of Experiments / Practices**

- Crop planning, raising field crops in an area of 5 guntas by each student
- Crop planning, raising field crops in an area of 5 guntas by each student.
- Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce.
- The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies.
- Preparation of balance sheet including cost of cultivation, net returns per student.

**Reference:**

1. Singh, S.S. and Singh, Rajesh. 2013. Crop Management Under Irrigated and Rainfed Conditions. Kalyani Publishers, New Delhi.
2. Panda, S.C. 2012. Modern Concepts and Advance Principles in Crop Production. Agrobios (India), Jodhpur
3. Reddy, S.R., 2012. Principles of Crop Production (4th edition), Kalyani Publishers, Ludhiana



**Unit I:** Origin, geographical distribution, economic importance

**Unit II:** soil and climatic requirements, varieties, cultural practices

**Unit III:** yield of oilseed crops- groundnut, sunflower, rapeseed and mustard, soybean, sesamum, niger, safflower, castor, linseed,

**Unit IV:** Commercial crops – sugarcane, cotton, jute, mesta.

**List of Experiments / Practices**

- Study of area, production and productivity of oilseeds and commercial crops in Karnataka, India and world
- Raising of important oilseed and commercial crops in the crop museum, Planting methods of sugarcane
- Study on methods of shelling and rhizobium and PSB seed treatment in groundnut, study on nipping in castor and safflower
- Methods of testing the maturity of sugarcane and computation of commercial cane sugar
- Study of yield contributing characters of oilseed and commercial crops
- Study on quality parameters of cotton, study of bast fibre like mesta, jute and their retting, visit to research stations of related crops/sugar factory.

**Reference:**

1. Reddy, S.R., 2012. Principles of Crop Production (4th edition), Kalyani Publishers, Ludhiana
2. Prasad, Rajendra. 2002. Text Book of Field Crops Production, ICAR, New Delhi.
3. ICAR. 2010. Handbook of Agriculture (6th edition), Indian Council of Agricultural Research, New Delhi.
4. Reddy, S.R. 2012. Agronomy of Field Crops. Kalyani Books, New Delhi.

**LIST OF EXPERIMENTS/ PRACTICES**

- Crop planning, raising field crops in an area of 5 guntas by each student.
- Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce.
- The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies.
  - Preparation of balance sheet including cost of cultivation, net returns per student.

**Reference:**

1. Panda, S.C. 2012. Modern Concepts and Advance Principles in Crop Production. Agrobios (India), Jodhpur
2. Singh, S.S. and Singh, Rajesh. 2013. Crop Management Under Irrigated and Rainfed Conditions. Kalyani Publishers, New Delhi.
3. Rathore, P.S. 2000. Techniques and Management of Field Crop Production, Agrobios (India), Jodhpur.
4. Prasad, Rajendra. 2002. Text Book of Field Crops Production, ICAR, New Delhi.



**List of Experiments / Practices**

- Aims and objectives of field experiments, Essence, levels and methods of research,
- Identification and statement of problem, selection of treatments, selection of site, plot shape and size, Use of random sampling numbers in field experiments
- Layout of field experiments and conduct of field trials by individual student, Recording of observations from field experiments, Review collection and writing of reference cards
- Basic concepts and measurement of data, Analysis of variance and test of significance
- Experimental designs and basic principles of experimental design, Completely Randomized Design (CRD)
- Randomized Complete Block design (RCBD), Latin Square design (LSD), Factorial Concept, each student has to conduct a micro plot field experiment.
- Study of tabulation, analysis of experimental data and experimental results, Transformation of data and Preparation of research report & presentation of results.

**Reference:**

1. Panda, S.C. 2012. Modern Concepts and Advance Principles in Crop Production. Agrobios (India), Jodhpur
2. Singh, S.S. and Singh, Rajesh. 2013. Crop Management Under Irrigated and Rainfed Conditions. Kalyani Publishers, New Delhi.
3. Rathore, P.S. 2000. Techniques and Management of Field Crop Production, Agrobios (India), Jodhpur.
4. Prasad, Rajendra. 2002. Text Book of Field Crops Production, ICAR, New Delhi.

**Unit I:** Farming System-scope, importance and concept, Types and systems of farming system and factors affecting types of farming, Farming system components and their maintenance, Cropping system and pattern, multiple cropping system, Efficient cropping system and their evaluation, Allied enterprises and their importance, Tools for determining production and efficiencies in cropping and farming system; Sustainable agriculture-problems and its impact on agriculture, indicators of sustainability, adaptation and mitigation

**Unit II:** conservation agriculture strategies in agriculture, HEIA, LEIA and LEISA and its techniques for sustainability, Integrated farming system-historical background, objectives and characteristics, components of IFS and its advantages, Site specific development of IFS model for different agro-climatic zones, resource use efficiency and optimization techniques, Resource cycling and flow of energy in different farming system, farming system and environment, Organic farming, principles and its scope in India; Initiatives taken by Government (central/state).

**Unit III:** NGOs and other organizations for promotion of organic agriculture; Organic ecosystem and their concepts; Organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming; Choice of crops and varieties in organic farming; Fundamentals of insect, pest, disease and weed management under organic mode of production; Operational structure of NPOP

**Unit IV:** Indian agriculture. Global Positioning System (GPS) Geographic Information System (GIS). Site Specific Nutrient Management (SSNM) for nutrient and irrigation management practices. Comparative yield, quality and farm profits under SSM practices v/s Variable Rate Technology (VRT) practices.

#### **List of Experiments / Practices**

- Visit of organic farms and outlets to study the various components and their utilization.
- Visit to IFS model in different agro-climatic zones of nearby states University/ institutes and farmers field to study the various components and their utilization
- Preparation of enrich compost, vermicompost, bio-fertilizers/bio-inoculants and their quality analysis; Indigenous technology knowledge (ITK) for nutrient, insect, pest disease and weed management; Cost of organic production system; Post harvest management; Quality aspect, grading, packaging and handling.

#### **Reference:**

1. Panda, S.C.,2004. Cropping Systems and Farming Systems, Agrobios (India), Jodhpur.
2. Panda, S.C.,2012. Modern Concepts and Advance Principles in Crop Production. Agrobios (India), Jodhpur
3. Sharma, Arun K., 2002. A Handbook of Organic Farming, Agrobios (India) Ltd., Jodhpur
4. Balasubramanian, P. and Palaniappan, S.P.,2016. Principles and Practices of Agronomy (2<sup>nd</sup> edition), Agrobios (India), Jodhpur



**Unit I:** Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India; Problems and prospects of rainfed agriculture in India .

**Unit II:** Soil and climatic conditions prevalent in rainfed areas; Soil and water conservation techniques, Drought: types, effect of water deficit on physio- morphological characteristics of the plants, Crop adaptation and mitigation to drought

**Unit III:** Water harvesting: importance, its techniques, Efficient utilization of water through soil and crop management practices

**Unit IV:** Management of crops in rainfed areas, Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, factors affecting watershed management.

**List of Experiments / Practices**

- Studies on climate classification, studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons.
- Studies on cropping pattern of different rainfed areas in the country and demarcation of rainfed area on map of India. irrigation on the basis of evapo-transpiration demand of crops.
- Critical analysis of rainfall and possible drought period in the country, effective rainfall and its calculation.
- Studies on cultural practices for mitigating moisture stress. Characterization and delineation of model watershed.
- Field demonstration on soil & moisture conservation measures.
- Field demonstration on construction of water harvesting structures. Visit to rainfed research station/watershed.

**Reference:**

1. Singh, S.S.1998. Crop Management Under Irrigated and Rainfed Conditions. Kalyani Publishers, New Delhi.
2. Panda, S.C.2012. Modern Concepts and Advance Principles in Crop Production. Agrobios (India), Jodhpur
3. Singh, S.S.and Singh, Rajesh. 2013. Crop Management Under Irrigated and Rainfed Conditions. Kalyani Publishers, New Delhi. 45. Rathore, P.S. 2000. Techniques and Management of Field Crop Production, Agrobios (India), Jodhpur.
5. Prasad, Rajendra. 2002. Text Book of Field Crops Production, ICAR, New Delhi.
6. ICAR. 2010. Handbook of Agriculture (6th edition), Indian Council of Agricultural Research, New Delhi.

## AGRICULTURAL ECONOMICS

AEC. 111

### FUNDAMENTALS OF AGRICULTURAL ECONOMICS

2+0

**Unit-I: Economics:** Meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro and macro economics, positive and normative analysis. Nature of economic Theory: ; rationality assumption, concept of equilibrium, economic laws as generalization of human behavior Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare. Agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in economic development Technical change and types, Agricultural planning and development in the country.

**Unit-II:** Basic concepts: Land reforms: meaning of land tenure, land tenancy, land reform measures – abolition of intermediaries, tenancy reforms, fixation of ceiling on land holdings, consolidation of holdings, development of cooperative farming. Agricultural labour and farm mechanization. Demand: meaning, law of demand, demand schedule and demand curve, determinants, utility Theory: ; law of diminishing marginal utility, equi-marginal utility principle. Consumer's equilibrium and derivation of demand curve, elasticity of demand: concept and measurement of price elasticity, income elasticity and cross elasticity.

**Unit-III:** Supply: Stock v/s supply, law of supply, supply schedule, supply curve, determinants of supply, elasticity of supply. Production: process, creation of utility, factors of production, laws of returns and returns to scale. Market structure: meaning and types of market, basic features of perfectly competitive and imperfect markets.

Distribution Theory: meaning, factor market and pricing of factors of production. Concepts of rent, wage, interest and profit. National income: Meaning and importance, circular flow, concepts of national income accounting and approaches to measurement, difficulties in measurement.

**Unit-IV:** Population: Importance, Malthusian and Optimum population theories, natural and socio-economic determinants, current policies and programmes on population control. Money: Barter system of exchange and its problems, evolution, meaning and functions of money, classification of money, money supply, general price index, inflation and deflation. Banking: Role in modern economy, Agricultural and public finance: meaning, micro v/s macro finance, need for agricultural finance, public revenue and public expenditure. Tax: meaning, direct and indirect taxes, agricultural taxation, VAT. Economic systems: Concepts of economy and its functions, important features of capitalistic, socialistic and mixed economies, elements of economic planning, NITI Ayoga.

#### Reference:

1. Dominick Salvatore, 2011, Outline of Microeconomics, Schaum's Outline Series.
2. Bhavani Devi, P. Raghu Ram, S. Subba Reddy, T.V. Neelakanta Sastry, 2009, Agricultural economics, Oxford and IBH Co. Pvt. Ltd., New Delhi.
3. K. K. Dewett and J. D. Varma, 1986, Elementary Economic Theory, S. Chand & Company, New Delhi.
4. Latika Sharma *et al* (2014) Principles of agricultural economics, Agrotech publishers, Udaipur.
5. M.L. Jhingan, 2004, Micro Economic Theory, Vikas Publishing House Pvt. Ltd., New Delhi.



**Unit I:** Agricultural Finance - meaning, scope and significance, credit needs and its role in Indian agriculture. Agricultural credit: meaning, definition, need, classification.

**Unit II:** Credit analysis: 3 R'S and 5 C'S of credits Loan repayment plans. Sources of agricultural finance: institutional and non-institutional sources, types of banks, functions of commercial and central bank, credit creation policy, social control and nationalization of commercial banks, micro financing including KCC and SHGs. Lead bank scheme, RRBs, Scale of finance and unit cost.

**Unit III:** Introduction to higher financing institutions – RBI, NABARD, ADB, IMF, World Bank, Insurance and Credit Guarantee Corporation of India. Cost of credit. Recent development in agricultural credit-Banking reforms and their implication on agricultural credit – Narasimham Committee and other reports. Preparation and analysis of financial statements – Balance Sheet and Income Statement. Basic guidelines for preparation of project reports Time value of money, capital budgeting techniques – PBP, ARR, NPV, BCR, IRR, Bank norms – SWOT analysis.

**Unit IV:** Agricultural Cooperation – Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture. Agricultural Cooperation in India - credit, multi-purpose cooperatives, farmers' service cooperative societies, role of ICA, NCUI, NCDC.

#### **List of Experiments / Practices**

- Determination of most profitable level of capital use. Optimum allocation of scarce capital among different enterprises.
- Exercise on Time value of money, capital budgeting techniques – PBP, ARR, NPV, BCR, IRR, Analysis of performance of cooperatives using secondary data.
- Analysis of performance of commercial banks and RRB's using secondary data. Visit to cooperative banks, credit societies, commercial banks, NABARD, lead bank to acquire firsthand knowledge of their management, schemes and procedures.
- Estimation of credit requirement of farm business – Case studies. Preparation and analysis of balance sheet – case studies.
- Preparation and analysis of income statement – case studies. Appraisal of a loan proposal – case studies.
- Techno-economic parameters for preparation of projects. Preparation of bankable projects for various agricultural crops / products including their value added products.

#### **Reference:**

1. S. Subba Reddy, P. Raghu Ram, 1996, Agricultural finance and management, Oxford & IBH Pub. Co, New Delhi
2. Kamat, G.S., 1978, New Dimensions of Cooperative Management, Himalayan Publishing House, Mumbai.
3. Nelson and Murray, 1988. Agricultural Finance. Kalyani Publishers, New Delhi.
4. Pandey, U.K. 1990. An Introduction to Agricultural Finance, Kalyani Publishers, New Delhi.
5. Singh, J.P., 1988, Agricultural Finance Theory and Practices, Ashish Publishing House, New Delhi.
6. Muniraj, R. 1987, Farm finance for development, Oxford & IBH Pub. Co., New Delhi.



**Unit I:** Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation, classification and characteristics of agricultural markets studying the problems of marketing- Functional, institutional, commodity and behavioral approaches, Market forces – Demand and Supply, Consumer surplus and producer surplus, nature and determinants of demand and supply of farm products

**Unit II:** producer's surplus – meaning and its types, marketable and marketed surplus, factors affecting marketable surplus of agri- commodities product life cycle (PLC) and competitive strategies Meaning and stages in PLC; characteristics of PLC; strategies in different stages of PLC; pricing and promotion strategies: pricing considerations and approaches – cost based and competition based pricing; Price determination under different types of markets, market promotion – advertising, personal selling, sales promotion and publicity – their meaning and merits & demerits

**Unit III:** Marketing process and functions: Marketing process-concentration, dispersion and equalization; exchange functions – buying and selling; physical functions – storage, transport and processing; facilitating functions – packaging, branding, grading, quality control and labeling (AGMARK); Market functionaries and marketing channels: Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel; number of channel levels; marketing channels for different farm products; Integration, efficiency, costs and price spread: Meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs; Role of Govt. in agricultural marketing and market regulation

**Unit IV:** Market research- information and intelligence, Public sector institutions- CWC, SWC, FCI, CACP & DMI – their objectives and functions; cooperative marketing in India, NAFED Risk in marketing: Types of risk in marketing; speculation & hedging; an overview of futures trading; Agricultural prices and policy: Meaning and functions of price; need for agricultural price policy; Administered Prices, CACP, MSP, MIS, Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agri-commodities; GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR. Quality control, HACCP, Eco-mark, Agri-export zones, Export- import bank of India.

#### **List of Experiments / Practices**

- Plotting and study of demand and supply curves and calculation of elasticities
- Study of relationship between market arrivals and prices of some selected commodities
- Computation of marketable and marketed surplus of important commodities
- Study of price behaviour over time for some selected commodities; Construction of index numbers; Visit to local markets to study various marketing functions performed by different agencies
- Identification of marketing channels for commodities, collection
- Analysis of data on marketing costs, margins and price spread and presentation of report in the class
- Visit to market institutions – NAFED, SWC, CWC, e-marketing, regulated market, cooperative marketing society, Export house, etc.



➤ To study their organization and functioning; Application of principles of comparative advantage of international trade.

**Reference:**

1. Acharya, S.S. and Agarwal, N.L., 1994, Agricultural Price Analysis and Price Policy, Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
2. Acharya, S.S. and Agarwal, N.L., 2004, Agricultural Marketing in India, Oxford and IBH Publishing Co. New Delhi.
3. G. L. Meena, S. S. Burark, D. C. Pant and Rajesh Sharma, 2017. Fundamentals of Agribusiness Management, Agrotech Publishing Academy, Udaipur, ISBN: 978-81-8321-418-6. First edition.
4. Kahlon, A.S. and George, M.V., 1985, Agricultural Marketing and Price Policy, Allied Publication Pvt. Ltd., New Delhi.
5. Kohls, Richard L. and Uhl, Joseph N., 1980, Marketing of Agricultural Products, Macmillan Publishing Co., Inc. New York
6. Mamoria, C.B and Joshi, R.L., 1971, Principles and Practice of Marketing in India, Kitabmahal, Allahabad.

## AEC. 321 FARM MANAGEMENT, PRODUCTION AND RESOURCE ECONOMICS 1+1

**Unit I:** Meaning and concept of farm management, objectives and relationship with other sciences. Meaning and definition of farms, its types and characteristics, factor determining types and size of farms. Principles of farm management: Differences between farm management and production economics, concept of production function and its type - Linear, quadratic, Cobb Douglas models, meaning and interpretation. Uses of production function in decision- making.

**Unit II:** Laws of returns: Law of variable proportions (factor- product), factor-factor and product-product relationships, law of equi- marginal returns, principle of opportunity cost, law of comparative advantage. Meaning and concept of cost, types of costs and their interrelationship, fixed costs, sunken costs, valuation and depreciation of farm assets, total and average cost curves in the short and long run and farm management cost concepts (CACP), Concept and estimation- gross farm income, net farm income, family labor income and farm business income. Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises. Discounted Cash Flow Measures and their role in financial strategic decisions etc.,

**Unit III:** Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm, single entry and double entry book keeping, farm inventory, balance sheet, profit and loss accounts. Meaning and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting, linear programming, appraisal of farm resources, selection of crops and livestock's enterprises. Concept of risk and uncertainty in farming, nature and sources of risks and its management strategies, Crop/livestock/ machinery insurance schemes – weather based crop insurance, features, determinants of compensation, PMFBY.

**Unit IV:** Concepts of resource economics, Significance of NRE in farming, differences between NRE and agricultural economics, unique properties of natural resources - land, surface water, groundwater, environment, biodiversity, ecosystem services: uniqueness, indispensability, irreversibility, invisibility, remoteness, intricacy, synergy, ambiguous property rights, externalities, market failure, free riding, property rights. Positive and negative externalities in agriculture, inefficiency and welfare loss, internalization of externalities, important issues in economics and management of common property resources of land, water, pasture, fishery and forest resources etc. evaluation, equipping farmer as decision maker – production.

### List of Experiments / Practices

- Preparation of farm layout. Determination of cost of fencing of a farm. Computation of depreciation cost of farm assets.
- Illustration of loss minimization principle, Application of equi-marginal returns/opportunity cost principle in allocation of farm resources.
- Determination of most profitable level of inputs use in a farm production process.
- Determination of least cost combination of inputs. Selection of most profitable enterprise combination.
- Formulation of LP problems. Application of cost principles including CACP concepts in the estimation of cost of crop and livestock enterprises.
- Preparation of farm plan and budget, partial budgeting exercises, Exercise on book keeping in farm, Amortization
- Illustration of costing of groundwater irrigation. Visit to IFS farms, farm section office, cooperative farms, and other representative farms.



### Reference:

1. Dhondyal, S.P., "Farm Management – An Economic Analysis", Aman Publishing House, Madhu Market, Meerut (U.P.).
2. Bhavani Devi, P. Raghu Ram, S. Subba Reddy, T.V. Neelakanta Sastry, 2009, Agricultural economics, Oxford and IBH Co. Pvt. Ltd., New Delhi.
3. Johl, S.S. and Kapoor, T.R., 2005, Fundamentals of Farm Business Management, Kalyani Publishers, Ludhiana..
4. Kerr, John M., et al., 1997, Natural Resource Economics: Theory and Applications in India, Oxford & IBH, New Delhi.
5. Raju, V. T. and D. V. S. Rao, 2002, "Economics of Farm Production and Management", Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
6. Sankhayan, P. L., 1988, Introduction to the Economics and Agricultural Production, Prentice Hall of India Private Limited, New Delhi.
7. Singh, I. J., 1977, Elements of Farm Management Economics, Affiliated East-West Press Pvt. Ltd., New Delhi.
8. Kahlon, A.S. and Karam Singh, 1992, Economics of Farm Management, Allied Publishers, New Delhi.
9. Doll, John P. and Orazem. F., 1984, Production Economics: Theory with Applications, John Wiley and Sons, New York.

## AGRICULTURAL ENGINEERING

### AEG. 111 INTRODUCTORY SOIL AND WATER CONSERVATION ENGINEERING 1+1

**Unit-I:** Introduction to Soil and Water Conservation causes of soil erosion. Definition and agents of soil erosion.

**Unit-II:** water erosion: Forms of water erosion. Gully classification and control measures. Soil loss estimation by universal Loss Soil Equation. Soil loss measurement techniques.

**Unit-III:** Principles of erosion control: Introduction to contouring, strip cropping. Contour bund. Graded bund and bench terracing, Grassed water ways and their design. Water harvesting and its techniques.

**Unit-IV:** Wind erosion: mechanics of wind erosion, types of soil movement. Principles of wind erosion control and its control measures.

#### List of Experiments / Practices

- General status of soil conservation in India.
- Calculation of erosion index.
- Estimation of soil loss. Measurement of soil loss.
- Preparation of contour maps.
- Design of grassed water ways.
- Design of contour bunds.
- Design of graded bunds.
- Design of bench terracing system, Problem on wind erosion.

#### Reference:

1. Land and Water Management Engineering. 1982. Murthy V.V.N. Kalyani Pubhliers, New Delhi.
2. Irrigation: Theory and Practices.2012. Michael A.M. Vikas Publishing House Pvt. Ltd., New Delhi.
3. Principles of Agricultural. Engineering. Vol. II. 2012. Michael A.M. and T.P. Ojha. Jain Brothers, New Delhi.
4. Soil and Water Conservation Water Management. 2010. Mahnot, S.C., Singh P.K. and Chaplot, P.C., Apex Publication House, Udaipur.



**Unit I:** Status of Farm Power in India, Sources of Farm Power engines, working principles of I C engines, comparison of two stroke and four stroke cycle engines, Study of different components of I.C. engine, I.C. engine terminology and solved problems, Familiarization with different systems of I.C.

**Unit II:** engines: Air cleaning, cooling, lubrication, fuel supply and hydraulic control system of a tractor

**Unit III:** Familiarization with Power transmission system : clutch, gear box, differential and final drive of a tractor, Tractor types, Cost analysis of tractor with Primary and Secondary Tillage implement, Implement for hill agriculture, implement for intercultural operations

**Unit IV:**, Familiarization with sowing and planting equipment, calibration of a seed drill and solved examples, Familiarization with Plant Protection equipment, Familiarization with harvesting and threshing equipment.

#### **List of Experiments / Practices**

- Study of different components of I.C. engine. To study air cleaning and cooling system of engine, Familiarization with clutch, transmission, differential and final drive of a tractor
- Familiarization with lubrication and fuel supply system of engine, Familiarization with brake, steering, hydraulic control system of engine
- Learning of tractor driving, Familiarization with operation of power tiller, Implements for hill agriculture
- Familiarization with different types of primary and secondary tillage implements: mould plough, disc plough and disc harrow.
- Familiarization with seed-cum-fertilizer drills their seed metering mechanism and calibration, planters and transplanter Familiarization with different types of sprayers and dusters Familiarization with different inter-cultivation equipment
- Familiarization with harvesting and threshing machinery.

#### **Reference:**

1. Principles of Agricultural Engineering. Vol. I. 2012. Michael, A.M. and T.P. Ojha. Jain Brothers, Jodhpur.
2. Farm Tractors, Maintenance and Repair. 1989. Rai and Jain. Tata Mc Graw Hill Publ. New Delhi.
3. Elements of Farm Machinery. 1989. Srivastava, A.C. Oxford IBH Publ. Company, New Delhi.
4. Elements of Agricultural Engineering, Vol. I & III. 1989. Singhal, O.P. Suraj Prakashan, Allahabad.
5. Element of Agricultural Engineering. 1990. Sahay, Jagdishwar. Agro. Book Agency, New Chitragupta Nagar, Patna.

**Unit I:** Classification of energy sources, contribution of these of sources in agricultural sector

**Unit II:** Familiarization with biomass utilization for biofuel production and their application, Familiarization with types of biogas plants and gasifiers,

**Unit III:** Biogas, bioalcohol, biodiesel and bio oil production and their utilization as bioenergy resource, introduction of solar energy, collection and their application

**Unit IV:** Familiarization with solar energy gadgets: solar cooker, solar water heater, application of solar energy: solar drying, solar pond, solar distillation, solar photovoltaic system and their application, introduction of wind energy and their application.

#### List of Experiments / Practices

- Familiarization with renewable energy gadgets.
- To study biogas plants, To study gasifier.
- To study the production process of biodiesel.
- To study briquetting machine
- To study the production process of bio-fuels.
- Familiarization with different solar energy gadgets.
- To study solar photovoltaic system: solar light, solar pumping, solar fencing.
- To study solar cooker
- To study solar drying system. To study solar distillation and solar pond.

#### Referenec:

1. G.D. Rai. Non-Conventional Energy Sources, Kh Publishers, New Delhi.
2. N. S. Rathore. A.K. Kurchania, N.L. Panwar. (2007). Non Conventional Energy Sources, Himanshu Publications.
3. N.S. Rathore. A. K. Kurchania, N.L. Panwar. (2007). Renewable Energy, Theory and Practice, Himanshu Publications.
4. K.C. Khandelwal. & S.S. Mandi. (1990). Biogas Technology.



**Unit I:** Green house technology: Introduction, Types of Green Houses; Plant response to Green house environment, Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes. Green house equipments, materials of construction for traditional and low cost green houses.

**Unit II:** Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying. Cost estimation and economic analysis.

**Unit III:** Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation. Drying and dehydration; moisture measurement, EMC.

**Unit IV:** Drying Theory: , various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryer). Material handling equipment; conveyer and elevators, their principle, working and selection.

#### **List of Experiments / Practices**

- Study of different type of green houses based on shape.
- Determine the rate of air exchange in an active summer winter cooling system.
- Determination of drying rate of agricultural products inside green house. Study of green house equipments.
- Visit to various Post Harvest Laboratories.
- Determination of Moisture content of various grains by oven drying & infrared moisture methods.
- Determination of engineering properties (shape and size, bulk density and porosity of biomaterials).
- Determination of Moisture content of various grains by moisture meter. Field visit to seed processing plant.

#### **Reference:**

1. Green house: Science and Technology. 2016. Kothari S, S.C.Kaushic and A.N.Mathur. Himanshu Publication, Udaipur.
2. Green House Technology- Application and Practice. Sharma A and V.M.Salokhe. 2006. Agro Tech. publication, Udaipur
3. Principles of Agricultural Engineering, Vol. I. 2012. Michael, A.M. and T. P. Ojha . Jain Brothers, New Delhi.
4. Post Harvest Technology of Cereals, Pulses and Oil Seeds.1999. Chakravarty, A. Oxford and IBH Pub. New Delhi.
5. Agricultural Process Engineering. 1955. Henderson, S.M. and R.L. Perry. John Willy and Sons, New York.
6. Unit operation of Agriculture Processing. 2004. Shay K.M. and Singh, K.K. Vikas Publication House, New Delhi.



## AGRICULTURAL ENTOMOLOGY

AET. 121

FUNDAMENTALS OF ENTOMOLOGY

2+1

**Unit I:** History of Entomology in India. Position of the insect in Animal kingdom. Factors for insect's abundance. Major points related to dominance of Insecta in Animal kingdom. Classification of phylum Arthropoda upto classes. Relationship of class Insecta with other classes of Arthropoda.

**Unit II:** Morphology: Structure and functions of insect cuticle and molting. Body segmentation. Structure of Head, thorax and abdomen. General external structure and modifications of insect antennae, mouth parts, legs, Wing venation, modifications and wing coupling apparatus. Structure of male and female genital organ. Metamorphosis and diapause in insects. Types of larvae and pupae. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretory (Endocrine) and reproductive system, in insects.

**Unit III :**Types of reproduction in insects. Major sensory organs like simple and compound eyes, chemoreceptors. Systematics: Taxonomy –importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order. Classification of class Insecta upto Orders.

**Unit IV:** Basic groups of present day insects with special emphasis to orders and families of Agricultural importance like Orthoptera: Acrididae, Tettigonidae, Gryllidae, Gryllotalpidae; Dictyoptera: Mantidae, Blattidae; Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae; Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae, Lygaeidae, Miridae, Reduviidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Aleyrodidae, Lophophidae, Aleurodidae, Pseudococcidae; Neuroptera: Chrysopidae; Hemirobidae; Lepidoptera: Pieridae, Papilionidae, Noctuidae, Nymphalidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Tenthredinidae, Apidae. Trichogrammatidae, Ichneumonidae, Braconidae, Chalcididae; Encyrtidae Bethyridae, Formicidae, Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae, Muscidae, Tephritidae, Tabanidae, Syrphidae.

### List of Experiments / Practices

- Methods of collection and preservation of insects including immature stages.
- External features of Cockroach/Grasshopper/Blister beetle.
- study of close relatives of insects, phylum Arthropoda.
- Types of insect antennae, mouthparts and legs; Wing venation, types of wings and wing coupling apparatus.
- Types of insect larvae and pupae.
- Dissection of digestive system in insects (Grasshopper, Cockroach).
- Dissection of male and female reproductive systems in insects (Grasshopper, Cockroach).
- Study of characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance.

### Reference:

1. Chapman .R.F.,1981, Insect Structure and Function. ELBS Publishers New Delhi.
2. David B.V. and Ananthakrishnan .T.N., 2003, General and Applied Entomology. 2nd Ed. Mc graw Hill publishing Co. Ltd. New Delhi.
3. Mathur and Upadhyay, 2005, A Text Book of Entomology. Aman Publishing House, Meerut.



4. Pant. N.C. and Ghai, S. 1981. *Insect Physiology and Anatomy*, ICAR, New Delhi.
5. Richards O.W. and Davies R.G., 1977. *Imm's General Text Book of Entomology*, Vol. I & II. Chapman and Hall, London.
6. Snodgrass R.E., 2001, *Principles of Insect Morphology*. CBS Publishers and Distributors, New Delhi.

**AET. 211 INSECT ECOLOGY, PRINCIPLES OF PEST MANAGEMENT AND NATURAL ENEMIES 2+1**

**Unit I:** Insect Ecology: Introduction, Environment and its components. Effect of abiotic factors—temperature, moisture, humidity, rainfall, light, atmospheric pressure and air currents. Effect of biotic factors – food competition, natural and environmental resistance. Concepts of Balance of life in nature, biotic potential and environmental resistance and causes for outbreak of pests in agro- ecosystem.

**Unit II:** Categories of insect pests, IPM: Introduction, history, importance, concepts, principles and tools of IPM. Economic importance of insect pests and pest risk analysis. Methods of detection and diagnosis of insect pest. Calculation and dynamics of economic injury level and importance of Economic threshold level. Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control. Ecological management of crop environment.

**Unit III:** Introduction to conventional pesticides for the insect pests management. Survey surveillance and forecasting of Insect pest. Development and validation of IPM module. Implementation and impact of IPM (IPM module for Insect pest). Safety issues in pesticide uses. Political, social and legal implication of IPM. Case histories of important IPM programmes.

**Unit IV:** Study of insecticides including mode of actions, formulations. Pest resurgence and insecticide resistance. Insect orders bearing predators and parasitoids used in pest control and their mass multiplication techniques. Important species of pollinator, weed killers and scavengers with their importance.

**List of Experiments / Practices**

- Methods of diagnosis and detection of various insect pests, Methods of insect pests measurement,
- Assessment of crop yield losses, calculations based on economics of IPM, Identification of biocontrol agents, different predators and natural enemies.
- Mass multiplication of NPV, coccinella, green lace wing and other important bioagents.
- Identification and nature of damage of important insect pests and their management. Insecticides formulations, plant protection equipments, Crop (agroecosystem) dynamics of a selected insect pest.
- Plan & assess preventive strategies (IPM module) and decision making. crop monitoring attacked by insect, pest and diseases, Awareness campaign at farmers' fields. Identification of major parasitoids and predators commonly being used in biological control.

**Reference:**

1. Yazdani G.S. and Agarwal M.L. 1979. Elements of Insect Ecology. Naroji publishing house, New Delhi.
2. Atwal, A.S. and Dhaliwal, G.S. 2002. Agricultural Pests of South Asia and Their Management, Kalyani Publishers, New Delhi.
3. David, B.V. and Ramamurthy, V.V. 2016. Elements of Economic Entomology, 8th Ed. Popular Book Depot, Chennai.
4. Dhaliwal, G.S. and Ramesh Arora 2001. Integrated Pest Management. Concepts and Approaches. Kalyani publishers, New Delhi.
5. Mathur and Upadhyay, 2005. A Text Book of Entomology, Aman Publishing House, Meerut.



6. Metcalf, R.L and Luckman W.H. 1982. Introduction to Insect Pest Management. Wiley Inter Science publishing, New York.
7. Srivastava, K.P. 2004. A Text Book of Entomology, Vol.I, Kalyani Publishers, New Delhi.
8. Dhawan, A.K. Integrated Pest Management, Scientific Publishers, Jodhpur.

**AET. 221 INSECT PESTS OF HORTICULTURAL CROPS AND THEIR MANAGEMENT 1+1**

**Unit I:** General account on nature and types of damage by different arthropod pests.

**Unit II:** Scientific name, order, family, host range, distribution

**Unit III:** Biology and bionomics, nature of damage, and management of major pests and control practices for other important arthropod pests of various vegetable crops, fruit crops, plantation crops, ornamental crops, narcotics, flowers, spices and condiments. Pest of crops grown under protected cultivation.

**Unit IV:** Pests of tuber crops, important vectors of plant diseases of horticultural crops.

**List of Experiments / Practices**

- Identification of different types of damage. Identification and study of life cycle and seasonal history of various insect pests attacking crops and their produce: (a) Vegetable Crops; (b) Fruit Crops; (c) Plantation, gardens, Narcotics, spices & condiments.
- Identification of insect pests. Identification of pests of protected cultivation crops.
- Determination of fruit and spices moisture content. Methods of sampling for pest damage assessment.
- Visit to nearby Horticultural research stations.

**Reference:**

1. Mathur and Upadhyay, 2005, A Text Book of Entomology. Aman Publishing House, Meerut.
2. Atwal, A.S. and Dhaliwal, G.S. 2002. Agricultural Pests of South Asia and Their Management, Kalyani Publishers, New Delhi.
3. Dhaliwal, G.S. and Ramesh Arora, 2001, Integrated Pest Management. Concepts and pproaches. Kalyani publishers, New Delhi.
4. B.V. David and V.V. Rammurthy, Elements of Economic Entomology
5. Pedigo L.P., Entomology and Pest Management.
6. Venu Gopal Rao, Insect Pest Management



## **AET. 311 INSECT PESTS OF FIELD CROPS & STORED GRAINS AND THEIR MANAGEMENT 1+1**

**Unit I:** General account on nature and type of damage by different arthropods pests. Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage, and management of major pests and scientific name, order, family, host range, distribution,

**Unit II:** Nature of damage and control practice other important arthropod pests of various field crops, Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain.

**Unit II:** Insect pests, mites, rodents, birds and microorganisms associated with stored grain and their management.

**Unit IV:** Storage structure and methods of grain storage and fundamental principles of grain store management. Important vectors of plant diseases of field crops.

### **List of Experiments / Practices**

- Identification of different types of damage.
- Identification and study of life cycle and seasonal history of various insect pests attacking crops and their produce: (a) Field Crops;
- Identification of insect pests and Mites associated with stored grain.
- Determination of insect infestation by different methods. Assessment of losses due to insects.
- Calculations on the doses of insecticides application.

### **Reference:**

1. Atwal, A.S. and Dhaliwal, G.S. 2002, Agricultural Pests of South Asia and Their Management, Kalyani Publishers, New Delhi
2. Mathur and Upadhyay, 2005, A Text Book of Entomology. Aman Publishing House, Meerut.
3. Manishekharan and Sudarrajan, Pest Management in Field Crops.
4. Pedigo L.P., Entomology and Pest Management.
5. VenuGopal Rao, Insect Pest Management.
6. B.P. Khare, Storage Entomology

## AGRICULTURAL EXTENSION

AEX. 111 RURAL SOCIOLOGY, EDUCATION PSYCHOLOGY AND CONSTITUTION OF INDIA 0+2

### List of Experiments / Practices

- Sociology and Rural sociology: Definition and scope, its significance in agriculture extension, Social Ecology, Rural society, Social Groups, Social Stratification, Culture concept, Social Institution, Social Change & Development.
- Educational psychology: Meaning & its importance in agriculture extension. Behavior: Cognitive, affective, psychomotor domain, Personality, Learning, Motivation, Theories of Motivation, Intelligence.
- Constitution of India: Meaning, Preamble and Characteristics of Constitution of India. Fundamental Rights and Duties. Directive Principles of State Policy.
- Constitutional provisions for welfare of SCs and STs, Minorities, Women and Children. Union Executive: President, Vice-President, Prime Minister, Council of Ministers – Powers and Functions.
- Parliament and Supreme Court of India – Powers and Functions. State Executive: Governor, Chief Minister, Council of Ministers. Legislature and Judiciary: Powers and Functions; Electoral Process; Human Rights Commission – Structure, Powers and Functions.

### Reference:

1. Ray, G.L., 2003, Extension Communication and Management. Kalyani Publishers. Fifth revised and enlarged edition.
2. Dahama, O.P. and Bhatnagar, O.P., 2003, Education and Communication for Development. Oxford and IBH Publishing Co. Pvt. Ltd.
3. Sandhu, A.S., 1993, Textbook on Agricultural Communication: Process and Methods. Oxford and IBH Publishing Co. Pvt. Ltd.
4. Chitambar, J.B., 2008, Introductory Rural Sociology. New Age International (P) Limited.
5. Sachdeva, D. R. and Bhushan, V., 2007, An Introduction to Sociology, KitabMahal Agency.
6. Chitambar, J.B., 1973, Introductory rural sociology. New York, John Wiley and Sons.
7. Desai, A.R., 1978, Rural sociology in India. Bombay, Popular Prakashan, 5th Rev. ed.
8. Doshi, S.L., 2007, Rural sociology. Delhi Rawat Publishers.
9. Jayapalan, N., 2002, Rural sociology. New Delhi, Altanic Publishers.
10. Sharma, K.L., 1997, Rural society in India. Delhi, Rawat Publishers



## **AEX. 121 FUNDAMENTALS OF AGRICULTURAL EXTENSION EDUCATION AND RURAL DEVELOPMENT 1+1**

**Unit I:** Education: Meaning, definition & Types; Extension Education- meaning, definition, scope and process; objectives and principles of Extension Education; Extension Programme planning- Meaning, Process, Principles and Steps in Programme Development.

**Unit II:** Extension systems in India: extension efforts in pre-independence era (Sriniketan, Marthandam, Firka Development Scheme, Gurgaon Experiment) and post independence era (Etawah Pilot Project, Nilokheri Experiment); various extension/ agriculture development programmes launched by ICAR/ Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND,NATP, NAIP). New trends in agriculture extension: privatization of extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems.

**Unit III:** Rural Development: concept, meaning, definition; various rural development programmes launched by Govt. of India. Community Development-meaning, definition, concept & principles, Philosophy of C.D. Rural Leadership: concept and definition, types of leaders in rural context; extension administration: meaning and concept, principles and functions.

**Unit IV:** Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes; transfer of technology: concept and models, capacity building of extension personnel.

### **List of Experiments / Practices**

- To get acquainted with university extension system.
- Group discussion- exercise; handling and use of audio visual equipments and digital camera and LCD projector; preparation and use of AV aids.
- Preparation of extension literature – leaflet, booklet, folder, pamphlet news stories and success stories.
- Presentation skills exercise; micro teaching exercise.
- A visit to village to understand the problems being encountered by the villagers/ farmers; to study organization and functioning of DRDA and other development departments at district level.
- Visit to NGO and learning from their experience in rural development.
- Understanding PRA techniques and their application in village development planning; exposure to mass media.

### **Reference:**

1. Dahama, O.P. and Bhatnagar, O.P. 1980. Education and Communication for Development. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Dudhani, C.M.; Hirevenkatgoudar, L.V., Manjunath, L.; Hanchinal, S.N. and Patil, S.L., 2004, Extension Teaching Methods and Communication Technology, UAS,Dharwad.
3. Kamat, M.G., 1985, Writing for Farm Families. Allied Publishers, New Delhi.
4. Kelsey, L.D. and Hearne, G.C., 1963, Cooperative Extension Work, Comstar Publishing Associate, New York.
5. Ray, G.L. (1991). Extension Communication and Management. Noya Prakash, Calcutta.

**AEX. 211 COMMUNICATION AND DIFFUSION OF AGRICULTURAL INNOVATIONS 1+1**

**Unit I:** Communication: meaning and definition; Principles and Functions of Communication. Models and barriers to communication. Agriculture journalism; diffusion and adoption of innovation: concept and meaning, process and stages of adoption.

**Unit II:** Extension teaching methods: meaning, classification, individual, group and mass contact methods, ICT Applications in TOT (New and Social Media), media mix strategies.

**Unit III:** Diffusion and Adoption of Innovations – Meaning, Definition, Models and adoption Process, Innovation – Decision Process – Elements, Adopter categories and their characteristics, Factors influencing adoption process;

**Unit IV:** Capacity building of Extension Personnel and Farmers - Meaning, Definition, Types of training, Training of farmers, farm women and Rural youth – FTC and KVK.

**List of Experiments / Practices**

- Simulated exercises on communication; Identifying the Problems, Fixing the Priorities and selecting the most important problem for preparation of a project.
- Developing a project based on identified problem in a selected village. Organization of Group discussion and Method demonstration.
- Visit to KVK / FTC. Planning and Writing of scripts for Radio and Television. Audio Visual aids – Meaning, Importance and Classification.
- Visit to community radio and television studio for understanding the process of programme production.
- Planning & Preparation of visual aids - Charts, Posters, Over Head Projector (OHP) Transparencies, Power Point Slides.
- Planning and Preparation of Agricultural Information materials – Leaflet, Folder, Pamphlet, News Stories, Success Stories.
- Field diary and lab record; indexing, footnote and bibliographic procedures. Handling of Public Address Equipment (PAE) System, Still camera, Video Camera and Liquid Crystal Display (LCD) Projector.
- Development of schedules, Questionnaires and field visits for Data Collection.

**Reference:**

1. Samanta, R.K.,1990, Development Communication for Agriculture. BR Publishing Corporation, Delhi.
2. Sandhu, A.S., 1993, Textbook on Agricultural Communication : Process and Methods. Oxford and IBH Publishing, Pvt.Ltd., New Delhi.
3. Singh, A.K., Lakhan Singh, R. and Roy Burman (2006). Dimensions of Agricultural Extension. Aman Publishing House, Meerut
4. Reddy, A.A., 2005 Extension Education. Sri Lakshmi Press, Bapatla.
5. Rogers, E.M., 2003. Diffusion of Innovations. Free Press, New Delhi.
6. Mehta, D.S., 1981, Mass Communication and Journalism in India. Vikas Publication, New Delhi.
6. Ray, G.L., 1991, Extension Communication and Management. Noya Prakash, Calcutta.



**Unit I:** Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs; SWOT Analysis & achievement motivation

**Unit II:** Government policy and programs and institutions for entrepreneurship development. Impact of economic reforms on Agribusiness/ Agri enterprises

**Unit III:** Entrepreneurial Development Process; Business Leadership Skills; Developing organizational skill (controlling, supervising, problem solving, monitoring & evaluation), Developing Managerial skills, Business Leadership Skills (Communication, direction and motivation Skills)

**Unit IV:** Problem solving skill. Supply chain management and Total quality management, Project Planning Formulation and report preparation. Financing of enterprise, Opportunities for agri-entrepreneurship and rural enterprise.

**List of Experiments / Practices**

- Assessing entrepreneurial traits, problem solving skills, managerial skills and achievement motivation, exercise in creativity, time audit through planning, monitoring and supervision, identification and selection of business idea, preparation of business plan and proposal writing.
- Visit to entrepreneurship development institute and entrepreneurs.

**Reference:**

1. Balasubramanyam M. 1985. Business Communication. Vani Educational Books, New Delhi.
2. Naterop, Jean, B. and Rod Revell. 1997. Telephoning in English. Cambridge University Press, Cambridge.
3. Mohan Krishna and Meera Banerjee. 1990. Developing Communication Skills. Macmillan India Ltd. New Delhi.
4. Krishnaswamy, N and Sriraman, T. 1995. Current English for Colleges. Macmillan India Ltd. Madras.
5. Narayanaswamy V R. 1979. Strengthen your writing. Orient Longman, New Delhi.
6. Sharma R C and Krishna Mohan. 1978. Business Correspondence. Tata McGraw Hill publishing Company, New Delhi.
7. Mamatha Bhatnagar and Nitin Bhatnagar. 2011. Effective Communication and Soft Skills. Person Education.
8. Meenakshi Raman, Sangeeta Sharma. Technical Communication Principles and Practice
9. Harold Wallace and Ann Masters. Personality Development. Cengage Publishers.
10. Andrea J. Rutherford. Basic Communication Skills for Technology. Pearson Education

## AGRICULTURAL MICROBIOLOGY

AMB. 111

FUNDAMENTALS OF MICROBIOLOGY

1+1

**Unit I:** Origin and evolution of Microbial life. Brief history of microbiology. Microscopes and microscopy. Overview of cell structure of prokaryotes and eukaryotes. General properties of viruses, overview of plant, animal and bacterial viruses, viroids and prions.

**Unit II:** Different groups of Microorganisms- Bacteria, Fungi, Algae and Protozoa. Microbial nutrition and culture media. Overview of microbial metabolism: glycolysis, citric acid cycle, anaerobic respiration, photosynthesis and fermentation. Microbial growth - measurement of growth, effect of environmental factors on growth.

**Unit III:** Qualitative and quantitative methods for the study of microorganisms. Microbial genetics: genetic recombination, conjugation, transformation, transduction, mutation and mutants, plasmids, transposons and insertion sequences, cloning vectors. Control of microbial growth: heat sterilization, radiation sterilization, filter sterilization, chemical growth control, disinfectants, antiseptics and antibiotics.

**Unit IV:** Microbial ecology- Microorganisms in nature and their interaction, methods in microbial ecology, Microbial interactions with higher organisms – plants and animals. Concepts of Immunology - Cells and organs of immune system, antigen- antibody reactions, types of immunity, polyclonal and monoclonal antibodies.

### List of Experiments / Practices

- Equipments used in a microbiology laboratory. Microscopy– principles and applications. Preparation of different culture media and sterilization methods.
- Isolation, pure culture and preservation of microorganisms. Staining techniques- simple, negative, capsule, endospore, Gram's staining etc.
- Qualitative and quantitative methods for the study of microorganisms. Influence of environmental factors on microorganisms.
- Biochemical activities of bacteria. Microscopic observation of bacteria, fungi, algae and protozoa.

### Reference:

1. Davis, B.D., Dullbecco R., Elisena H.S. 1990, Microbiology, 4th Edn. Ginsberg Publishers, Singapore
2. Tortora, G.J. Funke, B.R. and Case, C.L., 1994, Microbiology : An introduction, 5th Ed. The Benjamin/Cummings Publishing Company Inc.
3. Stainer, R.Y., 1995, General Microbiology. MacMillan Press, London.
4. Pelezar , M.T., 1995, Microbiology, Tata Mc Graw Hill Publishing, New Delhi.
5. Schlegel , H.G., 1995, General Microbiology 7th Ed., Cambridge University Press.
6. Prescott and Dunn (1999) : Industrial Microbiology 4th Edn. CBS Publishers & Distributors, New Delhi.
7. Purobit,S.S., 2000, Microbiology: Fundamental and Applications (6th Ed). Agrobios, (India).



**Unit I:** Occurrence and distribution of microorganisms in nature. Soil as a habitat for microbes. Soil microorganisms - bacteria, fungi, algae, protozoa and viruses. Soil enzymes. Role of microorganisms in biogeochemical cycles of carbon, nitrogen, potassium, phosphorus, sulphur and secondary and tertiary nutrients.

**Unit II:** Soil biotechnology - utilization of microorganisms in improving soil productivity. Microbial interactions - neutralism, commensalism, synergism, mutualism, competition, amensalism, parasitism and predation. Plant microbe interactions and their biotechnological implications, rhizosphere microflora, symbiotic and free living nitrogen fixing microorganisms, ectomycorrhizal and endomycorrhizal associations.

**Unit III:** Microbiology of hydrosphere and atmosphere. Microorganisms associated with animals and insects. Potentials and limitations of using microorganisms as agents of biological control of insect pests and diseases. Pesticide micro-flora interactions. Biodegradation, bioconversion of industrial, domestic and agricultural wastes.

**Unit IV:** Industrial use of microorganisms - biochemical processes involved and biotechnological applications. Microbiology of milk and milk products. Single cell protein. Role of microorganisms in biochemical transformation of raw and processed foods. Food spoilage, food poisoning and food borne infections. Principles and methods of Food preservation.

#### List of Experiments / Practices

- Determination of enzyme activities in soil.
- Mineralization of carbon, nitrogen, phosphorus and sulphur.
- Plant microbe interactions: free living nitrogen fixers, legume – Rhizobium symbiosis, mycorrhizal symbiosis, microbial inoculants, Azolla - Anabena symbiosis, Casurina - Frankia symbiosis, Study of epiphytic microorganisms.
- Study of beneficial microorganisms in Agriculture- Biofertilizer preparation, Compost making, Biogas production etc. Cultivation of mushrooms.
- Microbiological examination of water and effluents.
- Microorganisms in bread and wine making.
- Microflora associated with vertebrates and invertebrates.
- Microbiological examination of raw processed foods. Microbiological examination of milk and milk products.

#### Reference:

1. Dubey, R.C., and Maheshwari, D.K. .2010.A text book of Microbiology, S. Chand & Company Ltd, New Delhi.
2. Darralyn M., David S. and Phillip A. 2001. Introduction to microbiology, Black Well Publication Ltd. USA.
3. Nicklin, J., Graeme-Cook , K. and Killington, R. 2011. Instant Notes; Microbiology, 4th Edition, BIOS Publications
4. Pelezar , M.T., 1995, Microbiology, Tata Mc Graw Hill Publishing, New Delhi.
5. Schlegel, H.G., 1995, General Microbiology 7th Ed., Cambridge University Press.

## ANIMAL SCIENCE

### ASC. 311 LIVESTOCK, POULTRY & FISH PRODUCTION MANAGEMENT

2+1

**Unit I:** Role of livestock in the national economy. Reproduction in farm animals and poultry. Housing principles, space requirements for different species of livestock and poultry. Management of calves, growing heifers and milch animals.

**Unit II:** Management of sheep, goat and swine. Incubation, hatching and brooding. Broiler production. Management of growers and layers. Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry.

**Unit III:** Improvement of farm animals and poultry. Importance of Indigenours Live stock and poultry species. Feeding principles of livestock and poultry. Feed ingredients. Feed supplements and additives for livestock and poultry ration. Study of livestock and poultry diseases.

**Unit IV:** Prevention, vaccination schedule and control of important diseases of livestock and poultry. Marketing and Economics of livestock and poultry. Fisheries resources of india. Importance of Inland fisheries. important fishes and their production. New vistas in Inland fish production.

#### List of Experiments / Practices

- External body parts of cattle, buffalo, sheep, goat, swine and poultry.
- Handling and restraining of livestock. Identification methods of farm animals and poultry.
- Visit to IDF and IPF to study breeds of livestock and poultry and daily routine farm operations and farm records. Judging of cattle, buffalo and poultry.
- Culling of livestock and poultry. Planning and layout of housing for different types of livestock and poultry.
- Computation of rations for livestock. Clean milk production, milking methods. Hatchery operations, incubation and hatching equipments.
- Management of chicks, growers and layers. De-beaking, dusting and vaccination.
- Economics of cattle, buffalo, sheep, goat, swine and poultry production. Visit to inland fisheries unit.

#### Reference:

1. Banerjee, G.C. 2013. A Text Book of Animal Husbandary. 8<sup>th</sup> Ed. Oxford & IBH Pub.CO.Pvt Ltd.New Delhi.
2. Devendra C and Mecleroy GB, 1982. Goat and Sheep Production in Tropics.
3. Sastry N S R and Thomas, Ck 2006. Livestock Production and Management, Kalyani.
4. Thomas CK and Sastry, NSR. 1991. Dairy Bovine Production. Kalyani.
5. ICAR, Handbook of Animal Husbandry, 2011. 3<sup>rd</sup> revised Ed.
6. Sastry N S R and Thomas, Ck 2006. Livestock Production and Management, Kalyani Pub.
7. Singh, R A. 1996. Poultry Production 3<sup>rd</sup> Ed. Kalyani.
8. ICAR, Handbook of Animal Husbandry, 2011. 3<sup>rd</sup> revised Ed.
9. Prasad, J. 2008. Poultry Production and management. Kalyani Pub.
10. Singh, H., 2011. Handbook of Animal Husbandry, I.C.A.R. Publications, New Delhi
11. Eigan, W.M., and Paul, R., 2005. Dairy cattle feed, Johan Willey & Sons, New York
12. Kumar, A., Animal Husbandry, 2006. Discovery Publishing House, New Delhi



## APICULTURE

API. 311

INTRODUCTION TO APICULTURE

1+1

**Unit I:** Importance of Bees and Beekeeping, History and Development of Beekeeping; Species of honeybees and their colony structure; Morphology of honeybees; Anatomy of honeybees – Digestive, reproductive, nervous, Circulatory and Glandular system;

**Unit II:** Colony organization; Bee biology; Caste determination in honeybees; Age related activities of workers; Nest architecture; Behaviors in honeybees- Foraging, Communication, Robbing, Swarming and Homeostasis; How, when and where to start beekeeping;

**Unit III:** Bee flora; Seasonal management of bee colonies; Management of Robbing, Swarming and Queenless colonies; Uniting and division of honeybee colonies; Queen rearing; Bees as pollinators and pollination management;

**Unit IV:** Pests and Diseases of bees and their management; Hive products – Honey, Bee pollen, Bee wax, Propolis, Bee venom, Royal jelly and their extraction, processing, properties and uses; Poisoning of bees and its prevention; Economics of beekeeping.

### List of Experiments / Practices

- Identification of honeybee species; Identification of honeybee castes and their stages; Study of nest architecture; Handling and inspection of bee colonies;
- Study of bee hives and bee keeping equipments;
- Dissection of worker bees to study different morphological structures; Dissection of worker bees to study different anatomical structures;
- Sampoorna International Institute of Agri Science & Horticultural Technology Page | 79
- Hiving of feral colony; Management of bee colonies - feeding, Prevention of swarming, robbing and absconding; Mass queen rearing technique;
- Fixing comb foundation sheet and providing of super chamber to the bee colonies; Uniting and dividing of colonies; Extraction and processing of honey;
- Testing of honey for its purity; Extraction and processing of other bee products; Study of bees as pollinators; Identification of bee flora.
- Identification of bee pests and diseases; Visit to important apiaries and bee keeping societies around the region; Working out economics of beekeeping.

### Reference:

1. Jayashree K.V., C.S. Tharadevi and N. Aramugam, 2018, Apiculture. Saras publication.
2. Belsare, D.K., Rakesh Kumar Singh, Shashikala and Ravindra, 2017, Text book of Apiculture (Bee Keeping) Indian Books and periodicals.
3. Kugonza, D.R., 2009, Bee Keeping- Theory and Practice, Fountain Publishers.
4. Jayashree K.V., C.S. Tharadevi and N. Aramugam, 2016, Bee keeping. Saras publication.



# CROP PHYSIOLOGY

CPH. 211

FUNDAMENTALS OF CROP PHYSIOLOGY

2+1

**Unit I:** Introduction: Importance of physiology in agriculture. Plant-water relations: Structure, properties and functions of water; concept of diffusion, osmosis and water potential; Water balance of plants: Water in soil; Water absorption and translocation in plant; soil-plant-atmosphere continuum; Theories explaining water translocation. Transpiration: Significance of Transpiration; transpiration in relation to crop productivity, Stomatal physiology, Concept of water use efficiency.

**Unit II:** Mineral Nutrition: Importance of plant nutrients; Classification of plant nutrients; Nutrient uptake- Soil, root and microbes interaction, Microbial association for improved uptake of nutrients; Functions of plant nutrients- Deficiency and toxicity symptoms of plant nutrients; Hydroponics, aeroponics. Mechanism of ion absorption and translocation. Membrane transporters and carriers. Photosynthesis: Mechanism of carbon fixation by C<sub>3</sub>, C<sub>4</sub> and CAM pathway and their significance; Plant responses to elevated CO<sub>2</sub>/ climate change; Relation of photosynthesis and crop productivity; Starch and sucrose synthesis; Translocation of assimilates; Source and sink concept; Photorespiration; Factors affecting photosynthesis and productivity; Dry matter partitioning; Harvest index of crops

**Unit III:** Respiration: Significance; Respiratory metabolism, Alternative respiration, Factors regulating respiratory rates. Plant Growth and Development: Concept of plant growth and morphogenesis; Growth and yield parameters and their measurements; Hormones and plant growth regulators in modulating crop growth; Physiological importance of Auxins, GA, Cytokinin, ABA, Ethylene, Brassinosteroids and strigolactones; biosynthesis and mode of action of plant hormones; applications of growth regulators in agriculture, horticulture and industry.

**Unit IV:** Photoperiodism and vernalization: Basic concepts and their relevance in crop productivity; Phytochromes and their role. Seed dormancy and viability: Basic concepts, seed germination and seedling vigour. Stress Physiology: Plant responses to abiotic stresses; key concepts and definition; acclimation and adaptation mechanisms.

## List of Experiments / Practices

- Preparation of standard solutions; Methods of measuring water status in plant tissue; Determination of soil water status;
- Determination of stomatal frequency and index; Measurement of stomatal conductance and transpiration;
- Measurement of water use efficiency at single leaf level; Extraction, separation and quantification of photosynthetic pigments
- Measurement of photosynthetic rate; Measurement of growth and yield parameters; Measurement of respiration rate;
- Deficiency symptoms of nutrients and their identification; growth hormone bioassay; Seed dormancy and methods to break seed dormancy;
- Measurement of Seed viability and seedling vigor; effect of moisture stress on seed germination and seedling vigor.

## Reference:

1. Noggle and Fritz, Introductory Plant Physiology
2. Mohr and Scopfer : Plant Physiology



3. Kumar and Purohit : Plant Physiology - Fundamentals and Application
4. Taiz and Zeiger : Plant Physiology
5. Salisbury and Ross : A Text Book of Plant Physiology
6. Pande and Sinha : Plant Physiology
7. Jain V.K Fundamentals of Plant Physiology.
8. Salisbury J.B and Ross L. W., Plant physiology. Wadswar Publisher Company.

**Unit I:** Application of growth regulators in agriculture/ horticulture/ forestry/industry: Effect of growth regulators on important plant growth and developmental processes. Synthetic growth regulators - classification and their effect on plant growth and development. Practical utility of application of plant growth regulators on farm.

**Unit II:** Physiological basis of commercial micro propagation: Micro- propagation techniques and its application specific to growth modulation. Macro-propagation techniques including clonal multiplication of elite material. Haploids in crop improvement. Mineral nutrition: Foliar/ soil application of nutrients to correct the deficiency symptoms. Bio-fortification of micronutrients and their importance in human health. Herbicide physiology: Classification and mode of action of herbicide and their applications. Development of herbicide tolerant crops.

**Unit III:** Post harvest physiology: Physiological and biochemical changes during fruit ripening and storage. Senescence and post harvest shelf life of cut flowers, vegetables and fruits. Hormonal and chemical control of post harvest deterioration of fruits, vegetables and cut flowers and its significance in storage and transport. Seed physiology: Methods to break seed/ bud dormancy of important agriculture/ horticulture plants. Seed priming/ seed encapsulation techniques to improve seed germination and seedling vigour in important agriculture crops.

**Unit IV:** Drought mitigation strategies: Mechanism of drought adaptations. Plant traits linked to drought adaptation. Antitranspirants and their applications in agriculture, water holding polymers and their relevance. Crop modeling: Physiological yield models, plant ideotypes.

#### List of Experiments / Practices

- Growth regulator formulations for specific crops.
- Demonstration of plant growth hormones on important plant growth and developmental processes.
- Micro-propagation of commercially important crops.
- Techniques to develop deficiency symptoms of nutrients. Elemental analysis in plant tissues. Bio assay of herbicides.
- Mechanisms to enhance the uptake of herbicides. Identification of physiological maturity indices in important crops.
- Demonstration of anti-ethylene agent on shelf life of flowers/ fruits. Effect of growth regulators on delaying senescence/ ripening.
- Seed hardening techniques in cereal crops.
- Application of stable isotopes techniques in agriculture.
- Computer applications in plant physiology, crop productivity and modeling

#### Reference:

1. Kumar and Purohit : Plant Physiology - Fundamentals and Application
2. Taiz and Zeiger : Plant Physiology
3. Salisbury and Ross : A Text Book of Plant Physiology



**Unit I:** Basic concepts of Nanoscience and Nanotechnology: Introduction, definition and meaning of nanotechnology, classification of nanomaterials, scientific revolutions – time and length scale in structures. Size effects on structure and morphology of nanoparticles. Synthesis of nano material: Physical, chemical and biological methods. Role in social, economic, ethical and ecological spheres. Green nanotechnology.

**Unit II:** Application of nanotechnology in Agriculture: Effects of seed priming and foliar applications of nanomaterial on growth and productivity of crops. Uptake and translocation of nanoparticles. Quantification of enhanced nano-nutrient content in edible parts.

**Unit III:** In vitro and field efficacy of nanoparticles (pesticides) against plant pathogens. Bioassay of nano-formulations of insecticide.

**Unit IV:** Bio-safety of nano-formulations on natural enzymes. Study the fate and behavior of nano fertilizers in soils. Application of nano technology in recycling of Agriculture waste. Safety, toxicity and adoption of nano particles in the soil and aquatic life. Nano sensors in agriculture- nutrient, water, soil.

**Reference:**

1. Jana, B. L. 2016, Nanotechnology in Agriculture, Pointer Publishers, Jaipur
2. Charles P. Poole and Frank J. Owens, 2010, Introduction to Nanotechnology, Wiley Publications
3. Subramanian, K.S., 2015, Nanotechnology in Agriculture, New India Publishing Agency.

## FOOD SCIENCE AND NUTRITION

FSN. 111

PRINCIPLES OF FOODS SCIENCE & NUTRITION

2+0

**Unit I:** Concepts of Food Science (definitions, measurements, density, phase, change, pH, Osmosis, Surface tension, colloidal systems etc.): Food composition and chemistry (water, carbohydrates, proteins, fats, vitamins, minerals, flavours, colours, miscellaneous bioactives, important reactions):

**Unit II:** Food microbiology (bacteria, yeast, moulds, spoilage of fresh & processed foods, Production of fermented foods);

**Unit III:** Principles and methods of food processing and preservation (use of heat, low temperature, chemicals, radiation, drying etc.);

**Unit IV:** Food and nutrition, Malnutrition (over and under nutrition), nutritional disorders; Energy metabolism (carbohydrate, fat, proteins); Balanced/modified diets, Menu planning, New Trends in food science and nutrition.

### Reference:

1. Srilakshmi, B., 2010, Text Book of Food Science. New age international (P) limited, publisher, New Delhi
2. Sehgal, S. and Raghuvanshi, R.S., 2007, Text Book of Community Nutrition. ICAR Publication.
3. Khaddar V., 1999, Text Book of Food. Storage and Preservation. Kalyani Publishers, New Delhi.
4. Srilakshmi, B. 2010. Text Book of Nutrition Science, New age international (P) limited, Publisher, New Delhi.
5. Swaminathan, M., 1993, Advanced Textbook on Food and Nutrition. Volume I, Bappco, the Bangalore Press and Publishing Co. Ltd. Bangalore.



**Unit I:** Status of food processing in India. Food processing and distinctive features of food commodities. Primary, secondary and tertiary processing.

**Unit II:** Processing of -cereals, legumes, fats and oilseeds, fruits and vegetables, milk. Role of additives in value addition, packaging and labeling.

**Unit III:** Food Safety- Definition, Importance, Scope and Factors affecting food safety, health risks, Types of hazards: Biological, Chemical, Physical hazards. Food storage, Hygiene and Sanitation. Sources of contamination and their control. Personal Hygiene.

**Unit IV:** Food Safety management tools- basic concepts, PRPs, GHPs, GMPs, SSOPs etc. HACCP, ISO series and TQM. Food laws and Standards-Indian Food Regulatory, Regime, FSSAI, Global Scenario- CAC, BIS, AGMARK.

#### **List of Experiments / Practices**

- Processed and value added foods (cereals, pulses, fruits, vegetables).
- Planning and preparation of weaning and supplementary foods.
- Planning of balanced diet. Development of teaching models for community nutrition education
  - Protein energy malnutrition.
  - Micronutrient deficiencies
- Preparation of different types of media. Microbiological examination of different food samples.
- Assessment of personal hygiene and surface sanitation. Preparation of plans for implementation HACCP.

#### **Reference:**

1. Swaminathan, M., 1993, Advanced Textbook on Food and Nutrition. Volume I, Bappco, the Bangalore Press and Publishing Co. Ltd. Bangalore
2. Khaddar V., 1999, Text Book of Food, Storage and Preservation. Kalyani Publishers, New Delhi
3. Swaminathan. M. 1993. Advanced Textbook on Food and Nutrition. Volume I, Bappco, the Bangalore Press and Publishing Co. Ltd. Bangalore

## FORESTRY AND ENVIRONMENTAL SCIENCE

FES. 111

INTRODUCTION TO FORESTRY

1+1

**Unit I:** Introduction—definitions of forest and forestry, branches of forestry, history and education of forestry in India. objectives of silviculture, forest classification, salient features of Indian Forest Policies and Acts. Forest regeneration, Natural regeneration - natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers;

**Unit II:** Artificial regeneration – objectives, choice between natural and artificial regeneration, essential preliminary considerations. Crown classification. Tending operations– weeding, cleaning, thinning—mechanical, ordinary, crown and advance thinning. Forest mensuration—objectives, diameter measurement, instruments used in diameter measurement; Non instrumental methods of height measurement - shadow and single pole method;

**Unit III:** Instrumental methods of height measurement-geometric and trigonometric principles, instruments used in height measurement; tree stem form, form factor, form quotient, measurement of volume of felled and standing trees, age determination of trees. Indian wild life and management. Social forestry and its branches.

**Unit IV:** Agroforestry – definitions, importance, criteria of selection of trees in agroforestry, different agroforestry systems prevalent in the country, shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens. Cultivation practices of two important tree species of the region (Teak & Casurina).

### List of Experiments / Practices

- Identification of tree-species, seedlings, seed and non- wood timber forest products.
- Diameter measurements using calipers and tape, diameter measurements of forked, buttressed, fluted and leaning trees.
- Height measurement of standing trees by shadow method, Pencil method, single pole method and hypsometer.
- Volume measurement of logs using various formulae. Nursery lay out, seed sowing, vegetative propagation techniques.
- Forest plantations and their management.
- Visits of nearby forest based industries or National park/Agroforestry system/JFPM.

### Reference:

1. Tejwani, K. G. Agroforestry In India
2. Bebarta, K. C. Forest Resources & Sustainable Development
3. Prabhu, S. Indian Forestry
4. Bebarta, K. C. Planning For Forest Resources And Bio Diversity Management
5. Khanna L S . Forest Ministration, International Book Distributors Dehradun, Uttarakhand
6. Khanna L S. Principles and Practice of Silviculture”
7. Manikandan &Prabh . Indian Forestry: A breakthrough approach to Forest Service”



**Unit I:** Multidisciplinary nature of environmental studies Definition, scope and importance.

Natural Resources: Renewable and non-renewable resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, mining, and their effects on forest b) Water resources: Use and over-utilization of surface and ground water, dams benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. d) Energy resources: Growing energy needs, use of alternate energy sources. e) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

**Unit II:** Ecosystems: Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) Biodiversity and its conservation: - Introduction, definition, genetic, species & ecosystem. 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. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

**Unit III:** Environmental Pollution: definition, cause, effects and control measures of: a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution. Solid Waste Management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Social Issues and the Environment: From Unsustainable to Sustainable development, Urban problems related to energy, Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion. Wasteland reclamation. Consumerism and waste products.

**Unit IV:** Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness. Human Population and the Environment: population growth, variation among nations, population explosion, Environment and human health: Role of Information Technology in Environment and human health. Disaster Management: Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, avalanches, volcanic eruptions. Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, forest fire, road accidents, rail accidents, air accidents, sea accidents. Disaster Management- Effect to mitigate natural disaster at national and global levels. International strategy for disaster reduction. Role of NGOs, and media. Central, state, district and local administration; Disaster response of Armed forces, Police and other organizations.

**Reference:**

1. Ponamani, S., V. Sumitha, Bharathi and A. Balusamy, 2019, Environmental Studies and Disaster Management, Agrobios Publishers.
2. Ved P. Varma, 2019, Environmental Studies and Disaster Management, S. K. Kataria & Sons, Publisher.

## GENETICS AND PLANT BREEDING

GPB. 121

FUNDAMENTALS OF CYTOGENETICS

1+1

**Unit I:** Ultra structure of cell, cell organelles and their functions, structure of chromosome; chromonemata, chromosome matrix, chromomeres, centromere, secondary constriction and telomere.

**Unit II:** special types of chromosomes, chromosomal theory of inheritance- cell cycle and cell division- mitosis and meiosis and their significance.

**Unit III:** DNA: types, structure, replication, function, RNA: structure, types and function

**Unit IV:** life cycle of angiosperms: megasporogenesis and microsporogenesis and fertilization, structural and numerical variations in chromosome and their implications.

### List of Experiments / Practices

- Study of microscope, study of cell structure, mitosis and meiosis cell division.
- preparation and use of fixatives and stains for microscopy.
- preparation of slides for identification of mitotic and meiotic .
- stages, practice on mitotic and meiotic cell division.
- measurements of microstructures.

### Reference:

1. Vijendra Das, 2018, Genetics and Plant Breeding, New Age International (P) Ltd.
2. Gurpreet Singh Bhatia and B. D. Singh, 2017, Principles of Genetics and Plant Breeding, Kalyani Publishers, Ludhiana
3. George Acquaah, 2012, principles of Plant Genetics Breeding, Wiley-Blackwell 2<sup>nd</sup> Edition



**Unit I:** Pre-and Post-mendelian concepts of heredity, Mendelian principles of heredity. Probability and -Chi-square.

**Unit II:** Types of dominance, epistatic interactions with examples. Multiple alleles, pleiotropism, Sex determination and sex linkage, sex limited and sex influenced traits, Blood group genetics, Linkage and its estimation, crossing over mechanisms,

**Unit III:** chromosome mapping. Mutation, classification, mutagenic agents and induction of mutation. Qualitative & Quantitative traits, Polygenes and continuous variations, multiple factor hypothesis, cytoplasmic inheritance. Protein synthesis,

**Unit IV:** Transcription and translational mechanism of genetic material, gene concept: gene structure, function and regulation, Lac and Trptophan operons.

#### **List of Experiments / Practices**

- Solving problems on monohybrid, dihybrid, trihybrid, test cross and back cross.
- Solving problems on epistatic interactions including test cross and back cross.
- Concepts of probability and chi- square test and their application in genetics.
- Detection and estimation of linkage through two point test cross and three point test cross data.
- Solving problems of sex linkage.

#### **Reference:**

1. Singh B. D., 2015, Genetics, Kalyani Publisher, Ludhiana
2. Singh B. D., 2019, Fundamentals of Genetics, Kalyani Publisher, Ludhiana
3. Gurpreet Singh Bhatia and B. D. Singh, 2017, Principles of Genetics and Plant Breeding, Kalyani Publishers, Ludhiana

**Unit I:** Definition, history, objectives and accomplishments of plant breeding, modes of reproduction- its relevance on genetic consequences, breeding methods and cultivar options and its of plant breeding, pollination control systems-self-incompatibility and male sterility. Domestication, Acclimatization and Introduction; Centers of origin/diversity,

**Unit II:** Plant genetic resources, their conservation and utilization, genetic basis and breeding methods in self- pollinated crops - mass and pure line selection, components of genetic variation; heritability and genetic advance; hybridization techniques and handling of segregating populations; multiline concept, concepts of population genetics and Hardy- Weinberg Law, Genetic basis and methods of breeding cross pollinated crops, modes of selection.

**Unit III:** Population improvement methods- Ear to row method, modified Ear to Row, recurrent selection schemes; heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties; Breeding methods in asexually propagated crops, clonal selection and hybridization;

**Unit IV:** wide hybridization and pre-breeding; polyploidy in relation to plant breeding, mutation breeding-methods and uses; Breeding for important biotic and abiotic stresses; Biotechnological tools- DNA markers and marker assisted selection. Participatory plant breeding; Intellectual Property Rights, Patenting, Plant Breeders and & Farmer's Rights.

#### **List of Experiments / Practices**

- Plant Breeder's kit, Study of germplasm of various crops.
- Study of floral structure of self-pollinated and crosspollinated crops.
- Emasculation and hybridization techniques in self & cross pollinated crops.
- Study of male sterility system. Methods of calculating mean, range, variance, standard deviation, heritability.
- Designs used in plant breeding experiments, analysis of Randomized Block Design.
- prediction of performance of double and three-way cross hybrids.

#### **Reference:**

1. Phundan Singh, 2017, Fundamentals of Plant Breeding, Kalyani Publishers, Ludhiana
2. Gurpreet Singh Bhatia and B. D. Singh, 2017, Principles of Genetics and Plant Breeding, Kalyani Publishers, Ludhiana.



**Unit I:** Centers of origin, distribution of species, wild relatives and major breeding objectives and procedures including conventional

**Unit II:** Modern innovative approaches for development of varieties and hybrids for improved yield, adaptability, stability, biotic and abiotic stress tolerance

**Unit III:** Quality (physical, chemical and nutritional) of different cereals-rice, wheat, maize, sorghum, bajra and ragi; pulses- redgram, breengram, blackgram, chickpea, soybean;

**Unit IV:** Oilseeds- sunflower, niger, groundnut, sesame, castor, rapeseed and mustard, fibre crops- jute and cotton; cash crops- sugarcane, potato and tobacco.

#### **List of Experiments / Practices**

- Floral biology, emasculation and hybridization techniques in cereals-rice, wheat, maize, sorghum, bajra and ragi; pulses-redgram, breengram, blackgram, chickpea, soybean; oilseeds-sunflower,groundnut, sesame, castor, rapeseed and mustard
- fibre crops- jute and cotton; cash crops- sugarcane, potato and tobacco.
- Estimation of heterosis, inbreeding depression and heritability
- Layout of field experiments
- study of quality characters, sources of genes of important characters
- Visit to AICRP plots of different field crops.

#### **Reference:**

1. Mishra, S. N., Crop Breeding in India. Indian Book house, New Delhi.
2. Bandyopadhyay P. C., Breeding and Crop production. Gene-Tech Books, New Delhi.

**Unit I:** Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIPs and WIPO, Treaties for IPR protection: Types of Intellectual Property and legislations covering IPR in India:-Patents, Copyrights, Geographical indications, Trade secrets.

**Unit II:** Patents Act 1970 and Patent system in India, patentability, process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, compulsory licensing, Patent Cooperation Treaty, Patent search and patent database.

**Unit III:** Origin and history including a brief introduction to UPOV for protection of plant varieties, Protection of plant varieties under UPOV and PPV&FR Act of India, Plant breeder's rights, Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights.

**Unit IV:** Traditional knowledge-meaning and rights of TK holders. Convention on Biological Diversity, International treaty on plant genetic resources for food and agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features access and benefit sharing.

**Reference:**

1. Pandey Neeraj and Dharni Khushdeep, 2014, Intellectual Property Rights, PHI Learning Pvt. Ltd
2. Nithyananda K. V., 2019, Intellectual Property Rights – Protection and Management
3. Ramakrishna, B., Anil Kumar, H. S., 2017, Fundamentals of Intellectual Property Rights, Notion Press.



## HORTICULTURE

### HRT. 121 FUNDAMENTALS OF HORTICULTURE AND FRUIT CROPS PRODUCTION 1+1

**Unit I:** Horticulture - Definition and branches, Importance and scope, Classification of horticultural crops; Plant propagation - methods and propagating structures

**Unit II:** Principles of orchard establishment; Principles and methods of training and pruning Unfruitfulness; Pollination, pollinizers and pollinators

**Unit III:** Fertilization and Parthenocarpy; Importance of plant bio-regulators in horticulture; Importance of rootstocks; Origin, distribution, uses, area and production, soil and climatic requirements, commercial varieties/ hybrids, planting methods, nutrition, irrigation, weed management, pruning and training, inter

**Unit IV:** Mixed cropping, harvesting and yield of Mango, Banana, Citrus, Grapes, Guava, Papaya, Sapota, Pineapple, Pomegranate and Jackfruit.

#### List of Experiments / Practices

- Identification of garden tools
- Identification of fruits
- Preparation of potting mixture
- Layout and planting of orchard
- Bearing habits
- Propagation methods and physiological disorders of above fruits
- Methods of irrigation and fertilizer application in above fruits
- Visits to commercial orchards.

#### Reference:

1. Chadha, K.L., 2002, Handbook of Horticulture ICAR, New Delhi
2. D.K. Salunkhe and S.S. Kadam, 2013, A handbook of Fruit Science and Technology CRC Press
3. Jitendra Singh, 2011, Basic Horticulture Kalyani Publications, New Delhi.
4. K.V.Pete, 2009, Basics Horticulture New India Publishing Agency
5. Kausal Kumar Misra and Rajesh Kumar Fundamentals of Horticulture, 2014, Biotech Books
6. Kumar, N. Introduction to Horticulture, 1990, Rajyalakshmi publications, Nagarcoil, Tamilnadu
7. Neeraj Pratap Singh, 2005, Basic concepts of Fruit Science, IBDC Publishers, New Dehi
8. Prasad and Kumar, 2014, Principles of Horticulture 2nd Edn. Agrobios (India)
9. S. Prasad and U. Kumar, 2010, A handbook of Fruit Production, Agrobios (India)
10. Singh, H.P. Advances in Horticulture Biotechnology Vol. 7: Diagnostics for Horticulture crops Westville
11. Singh, H.P. Advances in horticulture Biotechnology, Vol-1: Fruit Crops Westville
12. Kapoor, B. Ethnobotany: A recent approach, Madhu
13. Basra, A.S. Plant Growth Regulators in Agriculture & Horticulture: Their Role and commercial use IBD
14. Swain, S. Precision Farming in Horticulture: Approaches and Strategies, NPH
15. Sharma, N. Biometrical methods in Horticultural Sciences, NIPA.

**Unit I:** Importance of vegetables in human nutrition and national economy; Kitchen gardening

**Unit II:** Origin, distribution, uses, area and production, soil and climatic requirements, commercial varieties/ hybrids, time of sowing, transplanting techniques, planting distance, fertilizer requirements

**Unit III:** irrigation, weed management, physiological disorders, harvesting and yield of Potato, Tomato, Brinjal, Chilli, Capsicum, Cucumber, Watermelon, Ridge gourd, Bitter gourd

**Unit IV:** yield of French bean, Cabbage, Cauliflower, Onion, Garlic, Carrot, Radish, Palak, Amaranthus, and Drumstick. Protected cultivation of Capsicum and European Cucumber.

**List of Experiments / Practices**

- Identification of vegetables and their seeds
- Study of morphological characters of different vegetables
- Seed extraction
- Seed viability tests
- Nursery raising
- Direct seed sowing and transplanting
- Harvesting and grading of vegetables.

**References:**

1. B.R.Choudhary, 2009, A Text book on production technology of vegetables Kalyani Publishers
2. K S Yawalkar, 2008, Vegetable crops in India Agri-Horticultural Pub. House. Nagpur
3. K.V.Kamath , 2007, Vegetable Crop Production Oxford Book Company
4. M.K.Rana Olericulture in India (2008) Kalyani Publishers, Ludhiana
5. M.S.Dhaliwal ,2008, Handbook of Vegetable Crops Kalyani Publishers, Ludhiana.
6. Nath Prem, 1994, Vegetables for the Tropical Regions ICAR New Delhi
7. P.Hazra, 2011, Modern Technology in Vegetable Production New India Publishing Agency, New Delhi
8. Singh, Umashankar, 2008, Indian Vegetables Anmol Publications. Pvt.Ltd .New Delhi
9. T.R.Gopal Krishnan, 2007, Vegetable Crops New India Publishing Agency. New Delhi



**Unit I:** Importance and scope of flower crops; Classification of ornamental plants Principles of landscaping

**Unit II:** Garden features and adornments; Garden styles and designs, Lawn and its maintenance

**Unit III:** Protected cultivation of Rose, Gerbera, Carnation, Anthurium and Orchids

**Unit IV:** Open cultivation of Gladiolus, Tuberose, Chrysanthemum, Marigold, Jasmine, Aster and Crossandra.

**List of Experiments / Practices**

- Identification of Ornamental plants
- Nursery bed preparation and seed sowing
- Planning, designing and layout of garden
- Physiological disorders of above flower crops
- Post harvest handling of cut and loose flowers
- Visit to commercial flower production units and nurseries.

**Reference:**

1. A.K. Tiwari and R. Kumar, 2012, Fundamentals of ornamental horticulture and landscape gardening New Delhi.
2. Arora, J.S., 2006, Introductory Ornamental Horticulture. Kalyani Publishers, Ludhiana.
3. Atal, E. K. and Kapur, B., 1982, Cultivation and Utilization of Medicinal and Aromatic plants CSIR, New Delhi
4. Azhar Ali Farooqui and Sreeramu, B.S., 2001, Cultivation of medicinal and aromatic plants United Press Limited.
5. Bimaldas Chowdhury and Balai Lal Jana, 2014, Flowering Garden trees Pointer publishers, Jaipur
6. Bose, T.K. Malti, R.G. Dhua, R.S. & Das, P., 2004, Floriculture and Landscaping, Nayaprakash
7. Bose, T.K. and Mukherjee, D., 2004, Gardening in India. Oxford & IBH Publishers, New Delhi
8. Chadha, K.L. and Chaudhary, B., 1986, Ornamental Horticulture in India, ICAR, New Delhi
9. H.S.Grewal and Parminder Singh, 2014, Landscape designing and ornamental plants
10. K.V.Peter, 2009, Ornamental plants New India publishing agency, New Delhi
11. R.K. Roy Fundamentals of Garden designing (2013) New India publishing agency
12. Rajesh Srivastava Fundamentals of Garden designing (2014) Agrotech press, Jaipur
13. Randhawa, G.S. Amitabha Mukhopadhyay Floriculture in India (2004) Allied Publishers Pvt. Ltd., New Delhi
14. Tiwari, A.K., 2013, Fundamentals of Ornamental Horticulture and Landscaping Gardening NIPA
15. Gupta, R.D. Agrotechniques and Uses of Medicinal Plants, Astral

**HRT. 311 PRODUCTION TECHNOLOGY OF PLANTATION CROPS, SPICES,  
MEDICINAL AND AROMATIC PLANTS**

1+1

**Unit I:** Origin, distribution, uses, area and production, soil and climatic requirements, c

**Unit II:** Commercial varieties, planting methods, nutrition, irrigation, weed management, inter and mixed cropping, harvesting

**Unit III:** yield of Coconut, Arecanut, Cashew, Tea, Coffee, Rubber, Pepper, Cardamom, Ginger, Turmeric, Coriander and Fenugreek Ashwagandha,

**Unit IV:** yield of Aloe, Periwinkle, stevia, Mints, Lemongrass, Ocimum, Patchouli and Geranium.

**List of Experiments / Practices**

- Identification, propagation, physiological disorders, processing and value addition of above crops.
- Extraction methods for essential oils.
- Visits to commercial Plantation.

**Reference:**

1. Prasad, S. and Bhardwaj, R. L., 2018, Production Technology of Spices, Aromatic, Medicinal and Plantation crops.
2. Jitendra Singh, 2008, Spices and Plantation Crops. Aavishkar Publishers and Distributors, Jaipur.
3. Alice Kurian and K.V. Peter, 2007, Commercial Crops Technology, Horticultural Sciences Series Vol-8. ed. by K.V. Peter, New India Publishing Agency, New Delhi.
4. Shanmugavelu, K.G., N. Kumar and K.V. Peter, 2005, Production Technology of Spices and Plantation Crops. Agrobios (India), Jodhpur.
5. Tiwari, R.S and AnkurAgarwal 2004. Production technology of spices. International book distributing Co., Lucknow.
6. Chadha, K. L., 2001, Handbook of Horticulture. ICAR Publication, New Delhi
7. Pruthi, J.S, 2001, Minor Spices and Condiments. Crop management and Postharvest technology. ICAR publication, New Delhi.
8. SanjeevAgarval, E.V. DivakaraSastry and R.K. Sahrama, 2001, Seed Spices: Production, quality and export. Pointer Publishers, Jaipur.
9. Pruthi, J.S, 1998, Major Spices of India. Crop management and Postharvest technology. ICAR publication, New Delhi.
10. Chadha, K.L and P. Rethinam, 1994, Advances in Horticulture - Vol. 10 & 11 Spices and Plantation Crops, ICAR publications, New Delhi.



## HRT. 321 POST HARVEST MANAGEMENT AND VALUE ADDITION OF FRUITS AND VEGETABLES 1+1

**Unit I:** Importance of post-harvest processing of fruits and vegetables; Extent and possible causes of post-harvest losses

**Unit II:** Pre harvest factors affecting postharvest quality, maturity, ripening and changes occurring during ripening; Respiration and factors affecting respiration rate

**Unit III:** Harvesting and field handling; Storage (ZECC, Cold storage, CA, MA and Hypobaric); Value addition concept; Principles and methods of preservation; Minimal processing; Intermediate moisture foods- Jam, Jelly

**Unit IV:** Marmalade – Concepts and Standards; Fermented and non-fermented beverages; Drying/ Dehydration of fruits and vegetables – Concept and methods; Canning - Concepts and Standards, Packaging of products.

### List of Experiments / Practices

- Containers for shelf life extension
- Effect of temperature on shelf life and quality of produce
- Chilling and freezing injury in vegetables and fruits
- Extraction and preservation of pulps and juices
- Preparation of Jam, Jelly, RTS, Nectar, Squash, Wine, Fruit bar, Candy, Tomato products
- Quality evaluation of products - physico- chemical and sensory
- Visit to processing unit/ industry.

### Reference:

1. Hosahalli, S. Ramaswamy, 2015, Postharvest Technologies of Fruits and Vegetables. DEstech Publishing Inc.
2. Rathore, N. S., G. K. Mathur and S. S. Chasta, 2015, Postharvest Management and Processing of Fruits and Vegetables. ICAR, New Delhi.
3. Sadhana Pandey, S. K. Pandey and P. H. Pandey, 2011, Postharvest Management of Horticultural Crops. Kalyani Publishers, Ludhiana.
4. Satish, M.C. Nautiyal Sharma, 2009, Postharvest Technology of Horticultural Crops, NIPA Publishers.
5. Satish Kumar Sharma, 2010, Postharvest Management and Processing of Fruits and Vegetables, New India Publishing Agency.

# PLANT BIOTECHNOLOGY

PBT. 121

FUNDAMENTALS OF PLANT BIOTECHNOLOGY

2+1

**Unit I:** Concept of Plant Biotechnology – History of Plant Tissue Culture and Plant Genetic Engineering; Scope and importance in Crop Improvement – Totipotency and Morphogenesis, Nutritional requirements of in-vitro cultures

**Unit II:** Techniques of in-vitro cultures; Micro-propagation, Anther culture, Pollen culture, Ovule culture, Embryo culture, Endosperm Culture and its applications. Somaclonal variation: Types, Reasons. Somatic embryogenesis and synthetic seed production technology

**Unit III:** Protoplast isolation, Culture, Manipulation and fusion; Products of somatic hybrids and cybrids, Applications in crop improvement. Genetic engineering: Restriction enzymes; vectors for gene transfer- Gene cloning, direct and indirect method of gene transfer, Transgenic plants and their applications.

**Unit IV:** Blotting techniques- DNA finger printing, DNA based markers- RFLP, AFLP, RAPD, SSR and DNA probes. Marker-assisted selection and its recent advances

## List of Experiments / Practices

- Requirements for plant tissue culture laboratory
- Techniques in plant tissue culture
- Media components and preparations, Sterilization techniques and Inoculation of various explants
- Aseptic manipulation of various explants; Callus induction and Plant regeneration;
- Micro-propagation of important crops, Anther, Embryo and Endosperm culture; Hardening/ Acclimatization of regenerated plants
- Somatic embryogenesis and synthetic seed production
- Isolation of protoplast, demonstration of culturing of protoplast
- demonstration of isolation of DNA
- Demonstration of gene transfer techniques- direct methods and indirect methods;
- Demonstration of confirmation of Genetic transformation,
- Demonstration of gel electrophoresis techniques.
- Restriction enzymes for digestion of DNA. Polymorphism, monomorphism, hybridity testing.

## Reference:

1. Singh, B. S. and M. P. Singh, 2006, Fundamentals of Plant Biotechnology. Satish Serial Publishing House, Delhi.
2. Armugam, N. and Kumaresan, V., 2019, Fundamentals of Plant Biotechnology. Saras Publication
3. Chawla, H. S., 2002 Introduction to Plant Biotechnology, Science publication
4. Neal Stewart, C., 2016, Plant Biotechnology- Principles, Techniques and Applications, Wiley Publication.



# PLANT PATHOLOGY

PAT. 211

FUNDAMENTALS OF PLANT PATHOLOGY

2+1

**Unit I:** Introduction: Importance of plant diseases, scope and objectives of Plant Pathology. History of Plant Pathology with special reference to Indian work. Terms and concepts in Plant Pathology. Cause and classification of plant diseases. Important plant pathogenic organisms, fungi, bacteria, fastidious vascular bacteria, phytoplasmas, spiroplasmas, viruses, viroids, algae, protozoa, phanerogamic parasites and nematodes with examples of diseases caused by them.

**Unit II:** Diseases and symptoms due to abiotic agents. Fungi: general characters, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction (asexual and sexual). Binomial system of nomenclature, rules of nomenclature. Classification of fungi, keys to phylum, classes, order and families. Bacteria and mollicutes: general morphological characters. Basic methods of classification and reproduction. Keys to major plant pathogenic bacteria genera.

**Unit III:** Viruses: nature, morphology, replication and transmission and classification of plant viruses. Keys to important plant virus families /genera. Nematodes: General morphology and reproduction, classification, keys to important plant pathogenic nematode genera, symptoms and nature of damage caused by plant nematodes. Phanerogamic plant parasites: Common characteristic of important parasites, disease development, survival and spread. Growth and reproduction of plant pathogens.

**Unit IV:** Liberation / dispersal and survival of plant pathogens. Types of parasitism and variability in plant pathogens. Pathogenicity: phenomenon of host infection by Fungi, Bacteria, Viruses, mollicutes and nematodes. Pathogenesis: Penetration and colonization. Role of enzymes, toxins and growth regulators in disease development and their classification.

## List of Experiments / Practices

- Acquaintance with various laboratory equipments and microscopy.
- Study of symptoms of various plant diseases caused by fungi, viruses, bacteria, nematodes and mollicutes.
- Field visit to get acquainted with plant disease symptoms.
- Collection and preservation of plant disease specimens.
- Study of morphology of fungi, viruses, bacteria, nematodes and phytoplasma.
- Study of life cycle/disease cycle of major fungal, bacterial, viral, nematode and phanerogamic plant parasites diseases.
- Macroscopic and microscopic examination of plant pathogens including staining techniques for bacteria.
- Preparation of culture media and sterilization.
- Different methods of isolation and purification of fungi, bacteria, viruses and extraction of nematodes.
- Study of different methods of artificial inoculation / transmission and proving Koch's postulates for different plant pathogens.
- Study of liberation of fungal spore. Study of micrometry.

## References:

1. Agrios G. N., 2005, Plant Pathology, 5th Ed. Academic Press, New York. (Indian Ed.)

2. Mehrotra, R.S. and Aggarawal, A., 2007, Plant Pathology. Tata McGraw Hill Publishing Co. Ltd., New Delhi
3. Singh, R.S., 2005, 4th ed. Principles of Plant Pathology. Oxford & IBH, New Delhi.
4. Nene, Y.L., 2015, Fungicides in Plant Diseases Control. Oxford & IBH published Co. Pvt. Ltd., New Delhi.
5. Singh, R.P., 2013, Plant Pathology. Kalyani Publishers.
7. Alexopoulos, C.J., Mims CW & Blackwell M. 2000. Introductory Mycology. 5th Ed. John Wiley & Sons, New York.
8. Dube, H.C. 2012. Modern Plant Pathology, Agro Bios , India
9. Lakshman, H.C. 2014. Bio-fertilizers and Bio-pesticides. Pointer Publishers.



**Unit I:** Defence mechanism in plants: structural, biochemical (pre and post-infection) and host plant resistances. Effect of pathogens on plant physiological processes viz., photosynthesis, respiration, translocation and transcription. Epidemiology: Epidemics and factors affecting disease development, patterns of epidemics and disease progress curves. Assessment of disease severity and crop losses.

**Unit II:** Survey, surveillance, remote sensing and forecasting of plant diseases Principles and methods of plant disease management: *Avoidance of the pathogen:* Choice of geographical area, selection of field and planting stock etc., *Exclusion of inoculum:* Plant quarantine regulations and inspections, post entry quarantine. *Eradication of the pathogen:* Cultural and physical methods of eradication and inoculum reduction; Biological methods of disease control: Crop rotation, use of trap crops, plant and plant products, use of biological control agents, mechanisms of biocontrol, cross protection.

**Unit III:** Breeding for disease resistance: Types of resistance, Development of resistant varieties, Induced resistance. Biotechnological approaches of diseases management. IPR and related issues. Chemical methods; nature, chemical combination, classification, mode of action and formulations of fungicides, bactericides, nematicides and antibiotics. Methods of application of chemicals. Insect vector management. Diagnosis of plant diseases. Seed pathology; importance of seed health to man and animals. seed borne nature of pathogens; Identification and detection of seed borne pathogens.

**Unit IV:** IDM: Introduction, history, importance & concepts. Economic importance diseases. Epidemiology and crop loss assessment methods with case studies. IDM module for important cereal (Rice), pulse (pigeon Pea), oil seeds (Sunflower and Groundnut) and vegetable (Tomato and Potato) and horticulture/plantation crops.

#### List of Experiments / Practices

- Methods of detection of different plant pathogens.
- Methods of estimation crop disease severity
- Methods of estimation of crop losses
- Methods of detection and identification of seed borne pathogens
- Isolation of biocontrol agents
- Testing the efficacy of biocontrol agents by dual culture technique.
- Mass multiplication of bioagents
- Methods of application of bioagents
- Study of fungicides, bactericides, nematicides and their formulations.
- Preparation of Bordeaux mixture and calculation of fungicide spray concentration.
- Bioassay of fungicide and antibiotics.
- Methods of application of chemicals
- Study of pesticide compatibility and their safe use
- Study of plant protection equipment's.
- Methods of screening for disease resistances.
- Visit to pesticide companies.

#### Reference:

1. Cook, A. A., 1981, Diseases of tropical and sub-tropical field fiber and oil plants. Mac Millan Publishing Co. New York.
2. Gupta V. K. and Paul, Y. S., 2008, Diseases of field crops. Second edition, Kalyani Publishing Co. New Delhi.
3. Mehrotra, R. S. and Aggarwal, A. 2012, 12<sup>th</sup> ed. Plant Pathology, Tata McGraw-Hill Publishing Co Ltd. ND.
4. Mishra A , Bohra, A. and Mishra , A. 2005, Plant Pathology. Agrobios. Jodhpur (India).
5. Rangaswamy,G and Mahadevan, A . 2012, 4<sup>th</sup> ed. Diseases of crop plants in India. Prentice hall of India Pvt Ltd, New Delhi.
6. Singh R S .2007, 8<sup>th</sup>ed. Plant Diseases. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi
7. Gupta ,V. K. 2014, Diseases of Fruit Crops. Kalyani Publishers
8. Chaube H.S., 2003,Crop Diseases and Their Management. PHI
9. Singh ,R. S .,2007. Plant Diseases.(9<sup>th</sup> Ed.) Oxford and IBH Publishing Co.Pvt .Ltd .ND
10. Singh , R.P., 2013. Plant Pathology. Kalyani Publishers
11. Tripathi, D.P., 2009. Crop Diseases, Kalyani Publishers
12. Gangawane, L.V. and Khilare, V.C. 2008. Crop diseases identification and management. Daya publishing house, New Delhi.
13. Gupta, S.K. and Thind, T.S. 2006. Disease problems in vegetable production. Scientific Publishers, Jodhpur.
14. Pathak, V.N., 1980 Diseases of fruit crops. Oxford and IBH Publishing Co. Pvt. Ltd, . New Delhi.
15. Singh, R.S., 2006. Diseases of fruit crops. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
16. Singh, R.S.,1994 Diseases of vegetable crops. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.



**Unit I:** Defence mechanism in plants: structural, biochemical (pre and post-infection) and host plant resistances. Effect of pathogens on plant physiological processes viz., photosynthesis, respiration, translocation and transcription. Epidemiology: Epidemics and factors affecting disease development, patterns of epidemics and disease progress curves. Assessment of disease severity and crop losses.

**Unit II:** Survey, surveillance, remote sensing and forecasting of plant diseases Principles and methods of plant disease management: *Avoidance of the pathogen:* Choice of geographical area, selection of field and planting stock etc., *Exclusion of inoculum:* Plant quarantine regulations and inspections, post entry quarantine. *Eradication of the pathogen:* Cultural and physical methods of eradication and inoculum reduction; Biological methods of disease control: Crop rotation, use of trap crops, plant and plant products, use of biological control agents, mechanisms of biocontrol, cross protection.

**Unit III:** Breeding for disease resistance: Types of resistance, Development of resistant varieties, Induced resistance. Biotechnological approaches of diseases management. IPR and related issues. Chemical methods; nature, chemical combination, classification, mode of action and formulations of fungicides, bactericides, nematocides and antibiotics. Methods of application of chemicals. Insect vector management. Diagnosis of plant diseases. Seed pathology; importance of seed health to man and animals. seed borne nature of pathogens; Identification and detection of seed borne pathogens.

**Unit IV:** IDM: Introduction, history, importance & concepts. Economic importance diseases. Epidemiology and crop loss assessment methods with case studies. IDM module for important cereal (Rice), pulse (pigeon Pea), oil seeds (Sunflower and Groundnut) and vegetable (Tomato and Potato) and horticulture/plantation crops.

#### **List of Experiments / Practices**

- Methods of detection of different plant pathogens.
- Methods of estimation crop disease severity
- Methods of estimation of crop losses
- Methods of detection and identification of seed borne pathogens
- Isolation of biocontrol agents
- Testing the efficacy of biocontrol agents by dual culture technique.
- Mass multiplication of bioagents
- Methods of application of bioagents
- Study of fungicides, bactericides, nematocides and their formulations.
- Preparation of Bordeaux mixture and calculation of fungicide spray concentration. Bioassay of fungicide and antibiotics.
- Methods of application of chemicals
- Study of pesticide compatibility and their safe use
- Study of plant protection equipment's.
- Methods of screening for disease resistances.
- Visit to pesticide companies.

#### **Reference:**

1. Cook, A. A. 1981. Diseases of tropical and sub-tropical field fiber and oil plants. Mac Millan Publishing Co. New York.
2. Gupta V K and Paul, Y S 2008, Diseases of field crops. Kalyani Publishing Co. New Delhi.
3. Mehrotra R S and Aggarwal A. 2012, 12<sup>th</sup> ed. Plant Pathology, Tata McGraw-Hill Publishing Co Ltd. New Delhi.
4. Mishra A , Bohra A and Mishra , A. 2005. Plant Pathology. Agrobios. Jodhpur (India).
5. Rangaswamy, G and Mahadevan, A . 2012. 4<sup>th</sup> ed. Diseases of crop plants in India. Prentice hall of India Pvt Ltd, New Delhi.

6. Singh R S .2007, 8<sup>th</sup>ed. Plant Diseases. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi
7. Gupta ,V. K. 2014, Diseases of Fruit Crops. Kalyani Publishers, Ludhiana.
8. Chaube H.S. Crop Diseases and Their Management. PHI
9. Singh R S .2006, Plant Diseases.(9<sup>th</sup> Ed.) Oxford and IBH Publishing Co.Pvt .Ltd .ND
10. Singh , R.P. 2013, Plant Pathology. Kalyani Publishers, Ludhiana.
11. Tripathi, D.P. 2009, Crop Diseases, Kalyani Publishers, Ludhiana.
12. Gangawane, L.V. and Khilare, V.C. 2008. Crop diseases identification and management. Daya publishing house, New Delhi.
13. Gupta, S.K. and Thind, T.S., 2006, Disease problems in vegetable production. Scientific Publishers, Jodhpur.
14. Pathak, V.N., 1980, Diseases of fruit crops. Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi.
15. Singh, R.S., 2006, Diseases of fruit crops. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
16. Singh, R.S,1994, Diseases of vegetable crops. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.



**Unit I:** Diseases of fruit crops, plantation crops, vegetables crops, flower crops, Aromatic and Medicinal plants with respect to economic importance, incidence, symptoms, etiology, disease cycle/life cycle and management practices.

**Unit II:** Fruit crops: Mango, Apple, Papaya, Citrus, Guava, Pomegranate, Grapes, Pineapple Sapota, Peach & Banana. Plantation crops: Coffee, Tea, Rubber, Coconut, Arecanut, Cardamom, Beetle vine, Pepper & Vanilla.

**Unit III:** Vegetable crops: Tomato, Potato, Brinjal, Crucifers, Cucurbits, Bhendi, Leafy vegetable diseases, Carrot, Onion, Garlic, Cassava, Beans, Peas & Capsicum. Flower crops: Rose, Jasmine, Tuberose, Crossandra, Chrysanthemum & Gladioli.

**Unit IV:** Medicinal and Aromatic crops: Periwinkle, Dioscorea, Solanum, Coleus, Davana, Citronella, Sandle, Geranium & Patchouli. Important post-harvest diseases of horticultural crops.

#### **List of Experiments / Practices**

- Study of symptoms, etiology and disease cycle / life cycles of selected diseases of horticultural crops covered in theory.
- Field visit for the diagnosis of field problems.
- Collection and preservation of plant diseased specimens.

(Note: Students should submit 50 pressed and well mounted specimens.)

#### **Reference:**

1. Cook, A. A., 1981. Diseases of tropical and sub-tropical field fiber and oil plants. Mac Millan Publishing Co. New York.
2. Gupta, V. K. and Paul, Y. S., 2008, Diseases of field crops. Kalyani Publishing Co. New Delhi.
3. Mehrotra R S and Aggarwal A. 2012. 12th ed. Plant Pathology, Tata McGraw-Hill Publishing Co Ltd. New Delhi.
4. Mishra A , Bohra A and Mishra , A. 2005. Plant Pathology. Agrobios. Jodhpur (India).
5. Rangaswamy, G and Mahadevan, A . 2012. 4th ed. Diseases of crop plants in India. Prentice hall of India Pvt Ltd, New Delhi.
6. Singh R S .2007, 8th ed. Plant Diseases. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi
7. Gupta , V. K. 2014, Diseases of Fruit Crops. Kalyani Publishers, Ludhiana.
8. Chaube H.S. Crop Diseases and Their Management. PHI
9. Singh, R. S. 2006,. Plant Diseases.(9th Ed.) Oxford and IBH Publishing Co.Pvt .Ltd .ND
10. Singh , R.P. 2013, Plant Pathology. Kalyani Publishers, Ludhiana.
11. Tripathi, D.P. 2009, Crop Diseases, Kalyani Publishers, Ludhiana.
12. Gangawane, L.V. and Khilare, V.C. 2008. Crop diseases identification and management. Daya publishing house, New Delhi.
13. Gupta, S.K. and Thind, T.S., 2006, Disease problems in vegetable production. Scientific Publishers, Jodhpur.
14. Pathak, V.N., 1980, Diseases of fruit crops. Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi.
15. Singh, R.S., 1994, Diseases of vegetable crops. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi



## SEED SCIENCE & TECHNOLOGY

SST. 311

PRINCIPLES AND PRACTICES OF SEED PRODUCTION

1+1

**Unit-I:** Introduction to seed science and technology, seed and its importance. Seed quality – characteristics of quality seeds, factors affecting seed quality and its maintenance. History and development of seed industry, Seed programmers, types, planning and execution. Different classes of seed, generation system of seed multiplication, seed replacement and varietal replacement rates- seed multiplication ratio, seed renewal and seed plan, Agencies involved in seed production at state and national level. Seed certification – control of seed source, field inspection, field counts, field standards. Principles of seed production- genetic, agronomic and economic principles, Maintenance of genetic purity during seed production.

**Unit-II:** Deterioration of crop varieties — factors and their control, Requirements for hybrid seed production and types of hybrids. Systems and techniques of hybrid seed production, male sterility, self incompatibility, CHA and EGMS. Planning for breeder, foundation, truthfully labelled and certified class of seed production.

**Unit-III:** Seed production- foundation and certified seed production in maize (varieties, hybrids, synthetics and composites); rice, sorghum and bajra (varieties and hybrids); greengram, blackgram, bengalgram, cowpea (varieties) ; soybean, groundnut (varieties); sunflower (varieties and hybrids); castor (varieties and hybrids); cotton (varieties and hybrids); tomato and brinjal (varieties and hybrids); chilli and bhendi (varieties and hybrids), onion and melons and gourds (varieties and hybrids) and potato (varieties and true potato seeds), seed crop harvesting methods and management. Seed production under protected cultivation. Seed marketing and distribution strategies– organizations, structures, sales, International trade

**Unit-IV:** Export and import policies for seed trade, generation activities, sales promotional media and factors affecting seed marketing. Seed Sales, License, pricing policy, cost benefit ratio, economic feasibility and factors influencing.

### List of Experiments / Practices

- Identification of seeds of agricultural/ horticulture crops. Study of seed structure in monocot and dicot seeds in agricultural and horticulture crops.
- Study of floral biology in self, cross and often cross pollinated crops. Identification of sex in gourds and melons. Identification of different varieties based on seed morphological characters in agriculture and horticulture crops. Isolation types, measurement and determination in self and cross pollinated crops.
- Carrying out field inspection and taking field counts. Study of different contaminants and practicing rouging. Practicing hybrid seed production techniques – hand emasculation and pollination.
- Practicing detassling techniques.
- Diagnostic identification of A, B and R lines in hybrid seed production.
- Studies on planting ratio, border rows and synchronization and supplementary pollination techniques in hybrid seed production.
- Determination of physiological maturity in agri- horticultural crops. Visit to KSSOCA and grow out test farms.



- Visit to seed production plots (OPV and hybrids) of public and private organizations. Calculation of economics of seed production (OPV and Hybrids).
- Visit to seed production under protected cultivation.

**Reference:**

1. Agarwal, R.L., 1991, Seed Technology. Oxford & IBH Publishing Co. Delhi
2. Agarwal, P.K., 1999, Seed Technology. ICAR, New Delhi.
3. Sen, Subir and Ghosh, Nabinanda. 2015. Seed Science and Technology. Kalyani Publishers. New Delhi.
4. Khare, Dhirenra and Bhale, Mohan, S., 2000, Seed Technology. Scientific Publishers (India), Jodhpur.
5. Kulkarni, G. N. 2002. Principles of Seed Technology. Kalyani Publishers. Ludhiana
6. Joshi, A.K. and Singh, B.D., 2013, Seed Technology. Kalyani Publishers, New Delhi.
7. Basavraju, G. V., Ravishankar, P. and Gowdiperu, Sarika, 2014, A Text book of Seed Science and Technology. Kalyani Publishers, Ludhiana.
8. Agrawal R. L., 1996, Seed Technology, Oxford and IBH Publicity Company, New Delhi.
9. Joshi, A. K. and Singh, B. D. 2003. Seed Science and Technology. Kalyani Publishers. Ludhiana.

**Unit-I:** Introduction to seed science and technology, seed and its importance. Seed quality – characteristics of quality seeds, factors affecting seed quality and its maintenance. History and development of seed industry, Seed programmers, types, planning and execution. Different classes of seed, generation system of seed multiplication, seed replacement and varietal replacement rates- seed multiplication ratio, seed renewal and seed plan, Agencies involved in seed production at state and national level. Seed certification – control of seed source, field inspection, field counts, field standards. Principles of seed production- genetic, agronomic and economic principles, Maintenance of genetic purity during seed production.

**Unit-II:** Deterioration of crop varieties — factors and their control, Requirements for hybrid seed production and types of hybrids. Systems and techniques of hybrid seed production, male sterility, self incompatibility, CHA and EGMS. Planning for breeder, foundation, truthfully labelled and certified class of seed production.

**Unit-III:** Seed production- foundation and certified seed production in maize (varieties, hybrids, synthetics and composites); rice, sorghum and bajra (varieties and hybrids); greengram, blackgram, bengalgram, cowpea (varieties) ; soybean, groundnut (varieties); sunflower (varieties and hybrids); castor (varieties and hybrids); cotton (varieties and hybrids); tomato and brinjal (varieties and hybrids): chilli and bhendi (varieties and hybrids), onion and melons and gourds (varieties and hybrids) and potato (varieties and true potato seeds), seed crop harvesting methods and management.

Seed production under protected cultivation. Seed marketing and distribution strategies– organizations, structures, sales, International trade

**Unit-IV:** Export and import policies for seed trade, generation activities, sales promotional media and factors affecting seed marketing. Seed Sales, License, pricing policy, cost benefit ratio, economic feasibility and factors influencing.

#### List of Experiments / Practices

- Identification of seeds of agricultural/ horticulture crops. Study of seed structure in monocot and dicot seeds in agricultural and horticulture crops.
- Study of floral biology in self, cross and often cross pollinated crops. Identification of sex in gourds and melons. Identification of different varieties based on seed morphological characters in agriculture and horticulture crops. Isolation types, measurement and determination in self and cross pollinated crops.
- Carrying out field inspection and taking field counts. Study of different contaminants and practicing rouging. Practicing hybrid seed production techniques – hand emasculation and pollination.
- Practicing detassling techniques.
- Diagnostic identification of A, B and R lines in hybrid seed production.
- Studies on planting ratio, border rows and synchronization and supplementary pollination techniques in hybrid seed production.
- Determination of physiological maturity in agri- horticultural crops. Visit to KSSOCA and grow out test farms.
- Visit to seed production plots (OPV and hybrids) of public and private organizations. Calculation of economics of seed production (OPV and Hybrids).
- Visit to seed production under protected cultivation.



### Reference:

1. Vanangamudi, K., Natarajan, N. , Bharathi, A., Umarani, R., Natarajan, N., Saravanan, T., 2010, Advances in Seed Science and Technology (volume 1): Recent Trends in Seed Technology and Management. Agrobios (India).
2. Basavraju, G. V., Ravishankar, P. and Gowdiperu, Sarika, 2014, A Text book of Seed Science and Technology. Kalyani Publishers, Ludhiana.
3. Agrawal R. L., 1996, Seed Technology, Oxford and IBH Publicity Company, New Delhi.
4. Joshi, A. K. and Singh, B. D. 2003. Seed Science and Technology. Kalyani Publishers. Ludhiana.

## SERICULTURE

SER. 321

INTRODUCTION TO SERICULTURE

1+1

**Unit-I:** Introduction, origin & history, statistics and distribution of sericulture, Mulberry varieties. Types of silks, Species of silkworms and their host plants. Raising of mulberry saplings, mulberry cultivation practices for irrigated and rainfed conditions, separate chawki garden. Intergrated nutrient Management. Pests and diseases of mulberry and their management. Life cycle of silkworms.

**Unit-II:** Morphology and anatomy of *Bombyx mori* L. Commercially exploited breeds of silkworm. Steps in silkworm egg production at grainage, egg sheets and loose egg production technology. Tier system of silkworm seed multiplication, seed area concept. Preservation and handling of eggs, egg incubation. Disinfection and hygiene in silkworm rearing. Silkworm rearing plan, Rearing house plan and equipments. Importance of chawki rearing, chawki rearing centres. Harvesting, transportation and preservation of leaves. Methods of silkworm rearing, shoot feeding, shelf rearing, rearing operations, environmental conditions and their management. Importance of feeding, bed cleaning, spacing, care during moulting. Picking and mounting ripened silkworms.

**Unit-III:** Harvesting of cocoons, grading, cocoon sorting, defective cocoons, and sale of cocoon in silk cocoon markets. Mechanization in sericulture. Pests and diseases of silkworms and their management. Post cocoon technology

**Unit-IV :** Steps in reeling – storage- cocoon drying/stifling, cocoon cooking, brushing, reeling and re-reeling. Different methods of silk reeling. Raw Silk Marketing- Silk Exchange- functions, Silk trade - import-export. Sericulture byproducts and their utilization for additional income. Economics of Sericulture.

### List of Experiments / Practices

- Mulberry varieties, Host plants of non-mulberry silkworms.
- Preparation of land, preparation of planting material and planting of mulberry, pruning,
- harvesting and storage of mulberry leaves. Pests and diseases of mulberry.
- Species of silkworms – life cycle of *Bombyx mori* L.
- Mulberry pests and diseases.
- Identification of cocoons of important breeds.
- External morphology of life stages – egg-larva- pupa and moth of *Bombyx mori* L. Study of silk gland and digestive system of *Bombyx mori* L.
- Disinfectants - rearing bed and general disinfectants. Grainage techniques.
- Study of rearing house plan and equipments for shoot feeding and shelf rearing.
- Methods Incubation of silkworm eggs and brushing.
- Identification of silkworms settling for moult, at moult, out of moult. Feeding, bed cleaning and spacing.
- Identification and picking of ripe worms, mounting, types of mountages, cocoon harvesting and grading. Pests and diseases of mulberry silkworm.
- Identification and picking Single cocoon reeling
- Study of reeling equipment.

### Reference:

1. Johnson, M. and M. Kesary, 2018, Sericulture, Saras Publication
2. Ganga, G., and J. Sulochana Chetty, 2017, Introduction to Sericulture, Oxford and IBH Publishing Co. Pvt. Ltd.



## SOIL SCIENCE & AGRICULTURAL CHEMISTRY

SAC. 121

FUNDAMENTALS OF SOIL SCIENCE

2+1

**Unit-I:** Introduction, origin & history, statistics and distribution of sericulture, Mulberry varieties. Types of silks, Species of silkworms and their host plants. Raising of mulberry saplings, mulberry cultivation practices for irrigated and rainfed conditions, separate chawki garden. Intergrated nutrient Management. Pests and diseases of mulberry and their management. Life cycle of silkworms.

**Unit-II:** Morphology and anatomy of *Bombyx mori* L. Commercially exploited breeds of silkworm. Steps in silkworm egg production at grainage, egg sheets and loose egg production technology. Tier system of silkworm seed multiplication, seed area concept.

Preservation and handling of eggs, egg incubation. Disinfection and hygiene in silkworm rearing. Silkworm rearing plan, Rearing house plan and equipments. Importance of chawki rearing, chawki rearing centres. Harvesting, transportation and preservation of leaves. Methods of silkworm rearing, shoot feeding, shelf rearing, rearing operations, environmental conditions and their management. Importance of feeding, bed cleaning, spacing, care during moulting. Picking and mounting ripened silkworms.

**Unit-III:** Harvesting of cocoons, grading, cocoon sorting, defective cocoons, and sale of cocoon in silk cocoon markets. Mechanization in sericulture. Pests and diseases of silkworms and their management. Post cocoon technology

**Unit-IV :** Steps in reeling – storage- cocoon drying/stifling, cocoon cooking, brushing, reeling and re-reeling. Different methods of silk reeling. Raw Silk Marketing- Silk Exchange- functions, Silk trade - import-export. Sericulture byproducts and their utilization for additional income. Economics of Sericulture.

### List of Experiments / Practices

- Mulberry varieties, Host plants of non-mulberry silkworms.
- Preparation of land, preparation of planting material and planting of mulberry, pruning, harvesting and storage of mulberry leaves. Pests and diseases of mulberry.
- Species of silkworms – life cycle of *Bombyx mori* L.
- Mulberry pests and diseases.
- Identification of cocoons of important breeds.
- External morphology of life stages – egg-larva- pupa and moth of *Bombyx mori* L. Study of silk gland and digestive system of *Bombyx mori* L.
- Disinfectants - rearing bed and general disinfectants.
- Grainage techniques.
- Study of rearing house plan and equipments for shoot feeding and shelf rearing.
- Methods Incubation of silkworm eggs and brushing.
- Identification of silkworms settling for moult, at moult, out of moult. Feeding, bed cleaning and spacing.
- Identification and picking of ripe worms, mounting, types of mountages, cocoon harvesting and grading. Pests and diseases of mulberry silkworm.
- Identification and picking Single cocoon reeling
- Study of reeling equipment.

**Reference:**

1. Sehgal, J., 2000. Pedology: Concepts and applications, Kalyani publisher, Ludhiana
2. Mehra R.K., 2004. Text book of Soil Science, ICAR, New Delhi
3. Boul S.W., Hole R.D., McCracken and Southard R.J., 1998. Soil genesis and classification Fourth Ed Panima Publishing corporation, New delhi.
4. Baver, L.D. Gardener, W.H. and gardener W.R., 1976. Soil Physics Wiley Eastern Ltd, New Delhi.



**Unit-I:** Soil chemistry- Scope and importance . components of soils – inorganic and organic components. Soil colloids – types properties and significance of soil colloids. Layer silicate clays- genesis, structure and properties.

**Unit-II:** Source of charges – positive and negative charges, electrical double layer – Helmholtz, Gouy – Chapman, stern theories. Ion exchange cation exchange capacity and anion exchange capacity, factors influencing ion exchange and its significance.

**Unit-III:** Soil organic matter – composition, decomposition, fractionation of organic matter, uses; Humus – humic substances,

**Unit-IV:** nature and properties ; carbon cycle, C:N ratio; Chemistry of submerged soils.

#### **List of Experiments / Practices**

- Analytical chemistry – basic concepts, techniques and calculation.
- Determination of soil Ph.
- Determination of electrical conductivity of soil.
- Determination of soil organic carbon; (Ca, Mg, K and Na).
- Determination of base saturation and exchangeable sodium percentage of soil.

#### **Reference:**

1. Biswas, T.D. and Mukherjee, S.K., 2006 Text book of Soil Science. Tata McGraw Hill publishing Co. Ltd, New Delhi
2. Brady, N.C. and Weil, R.R., 2002. The Nature and Properties of soils. Prentice Hall of India Pvt. Ltd, M-97, Connaught Circus, New Delhi
3. Saroj Kumar Sanyal, 2018, Text Book of Soil Chemistry. Daya Publishing House
4. Shivanand Tolanur, 2018, Soil Chemistry 2<sup>nd</sup> Edition, CBS Publisher

**Unit-I:** Soil quality and health, Distribution of Waste land and problem soils in India. Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability; Their categorization based on properties.

**Unit-II:** Reclamation and management of Saline and sodic soils, Acid soils, Acid Sulphate soils, Eroded and Compacted soils, Flooded soils, Polluted soils - Soil pollution - behaviour of pesticides and inorganic contaminants, prevention and mitigation of soil pollution. Irrigation water – quality and standards, utilization of saline water in agriculture.

**Unit-III:** Multipurpose tree species, bio remediation through MPTs of soils, land capability and classification, land suitability classification. Problematic soils under different Agroecosystems. Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture. Crop discrimination and Yield monitoring, soil mapping fertilizer recommendation using geospatial technologies;

**Unit-IV:** Spatial data and their management in GIS; Remote sensing concepts and application in agriculture; Image processing and interpretation; Global positioning system (GPS), components and its functions; Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs. Remote sensing and GIS in diagnosis and management of problem soils.

#### LIST OF EXPERIMENTS/ PRACTICES

- Determination of Soil pH, EC, ESP, CEC, LR, GR. Quality of irrigation water .
- Determination of anion, cation, SAR in irrigation water.
- study of topographical maps.
- Use of GPS, introduction to remote sensing and GI.,
- Visit to pesticides residue lab.
- Visit to problematic soil site.
- Visit to KRSRAC.

#### Reference:

1. Mehra R.K., 2004. Text book of Soil Science, ICAR New Delhi
2. Tisdale, S.L. Nelson, W.L. Beaton, J.D. and Havlin, J.L., 1991. Soil fertility and fertilizers. Prentice Hall of India, Pvt .Ltd, New Delhi
3. Bear F.E., 1964. Chemistry of the Soil. Oxford & IBH.
4. Jurinak J.J., 1978. Salt-affected Soils. Department of Soil Science & Biometeorology. Utah State Univ.
5. USDA, 1954. Diagnosis and Improvement of Saline and Alkali Soils. Oxford & IBH.
6. ISSS, 2009. Fundamentals of Soil Science. Division of Soil Science, IARI, New Delhi
7. Richards, L.A., 1954. Diagnosis and improvement of saline and alkali soils. USDA Hand book No. 60, Washington, DC USA.



**Unit-I:** Introduction and importance of organic manures, properties and methods of preparation of bulky and concentrated manures. Green leaf manuring. Fertilizer recommendation approaches. Integrated nutrient management.

**Unit-II:** Chemical fertilizers: classification, composition and properties of major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, Complex fertilizers, nano fertilizers Soil amendments, Fertilizer Storage, Fertilizer Control Order.

**Unit-III:** History of soil fertility and plant nutrition. criteria of essentiality. role, deficiency and toxicity symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants.

**Unit-IV:** Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients. Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil. Forms of nutrients in soil, plant analysis, rapid plant tissue tests. Indicator plants. Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions.

#### **List of Experiments / Practices**

- Introduction of analytical instruments and their principles, calibration and applications.
- Colorimetry and flame photometry.
- Estimation of soil organic carbon.
- Estimation of alkaline hydrolysable N in soils.
- Estimation of soil extractable P in soils.
- Estimation of exchangeable K; Ca and Mg in soils .
- Estimation of soil extractable S in soils.
- Estimation of DTPA extractable Zn in soils.
- Estimation of N in plants.
- Estimation of P in plants. Estimation of K in plants. Estimation of S in plants.
- Analysis of Manures and fertilizers.
- Visit to STL/FTL.

#### **Reference:**

1. Tisdale, S.L. Nelson, W.L. Beaton, J.D. and Havlin, J.L., 1991. Soil fertility and fertilizers. Prentice Hall of India, Pvt .Ltd, New Delhi.
2. Yawalkar, K.S. and Agarwal. J.P., (1992). Manure and fertilizers. Agriculture- Horticulture Publishing House, Nagpur.
3. Chopra, S.L. and Kanwar, J.S., (1991). Analytical Agriculture, Chemistry, Kalyani Publishers, New Delhi.
4. Basak, R.K., 2000. Fertilizers, Kalyani Publishers, Ludhiana
5. Mehra R.K., 2004. Text book of Soil Science, ICAR New Delhi

## **STUDENT “READY” (RURAL ENTREPRENEURSHIP AWARENESS DEVELOPMENT YOJANA) PROGRAMME**

### **Components of the programme :**

- i) Experiential Learning/Hands on Training / Skill Development Training
- ii) Rural Agriculture Work Experience
- iii) In Plant Training/ Industrial Attachment /Students Projects

### **I EXPERIENTIAL LEARNING**

- To be offered during Eighth semester
- 0+20 Credit Hours
- Register for of two modules any
- Each module of 0+10 credit hours.

#### **A) Concept**

- ‘Experiential’ means that learning and development a achieved through personally determined experience and are involvement.
- Experiential learning is a business curriculum related endeavour which is interactive.
- EL is for building (or reinforcing) skills in
  - a) Project development and execution
  - b) Decision-making
  - c) Individual and team coordination
  - d) Approach to problem solving
  - e) Accounting, marketing and resolving conflicts etc.
- End to end approach.
- Carefully calibrated activities move participants to explore and discover their own potential.
- Both activities and facilitation play a critical role in enhancing team performance.

#### **B) Objectives**

To provide excellent opportunity to develop analytical and entrepreneurial skills, and knowledge through meaningful hands on experience, confidence in their ability to design and execute project work.

The main objectives of EL are:

- To promote professional skills and knowledge.
- To build confidence and to work in project mode.
- To acquire enterprise management capabilities.



### **C) Duration**

- 180 days (one semester) period in the final year.
- Students and faculty are expected to attend the activities even on institutional holidays with total commitment, and without any time limit or restriction of working hours.

### **D) Attendance**

- Minimum attendance required is 85%.
- Any student in the event of recording shortage of attendance has to re-register the EL when offered next by paying the assigned fee.

### **E) Students' Eligibility**

- To get the eligibility for registering the EL programme, the students should have completed all the courses successfully.
- Assignment/allotment of the EL programme shall be based on merit of the student at the end of 5<sup>th</sup> Semester.

## **II RURAL AGRICULTURAL WORK EXPERIENCE**

- To be offered during Seventh semester
- 0+20 credit hours in two parts: RAWE and AIA
- Attachment in University/ College/ KVK or a Research Station
- Helps the students primarily to understand the rural situations, status of Agricultural technologies adopted by farmers, prioritize the farmer's problems and to develop skills & attitude of working with farm families for overall development in rural area.
- Timings for RAWE can be flexible for specific regions to coincide with the main cropping season.

### **Objectives**

- To provide an opportunity to the students to understand the rural setting in relation to agriculture and allied activities.
- To make the students familiar with socio-economic conditions of the farmers and their problems.
- To impart diagnostic and remedial knowledge to the students relevant to real field situations through practical training.
- To develop communication skills in students using extensive teaching methods in transfer of technology.
- To develop confidence and competence to solve extension teaching methods in transfer of technology. Agricultural problems.
- To acquaint students with on-going extension and rural development programmes.

## MODULES FOR SKILL DEVELOPMENT AND ENTREPRENEURSHIP

A student has to register 20 credits opting for two modules of (0+10) credits each (total 20 credits) from the package of modules in the VIII semester.

Course No	Course Title	Cr Hrs
ESE. 421	Commercial Sericulture	0+10
EAG. 421	Organic Production Technology	0+10
EAM. 421	Production Technology for Bio-fertilizers	0+10
EAM. 422	Mushroom Cultivation Technology	0+10
EAP. 421	Commercial Beekeeping	0+10
EAS. 421	Poultry Production Technology	0+10
EEP.421	Production Technology for Bio-agents	0+10
EFS. 421	Food Processing	0+10
EHR.421	Commercial Horticulture	0+10
HER. 422	Floriculture and Landscaping	0+10
ESA. 421	Soil, Plant, Water and Fertilizer Testing	0+10
ESA. 422	Agriculture Waste Management	0+10
EST. 421	Seed Production and Technology	0+10

**ESE. 421**

**COMMERCIAL SERICULTURE**

**0+10**

**Mulberry Cultivation:** Raising of mulberry saplings, establishment of mulberry garden for rainfed, irrigated condition and exclusive chawki garden, manure and fertilizer schedule, Integrated Nutrient management, pruning practices, mechanization in mulberry cultivation, mulberry diseases and pests and their control measures.

**Silkworm rearing:** Planning and preparation for silkworm rearing disinfection and hygiene in rearing house, different rearing appliances egg transportation, egg incubation, harvest and leaf preservation chawki rearing, late age silkworm rearing methods, bed spacing, Feeding, care during moult, Silkworm diseases and pests and their management, mounting, harvesting, cocoon sorting, deflossing,



transportation and marketing of cocoons, Mechanization in silkworm rearing, Economics of mulberry cultivation and silkworm rearing, By-product utilization and value addition for additional income.

EAG. 421

**ORGANIC PRODUCTION TECHNOLOGY**

0+10

**Production of Organic Manures: Green biomass production:** Raising sunhemp, dhaincha, and other green manure crops in 500 m area by each student. **Compost production:** VAT method of composting, structure requirement, substrates assembling, filling the VATS, watering, turning and removing the matured compost from the VATS, **NADEP method of composting:** structure requirement, advantage over other composting methods, filling the substrates, watering. Judging the maturity of the compost. **Vermicompost production:** Structures in vermicompost production, earthworms- species, lifecycle, temperature, moisture and substrate requirements, Management aspects-size reduction of substrates, aeration, watering, protection of earthworms against natural enemies. Each student shall produce at least 0.5 tonne of vermicompost, Maturity of the Vermicompost, separation of worms from the compost and bagging, Value addition-enrichment with concentrated organic sources, microbial cultures, Quality analysis of different composts, standards of different composts, **Production of biodigested liquid manures:** Structure requirements, assembling green biomass, cattle dung and urine, production and use of biodigested liquid manure, Value addition of composts: enrichment with concentrated organic nutrient sources, microbial consortia, Value addition of biodigested liquid manures. **Production of indigenous organic additives:** Panchagavya, Beejamruta, Jeevamruta and Vermiwash. **Organic crop production:** Commercial cultivation of crops by adopting addition of Composts: enrichment with concentrated organic nutrient organic farming practices. Individual students shall raise short duration crops such as field bean, french bean, baby corn, vegetable cowpea, onion and other appropriate short duration crops in 500sq m<sup>2</sup> area in the organic farming block maintained in the campus by following organic ways of nutrient and weed management and plant protection practices. **Organic certification:** Requirements for conversion from conventional farming to organic farming, **Certification:** Government and Non-Government agencies involved in certification, permitted and restricted materials in organic farming, Cares to be taken in harvesting, processing, packaging and storing of organic produce, labelling organic produce, Organic Logos used in organic produce packages, Preparation of the project report and presentation.

EAM. 421

**PRODUCTION TECHNOLOGY FOR BIO-FERTILIZERS**

0+10

Different types of biofertilizers and their role in plant nutrition, Acquaintance of laboratory and mass production equipments, Preparation of different culture media and sterilization techniques, Mother culture and starter culture production and their maintenance, isolation and examination of freeliving heterotrophic and photo autotrophic nitrogen fixing bacteria from soil, Isolation and Examination of Associative Nitrogen fixing bacteria, Isolation non- examination of root nodule bacteria from leguminous and legumonous plants Study of Azolla -Anabaena symbiosis. Isolation and examination



of phosphate/potassium solubilizing microorganisms Study of mycorrhizal symbiosis and method of mass arbuscular mycorrhizal fungi, Study of plant growth promoting rhizobacteria, Different formulations of biofertilizers, packing and storing methods, Production technology for carrier based and liquid biofertilizers, Quality standards for biofertilizers, Role of microorganisms in bioconversion of agricultural wastes. Principles and methods involved in Compost making, Entrepreneurship development- preparation of project proposals for setting different capacity biofertilizer units.

**EAM. 422      PRODUCTION TECHNOLOGY FOR MUSHROOMS      0+10**

Characteristics and morphological features of mushrooms; Types of mushrooms cultivated, Maintenance of mushroom laboratory, Equipments used in mushroom laboratory, Preparation of culture media, Pure culture techniques, Spore print preparation, Mother culture preparation of mushroom, Spawn production, Layout of mushroom houses, Cultivation of oyster mushroom and milky mushroom, Harvesting, Processing, Packing of mushrooms, Pests, diseases and abiotic stress of cultivated mushrooms, Project preparation for spawn production and mushroom cultivation, Exposure/visits to spawn and mushroom production centers.

**EAP 421                                      COMMERCIAL BEEKEEPING                                      0+10**

Handling of bee colonies for acquainting with different castes immature stages and different kinds of cells of honey bees, How When and Where to start beekeeping, Ways for procuring bee colonies, Location of bee colonies in nature, hiving and transfer to Bee hive, Survey on Bee flora for profitable beekeeping. Seasonal bee hive, Survey management of honey bee colonies during different seasons of the year, Management of honey bees colonies during dearth/ lean period and honey flow season, Preparation of honey bee colonies for higher honey production, Swarming, robbing, queenlessness colonies and their management. Dividing and uniting of honey bee colonies, Pests and diseases of honey bees and their management, Mass queen rearing for multiplication of colonies. Extraction, processing, testing of honey or its purity, composition and uses of honey. Extraction, processing, properties and uses of bee wax. Extraction, processing and uses of other bee hive products such as royal jelly, propolis, bee venom and pollen. Preparation of value added bee hive products. Role of honey bees in crop pollination for increasing crop productivity, Maintenance of honey bee colony records, Working out economics of beekeeping.

**EAS. 421                                      POULTRY PRODUCTION TECHNOLOGY                                      0+10**

**History and classification of Modern Poultry breeds** -Mankind has been rearing Poultry for game, eggs meat and as a companion bird and providing food, nutrition & financial security. **Archaeopteryx**



IS said to be the origin for all modern class of birds Aves. It is said to have teeth, tail like structure and used to fly. Wild jungle fowl from Southeast Asia is said to be the origin, however, the Red jungle fowl *nusgallus* predominant. All the Four modern breeds belongs to Genus namely, **Gallus** and four species **gallus, varius, sonneratti and lafayetti** The general classification is based on the type for which they are maintained like Egg type, Meat type, Dual purpose and Game type.

The modern classification is based on the origin and has Four Classes namely **English, American, Mediterranean and Asiatic**. **Egg – parts of egg and formation of egg**. In Nature, Egg is a complete Unit of all the nutrients required for development of an embryo. It has all the nutrients except Calcium, water soluble and fat soluble vitamins and is termed as unadulterated Shape of an egg is termed as prolate **spheroid** Pigments Ooporphyrins and Xanthophylls are for shell and yolk colour, respectively. Responsible. **Broiler and layer industry – COLOURED broiler rearing**, The TWO distinct commercial activities are rearing birds for Meat and Egg. Poultry meat is the cheapest animal protein and has religious stigma for its use and has remained a favorite among all religions and regions globally. Broilers are meat type birds reared for 5-6 weeks which are tender, juicy, succulent, low in fat (lean meat) and nutritious. Thus a farmer can raise 5-6 crops in a year completely depending and earning livelihood. Broiler chicks are bred for faster growth achieving a growth of 2000g from a 40 g chick in 40 days i.e. A growth of 50 times in 40 days. A Feed Conversion Ratio (FCR) of 1.7-1.8 is achieved with a mortality rate of less than 2%. Still the per capita poultry meat consumption is about 2 kgs against an ICMR recommendation of 15 kgs. India stands 4<sup>th</sup> in Poultry Meat production.

**Layer farming-** In poultry females are exclusively maintained commercially for Eggs (table eggs) for providing wholesome and nutritious eggs for use in various farms both in fresh and white egg and yellow in powder farms. A per capita consumption of 45 eggs is achieved against the recommendation of 180 eggs leaving a huge gap leaving scope for growth in layers.

#### **Housing principles- Orientation, Brooder houses, grower houses layer houses**

The Poultry sheds are to be in elevated places, rat proofed, oriented in East-West direction enabling a good cross ventilation with a width of not more than 25 ft, overhang of 2-2.5 ft and any required length. Gable type sheds with side wall of 8 ft & center height of 12 ft width Asbestos roofing is ideal. Quality water supply to be ensured. Depending upon the type /age of birds brooder, grower & layer sheds are built. Care must be taken to spend least on sheds but ensure technical specifications.

#### **Management practices – scientific principles, litter n feeding & watering, lighting and bio-**

**Security**, Poultry farming is not only a science but also an art and incorporates the basics of birds behavior, needs and comforts that makes poultry a successful livestock business. right from brooding - providing heat initially for chicks (2-3 weeks), providing feed **ad libitum**, cool and quality water, light for visibility, turning (raking) the litter to maintain it with optimum moisture -neither dusty that diseases or wet that may result in diseases. Sanitary and Bio security measures such as washing, disinfection, white wash, flaming, movement of workers, entry of vehicles and outsiders are to be monitored. Need based Feeding timely with right type of feeds management may lead to respiratory restraining wastage is of paramount importance. In case of broilers light during night for visibility and



8 hrs of artificial light in layers is essential for birds maturity and consistent maintenance of egg production at 1 ft.candle at bird level.

### **Poultry Nutrition and feeding principles- feed ingredients ,types of feed, feed formulation**

In poultry nearly 70 % of the cost of production is on feed alone hence utmost care to be exercised in selection of feed ingredients, macro & micro nutrients, feed mixing depending upon the age of the birds. The require protein ,energy& other nutrients are provided by mixing various feed ingredients like maize, soya extract, cotton ,sunflower cake,rice polish, mineral mixture etc., Types of feed are Broiler Standard Feeds are available in the market and a large farmer will have own feed mixing plant for better economics. R pre-starter,starter, finisher ration, grower and layer feeds.

### **Common diseases and Vaccination programme- viral, bacterial, ecto & endo parasites**

Various diseases and pests have to be checked using both prophylactic and curative measures. Timely vaccination, de worming, and preventive doses of medicine in feed as well a water are We are having pellet vaccines for easy administration of vaccines . Bio securi .

### **Marketing and Economics of Poultry production**

Indian Poultry marketing is very interesting and 90-95 % of the birds are sold as Live and termed as WET market. Only a small portion is marketed as dressed, frozen , ready to cook meat However organization like NECC, NMPPB, Egg & Meat corporations have tried to contain guide the industry which is contributing to the tune of about 60.000 crores providing food & nutrition security, employment both direct & indirect. It is highly unpredictable leaving Economists ,producers a well a consumers guessing.

**EEP 421**

### **PRODUCTION TECHNOLOGY FOR BIO AGENTS**

**0+10**

Biological Control; definition, history, prospectus & principles and important mile stones in biological control, Mass multiplication of important bio agents, predators, parasitoids, rearing of laboratory hosts for parasitoids, predators and pathogens, Mass multiplication of selected parasitoids such as Trichogramma sp., Goniozusnephantidis, Braconbrevicornis, Cotesiaplutella etc., ; Predators (Cryptolaemus montrouzieri, Chrysoperlacarnea, Diphaaphidivora etc., ; Insect Pathogens (Ha NPV, SL NPV, Beauveria bassiana, Metarhiziumanisopliae, Nomurearileyi, Verticillium lecanii,); Entomo pathogenic nematodes StinernemaglaseriHeterorhabditis sp. Etc. Determination of cost of production of biocontrol agents. Visit to commercial units producing biocontrol agents.

Biological control; definition and introduction from Plant Pathology perspective, Methods of isolation of biocontrol agents viz., Trichoderma, Pseudomonas, Bacillus, Paecilomyces and Verticillium from rhizosphere soil, roots and foliage of different crop plants, their purification and cultural studies viz., growth phase, C, N, temperature and pH requirement. Methods of screening of biocontrol agents for their efficacy against selected fungal, nematode and bacterial plant pathogens, Interaction between



different biocontrol agents, Evaluation of different solid and liquid growth media for mass multiplication, Study of methods for rapid multiplication, Formulation of mass produced biocontrol agents using different carrier and additives and packaging, Quality control: evaluation of formulated products for bioefficacy and longevity in different storage conditions. Methods of application of biocontrol agents viz., seed treatment, seedling dip, foliar application, soil application and their evaluation in vivo, Enrichment of organic manures and amendments with biocontrol agents.

**EFS. 421**

## **FOOD PROCESSING**

**0+10**

Importance of commercial processing, need for understanding market status and data analysis Different processing, methods Primary processed foods, Secondary processed foods and Tertiary processed foods, Grain quality assessment, Cereals, millets, Ragi, Wheat, Maize, Pulses, /legumes, Selection of grains: Test suitability of grains namely rice, Wheat, Ragi, Maze, Pulses for processing as approved by (FDA/ TAO, HACCP/FSSAI, WHO/GOI/GOK/BIS/any other.) Indian regulatory agency, Primary processing of grains: dehusking /dehulling milling, roasting, popping, malting, etc. for grains, namely ragi, paddy, wheat, millets, maize, pulses, nuts, value added/fortified flours & foods: Energy food mix: Ragi/wheat maize/ millets. Malt drink, supplementary foods, fortified composite flour, and instant flour mixes, Techniques evaluation of products Physical, Sensory & Objective evaluation methods computing nutritive value. Food Safety measures: Hygiene/ Sanitation/ standards/regulations related to grains & products based FDA/FAO/WHO/ GOI/GOK/BIS/ on suitable methods approved any other Indian regulatory agency. Shelf life of products: Grain storage practices, Use of additives & Preservatives, Labeling & its importance. Market study of exiting labeled foods, Label designing/ Packaging its requirements. Development of RTE Foods, Flour based shelf stable snack foods. Acceptability testing, project plan & Presentation By students: Product design, Machinery and equipment material & marketing supply chain. Processing & recording/book keeping, costing, Value chain of raw materials: study existing practice in industry trough visit & interaction Milling industry procurement/ milling/ marketing system, Storage & testing of raw materials testing of function & behavior of raw materials & products, Familiarization of equipment and their role, functioning, operation techniques cleaning condition regulation, maintenance handling, Baked produces, Processing of bread by different methods, importance of RH/ Temperature/pH, baking & finishing, processing of rolls/pizza/rusk/ etc., serving Techniques. Processing of biscuits: Regular biscuits fiber rich (Different fiber).

Development of questionnaire for data collection, Market survey on the processed and health foods, Data computation and presentation, Industry Visits/ Food processing industries, Flourmills, Baking industries, Vegetable and fruits processing units, Student group activities.



**EHR. 421**

**COMMERCIAL HORTICULTURE**

**0+10**

Study of importance, problems and prospectus of nursery industry Study of high-tech nursery management practices, use of polyhouse and shade nets in planting materials production, Practice propagation techniques of fruits, vegetables and plantation crops care of nursery plants, Tissue culture techniques in rapid multiplication of horticulture crops. Practice of open and protected cultivation Techniques such as bed preparation, fumigation, mulching, drip irrigation, fertigation, training, pruning, foliar application of micronutrients and other special practices, plant protection measures, harvesting, grading and packaging of important vegetable crops. Practice of pruning and training methods, fertilizers application, foliar application of micronutrients and growth regulators, identification of symptoms of insect and disease infestation, plant protection measures, intercultural operations, harvesting, grading, marketing of important fruit crops. Roof top / terrace gardening. Practice of preparing processed products such as RTS, Jams, Ketchup, Pickles, etc., from fruits and vegetables. Estimation of cost of cultivation and economic feasibility studies of important vegetables and fruits. Visit to high tech nurseries, institutions and farmers field, Final evaluation and examination.

**EHR. 422**

**FLORICULTURE AND LANDSCAPING**

**0+10**

Importance and scope of Floriculture and landscaping practice of nursery techniques and management of ornamental crops, Propagation techniques for ornamental crops, nursery bed preparation, raising seedlings in protrays and poly bag, Production technology of flower crops like -China aster, Marigold, Tuberosa and Gladiolus under open I condition and Rose, Gerbera, Anthurium and Carnations under protected cultivation. Preparation of main field, application of FYM, fertilizer management, mulching, drip irrigation practices for Open cultivation as well as protected cultivation. Special practices to be followed in flower crop production such as pinching, disbudding, pruning, training, desuckering, staking and wire netting etc., Maintenance of shrubs climbers and trees, Establishment of hedges, edges, flower beds and rockeries, Practices of Bonsai and flower arrangement, Establishment of Garden adornments and vertical gardens, Maintenance of lawn and its management, Visit to commercial nurseries, high tech floriculture units and farmer's field, Final evaluation and examination.

**ESA. 421 SOIL, PLANT, WATER MANURE AND FERTILIZERS TESTING**

**0+10**

**Good laboratory practices (GLP)**

**Principles of analytical chemistry**

Analytical techniques, concepts of gravimetry, concepts of titrimetry (volumetric), preparation of standard solution of an acid

**Instruments used in soil, plant, water, manure and fertilizer analysis**



Potentiometer (pH meter), Conductometer (EC bridge) Spectrophotometer, Flame photometer, Atomic Absorption. Spectrophotometer (AAS)

### **Soil Analysis**

Collection and preparation of soils samples, study of soil profile, physical properties of soil, mechanical analysis (soil texture), International pipette method, Hydrometer method, Determination of soil texture by feel method, density of soil, Bulk density of soil, Particle density of soil, pore space of soil, soil colour, physico chemical properties of soil, pH of soil, EC of soil, Chemical properties of soil, organic matter in soil, cation exchange capacity (CEC) of soil, Major nutrients in soil, available nitrogen in soil, available Phosphorus in soil, available potassium in soil, Secondary nutrients in soil, Determination of exchangeable calcium and magnesium in soil, available sulphur in soil, Micronutrients in soil, available micronutrient cations in soil, available boron in soil, Problematic soils and amendments, Soil acids and lime requirement, Determination of exchangeable acidity in soil, reserve acidity in soil, extractable aluminium in soil, lime requirement of acid on soil, Soil alkalinity and gypsum requirement, Determination of lime content of soil, carbonate and bicarbonate in soil, chloride in soil, carbonate and bicarbonate in soil, chloride in soil, sodium in soil, gypsum requirement of alkali soil .

### **Irrigation Water Analysis**

Irrigation water sampling, Determination of pH irrigation water, Irrigation water electrical conductivity of irrigation water, carbonate and bicarbonate in irrigation water, chloride in irrigation water, calcium and magnesium in irrigation water, sodium in irrigation water, Computation of SAR and RSC of irrigation water, Determination of boron in irrigation water.

### **Waste Water Analysis**

Collection and preservation of waste water samples, Analysis of different parameters of waste water, Determination of pH of waste water, EC in waste water, carbonate and bicarbonate in waste water, chloride in waste water, calcium and magnesium in waste water, potassium and sodium in waste water, Phosphorus in waste water, sulphur in waste water, acidity of waste water, total, suspended and dissolved solids in waste water, nitrate in waste water, dissolved oxygen in waste water, biological oxygen demand in waste water, chemical oxygen demand in waste water

### **Plant Analysis**

Sampling handling and preparation of plant sample, Determination of Nitrogen in plant sample, Digestion of plant sample for estimation of nutrients (except nitrogen), Determination of phosphorus in plant Sample, potassium in plant sample, calcium and magnesium in plant sample, sulfur in plant sample, micronutrients in plant sample

### **Organic Manure Analysis**

Determination of pH of manure, EC of manure, organic carbon in manure, nitrogen in manure, Digestion for estimation of other nutrients in manure, Determination of phosphorus in manure, potassium in manure, calcium and magnesium in manure, sulfur in manure, micronutrients in manure

### **Fertilizer Analysis**

Fertilizer sampling, Qualitative test for identification of fertilizer, Detection of adulterants in fertilizer, Estimation of ammonium nitrogen ( $\text{NH}_4\text{-N}$ ) in ammonium fertilizer, nitrate nitrogen ( $\text{NO}_3\text{-N}$ ) in nitrate fertilizer, amide nitrogen ( $\text{NH}_2\text{-N}$ ) in amide fertilizer (urea), Determination of biuret content of urea, Estimation of phosphorus in phosphatic fertilizer, Determination of potassium in potassic fertilizer.



**ESA. 422 AGRICULTURE WASTE MANAGEMENT / MANAGEMENT OF ORGANIC 0+10**

**RESOURCES IN AGRICULTURE**

- Collection of crop residues – bulky organic residues, concentrated organic residues. Green manuring. Agro industrial waste urban waste, sewage and sludge.
- Composting of organic residues. Conventional and mechanized techniques of composting.
- Vermicomposting of organic residues.
- Biogas preparation using organic resource
- Analysis of physical, chemical, biological and biochemical properties of different compost and spent slurry.
- Evaluation of different types of compost and spent slurry through field study and analysis of soil and crop data and presentation of soil test results and submission of report.

**EST. 421**

**SEED PRODUCTION TECHNOLOGY**

**0+10**

1. Principles of seed production in self and cross pollinated crops
2. Land preparation and management of seed production in maize, sunflower, tomato / chilli, soyabean
3. Seed production techniques in cereals, pulses, oilseeds and vegetable crops
4. Seed production techniques in hybrids and varieties
5. Seed certification principles and procedures
  - Phases of seed certification
  - Field inspections
  - Rejection of seed field
  - Awarding the labels and tags
  - Indian minimum seed certification standard for important field crops
6. Harvesting of seed crop, physiological maturity index and methods of harvesting, and threshing
7. Seed processing and drying
8. Seed testing methods and procedures
  - Seed sampling, method of sampling and procedures
  - Seed germination
  - Seed moisture determination
  - Physical purity analysis
  - Seed vigour and viability
  - Seed health testing methods

- Genetic purity testing

9. Seed treating methods and procedures

10. Seed storage and methods of storability

11. Seed marketing channels in Karnataka

12. Visit to seed production fields and seed industries

#### Evaluation of Experiential Learning (EL) / Hands Training (HoT) Programme

Sl. No.	Parameters	Max. marks
1.	Project Planning and Writing	10
2.	Presentation	10
3.	Regularity	10
4.	Monthly Assessment	10
5.	Output delivery	10
6.	Technical Skill Development	10
7.	Entrepreneurship Skills	10
8.	Business networking skills	10
9.	Report Writing Skills	10
10.	Final Presentation	10
<b>Total</b>		<b>100</b>



## EVALUATION OF STUDENT READY PROGRAM

- Students shall be evaluated component-wise under village attachment/ agro-industrial attachment/ hands on training/skill development training/experiential learning/student projects.
- Each College of the University will designate a Student READY Program Coordinator and component wise evaluation committees. These committees will evolve a method of evaluation depending upon the component undertaken giving due weightage to the observations made by the Scientists/Agro industrial Officer and the Program Coordinator with whom they are attached.
- Since the Credit Hours allotted to the Student READY program are gradual, the minimum condition of attendance and grading system will apply for the program as will be applicable to other courses.
- It is expected that at the end of Student READY program, the students should gain competency for entrepreneurship, which should be innovative and creative in nature. The evaluation committee must ensure percentage increase in this competency at the end & successful organization of all Student READY programs.

### Educational Tour

One Educational Tour for 15 days during break period after the V Semester shall be conducted and grading shall be done as Satisfactory/ Non Satisfactory.

## EXAMINATION AND EVALUATION SYSTEM

Declaration of division (I, II and III divisions, distinctions etc.) in the degree certificate to be made compulsory by all Universities:

### 1. Examination

- External theory (50%)
- Internal Theory + Practical (50%)

#### • Courses with Theory and Practical

Mid-term Exam (30%) + Assignment (5%) in practical oriented courses + Practical (15%)

#### • Courses with only Theory

Mid-term Exam (40%) + Assignment (10%)

#### • Courses with only Practical:

(100%) Internal

- Paper to be set by external: HOD shall ensure the coverage of syllabus. If needed moderation can be done.
- Evaluation to be done internally by the faculty other than the Course Instructor. Syllabus of the concerned course shall be sent to the external examiner, who shall prepare the question papers. For

practical, it is recommended that examination shall be conducted by course instructor(s) and one teacher nominated by HOD.

## 2. Evaluation

Percentage of Marks Obtained	Conversion into Points	OGPA	Division
100	10 Points		
90 to < 100	9 to < 10	5.000 – 5.999	Pass
80 to <90	8 to <9		
70 to <80	7 to < 8	6.000 – 6.999	II division
60 to <70	6 to <7		
50 to <60	5 to <6	7.000 – 7.999	I division
<50 (Fail)	<5	8.000 and above	I division with distinction
Eg. 80.76	8.076		
43.60	4.360		
72.50 (but shortage in attendance)	Fail (1 point)		

Grade Point Average (GPA) = Total points scored/Total credits (for 1 semester)

Cumulative Grade Point Average (CGPA) =  $\sum$  Total points scored / Course credits

Overall Grade Point Average (OGPA) =  $\sum$  Total points scored (after excluding failure points) / Course credits

% of Marks = OGPA x 100/10