

**MAHATMA GANDHI UNIVERSITY  
KOTTAYAM**



**B.VOC. DEGREE PROGRAMME IN**

**SUSTAINABLE AGRICULTURE**

**REGULATION, SCHEME AND SYLLABUS**

**(2019 ADMISSION ONWARDS)**

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## **REGULATION AND SCHEME FOR B.VOC. PROGRAMME UNDER MAHATMA GANDHI UNIVERSITY**

We are facing unprecedented challenges – Skill and knowledge, the driving forces of economic growth and social development for any country. Presently, the country faces a demand – supply mismatch, as the economy needs more ‘skilled’ workforce than that is available. In the higher education sphere, knowledge and skills are required for diverse forms of employment in the sector of education, health care manufacturing and other services. Potentially, the target group for skill development comprises all those in the labour force, including those entering the labour market for the first time, those employed in the organized sector and also those working in the unorganized sector. Government of India, taking note of the requirement for skill development among students launched National Vocational Education Qualification Framework (NVEQF) which was later on assimilated into National Skills Qualifications Framework (NSQF). Various Sector Skill Councils (SSCs) are developing Qualification Packs (QPs), National Occupational Standards (NOSs) and assessment mechanisms in their respective domains, in alignment with the needs of the industry.

The University Grants Commission (UGC) has launched a scheme on skills development based higher education as a part of college/university education, leading to Bachelor of Vocation (B.Voc.) Degree with multiple exits such as Diploma/Advanced Diploma under the NSQF (National skill Qualifications framework). The B.Voc. programme is focused on universities and colleges providing undergraduate studies which would also incorporate specific job roles along with broad based general education. This would enable the graduates completing B.Voc. to make a meaningful participation in accelerating India’s economy by gaining appropriate employment, becoming entrepreneurs and creating appropriate knowledge. The proposed vocational programme will be a judicious mix of skills, professional education related to concerned vocation and also appropriate content of general education.

The **Mahatma Gandhi University** gave a strong momentum to the initiatives of UGC-NSQF in the very beginning itself. This University provides opportunities to its affiliating colleges since Academic Year 2014-15 to start skill based vocational Graduate programmes strictly under the guidelines of UGC and NSQF.

### **1. TITLE**

These regulations shall be called “**MAHATMA GANDHI UNIVERSITY REGULATIONS FOR B.VOC PROGRAMME 2018**”.

## 2. SCOPE

Applicable to all regular B.Voc Programme conducted by the University with effect from 2018 admissions onwards, except for B.Voc. Programmes, having scheme and syllabus already approved by MGU under 2014 regulation and scheme.

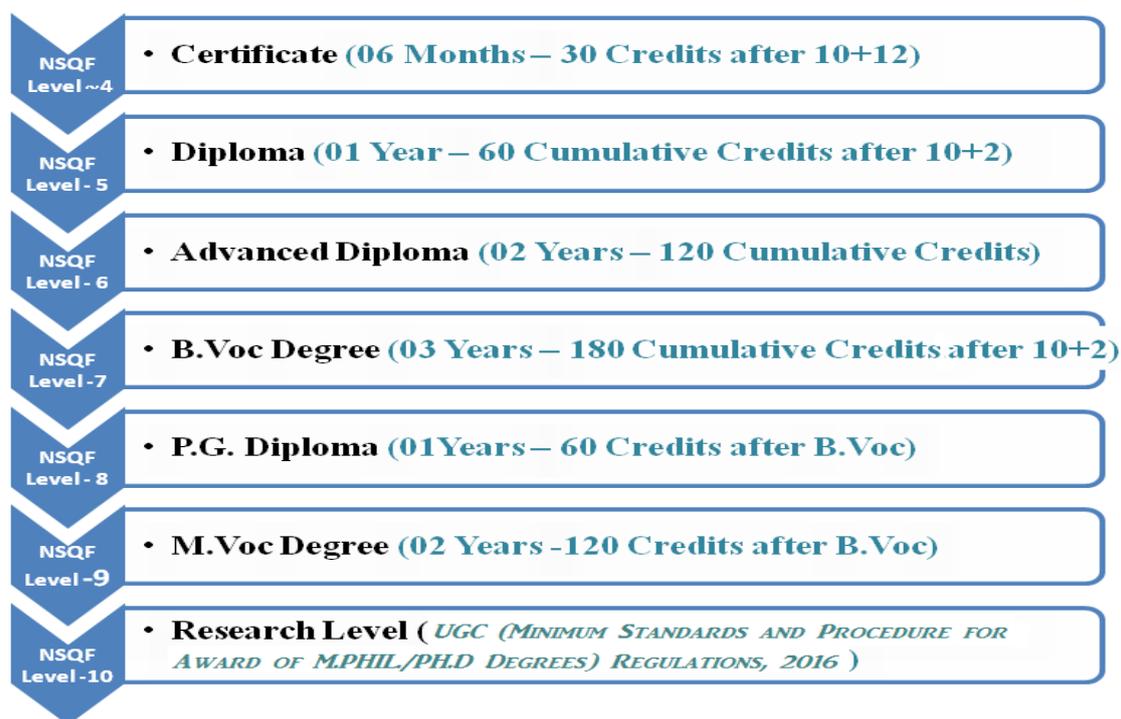
During the academic year 2019-20 admission onwards, all regular B.Voc Programme in affiliating colleges under MG University should strictly follow *Mahatma Gandhi University Regulations For B.Voc Programme 2018*.

## 3. ELIGIBILITY FOR ADMISSION AND RESERVATION OF SEATS

Eligibility for admissions and reservation of seats for various Undergraduate Programmes shall be according to the rules framed by the University and UGC in this regard, from time to time.

## 4. TYPE OF COURSES AND AWARDS:

There will be full time credit-based modular programmes, wherein banking of credits for skill and general education components shall be permitted so as to enable multiple exit and entry.



The multiple entry and exit enables the learner to seek employment after any level of Award and join back as and when feasible to upgrade qualifications / skill competencies either to move higher in the job profile or in the higher educational system. This will also provide the learner an opportunity for vertical mobility to second year of B.Voc degree programme after one year diploma and to third year of B.Voc degree programme after a two

year advanced diploma. The students may further move to Masters and Research degree programmes mapped at NSQF Level 8 – 10.

## **5. CURRICULA AND CREDIT SYSTEM FOR SKILL BASED COURSES**

In order to make education more relevant and to create ‘industry fit’ skilled workforce, the institutions recognized under B.Voc Degree programme offering skill based courses will have to be in constant dialogue with the industry and respective Sector Skill Councils (SSC’s) so that they remain updated on the requirements of the workforce for the local economy. These institutions should also preserve and promote the cultural heritage of the region, be it art, craft, handicraft, music, architecture or any such thing, through appropriately designed curriculum leading to gainful employment including self-employment and entrepreneurship development.

The curriculum in each of the semester/years of the programme(s) will be a suitable mix of general education and skill development components. The General Education Component shall have 40% of the total credits and balance 60% credits shall be of Skill Component.

The institution(s) shall prepare draft curriculum as per the UGC guidelines for Curricular Aspects Assessment Criteria and Credit System for Skill based Vocational Courses and place it for vetting by the UGC Advisory Committee constituted under these guidelines.

The Curriculum shall be finally approved by the Board of Studies (BoS) and Academic Council of the University / Autonomous College. The Universities where BoS for Vocational subjects has not yet been constituted, the curriculum may be considered by the BoS in allied subject area or an ad-hoc BoS may be constituted till the time regular BoS is notified in the university. The BoS should consider the programme wise curriculum based QP for skill component and relevant general education subjects *i.e.* the curricula for programmes in one broad subject area may vary from institution to institution in case the different progressive QPs are mapped with the programmes being offered. The choice of different progressive Job roles for a course may also be enabled under CBCS.

## **6. STRUCTURE OF THE PROGRAMME**

### **6.1 Skill Development Components - 60% Weight age**

### **6.2 General Education Component - 40% Weight age**

The B.Voc Programme should comprise 60% Skill Development Components (60 % of total Credit) and 40% General Education Component (40% total Credit) as per guidelines of UGC and NSQL.

As an illustration, awards shall be given at each stage as per Table 1 below for cumulative credits awarded to the learners in skill based vocational courses.

**Table 1**

<b>NSQF Level</b>	<b>Skill Component Credits</b>	<b>General Education Credits</b>	<b>Total Credits for Award</b>	<b>Normal Duration</b>	<b>Exit Points / Awards</b>
7	108	72	180	Six Semester s	B.Voc Degree
6	72	48	120	Four semesters	Advanced Diploma
5	36	24	60	Two semesters	Diploma
4	18	12	30	One semester	Certificate

## **7. SCHEME AND SYLLABUS**

7.1. B.Voc Programme should include (a) General Education Component, (b) Skill Education Component

7.2. The B.Voc Programme should followed Credit and Semester System of MGU.

7.3. A separate minimum of 30% marks each for internal and external (for both theory and AOC) and aggregate minimum of 40% are required for a pass for a course. For a pass in a programme, **Grade P** is required for all the individual courses. If a candidate secures **F Grade** for any one of the courses offered in a Semester/Programme, **only F grade** will be awarded for that Semester/Programme until he/she improves this to **P Grade** or above within the permitted period.

## **8. ASSESSMENT AND EVALUATION BY MG UNIVERSITY.**

General Education Components and Skill Development Components shall be assessed and evaluated by MG University as per University Norms and UGC-NSQF guidelines.

## 9. ASSESSMENT AND CERTIFICATION BY SECTOR SKILL COUNCIL (SSC)

The affiliated colleges should make necessary arrangements for the simultaneous assessments and certification of Skill Development Component by aligned SSC having the approval of National Skill Development Corporation of India (NSDC).

## 10. EXAMINATIONS

10.1 The evaluation of each paper shall contain two parts:

- (i) Internal or In-Semester Assessment (ISA)
- (ii) External or End-Semester Assessment (ESA)

10.2. The internal to external assessment ratio shall be 1:4.

Both internal and external marks are to be rounded to the next integer.

All the courses (theory & AOC), grades are given **on a 7-point scale** based on the total percentage of marks, **(ISA+ESA)** as given below:-

Percentage of Marks	Grade	Grade Point
95 and above	O (Outstanding)	10
90 to below 95	A+ (Excellent)	9
80 to below 90	A (Very Good)	8
70 to below 80	B+ (Good)	7
60 to below 70	B (Above Average)	6
50 to below 60	C (Average)	5
40 to below 50	P (Pass)	4
Below 40	F(Fail)	0
	Ab (Absent)	0

## 11. CREDIT POINT AND CREDIT POINT

**AVERAGE Credit Point (CP)** of a paper is calculated using the formula:-

$$CP = C \times GP, \text{ where } C \text{ is the Credit and } GP \text{ is the Grade point}$$

**Semester Grade Point Average (SGPA)** of a Semester is calculated using the formula:- $SGPA = TCP/TC$ , where *TCP* is the Total Credit Point of that semester.

**Cumulative Grade Point Average (CGPA)** is calculated using the formula:-

$$CGPA = TCP/TC, \text{ where } TCP \text{ is the Total Credit Point of that programme.}$$

**Grade Point Average (GPA)** of different category of courses viz. Common Course I, Common Course II, Complementary Course I, Complementary Course II, Vocational course, Core Course is calculated using the formula:-

$$GPA = TCP/TC, \text{ where } TCP \text{ is the Total Credit Point of a category of course.}$$

*TC* is the total credit of that category of course

Grades for the different courses, semesters and overall programme are given based on the corresponding CPA as shown below:

GPA	Grade	
9.5 and above	<b>O</b>	<b>Outstanding</b>
9 to below 9.5	<b>A+</b>	<b>Excellent</b>
8 to below 9	<b>A</b>	<b>Very Good</b>
7 to below 8	<b>B+</b>	<b>Good</b>
6 to below 7	<b>B</b>	<b>Above Average</b>
5 to below 6	<b>C</b>	<b>Average</b>
4 to below 5	<b>P</b>	<b>Pass</b>
Below 4	<b>F</b>	<b>Failure</b>

## 12. MARKS DISTRIBUTION FOR EXTERNAL AND INTERNAL EVALUATIONS

The external theory examination of all semesters shall be conducted by the University at the end of each semester. Internal evaluation is to be done by continuous assessment. For all courses total marks of external examination is 80 and total marks of internal evaluation is 20. Marks distribution for external and internal assessments and the components for internal evaluation with their marks are shown below:

### 12.1 For all Theory Courses

- a) **Marks of external Examination** : **80**  
b) **Marks of internal evaluation** : **20**

<b>Components of Internal Evaluation – Theory</b>	<b>Marks</b>
Attendance	5
Assignment /Seminar/Viva	5
Test paper(s) (1 or 2) (1×10 =10; 2×5 =10)	10
<b>Total</b>	<b>20</b>

For all AOC Courses total marks for external evaluation is 80 and total marks for internal evaluation is 20.

### 12.2 For all AOC Courses

- a) **Marks of external Examination** : **80**  
b) **Marks of internal evaluation** : **20**

<b>Components of Internal Evaluation – AOC</b>	<b>Marks</b>
Attendance	<b>5</b>
Record	<b>5</b>
Skill Test	<b>5</b>
Lab Performance / Punctuality	<b>5</b>
<b>Total</b>	<b>20</b>

\*Marks awarded for Record should be related to number of experiments recorded and duly signed by the teacher concerned in charge.

All three components of internal assessments are mandatory.

### 12.3 Project Evaluation

- a) Marks of external Examination : 80  
b) Marks of internal evaluation : 20

Components of Internal Evaluation	Marks
Punctuality	5
Experimentation/Data Collection	5
Skill Acquired	5
Report	5
<b>Total</b>	<b>20</b>

\*Marks for dissertation may include study tour report if proposed in the syllabus.

Components of External Evaluation	Marks
Dissertation (External)	50
Viva-Voce (External)	30
<b>Total</b>	<b>80</b>

(Decimals are to be rounded to the next higher whole number)

### 13. INTERNSHIP

After the completion of every even semester, the student will undergo a minimum of two weeks Internship Programme in an Industry, having a good exposure in the concerned skill (Established at least two years prior), capable of delivering the skill sets to the students.

At the end of the Internship, the students should prepare a comprehensive report.

### 14. ATTENDANCE EVALUATION FOR ALL PAPERS

Attendance Percentage	Marks
Less than 75 %	1 Mark
75 % & less than 80%	2 Marks
80% & less than 85%	3 Marks
85% & less than 90%	4 Marks
90% & above	5 Marks

(Decimals are to be rounded to the next higher whole number)

## **15. ASSIGNMENTS**

Assignments are to be done from 1st to 4th Semesters. At least one assignment per course per semester should be submitted for evaluation.

## **16. INTERNAL ASSESSMENT TEST PAPERS**

Two test papers are to be conducted in each semester for each course. The evaluations of all components are to be published and are to be acknowledged by the candidates. All documents of internal assessments are to be kept in the college for one year and shall be made available for verification by the University. The responsibility of evaluating the internal assessment is vested on the teacher(s), who teach the course.

## **17. GRIEVANCE REDRESSAL MECHANISM**

Internal assessment shall not be used as a tool for personal or other type of vengeance. A student has all rights to know, how the teacher arrived at the marks. In order to address the grievance of students, a three-level Grievance Redressal mechanism is envisaged. A student can approach the upper level only if grievance is not addressed at the lower level.

### **17.1. Level 1: Department Level:**

The Department cell chaired by the HOD, Department Coordinator, Faculty Advisor and Teacher in-charge as members.

### **17.2. Level 2: College level**

A committee with the Principal as Chairman, College Coordinator, HOD of concerned Department and Department Coordinator as members.

### **17.3. Level 3: University Level**

A Committee constituted by the Vice-Chancellor as Chairman, Pro-Vice-Chancellor, Convener - Syndicate Standing Committee on Students Discipline and Welfare, Chairman-Board of Examinations as members and the Controller of Examination as member-secretary.

The College Council shall nominate a Senior Teacher as coordinator of internal evaluations. This coordinator shall make arrangements for giving awareness of the internal evaluation components to students immediately after commencement of first semester

The internal evaluation marks/grades in the prescribed format should reach the University before the 4th week of October and March in every academic year.

## 18. EXTERNAL EXAMINATION

The external examination of all semesters shall be conducted by the University at the end of each semester.

- Students having a minimum of 75% average attendance for all the courses only can register for the examination. Condonation of shortage of attendance to a maximum of 10 days in a semester subject to a maximum of 2 times during the whole period of the programme may be granted by the University on valid grounds. This condonation shall not be counted for internal assessment. Benefit of attendance may be granted to students attending University/College union/Co-curricular activities by treating them as present for the days of absence, on production of participation/attendance certificates, within one week, from competent authorities and endorsed by the Head of the institution. This is limited to a maximum of 10 days per semester and this benefit shall be considered for internal assessment also. Those students who are not eligible even with condonation of shortage of attendance shall repeat the **semester** along with the next batch after obtaining readmission.

- Benefit of attendance may be granted to students attending University/College union/Co-curricular activities by treating them as present for the days of absence, on production of participation/attendance certificates, within one week, from competent authorities and endorsed by the Head of the institution. This is limited to a maximum of 10 days per semester and this benefit shall be considered for internal assessment also.

- Those students who are not eligible even with condonation of shortage of attendance shall repeat the course along with the next batch.

- There will be no supplementary exams. For reappearance/ improvement, the students can appear along with the next batch.

- Student who registers his/her name for the external exam for a semester will be eligible for promotion to the next semester.

- A student who has completed the entire curriculum requirement, but could not register for the Semester examination can register notionally, for getting eligibility for promotion to the next semester.

- A candidate who has not secured minimum marks/credits in internal examinations can re-do the same registering along with the University examination for the same semester, subsequently.

## 19. PATTERN OF QUESTIONS

Questions shall be set to assess knowledge acquired, standard and application of knowledge, application of knowledge in new situations, critical evaluation of knowledge and the ability to synthesize knowledge. The question setter shall ensure that questions covering all skills are set. She/he shall also submit a detailed scheme of evaluation along with the question paper. A question paper shall be a judicious mix of short answer type, short essay type /problem solving type and long essay type questions.

### 19.1 Pattern of questions for External examination – Theory paper

Question Type	Total no. of questions	Number of questions to be answered	Marks of each question	Total marks
Very short answer type	12	10	2	20
Short answer (Not to exceed 60 words)	9	6	5	30
Long essay	4	2	15	30
<b>TOTAL</b>	<b>25</b>	<b>18</b>		<b>80</b>

### 19.2 Pattern of questions for external examination – AOC

Question Type	Total no. of questions	Number of questions to be answered	Marks of each question	Total marks
Theory Assessment- Short Answer Type	8	5	4	20
Skill Assessment- Practical	1	1	60	60
<b>TOTAL</b>	<b>9</b>	<b>6</b>		<b>80</b>

### 19.3 Mark division for external AOC/ LAB examination

Record	Theory/ Procedure/ Design	Activity/ Neatness	Result	Viva	Total
10	10	20	10	10	60

## **20. RANK CERTIFICATE**

The University publishes rank list of top 10 candidates for each programme after the publication of 6<sup>th</sup> semester results. Rank certificate shall be issued to candidates who secure positions from 1<sup>st</sup> to 3<sup>rd</sup> in the rank list. Candidates who secure positions from fourth to tenth in the rank list shall be issued position certificate indicating their position in the rank list.

Candidates shall be ranked in the order of merit based on the CGPA scored by them. Grace marks awarded to the students should not be counted fixing the rank/position. Rank certificate and position certificate shall be signed by the Controller of Examinations.

## **21. MARK CUM GRADE CARD**

The University shall issue to the students grade/marks card (by online) on completion of each semester, which shall contain the following information:

- Name of University
- Name of the College
- Title & Model of the B. VOC Programme
- Semester concerned
- Name and Register Number of student
- Code, Title, Credits and Max. Marks (Int, Ext & Total) of each course opted in the semester
- Internal marks, External marks, total marks, Grade, Grade point (G) and Credit point in each course in the semester
- Institutional average of the Internal Exam and University Average of the External Exam in each course.
- The total credits, total marks (Max & Awarded) and total credit points in the semester (corrected to two decimal places)
- Semester Credit Point Average (SCPA) and corresponding Grade
- Cumulative Credit Point Average (CCPA)

The final Grade/mark Card issued at the end of the final semester shall contain the details of all courses taken during the entire programme and shall include the final grade/marks scored by the candidate from 1<sup>st</sup> to 5<sup>th</sup> semester, and overall grade/marks for the total programme.

## **22. READMISSION**

Readmission will be allowed as per the prevailing rules and regulations of the university.

There shall be **3 level monitoring** committees for the successful conduct of the scheme. They are:

1. Department Level Monitoring Committee (DLMC), comprising HOD and two senior-most teachers as members.
2. College Level Monitoring Committee (CLMC), comprising Principal, Dept. – Co-Ordinator and A.O/Superintendent as members.
3. University Level Monitoring Committee (ULMC), headed by the Vice – Chancellor and Pro–Vice – Chancellor, Convenors of Syndicate subcommittees on Examination, Academic Affairs and Staff and Registrar as members and the Controller of Examinations as member-secretary.

## **23. TRANSITORY PROVISION**

Notwithstanding anything contained in these regulations, the Vice Chancellor shall, for a period of one year from the date of coming into force of these regulations shall be applied to any programme with such modifications as may be necessary.

## B.Voc - Sustainable Agriculture

### Detailed Scheme for the Distribution of Credits and Period of Instruction

**Total Credits per semester = 30, Total Credits for the course = 180**

**Total contact hours per week = 25, Total contact hours per semester = 450**

(Course Code details: SAG-Sustainable AGRiculture, FPR-Food Processing, EES-Energy and Environmental Studies, 1- First Semester, S-Skill Development, 1T-First Theory Paper, 2T- Second Theory Paper, P- Practical, G-General Education, I- Internship/training.)

<b>First Semester</b>								
Sl. No	Type of course	Course code	Title of course	Exam duration	Credit per course	Contact hours per week	Total contact hours for the course	Total credits for the semester
1	Skill Component	SAG1S1T	Fundamentals of Agronomy	3	3	3	54	
2	Skill Component - Practical	SAG1S1P	Fundamentals of Agronomy-Practical	3	2	2	36	
3	Skill Component	SAG1S2T	Fundamentals of Horticulture	3	3	3	54	
4	Skill Component - Practical	SAG1S2P	Fundamentals of Horticulture – Practical	3	2	2	36	
5	Skill Component	SAG1S3T	Fundamentals of Entomology and insect ecology	3	3	3	54	
6	Skill Component - Practical	SAG1S3P	Fundamentals of Entomology and insect ecology-Practical	3	2	2	36	

7	General Component	BOCG101	Listening and Speaking Skills in English	3	4	4	72	
8	General Component	FPR1G1T	Basic Principles of Food processing	3	3	2	36	
9	General Component-Practical	FPR1G1P	Basic Principles of Food Processing – Practical	3	2	1	18	
10	General Component	EE1G1T	Alternative Energy Sources	3	3	3	54	
11	Skill Component Internship/Training	SAG1SI1	Propagation Techniques	Internal Evaluation	3	-	-	
<b>TOTAL</b>					<b>30</b>	<b>25</b>	<b>450</b>	<b>30</b>

<b>Second semester</b>								
<b>Sl. No</b>	<b>Type of course</b>	<b>Course code</b>	<b>Title of course</b>	<b>Exam duration</b>	<b>Credit per course</b>	<b>Contact hours per week</b>	<b>Total contact hours for the course</b>	<b>Total credits for the semester</b>
12	Skill Component	SAG2S1T	Plantation Crops, Spices and Fruits	3	3	3	54	
13	Skill Component - Practical	SAG2S1P	Plantation Crops, Spices and Fruits-Practical	3	2	2	36	
14	Skill Component	SAG2S2T	Fundamentals of Genetics, Plant Breeding and Seed technology	3	3	3	54	
15	Skill Component - Practical	SAG2S2P	Fundamentals of Genetics, Plant Breeding and Seed technology - Practical	3	2	2	36	
16	Skill Component	SAG2S3T	Fundamentals of Soil Science	3	3	3	54	

17	Skill Component - Practical	SAG2S3P	Fundamentals of Soil Science - Practical	3	2	2	36	
18	General Component	BOCG201	Writing and Presentation Skills in English	3	4	4	72	
19	General Component	FPR2G1T	Fruit and vegetable processing technology	3	3	2	36	
20	General Component- Practical	FPR2G1P	Fruit and vegetable processing technology - Practical	3	2	1	18	
21	General Component	EE2G1T	Environmental Science	3	3	3	54	
22	Skill Component Internship/Training	SAG2SI1	Cultivation of tuber crops	Internal Evaluation	3	-	-	
<b>TOTAL</b>					<b>30</b>	<b>25</b>	<b>450</b>	30

### Third Semester

Sl. No	Type of course	Course code	Title of course	Exam duration	Credit per course	Contact hours per week	Total contact hours for the course	Total credits for the semester
23	Skill Component	SAG3S1T	Fundamentals of Plant Pathology and Crop Disease Management	3	3	3	54	
24	Skill Component - Practical	SAG3S1P	Fundamentals of Plant Pathology and Crop Disease Management -Practical	3	2	2	36	
25	Skill Component	SAG3S2T	Protected cultivation of Horticultural crops	3	3	3	54	
26	Skill Component - Practical	SAG3S2P	Protected cultivation of Horticultural crops -Practical	3	2	2	36	
27	Skill Component	SAG3S3T	Integrated pest management in crops	3	3	3	54	
28	Skill Component - Practical	SAG3S3P	Integrated pest management in crops - Practical	3	1	1	18	
29	General Component	SAG3G1T	Plant Physiology	3	3	3	54	
30	General Component-Practical	SAG3G1P	Plant Physiology-Practical	3	1	1	18	
31	General Component	FPR3G1T	Cereals and pulses processing technology	3	3	2	36	
32	General Component-Practical	FPR3G1P	Cereals and pulses processing technology-practical	3	1	1	18	
33	General Component	EE3G1T	Analysis of Environmental Impacts	3	4	4	72	

34	Skill Component Internship/Training	SAG3GI1	Cultivation of rice	Internal evaluation	4	-	-	
<b>TOTAL</b>					<b>30</b>	<b>25</b>	<b>450</b>	<b>30</b>

### Fourth Semester

Sl. No	Type of course	Course code	Title of course	Exam duration	Credit per course	Contact hours per week	Total contact hours for the course	Total credits for the semester
35	Skill Component	SAG4S1T	Management of Weeds, Medicinal plants and Fodder crop production	3	3	3	54	
36	Skill Component - Practical	SAG4S1P	Management of Weeds, Medicinal plants and Fodder crop production -Practical	3	2	2	36	
37	Skill Component	SAG4S2T	Livestock Farming	3	3	3	54	
38	Skill Component - Practical	SAG4S2P	Livestock Farming -Practical	3	1	1	18	
39	Skill Component	SAG4S3T	Agricultural Engineering and Farm Machinery	3	3	3	54	
40	Skill Component - Practical	SAG4S3P	Agricultural Engineering and Farm Machinery -Practical	3	2	2	36	
41	General Component	SAG4G1T	Commercial vegetable production	3	3	3	54	
42	General Component-Practical	SAG4G1P	Commercial vegetable production - Practical	3	1	1	18	

43	General Component	FPT4G1T	Dairy Technology	3	3	2	36	
44	General Component-Practical	FPT4G1P	Dairy Technology - Practical	3	1	1	18	
45	General Component	EE4G1T	Energy Conservation Techniques	3	4	4	72	
46	Skill Component Internship/Training	SAG4GI1	Organic vegetable cultivation	Internal evaluation	4	-	-	
<b>TOTAL</b>					<b>30</b>	<b>25</b>	<b>450</b>	<b>30</b>

### Fifth Semester

Sl. No	Type of course	Course code	Title of course	Exam duration	Credit per course	Contact hours per week	Total contact hours for the course	Total credits for the semester
47	Skill Component	SAG5S1T	Landscape designing and indoor gardening	3	3	3	54	
48	Skill Component - Practical	SAG5S1P	Landscape designing and indoor gardening- Practical	3	1	1	18	

49	Skill Component	SAG5S2T	Commercial enterprises	3	3	3	54	
50	Skill Component - Practical	SAG5S2P	Commercial enterprises -Practical	3	1	1	18	
51	Skill Component	SAG5S3T	Fundamentals of organic farming	3	3	3	54	
52	Skill Component - Practical	SAG5S3P	Fundamentals of organic farming – Practical	3	1	1	18	
53	General Component	SAG5G1T	Principles of Agribusiness Management	3	4	4	72	
54	General Component	SAG5G2T	Plant Biotechnology	3	3	3	54	
55	General Component	SAG5G2P	Plant Biotechnology - Practical	3	2	1	18	
56	General Component	CA5G3T	Fundamentals of Computer	3	3	3	54	
57	Skill Component Internship/Training	SAG5SI1	Method demonstration	Internal evaluation	6	2	36	
<b>TOTAL</b>					<b>30</b>	<b>25</b>	<b>450</b>	<b>30</b>

### Sixth Semester

Sl. No	Type of course	Course code	Title of course	Exam duration	Credit per course	Contact hours per week	Total contact hours for the course	Total credits for the semester
58	Skill Component	SAG6S1T	Farming System Approach for Sustainable Crop Production	3	4	4	72	

59	Skill Component - Practical	SAG6S1P	Farming system Approach for Sustainable Crop Production–Practical	3	2	2	36	
60	General Component	SAG6G1T	Communication and Agricultural Extension system	3	3	3	54	
61	General Component	SAG6G2T	Agriculture Waste Management	3	3	3	54	
62	General Component-Practical	SAG6G2P	Agriculture Waste Management-Practical	3	2	1	18	
63	General Component	IBS6G3T	Introduction to Business studies	3	4	4	72	
64	Skill Component Internship/Training	SAG6SI1	Agricultural Extension Programme	Internal evaluation	4	--	--	
65	Skill Component Project/Dissertation	SAG6SP1	Project/Dissertation	Viva voce	8	8	144	
<b>TOTAL</b>					<b>30</b>	<b>25</b>	<b>450</b>	<b>30</b>

**SEMESTER-I**  
**SAG1S1T- Fundamentals of Agronomy**

**Credits: 3**

**54 Hrs**

**Objectives:**

- To enable the students to acquire knowledge on importance of agriculture and various types of farming.
- To study the fundamentals of agronomy and classification of field crops.

**MODULE 1**

**6 Hrs**

Importance of agriculture in India and Kerala, Hunger and food security, Agronomy, Sustainable agriculture, Subsistence agriculture, commercial agriculture, Extensive and intensive agriculture, Peasant farming, Urban agriculture, Agribusiness, Agricultural seasons in India and Kerala, Rainfed and irrigated agriculture.

**MODULE 2**

**12 Hrs**

Agricultural classification of crops, Agronomic classification of crops, Botanical classification of crops, Major farming systems in Kerala and Cropping Intensity, Methods of sowing/planting - planting geometry and its effect on growth and yield.

**MODULE 3**

**12 Hrs**

Soil and climatic requirements, varieties, cultural practices, special systems of cultivation, harvesting and processing of major cereals and millets, pulses, tubercrops, rice, maize, finger millet, cowpea, tapioca, sweet potato, amorphophallus, yams, coleus, arrowroot etc

**MODULE 4**

**12 Hrs**

Introduction to Meteorology and Agricultural Meteorology - Scope and importance of Agricultural Meteorology - Composition of Atmosphere - Role of greenhouse gases in global cooling and warming - Concept of weather and climate - Micro-meso-macro and phyto climates. soil temperature and its variations.

**MODULE 5**

**12 Hrs**

Factors determining weather and climate- Rainfall, wind, Solar radiation ,atmospheric pressure and relative humidity -Instruments used for measuring different parameters. Types of agrometeorological stations. Indian monsoons – South west monsoon and North-East monsoon, crop weather relation ship Preparation of crop weather calendars –Njattuvella calendar-- weather

**Text Books:**

1. Balasubramaniyan, P and Palaniappan, S.P. 2001. *Principles and Practices of Agronomy* AgroBios(India )Ltd., Jodhpur.
2. De, G.C.1989.*Fundamentals of Agronomy*. Oxford & IBH Publishing Co., New Delhi.
3. Grigg, D.B. 1974. *The Agricultural Systems of the World: An Evolutionary Approach*. Cambridge University Press, Cambridge.
4. Harlan, J.R. 1992. *Crops and Man*. American Society of Agronomy& Crop Science Society of America, Madison, WI.
5. Havlin, J. L., Beaton, J. D., Tisdale, S.L., and Nelsothn, W.L. 2006. *Soil Fertility and Fertilizers: An Introduction to Nutrient Management* (7 ed.). Pearson Education, Delhi.
6. ICAR.2006. *Hand book of Agriculture*, ICAR, New Delhi.
7. Reddy.T.Y and Reddy, G.H.S.1995.*Principles of Agronomy*, Kalyani Publishers, Ludhiana.

8. Chatterjee, B.N. and Maiti, S.1985.*Principles and Practices of Rice Growing*. Oxford & IBH Publishing Co., New Delhi.

### **SAG1S1P- Fundamentals of Agronomy - Practical**

**Credits: 2**

**36 Hrs**

#### **Objectives**

- To familiarize with cultivation aspects of cereals and millets, pulses and tubercrops.
1. Identification of cereals and millets, pulses, and tuber crops. **3 Hrs**
  2. Seed treatment - *Rhizobium* inoculation of leguminous crops. **4 Hrs**
  4. Identification of manures -organic manures: bulky and concentrated manures Fertilizers: Straight, complex and mixed fertilizers - identification and preparation. **5 Hrs**
  5. Fertilizer recommendation and calculation for major cereals and pulses. **5 Hrs**
  6. Familiarization with green manure crops and cover crops. **5 Hrs**
  7. Practice of methods of fertilizer applications- broadcasting, placement, foliar application and fertigation. **5 Hrs**
  8. Yield estimation of crops- biological yield and economical yield. **4 Hrs**
  9. Identification of important Meteorological instruments **5 Hrs**

### **SAG1S2T- Fundamentals of Horticulture**

**Credits: 3**

**54 Hrs**

#### **Objectives**

- To acquaint with importance, division and classification of horticultural crops.
- To understand the basic principles and types of plant propagation.

#### **MODULE 1**

**10 Hrs**

Horticulture - definition, importance, division and classification of horticultural crops. Importance of horticulture in India and Kerala.Orchard planning, layout, planting systems - management practices.Tree forms and functions - Training and pruning in horticultural crops - principles and methods, techniques of training and pruning, fruit thinning.

#### **MODULE 2**

**10 Hrs**

Different management practices in horticultural crops - mulching, water management, soil-fertility management, weed management, nutrition, management of pest and disease, maturity, harvesting and post-harvest handling of horticultural produce.

#### **MODULE 3**

**10 Hrs**

Plant propagation - definition and basic concepts, sexual and asexual types - advantages and disadvantages. Media, containers, potting, re potting and pre planting treatments.Asexual propagation -propagation by cuttings, types of cuttings, factors affecting rooting of cuttings. Propagation by layering - types of layering.

#### **MODULE 4**

**12 Hrs**

Propagation by grafting - methods of grafting - development of graft unions, separation and after care.Stock-scion relationship - Graft incompatibility - factors affecting incompatibility.

Propagation by budding, methods of budding - A comparative study between grafting and budding.

#### **MODULE 5**

**12 Hrs**

Nursery - site selection, layout - components of a nursery - production unit, sales unit, display area, management and maintenance, propagation unit - close planted progeny orchards. Plant propagating structures-.greenhouse, glasshouse, hot bed, cold frame, lath house, net house, mist chamber.

#### **Text books:**

1. Bose, TK., Mitra, SK. and Sadhu, K. 1986.*Propagation of tropical and subtropical horticultural crops*. NayaProkash, Calcutta.
2. Denixon, RI. 1979. *Principles of Horticulture*. Mac Millan, New York.
3. Edmond, JB., Sen, TD, Andrews, TS and Halfacre, RG. 1977. *Fundamentals of Horticulture*. Tata McGraw Hill, New Delhi.
4. Hartmann, HT. and Kester, DE.1986.*Plant propagation - Principles and practices*.Prentice-Hall, New Delhi.
5. Leopold, A.C. and Kriedeman, P.E. 1975.*Plant Growth and Development*. Tata McGrawHill Publishing Co. Ltd., New Delhi.
6. Chadha, K. L. 2003. Handbook of Horticulture, ICAR, New Delhi.

#### **SAG1S2P-Fundamentals of Horticulture -Practical**

**Credits: 2**

**36 Hrs**

#### **Objectives**

- To develop skill in propagation and cultivation aspects of horticultural crops.

- |   |              |
|---|--------------|
| 1. Familiarization to Different planting systems and layout                                   | <b>5 Hrs</b> |
| 2. Propagation methods - sexual propagation -seed viability tests, dormancy breaking methods. | <b>4 Hrs</b> |
| 3. Propagation structures - mist chamber, green house, hot beds etc.                          | <b>6 Hrs</b> |
| 4. Propagation by cuttings.   | <b>5 Hrs</b> |
| 5. Propagation by layering - types of layering.   | <b>4 Hrs</b> |
| 6. Propagation by grafting - methods of grafting  | <b>6 Hrs</b> |
| 7. Propagation by budding, methods of budding   | <b>6 Hrs</b> |

#### **SAG1S3T-Fundamentals of Entomology and Insect ecology**

**Credits: 3**

**54 Hrs**

#### **Objectives**

- To familiarize with insect pests and to understand about the Insect ecology

#### **Module 1**

**16 Hrs**

History of Entomology. Classification of phylum Arthropoda. Relationship of class Insecta with other classes of Arthropoda. Insects in relation to man - Factors for insect abundance and success. Morphology –Grasshopper/Plant bug, structure and functions of insect cuticle, Moulting. Body segmentation. Structure of Head, thorax and abdomen .Structure and modifications of insect mouth parts. Types of insect larvae and pupae.

**Module 2** **6 Hrs**  
Insect orders of agricultural importance- Lepidoptera, coleoptera, hemiptera, diptera and hymenoptera.

**Module 3** **10 Hrs**  
Insect Ecology- introduction. Environment and its components. Population dynamics- effect of abiotic factors- temperature, moisture, humidity, Rainfall, light, atmospheric pressure and air currents. Effect of biotic factors - food, natural enemies.

**Module 4** **10 Hrs**  
Concepts of Balance of life in nature, biotic potential and environmental resistance. Pests - definition, categories of pests, causes for pest outbreak. Losses caused by pests.

**Module 5** **12 Hrs**  
Identification, symptoms of damage caused by pests of Rice, Coconut, Banana, Pepper, cardamom, Brinjal, Bittergourd and cowpea. Nematode Pests of crops, Common Pests of stored food products/grains. Pest monitoring - Pest surveillance and pest forecasting. Assessment of pest population and damage.

**Text books:**

1. Mani, M. S. 1968. General Entomology. Oxford and IBH Publishing Company, New Delhi.
2. Nayar, K. K., Ananthakrishnan T. N. and David.B.V. 1976. General and Applied Entomology, Tata McGraw Hill Publishing Company Limited, New Delhi, 589p.
3. Pedigo, L. P. 1999. Entomology and Pest Management.Third Edition. Prentice Hall, New Jersey, USA.
4. Richards, O.W. and Davies, R. G. 1977.Imm's General Text Book of Entomology, Vol.1&2, Chapman and Hall Publication, London.
5. Srivastava, P. D. and Singh, R. P. 1997.An Introduction to Entomology, Concept Publishing Company, New Delhi.
6. Dhaliwal, G. S. and Ramesh Arora. 1998. Principles of Insect Pest Management. Kalyani Publishers, New Delhi.

**SAG1S3P-Fundamentals of Entomology and Insect ecology- Practical**

**Credits: 2** **36 Hrs**

**Objectives**

- To develop skill in different IPM practices in insect pest management and to familiarize with insect morphology
1. External features of grasshopper **2Hrs**
  2. Types of insect mouthparts. **2Hrs**
  3. Structure and modifications of insect antennae **3 Hrs**
  4. Structure and modifications of insect legs **3 Hrs**
  5. Types of insect larvae and pupae. **3 Hrs**
  6. Identification of different types of insect damages on crop plants **4 Hrs**
  7. Identification, symptoms of damage, collection and preservation of pests of Rice, Coconut, Banana, Pepper, cardamom, Brinjal, Bittergourd and cowpea. **8 Hrs**

8. Identification of Pests of stored food grain/products	3 Hrs
9. Sampling techniques for the estimation of insect population in selected crops	4 Hrs
10. Estimation of insect damage in selected crops	4 Hrs

### **BOCG101- Listening and Speaking Skills in English**

**Credits: 4**

**72 Hrs**

**Objectives:**

- To introduce the students to the speech sounds of English in order to enable them to listen to English and speak with global intelligibility.
- To enable the students to speak English confidently and effectively in a wide variety of situations.
- To help the students to improve their reading efficiency by refining their reading strategies.

**MODULE – I**

Speech Sounds: Phonemic symbols – Vowels – Consonants – Syllables – Word stress – Stress in polysyllabic words – Stress in words used as different parts of speech – Sentence stress – Weak forms and strong forms – Intonation

**Sample activities:**

- 1- Practice reading aloud. Use a variety of texts including short stories, advertisement matter, brochures, etc
- 2- Read out a passage and ask the students to identify the stressed and unstressed syllables.

**MODULE – II**

Basic Grammar: Articles - Nouns and prepositions - Subject-verb agreement - Phrasal verbs - Modals - Tenses - Conditionals – Prefixes and suffixes – Prepositions -Adverbs – Relative pronouns - Passives - Conjunctions - Embedded questions - Punctuation – Abbreviations-concord- collocations-phrasal verbs- idiomatic phrases

**Sample activities:**

- 1- Ask students to write a story/report/brochure, paying attention to the grammar.

**MODULE – III**

Listening: Active listening – Barriers to listening – Listening and note taking – Listening to announcements – Listening to news on the radio and television.

**Sample activities:**

- 1- Information gap activities (e.g. listen to a song and fill in the blanks in the lyrics given on a sheet)
- 2- Listen to BBC news/ a play (without visuals) and ask the students to report what they heard.

**MODULE– IV**

Speaking- Fluency and pace of delivery – Art of small talk – Participating in conversations – Making a short formal speech – Describing people, place, events and things – Group discussion skills, interview skills and telephone skills.

**Sample activities:**

- 1- Conduct group discussion on issues on contemporary relevance.

- 2- Ask students to go around the campus and talk to people in the canteen, labs, other departments etc. and make new acquaintances.
- 3- Conduct mock interviews in class.
- 4- Record real telephone conversations between students and ask them to listen to the recordings and make the corrections, if any are required.

### **MODULE – V**

Reading: Theory and Practice – Scanning – Surveying a textbook using an index – reading with a purpose – Making predictions – Understanding text structure – Locating main points – Making inferences – Reading graphics – Reading critically – Reading for research.

#### **Books for Reference:**

- 1.V.Sasikumar, P KiranmaiDutt and GeethaRajeevan, .Communication Skills in English.Cambridge University Press and Mahatma Gandhi University.
2. Marilyn Anderson, Pramod K Nayar and Madhucchandra Sen. Critical Thinking, Academic Writing and Presentation Skills. Pearson Education and Mahatma Gandhi University.

#### **For Further Activities**

1. A Course in Listening and Speaking I & II, Sasikumar, V.,KiranmaiDutt and Geetha Rajeevan, New Delhi: CUP, 2007
2. Study Listening: A Course in Listening to Lectures and Note-taking Tony Lynch New Delhi: CUP,2007.
3. Study Speaking: A Course in Spoken English for Academic Purposes. Anderson, Kenneth, Joan New Delhi: OUP, 2008

### **FPR1G1T- BASIC PRINCIPLES OF FOOD PROCESSING**

**Credit: 3** **36 Hrs**

#### **Objectives**

- To provide a basic sequence of steps to produce an acceptable and quality food product from raw materials.
- Study of scientific and technological advancements in food processing.

**Module 1- Classification of Food** **12 hrs**

Definition of food, classification of foods- based on origin, pH, nutritive value, functions of food, Health food, ethnic food, organic food, functional food, nutraceuticals.

**Module 2-Fundamentals of Food Processing** **12 hrs**

Steps involved in converting a raw harvested food materials to a preserved product with sound quality- harvesting, storage, manufacturing, preservation, packaging, distribution and marketing.

**Module 3- Post Harvest Management** **10 hrs**

Chemical, enzymatic, physical and biological deterioration, implications and prevention.

**Module 4-Ethnic Foods and its Processing** **10 hrs**

Banana products- banana puree, banana chips, banana powder, Banana figs, banana flour; Tapioca products- Tapioca chips, tapioca powder.

**Module 5-Processing of Modern Foods** **10 hrs**

Pasta, Macaroni, Noodles, Mayonnaise, Salad Dressing, Margarine, Potato wafers, Corn flakes, Pop corn.

**Text books:**

1. Brian E. Grimwood, Coconut Palm Products: Their Processing in Developing Countries, 1979.
2. Hui, Y H and Associate Editors; Hand Book of Food Products Manufacturing Vol I, Wiley- Interscience, New Jersey 2007.
3. Hui, Y H and Associate Editors; Hand Book of Food Products Manufacturing Vol II, wiley- Interscience, New Jersey 2007.
4. Manay, N.S, Shadaksharaswamy, M., Foods- Facts and Principles, New Age International Publishers, New Delhi, 2004.
5. Potter, N. N, Hotchkiss, J. H. Food Science. CBS Publishers, New Delhi. 2000.
6. Srilakshmi, B. Food Science (3<sup>rd</sup> edition), New Age International (P) Limited Publishers, New Delhi, 2003.

**FPR1G1P- BASIC PRINCIPLES OF FOOD PROCESSING-Practical**

**Credit: 2**

**18 Hrs**

**Objectives**

- To study the manufacture of various food products

- |                                 |      |
|---------------------------------|------|
| 1. Preparation of mayonnaise    | 3hrs |
| 2. Preparation of peanut butter | 5hrs |
| 3. Preparation of potato chips  | 3hrs |
| 4. Preparation of tapioca chips | 2hrs |
| 5. Preparation of banana chips  | 2hrs |
| 6. Preparation of banana puree  | 3hrs |

**Text Books:**

1. Manay, N.S, Shadaksharaswamy, M., Foods- Facts and Principles, New Age International Publishers, New Delhi, 2004.
2. Potter, N. N, Hotchkiss, J. H. Food Science. CBS Publishers, New Delhi. 2000.
3. Srilakshmi, B. Food Science (3<sup>rd</sup> edition), New Age International (P) Limited Publishers, New Delhi, 2003.

**EE1G1T - ENERGY RESOURCES IN INDIA**

**Credits: 3**

**54 Hrs**

**Objectives:**

- To explain concept of various forms of energy resources.
- To outline division aspects and utilization of renewable energy sources for both domestics and industrial applications.

**Module 1**

**12 hrs**

Energy: Types of resources and its characteristics, Energy resources and its distribution in India: Different types of power resources in India: Hydro, Nuclear, Thermal Power plants: brief idea. Indian Energy Sector; Energy Demand in India- Renewable Energy Programmes.

**Module 2****12 hrs**

Solar Energy, Solar Energy potential, solar radiation and Measurement, types of solar energy collectors. Applications: Solar water heating systems, Solar room heating, solar photo voltaic system-Solar energy conversion system-its different types.

**Module 3****12 hrs**

Wind Energy, Scope for Wind energy in India, Basic principles of wind energy conversion, Site selection considerations, Basic components of wind energy conversion system, Types of wind machines, Application of Wind Energy.

**Module 4****12 hrs**

Biomass resources and Biogas energy, Biomass conversion technologies, Classification of biogas plants, Factors affecting yield of biogas plants, Properties & Characteristics of Biogas.

**Module 5****6 hrs**

Other sources of renewable energy, Tidal Energy, Geothermal Energy, Magneto – Hydro Dynamic energy, Chemical energy Sources, Hydrogen Energy.

**Text books:**

1. Solar Energy Utilization, G. D. Rai, Khanna & Khanna, New Delhi.
2. Non-conventional energy source, G. D. Rai, Khanna & Khanna, New Delhi.
3. Sustainable Energy, J. W. Tester & M. Drate, Prentice Hall of India, New Delhi.
4. Principles of Power system, V. K. Meththa, S.ChandCo.Ltd., New Delhi.
5. Raikhy, P.S. and Parminder Singh, (1990): Energy Consumption in India – Pattern and Determinants, Deep and Deep, New Delhi.
6. Non-conventional Energy Resources and utilization by Er. R.K. Rajput

**SAG1SI1- Propagation Techniques****Credits: 3****Objectives**

- To develop skill in Propagation Techniques and nursery management

**Work plan:**

Familiarization with basic principles and types of plant propagation and nursery management. Each student has to produce 25 planting material.

## SEMESTER-II

### SAG2S1T- Plantation Crops, Spices and Fruits

**Credits: 3**

**54 Hrs**

#### **Objectives**

- To acquaint with the cultivation aspects of Plantation crops, spices and fruit crops.

#### **Module1**

**12 Hrs**

Plantation crops, Introduction - importance - area, production - origin, distribution - varieties - climate, soil, site selection - propagation, production of quality planting materials and hybrids - nursery management - layout, planting, aftercare - irrigation, manuring - stage of harvest, harvesting, yield and uses of :-coconut and Rubber.

#### **Module2**

**10 Hrs**

Plantation crops, Importance - area, production - origin, distribution - varieties - climate, soil, site selection - propagation, production of quality planting materials and hybrids - nursery management - layout, planting, aftercare - irrigation, manuring - stage of harvest, harvesting, yield and uses of cashew, tea and coffee.

#### **Module 3**

**12 Hrs**

Spices, Definition - classification - importance to the state. Origin - distribution - area, production .varieties - climate, soil - propagation, nursery management - site selection, layout, planting - crop management including manuring, irrigation, shade regulation, harvesting, yield of the following crops: Pepper, cardamom, ginger, and nutmeg.

#### **Module 4**

**15 Hrs**

Fruits, Importance and scope of commercial fruit production - Global scenario of fruit production and export - Present status of fruit production in the state and in the country - problems and prospects. Crop management practices - selection and preparation of planting materials, field preparation and planting, manuring, irrigation, weed management, use of bio-regulators, other cultural operations. Cultural practices for quality improvement. Maturity indices, harvesting, grading, packing, storage and ripening techniques. Industrial and export potential- of Crops-Banana, mango, and pineapple.

#### **Module 5**

**5 Hrs**

Fruits, Management practices of crops gaining importance in the state recently (mangosteen, rambutan and jack fruit).

#### **Text books:**

1. Chadha, K.L.2001. Hand Book of Horticulture,ICAR, New Delhi.
2. Kumar.N, Abdul Khader.J.B.M.Rangaswami.P. and Irulappan., 1993. Introduction to spices
3. Menon.K.P.V. and Pandalai.K.M. 1960. The coconut Palm - a monograph. Indian Central Coconut Committee, Ernakulam.
4. Purseglove. J.W., Brown, E.G.Green, C.L. and Robbins, S.R.G.1981.SpicesVol-I & II.
5. Pruthi.J.S. 1993.Major Spices of India, Crop Management - Post Harvest Technology, ICAR, New Delhi.
6. Pruthi, J.S.2001 Minor Spices and Condiments-Crop Management and Post HarvestTechnology, ICAR, New Delhi, India.
7. Amar Singh, 1986. Fruit Physiology and Production.Kalyani Publishers, New Delhi.
8. Bose, T.K, Mitra,S.K. and Sanyal, D. 2002. Fruits: Tropical and Subtropical. Vol. I & II,

- Nayaprakash publications, Calcutta.
9. Hayes, W.B. 1957. Fruit Growing in India. Kitabitan, Allahabad.
  10. Kumar, N. 1997 (6<sup>th</sup> Edition). Introduction to Horticulture. Rajhalakshmi Publications, Nagercoil
  11. Mitra, S.K, Bose, T.K and Rathore, D.S. 1991. Temperate Fruits. Horticulture and Allied Publishers, Calcutta.
  12. Naik, K.C. 1949. South Indian Fruits and Their Culture. Varadachari Co., Madras.
  13. Samson, J.A. 1980. Tropical Fruits. Longman group, London.

### **SAG2S1P-Plantation Crops, Spices and Fruits- Practical**

**Credits: 2** **36 Hrs**

#### **Objectives**

- To acquire skill on cultivation aspects of Plantation crops, spices and fruit crops

**Plantation Crops** **14 Hrs**

- Coconut: Nursery techniques, Seedling selection, Production of quality planting materials and hybrids and mother palm selection,
- Familiarization with varieties, Moisture conservation methods in coconut plantations.
- Tapping systems in rubber.
- Training and pruning in tea and coffee.

**Spices** **10 Hrs**

- Morphology, nursery techniques, planting in main field, cultural operations and harvesting of pepper, cardamom, ginger, nutmeg

**Fruits (Banana, Pineapple and Mango.)** **12 Hrs**

- Familiarization with important varieties. Practice in propagation, selection of good planting materials, field preparation and planting, manuring and use of growth regulators. Familiarization with weedicides, and plant protection chemicals. Studies on major pests, diseases and nutritional disorders. Studies on maturity indices and storage.
- Visit to research stations, farmers' field, marketing outlets and processing units.

### **SAG2S2T-Fundamentals of Genetics, Plant Breeding and Seed technology**

**Credit: 3** **54 Hrs**

#### **Objectives**

- To familiarize with the fundamentals of plant breeding.
- To familiarize with the basics of seed technology.

**Module1: Principles of Genetics** **12 Hrs**

Mendel's laws of inheritance and exceptions to the laws, Types of gene action-complementary gene action, epistasis, inhibitory gene action, duplicate gene action, polymeric gene action, Multiple alleles, Pleiotropism, Penetrance and expressivity.

**Module 2: Quantitative traits and Qualitative traits** **10 Hrs**

Quantitative traits and Qualitative traits; Multiple factor hypothesis: Cytoplasmic inheritance - important features and difference from chromosomal inheritance; Linkage and crossing

over

**Module 3: Principles of plant breeding**

**14 Hrs**

Aims, objectives and importance of Plant Breeding; Modes of reproduction, Sexual, Asexual, Apromixis and their classification; Modes of pollination, genetic consequences, differences between self and cross pollinated crops; Methods of breeding - introduction and acclimatization. Selection, Mass selection, Johannson's pure line theory, Hybridization, Aims and objectives, types of hybridization; Methods of handling of segregating generations, pedigree method, bulk method, back cross method

**Module4:**

**10 Hrs**

Breeding objectives and concepts of breeding in self pollinated , cross pollinated and vegetatively propagated crops. (Clonal selection; Mutation breeding; Ploidy breeding). Breeding of Cereals – rice. Pulses- cow pea. Oil seeds - ground nut. Vegetables-Tomato, bhindi. Fruit crops- mango. Plantation crops - Coconut.

**Module 5: Principles of Seed Technology**

**8 Hrs**

Meaning, Factors affecting germination and growth, Seed index, Real value of seed, Purity percentage, Duckage, Isolation distance, Types of pure seeds- Nuclear seeds, Foundation seeds, Registered seed Certified and improved seed, Viability test, Seed dormancy and its breaking, Seed treatment, National Seed Corporation and State Seed Corporation

**Text books:**

1. Allard, R.W. 1960. Principles of Plant Breeding. John Wiley & Sons INC. USA. Toppan Co. Ltd. Japan
2. Choudhari, T.C. 1982. Introduction to Plant Breeding. Oxford A& IBH Publishing Co., New Delhi
3. Elliot. 1958. Plant Breeding & Cytogenetics. Mc Grow Hill. New York
4. Sharma, J.R. 1989. Principles and Practice of Plant Breeding. Tata McGraw - Hill Publishing Company Limited, New Delhi.
5. Singh, B.D. 2001. Fundamentals of Genetics. Kalyani Publishers. New Delhi. Ludhiana
6. Singh, B.D. 2003. Plant Breeding Principles and Methods. Kalyani Publishers. New Delhi/ Ludhiana.
7. Agrawal, R.L. 1995. *Seed Technology*. Oxford, IBH Publishing Co., New Delhi.
8. Dahiya, B.S and Rai, K.N., 1997. *Seed Technology*, Published by Kalyani Publishers, Chennai.

**SAG2S2P-Fundamentals of Plant Breeding and Seed technology-Practical**

**Credit: 2**

**36 Hrs**

**Objectives**

- To familiarize with the botanical aspects of field crops.
- To develop skill in various aspects of seed production.

1. Identification of various stages of cell division
2. Fertilization and life cycle of an angiospermic plant
3. Floral morphology, selfing, emasculation and crossing techniques

4. Identification of seeds of summer vegetables and cool season vegetables
5. Seed sampling principles and procedures
6. Physical purity analysis of seeds
7. Seed Testing: Germination analysis and viability analysis of seeds
8. Seed dormancy and breaking methods
9. Techniques of hybrid seed production in tropical vegetables
10. Seed extraction techniques
11. Seed treatment against systemic diseases
12. Visit to seed production plots
13. Visit to seed processing plants
14. Visit to seed testing laboratories.

### **SAG2S3T- Fundamentals of Soil Science**

**Credit: 3**

**54 Hrs**

**Objectives**

- To study fundamentals of soil science
- To familiarize with plant nutrients and identification of deficiency symptoms

**Module 1**

**8 hrs**

Soil –definition- soil profile-components of soil-importance of top soil and sub soil-difference between soil and sub soil-ideal soil conditions for plant growth.

**Module2**

**10 hrs**

Physical properties of soil-soil texture-soil structure-density of soil-porosity of soil-soil consistence-soil colour-soil temperature-soil consistence. Role of physical properties in soil fertility-role of texture, structure, density, porosity, consistence, colour, temperature. soil air-soil water-soil colloids.

**Module 3**

**12 hrs**

Soil reaction-pH-factors controlling soil reaction-soil reaction and plant growth -Major soil constraints- soil acidity, salinity-method of alleviating soil problems. acid soil-development and formation-effect of soil acidity on plants-reclamation, acid sulphate soils. saline and alkali soils-formation-characteristics-effect of soil salinity and alkalinity-reclamation. calcareous soil- formation-effect of calcareous soil-management.

**Module 4**

**10 hrs**

Important soil types of Kerala including problem soils. Soil erosion – definition – different types of erosion-Variou measures for conservation of soil and water – agronomic measures. Soil testing- procedure for soil sample collection- preparation of soil sample.

**Module 5**

**14 hrs**

Soil productivity and fertility. - Crop nutrition - nutrients -classification - Nutrient sources-organic manures -fertilizers - biofertilizers .Nutrient recycling through manures and fertilizers -organic manures. Fertilizers and fertilizer use- management of fertilizers.

Biological nitrogen fixation, Green manure crops and cover crops .Integrated Nutrient Management.

**Text books:**

1. Biswas, T.D. and Mukherjee, S.K. 1987. Text Book of Soil Science. Tata McGraw Hill Publishing Co., New Delhi
2. Black, C.A. 1982. Methods of Soil Analysis, Part I ASA, Madison, USA.
3. Brady, N.C. 1990 Nature and Properties of Soils. 10th Edn, Macmillan Publishing Co. Inc., New York
4. Das, D.K. 1997. Introductory Soil Science. Kalyani Publishers New Delhi
5. Fundamentals of Soil Science. Published by Indian Society of Soil Science, IARI New Delhi, 2002
6. Tisdale,S.L., Nelson,W.L.,Beaton, J.D. and Havlin, J.L. 1995. Soil fertility and Fertilizers. 5th Edn. Macmillan publishing company, USA

**SAG2S2P- Fundamentals of Soil Sciences – Practical**

**Credit:2**

**36 Hrs**

**Objectives**

- To study soil testing procedure and identify deficiency symptoms

1. Soil testing-procedure for soil sample-collection and preparation of soil sample	<b>6 hrs</b>
2. Study of soil profile	<b>3 hrs</b>
3. Identification of deficiency symptoms	<b>4 hrs</b>
4. Estimation of pH	<b>5 hrs</b>
5. Fertilizer calculation of different crops	<b>3hrs</b>
6. Visit to soil testing lab	<b>5 hrs</b>
7. Soil mapping	<b>4 hrs</b>
8. Soil testing and familiarization of nutrient supplements.	<b>6 hrs</b>

**BOCG201 - Writing and Presentation Skills in English**

**Credits: 4**

**72 Hrs**

**Objectives:**

- To make the students aware of the fundamental concepts of critical reasoning and to enable them to read and respond critically, drawing conclusions, generalizing, differentiating fact from opinion and creating their own arguments.
- To assist the students in developing appropriate and impressive writing styles for various contexts.

- To help students rectify structural imperfections and to edit what they have written.
- To equip students for making academic presentations effectively and impressively.

### **MODULE – I**

Letter Writing: Letters - letters to the editor - resume and covering letters -parts and layout of business letters-business enquiry letters offers, quotation-orders and execution-grievances and redressal-sales letters-follow-up letters-status enquiry-collection letters-preparation of power of attorney for partnership- job application letters-resume-CV-reference and recommendation letters-employment letters.

### **MODULE II**

Other types of Academic and business Communication (written):Seminar papers- project reports - notices - filling application forms - minutes, agenda-reports-essays.

### **MODULE – III**

Presentation Skills: Soft skills for academic presentations - effective communication skills – structuring the presentation - choosing appropriate medium – flip charts – OHP – Power Point presentation – clarity and brevity - interaction and persuasion.

\*Compulsory activity: PowerPoint presentations to be conducted by each student in class

### **MODULE IV**

Non-verbal communication-Body language-Kinesics,Proxemics-Para language Channels- Barriers-Principles of effective communication

### **MODULE V**

Online writing and Netiquette- Writing e-mails- use of language – writing for blogs – social media etiquette- professional networking online (LinkedIn, E-factor etc.) Compulsory activity: Each student should create a blog and/or profile in LinkedIn.

#### **Books for Reference:**

1. Marilyn Anderson, Pramod K Nayar and Madhucchandra Sen. Critical Thinking, Academic Writing and Presentation Skills. Pearson Education and Mahatma Gandhi University.
2. Antony Thomas,Business Communication and MIS, Pratibha Publications. Bhatia R.C.Business Communication
3. SaliniAgarwal Essential communication skill. Reddy P.N, and Apopannia, Essentials of Business communication.
4. Sharma R.C,KRISHNA Mohan, Business Communication and Report writing Leod,M.C.,Management Information system.

## **FPR2G1T-FRUIT AND VEGETABLE PROCESSING TECHNOLOGY**

**Credit: 3**

**36 Hrs**

### **Objectives**

- To provide a basic understanding of processing of fruits and vegetables.

### **Module 1- Introduction**

**10 hrs**

Ripening and quality of fruits, harvesting and transportation, cold storage of fruits, selection and preparation of fruits for processing, deskinning, enzyme inactivation, packing and processing.

**Module 2- Processing of juice, jam and jelly** **12 hrs**

Fruit juice manufacture, Canning of fruit juices, freezing of fruit pulps. Aseptic processing of fruit juices. Packaging of aseptically processed juices and pulps. Concentrated fruit juices. Manufacture of jams. Theory of jelly formation, ingredients. Machinery. Jellies, marmalades, squashes, cordials, syrups, specifications.

**Module 3- Processing of tomato, apple and orange** **12 hrs**

Tomato juice, canned whole tomatoes, tomato ketchup, tomato jams, tomato puree, tomato powder. Apple and apple product- Clarified apple juice, aseptically packed apple puree, apple cider, orange products- orange juice, concentrated orange juice, orange squash, orange jams.

**Module 4- Processing of pineapple and mango** **12 hrs**

Pineapple products- juice, jam, canning, Mango and mango products- raw unripe mango products: brined mango slices, dried green mango slices and powder (Amchur), canned mango slices in syrup, canned or frozen mango pulp, mango juice or mango nectar, mango jam, mango squash, mango juice powder, mango freeze dried products, mango syrup.

**Module 5- Processing of vegetables** **8 hrs**

Processing of okra (ladies finger), potatoes, onions, carrots, green peas, procuring, transportation, storage, processing, packaging and ware housing.

**Text books:**

1. Siddappa and Bhatia, Fruits and Vegetable Processing Technology
2. Lea, R. A. W, Fruit juice processing and packaging
3. Hui, Y. H. Processing of fruits
4. Cash J. N. Processing of vegetables
5. Jongen, W. Fruit and vegetable processing

**FPR2G1P- FRUIT AND VEGETABLE PROCESSING TECHNOLOGY-PRACTICAL**

**Credit: 2**

**Hrs: 18 Hrs**

**Objectives**

- To familiarize the students with processing of fruits and vegetables
  1. Processing of mango squash 3hrs
  2. Processing of pineapple jam 5hrs
  3. Manufacture of tomato puree 2hrs
  4. Manufacture of tomato sauce 4hrs
  5. Manufacture of tomato ketchup 4hrs

**Text books:**

1. Siddappa and Bhatia, Fruits and Vegetable Processing Technology
2. Lea, R. A. W, Fruit juice processing and packaging
3. Jongen, W. Fruit and vegetable processing

## EE2G1T - ENVIRONMENTAL SCIENCE

**Credits: 3**

**54 Hrs**

### **Objectives:**

- To create awareness about the importance of environment, its ecological balance and make him/her sensitive to the environment issues in every endeavor that he/she participates.

### **Module 1**

**20 Hrs**

Environmental studies, Definition, Scope and Importance – Need For Public Awareness – Forest Resources:- Use and Over - Exploitation, Deforestation. Mining, Dams and their Ground Water, Floods, Drought, Conflicts over Water, Dams – Benefits and Problems. Mineral Resources:- Use Effects on Forests and Tribal People. Water Resources:- Use and Over-Utilization of Surface and Exploitation, Environmental Effects of Extracting and Using Mineral Resources. Food Resources: World Food Problems, Changes caused by Agriculture and Overgrazing, Effects of Modern Agriculture, Fertilizer- Pesticide Problems, Water Logging, salinity. Land Resources:- Land as a Resource, Land Degradation, Man Induced Landslides, Soil Erosion and Desertification – Role of an Individual in Conservation of Natural Resources.

### **Module 2**

**10 Hrs**

Concepts of an Ecosystem – Structure and Function of an Ecosystem – Producers, Consumers and Decomposers – Energy Flow in the Ecosystem – Ecological Succession – Food Chains, Food Webs and Ecological Pyramids – Introduction, Types, Characteristic Features, Structure and Function of the Forest Ecosystem Grassland Ecosystem Desert Ecosystem Aquatic Ecosystems.

### **Module 3**

**10 Hrs**

Introduction to Biodiversity – Definition: Genetic, Species and Ecosystem Diversity – Biogeographical Classification of India – Value of Biodiversity: Consumptive Use, Productive Use, Social, Ethical, Aesthetic and Option Values – Biodiversity at Global, National and Local Levels – India as a Mega-Diversity Nation – Hot-Spots of Biodiversity – Threats to Biodiversity: Habitat Loss, Poaching of Wildlife, Man-Wildlife Conflicts – endangered and Endemic Species of India – Conservation of Biodiversity: In-Situ and Ex-Situ conservation of Biodiversity.

### **Module 4**

**14 Hrs**

Environmental pollution Definition – Causes, Effects and Control Measures of:- Air Pollution, Water Pollution, Soil Pollution, Marine Pollution, Noise Pollution, Thermal Pollution, Nuclear Hazards – Soil Waste Management:- Causes, Effects and Control Measures of Urban and Industrial Wastes – Role of an Individual in Prevention of Pollution – Pollution Case Studies – disaster Management:- Floods, Earthquake, Cyclone and Landslides.

### **Text Books:**

1. Masters, G.M., “Introduction to Environmental Engineering and Science”, Pearson Education Pvt., Ltd., 2nd Edition, 2004.
2. Miller, T.G. Jr., “Environmental Science”, Wadsworth Pub. Co.
3. Townsend C., Harper, J. and Begon, M., “Essentials of Ecology”, Blackwell Science, 2003.
4. Trivedi, R.K., and Goel, P.K., “Introduction to Air Pollution”, Techno- Science.

## **SAG2SI1 - Cultivation of tuber crops**

**Credits: 3**

**Objectives**

- To develop field level practical work experience in tuber crops cultivation

**Work plan:**

Familiarization with main field preparation, sowing/planting, nutrient management and other intercultural operations of any major field crops such as tuber crops, by allotting each student an area of 40.46 m<sup>2</sup> (1 Cent).

## SEMESTER-III

### SAG3S1T- Fundamentals of Plant Pathology and Crop Disease Management

**Credit: 3**

**54 Hrs**

#### Objectives

- To understand the general characters of major plant pathogens.
- To acquaint with principles of crop disease management.

#### MODULE I : Introductory plant pathology

**12 Hrs**

Plant Pathology – an introduction and definitions of technical terms. Concept of plant disease- Definition- classification of plant diseases- Disease causing organisms- bacteria, fungi, viruses, viroids, phytoplasmas, fastidious vascular bacteria

#### MODULE 2: Principles of crop disease management

**12 Hrs**

Introduction - importance and history of crop disease management. Epidemiology of crop diseases - weather factors and their role - temperature, rainfall, relative humidity etc. Principles of crop disease management - Importance, general Principles - Avoidance - Exclusion – protection. Plant Quarantine and Inspection

#### MODULE 3: Strategies of Plant Disease management

**16 Hrs**

Cultural control-Roguing, eradication of alternate and collateral hosts, crop rotation, mixed cropping manure and fertilizer management. Sanitation, hot weather ploughing, soil amendments, time of sowing, seed rate and plant density, irrigation and drainage. Biological control - Role and mechanisms of biocontrol agents and PGPR. Physical Methods - soil solarisation, heat treatment etc. Chemical methods -Fungicides -classification - chemical groups of fungicides - inorganic, organic, systemic, antibiotic etc., Methods of application of fungicides - seed, soil, foliar spray, post harvest treatment, root feeding etc Fungicide formulations - Characteristics of an ideal fungicide. Compatibility and phytotoxicity of fungicides. Plant disease resistance - types of resistance - vertical and horizontal - Defense mechanism in plants - Structural and Bio- chemical (pre and post- infection) cross-protection.

#### MODULE 4

**8 Hrs**

Diseases of major field crops, pulses and oil seeds- Rice, Cow pea, Ground nut and Coconut. Diseases of major vegetables, fruit crops and spices – Solanaceous, cucurbitaceous vegetables, Bhindi, Mango, Banana, pepper, cardamom and Ginger

#### MODULE 5

**6 Hrs**

Integrated plant disease management (IDM) - Concepts, advantages and Importance.

#### Text books:

1. Agrios, G.N. 2005. *Plant Pathology* Academy Press. New York.
2. Ravichandra, N.G. 2013. *Fundamentals of Plant Pathology*.PHILearning Pvt Ltd. 639p.
3. Nene, Y.L. and Thapliyal, P.N. 1998. *Fungicides in Plant Disease Control*. Oxford and IBH New Delhi
4. Singh, R.S 2002. *Introduction to Principles of Plant Pathology*. Oxford and IBH Publishing, New Delhi.
5. Sharma, P. D. 2001. *Plant Pathology*, Rastogi publications, Shivaji Road, Meerut.
6. Gupta, G.P. 2004. *Text Book of Plant Diseases*. Discovery Publishing House. New Delhi

7. Gupta, V. K. and Sharma, R.C. 2011. Integrated Disease Management and Plant Health. Scientific Publishers

**SAG3S1P- Fundamentals of Plant Pathology and Crop Disease Management –Practical**  
**Credit: 2** **36 Hrs**

**Objectives**

- To familiarize with the symptomatology of plant diseases.
- To develop skill in preparing and using plant protection chemicals and usage of plant protection equipments.

**3 Hrs each for every practical**

1. Common symptoms of plant diseases caused by fungi.
2. Symptomatology of viral diseases
3. Symptomatology of bacterial & phytoplasmal diseases.
4. Estimation of losses due to diseases
5. Method of scoring for diseases and Scoring for important fungal/Viral/bacterial diseases
6. Preservation of plant disease specimens.
7. Familiarization with different groups of fungicides.
8. Preparation of Bordeaux mixture, Bordeaux paste and cheshunt compound  
phytotoxicity of fungicides
9. Preparation of fungicidal spray solutions- methods of application of fungicides -  
spraying and soil drenching.
10. Seed treatment with systemic and contact fungicides.
11. Solarisation for management of soil borne pathogens.
12. Preparation and application of botanicals and bio control agents

**Note:-** 1. Record in proper form should be maintained for the practical. Exercise should be completed in the practical class itself and should be approved by the course teacher on the same day. Each student should submit at the time of final examination a herbarium consisting of **50 (fifty)** well preserved specimen in three installments during the semester.

**SAG3S2T-Protected cultivation of Horticultural crops**

**Credits: 3** **54 Hrs**

**Objectives**

- To familiarize with protected cultivation structures and cultivation practices

**Module1** **12 Hrs**

Introduction - scope and importance - problems and prospects of protected culture in India - growing structures - green house - polyhouse - net house - basic considerations in establishment and operation of greenhouses - maintenance .

**Module 2** **12 Hrs**

Advantages of growing plants in a greenhouse - functioning and maintenance. Manipulation of environmental factors - environmental control systems in green house. Maintenance of cooling and heating system in green houses.

**Module 3** **12 Hrs**  
 Type of containers used in protected culture. Substrate -Use of substrate and preparation of substrate for protected cultivation, soil decontamination. Water management - nutrient management (fertigation).

**Module 4** **10 Hrs**  
 Crop regulation - special horticultural practices in protected cultivation for commercially important crops: vegetable crops, flowering plants, seedlings, etc

**Module 5** **8 Hrs**  
 Harvesting methods - postharvest handling - standards - grading - packing and marketing.

**Suggested Readings:**

1. Farm Information Bureau. 2014. Green House Management & Operations
2. Manohar, K.R. and Thinathane, I.C. 2007. Greenhouse technology and management. B.S.Publications, Hyderabad.
3. Nelson, P.V. 2011. Greenhouse operation and maintenance. Prentice Hal.
4. Prasad and Kumar. 2012. Greenhouse management for horticulture crops. Agrobios (India), Jodhpur

**SAG3S2P-Protected cultivation of Horticultural crops-Practical**

**Credit: 2** **36 Hrs**

- To practice with protected cultivation practices of important crops

**Practical Schedule**

- |  |       |
|--|-------|
| 1. Study of structures utilized for protected culture.                     | 6 Hrs |
| 2. Cost estimation of different growing structures                         | 3 Hrs |
| 3. Design and orientation of poly/green houses.                            | 4Hrs  |
| 4. Study of various inputs used for protected culture                      | 4 Hrs |
| 5. Type of containers used in protected culture.                           | 3Hrs  |
| 6. Use of substrate and preparation of substrate for protected cultivation | 5Hrs  |
| 7. Fertigation system in green houses                                      | 4 Hrs |
| 8. Maintenance of cooling and heating system in green houses.              | 5 Hrs |
| 9. Special horticultural practices in protected cultivation                | 6 Hrs |
| 10. Study of Irrigation equipments in green houses                         | 6 Hrs |
| 11. Visit to commercial green houses.                                      | 6 Hrs |

**SAG3S3T-Integrated Pest management in crops**

**Credits: 3** **54 Hrs**

**Module 1** **8 Hrs**

IPM- introduction, importance, concepts, principles. Tools of IPM- Host plant resistance, definition, mechanisms of resistance, compatibility with other pest management practices - merits and demerits.

**Module 2** **12 Hrs**

IPM Methods- Cultural methods, Mechanical methods, Physical and Legislative methods, Biological methods- definition, methods, advantages, limitations. Natural enemies- parasites, predators and microorganisms used in pest control.

**Module 3** **10 Hrs**

Important groups of micro organisms-bacteria, viruses and fungi used in insect pest control. Mass multiplication techniques of important biocontrol agents.

**Module 4** **12 Hrs**

Chemical control - importance, hazards and limitations. Classification of insecticides based on chemical nature- insecticides of plant origin (botanical insecticides) and Synthetic insecticides. Preparation of neem oil garlic emulsion and tobacco decoction. Formulations of insecticides and calculation of quantity of formulations for field application. Synthetic insecticides -organophosphates, carbamates, synthetic pyrethroids.

**Module 5** **12 Hrs**

Distribution, host-range, symptoms of damage and management practices for major pests of the following crops-Rice, Coconut, Banana, Cashew, Pepper, cardamom, Brinjal, Bittergourd and cowpea.

**Text books:**

1. Mani, M. S. 1968. General Entomology. Oxford and IBH Publishing Company, New Delhi.
2. Nayar, K. K., Ananthakrishnan T. N. and David B.V. 1976. General and Applied Entomology, Tata McGraw Hill Publishing Company Limited, New Delhi.
3. Srivastava, P. D. and Singh, R. P. 1997. An Introduction to Entomology, Concept Publishing Company, New Delhi.
4. Dhaliwal, G. S. and Ramesh Arora. 1998. Principles of Insect Pest Management. Kalyani Publishers, New Delhi.
5. Gour, T. B. and Sridevi, D. 2012. Chemistry, toxicity and mode of action of insecticides. Kalyani publishers, Bangalore, 316 p.
6. Metcalf, R. L. and Luckman, W. H. 1994. Introduction to Insect Pest Management. John Wiley and sons, New York, 605 p.

**SAG3S3P-Integrated Pest management in crops-Practical**

**Credit: 1** **18 Hrs**

1. Familiarization with cultural methods of pest control. **1 Hr**
2. Familiarization with Mechanical methods of pest control. **2 Hrs**
3. Identification of predators. **1 Hr**
4. Identification of microbial agents. **1 Hr**
5. Familiarization with different formulations of insecticides. **1 Hr**
6. Preparation of neem oil garlic emulsion and tobacco decoction. **1 Hr**
7. Familiarization with different insecticides. **1 Hr**
8. Calculation of doses/concentrations of insecticides. **2 Hrs**
9. Preparation of spray fluid for field application. **2 Hrs**
10. Identification, symptoms of damage, collection and preservation of pests of: **6 Hrs**

- a) Rice, Coconut.
- b) Banana, Cashew.
- c) Pepper, cardamom.
- d) Brinjal, Bittergourd and cowpea.

### **SAG3G1T-Plant Physiology**

**Credit: 3**

**54 Hrs**

**Objectives:**

- To familiarise with the physiological processes in plants.
- To learn about plant nutrients and use of growth regulators.

**MODULE 1**

**12 Hrs**

Crop Physiology, Introduction, and importance in agriculture. Growth and development-definition, determinate and indeterminate growth, Measurement of growth, growth analysis growth characteristics, definitions and mathematical formulae.

**MODULE 2**

**10 Hrs**

Plant water relations: Crop water relations, physiological importance of water to plants, water potential and its components, measurement of water status in plants. Transpiration, significance, transpiration in relation to crop productivity, water use efficiency, WUE in C<sub>3</sub>, C<sub>4</sub> and CAM plants. Factors effecting WUE.

**MODULE 3**

**10 Hrs**

Photosynthesis and respiration: Photosynthesis, Energy synthesis, relationship of photosynthesis and crop productivity, photorespiration; Factors affecting photosynthesis and productivity, methods of measuring photosynthesis, photosynthetic efficiency. Harvest index of crops, respiration and its significance.

**MODULE 4**

**10 Hrs**

Plant Nutrients, definition - classification of plant nutrients based on quantity, function and mobility - physiology of nutrient uptake - functions of plant nutrients - deficiency and toxicity symptoms of plant nutrients - foliar nutrition - hydroponics.

**MODULE 5**

**12 Hrs**

Plant growth Regulators: Plant growth regulators - occurrence - mode of action of auxins, gibberellins, cytokinins, ABA, Ethylene. Novel plant growth regulators, commercial application of plant growth regulators in agriculture (with examples in mango, pineapple, cucurbits, ornamental plants, pepper, rubber). Senescence - physiological and biochemical changes and their significance.

**Text books:**

1. Noggle G.R. & Fritz G.J. 1992. Introductory Plant Physiology II End. Prentice Hall of India (P) Ltd., New Delhi
2. Bidwil R.G.S. Plant Physiology II End. Macmillan, Publishing Co., Inc. New York.
3. Salisbury, F. B. & Ross. C.W. Plant Physiology, CBS Publishers & Distributors, New Delhi

4. Malick ,C.P. and Srivastava, A.K.2000.Text book of Plant Physiology. Kalyani publishers,New Delhi.
5. Taiz, Land Zeiger, E. 2014. Plant Physiology. Sinauer Associates, Inc., Publishers
6. Gupta .N.K and Sunita Gupta.2005.Plant Physiology. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.
7. Malick, C.P and Srivastava, A. K.2000. Text book of Plant Physiology. Kalyani publishers, New Delhi.

### **SAG3G1P- Plant Physiology-Practical**

**Credit: 1**

**18 Hrs**

**Objectives:**

- To practise with the estimation of physiological parameters in plants  
**(1-7: 2 Hrs each and 8:- 4 Hrs)**
  1. Growth analysis; calculation of growth parameters, Yield analysis.
  2. Measurement of leaf area by different methods.
  3. Estimation of RWC
  4. Separation of photosynthetic pigments
  5. Estimation of chlorophyll pigments
  6. Stomata; structure; frequency and index.
  7. Identification of plant nutrient deficiency symptoms.
  8. Detection of NPK deficiencies in plant samples by rapid tissue testing.

### **FPR3G1T-CEREALS AND PULSES PROCESSING TECHNOLOGY**

**Credit: 3**

**36 Hrs**

**Objectives**

- To give a general outline about the principles, structure and composition, economic importance, storage and processing of different cereals, pulses and their products.

**Module 1- Rice**

**9hrs**

Cereal grain structure, composition of rice, Processing- Milling, parboiling– Avorio process, conversion process, Malek process and Fernandez process and its advantages, by-products of cereals– starch, gluten, dextrose, dextrin, bran, broken grains, parched rice, puffed rice, flaked rice, popped rice, hulls, rice pollards, bran oil, germ and germ oil, husk, straw.

**Module 2- Wheat**

**8hrs**

Classification of wheat, structure and composition, Harvesting and storage: wheat milling, wheat products: whole wheat flour, maida, semolina, macaroni products and its method of preparation: macaroni, spaghetti and vermicelli.

**Module 3- Millets**

**6hrs**

Corn- types of corn, structure and composition, nutritive value, processing of corn: dry milling, wet milling and alkali processing, products of corn: degerminated flour, corn germ oil, pop corn, corn starch. Jowar, Ragi, Bajra and Rye: Nutritive value and processing.

**Module 4- Breakfast cereals**

**6hrs**

Definition, Nutritive value of breakfast cereals, and classification of breakfast cereals: uncooked breakfast cereals and ready to eat cereals: processing of ready –to-eat cereals

(Batch cooking, continuous cooking and extrusion cookers) and products (flaked cereals, puffed cereals, shredded products, granular products).

#### **Module 5- Pulses**

**7hrs**

Introduction, composition, processing, utilization of pulses, toxic constituents of pulses, important pulses- Bengal gram, red gram, black gram, green gram, moth bean, lentil, horse gram, field bean, pea, khesari dhal, cluster bean, cow pea, kidney bean, soyabean- processing, fermented products of soyabean.

#### **Text books:**

1. David Dendy A.V, etal; *Cereals and Cereal Products: Technology and Chemistry*, - 2000
2. Manay, N.S, Shadaksharaswamy, M., *Foods- Facts and Principles*, New Age International Publishers, New Delhi, 2004.
3. Potter, N.N. and Hotchkiss J. H. *Food Science*. CBS publishers and distributors. 1996.
4. Srilakshmi, B. *Food Science*. New Age International Publishers, New Delhi, 2003.
5. Subalakshmi, G and Udipi, S.A. *Food processing and preservation*. New Age International Publishers, New Delhi, 2001.

#### **FPR3G1P - Cereals and pulses processing technology-practical**

**Credit: 1**

**18 hrs**

#### **Objectives:**

- To give a general outline of the processing of different cereals, pulses and their products.
  1. Manufacture of bread 16 hrs
  2. Manufacture of cake 8 hrs
  3. Manufacture of biscuit 8 hrs

#### **Text Books:**

1. Manay, N.S, Shadaksharaswamy, M., *Foods- Facts and Principles*, New Age International Publishers, New Delhi, 2004.
2. Potter, N. N, Hotchkiss, J. H. *Food Science*. CBS Publishers, New Delhi. 2000.
3. Srilakshmi, B. *Food Science (3<sup>rd</sup> edition)*, New Age International (P) Limited Publishers, New Delhi, 2003.

#### **EE3G1T - Analysis of Environmental Impacts**

**Credits: 4**

**72 hrs**

#### **Course Objectives:**

- To have an idea of the impacts of manmade activities on the environment.
- To have an understanding of the possible remedies in this regard.

#### **Module 1**

**14 Hrs**

Social issues and the environment– Urban Problems Related To energy – Water conservation, Rain Water Harvesting, Watershed Management – Environmental Ethics:- Issues and Possible Solutions

#### **Module 2**

**20 Hrs**

Climate Change, Global Warming, Acid Rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust, Consumerism and Waste Products. Impacts of climate change: Extreme

weather events, Temperature Rise, Sea Level rise, Coastal Erosion and landslides; future impacts of global warming, global warming and the hydrological cycle, climate change impact on ecosystems and agriculture.

### **Module 3**

**20 Hrs**

Impact of Developmental Activities and Land use, surface water, Air and Biological environment, Air pollution sources, of Air pollution Impact. Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

### **Module 4**

**18 Hrs**

Possible remedies of global warming- various mitigation and adaptation measures taken/ proposed to combat global warming; National and International policies to combat global warming and climate change-UNFCCC Kyoto Protocol, Role of countries and citizens in mitigating Global Warming

#### **Text books:**

1. Y. Anjaneyulu, *Environmental Impact Assessment Methodologies*, B.S. Publication, Sultan Bazar, Hyderabad. 2002
2. J. Glynn and Gary W. Hein *Environmental Science and Engineering*, Prentice Hall Publishers 2000
3. Suresh K. Dhaneja – S.K., *Environmental Science and Engineering*, Katania & Sons Publication. New Delhi. 1998
4. Dr H.S. Bhatia *Environmental Pollution and Control*, Galgotia Publication (P) Ltd, Delhi, 1996
5. Current trends in Global Environment by A.L. Bhatia (2005) Energy Sources
6. Global Warming – A Very Short Introduction, Mark Maslin, Oxford.
7. UNFCCC & IPCC reports ([www.unfccc.int](http://www.unfccc.int) & <http://www.ipcc.ch/>)
8. Global Warming The Complete Briefing - John T Houghton Cambridge press
9. Climate Change: A Multidisciplinary Approach, by William James Burroughs, Cambridge press
10. Contemporary climatology-Robinson, Taylor and Francis group

## **SAG3GI1**

### **Cultivation of rice**

#### **Credit: 4**

#### **Objectives**

- To understand the sustainable cultivation aspects of rice under low land condition

Rice-crop planning, Nursery raising: Land preparation, seed treatment, sowing, water management, nutrient management, and plant protection Main field preparation, transplanting, nutrient management, water management, Identification of weeds and weed management, Identification of insect pests and diseases and plant protection, harvesting, postharvest handling of produce, storage and marketing of produce. Harvest Index- Preparation of balance sheet including cost: benefit ratio (A minimum 5cents will be allotted to each student).

**Note:** In addition to regular practicals, the students will complete certain time bound operations after the regular class hours.

## SEMESTER- 4

### **SAG4S1T- Management of Weeds, Medicinal plants and Fodder crop production**

**Credit: 3**

**54 Hrs**

#### **Objectives**

- To understand the general characters of weeds and their management
- To acquaint with cultivation of fodder crops, etc.

#### **MODULE 1**

**12 Hrs**

Weeds: Introduction, harmful and beneficial effects, classification, propagation and dissemination. Concepts of weed prevention, control and eradication. Aquatic and problematic weeds and their control.

#### **MODULE 2**

**8 Hrs**

Methods of weed control: physical, cultural, chemical and biological methods. Integrated weed management (IWM)

#### **MODULE 3**

**12 Hrs**

Herbicides: advantages and limitation of herbicide usage in India, Herbicide classification, formulations, methods of application. Compatibility of herbicides with other agro chemicals; Weed management in rice, banana, pineapple, coconut, rubber, vegetables.

#### **MODULE 4**

**8 Hrs**

Origin, economic importance, soil and climatic requirement, varieties, cultural practices, harvesting and postharvest handling of major Medicinal plants.

#### **MODULE 5**

**14 Hrs**

Agrostology - Important terms and definitions - Importance in live stock nutrition - classification of fodder crops, economic importance, soil and climatic requirements, varieties, cultural practices, harvesting and yield (Guinea grass, Hybrid Napier, Congo signal, Gambagrass, Setaria, Cereal fodders, Ground legumes, Tree legumes, Pastures) and Forage preservation.

#### **Text books:**

1. Balasuramaniyan, P. and Palaniappan, SP. 2003.Principles and Practices of Agronomy.Agrobios(India)
2. ICAR [Indian Council of Agricultural Research].2006. Hand Book of Agriculture. ICAR, New Delhi
3. KAU [Kerala Agricultural University].2007.Package of Practices Recommendations - Crops. Directorate of Extension, Kerala Agricultural University, Thrissur
4. Thomas, J., Joy, P.P., Mathew, S., Skaria, B.P., Duethi, P.P. and Joseph, T.S. 2000.Agronomic Practices for Aromatic and Medicinal Plants. Directorate of Arecanut and Spices Development, Kozhikode.
5. Gurmel Singh, C. Venkataraman, G., Sastry,B. and Joshi, P. 1990.Manual of Soil and Water Conservation Practices. Oxford and IBH Publishing Co., New Delhi.
6. Rao, V.S. 2000. Principles of Weed science. Oxford & IBH Publishing Co. New Delhi

7. Lenka, D. 2001. Irrigation and Drainage. Kalyani Publishers, New-Delhi.
8. Mal, B. C. 2002. Introduction to Soil and Water Conservation Engineering, Kalyani
9. Aldrich, R.J. and Kramer, R.J. 1997. Principles in Weed Management. Panama Publications, New Delhi.
10. Ashton, P.M. and Crafts, A.S. 1981. Mode of Action of Herbicides (2 Ed.) Wiley- Inter Science, New York.

**SAG4S1P- Management of Weeds, Medicinal plants and Fodder crop production -  
Practical**

**Credit: 2**

**36 Hrs**

**Objectives**

- To familiarize with the general characters of weeds and their management.
- To familiarize with cultivation of rice, fibre crops, fodder crops etc.

**(4 Hrs each)**

1. Techniques of weed collection, identification and preparation of herbarium of weeds.
2. Herbicide formulation and identification - Herbicide label information.
3. Study of herbicide application equipments and calibration.
4. Computation of herbicide doses.
5. Field practice of spraying herbicides in the field.
6. Recording observations on the effect of herbicides on crops and weeds.
7. Familiarization and planting of various fodder crops and their preservation.
8. Familiarization and planting of major medicinal plants.

**SAG4S2T- Livestock Farming**

**Credit: 3**

**54 Hrs**

**Objectives**

- To familiarize with fundamentals of livestock farming.
- To acquaint with the management of various farms.

**MODULE 1**

**10 Hrs**

Role of Livestock in National economy: Management- Principles of management, Functions of management, Tools of management. General Management Practices in Dairy farming- Grooming, Drying off, Control of bad habits, Castration, Dehorning, Trimming, Shoeing, Identification marks, removing extra teats.

**MODULE 2**

**12 Hrs**

Cattle and Buffalo management- Housing of Cattle, Calf raising, Heifer management, Management of pregnant and lactating cow and Buffaloes, Care and management of cross breed cow, Care and management of breeding bull. Clean milk production: Source of contamination. Milk Industry: Dairy Development in India- Operation Flood Programme, Contribution of Military Dairy Farm, NDDB, NDRI, Milk grid to dairy development. Dairy

Co-operatives structure and functions

**MODULE 3** **8 Hrs**

General management practices in Goat, Rabbit and Pig farming

**MODULE 4** **8 Hrs**

General Management practices in Poultry, Duck and Quail Farming

**MODULE 5** **16 Hrs**

Classification of Animal Diseases: Study of major Diseases- Foot and mouth disease (FMD) Rinderpest, Anthrax, Black quarter (BQ), Haemorrhagic Septicaemia (HS). Study of Parasitic Diseases: Brucellosis, Babesiosis, Theileriosis. Diseases of lactating cow: Mastitis, Dystokia Milk fever, Prolaps, Ketosis. Diseases of Calves: Pneumonia, Calf score, Diarrhoea. Poultry Diseases- Ranikhet, Coccidiosis, Bird flu, Parasites of poultry. First aid measures. Disposal of carcasses.

**Text books:**

- 1) A Text Book of Animal Husbandry by G.C. Banarjee
- 2) A Text Book of Animal Science by Dr. A.U. Bhikane and Dr. S.B. Kawitkar
- 3) Advances in Dairy Animal Production by V.D. Mudgal, K.K. Singhal and D.D. Sharma
- 4) Handbook of animal Husbandry, The I.C.A.R. publication
- 5) Animal Husbandry & Dairy Science by Jagdish Prasad.
- 6) Dairy India Yearbook - 2007 by P.R. Gupta
- 7) Handbook of Veterinary Physician by V.A. Sapre
- 8) Farm Animal management and feeding practices in India by Thomas & Shashtri
- 9) Dairy Microbiology by K.C. Mahanta

**SAG4S2P- Livestock Farming-Practical**

**Credit: 1** **18 Hrs.**

**Objectives**

- To familiarize with practices in livestock farming.
- To acquaint with the management of important farm animals and birds

1. Morphology of cattle, buffalo and poultry **1hrs**
2. Classification of Cattle Breeds **1hr**
3. Study of Cattle Breeds **1hrs**
  - a. Milch : Gir, Sahiwal, Red Sindhi,
  - b. Draught: Khillar, Dangi, Red kandhari.
  - c. Dual: Deoni, Hariyana
  - d. Exotic: Jearsy, H.F.
  - e. Cross breed: Holdeo, Jerdeo.
4. Study of Buffalo Breeds: Murrah, Jaffrabadi, Nagpuri and Surti **2hrs**
5. Study of Goat breeds: Osmanabadi, Jamnapuri, Saanem **2hrs**
6. Study of Duck breeds: Chara Chemballi, Khaki, Campbell, Vigova **2hrs**
7. Identification marks of farm animals **1hr**
8. Handling and casting of farm animals **1hr**
9. Determination of body weight of animal **1hr**

10. Visit to veterinary hospital 2hrs  
 11. Visit to Dairy farm/ Poultry farm/Goat farm/Duck Farm 2hrs

### **SAG4S3T- Agricultural Engineering and Farm Machinery**

**Credit: 2** **54 Hrs**

#### **Objectives**

- To familiarize with fundamentals of water management
- To acquaint with various soil conservation methods
- To acquaint with farm machineries and their working

#### **MODULE 1**

**8 Hrs**

Irrigation: definition and objectives. Role of water in soil and plants- Irrigated agriculture vs. Rainfed agriculture, dry farming and dryland farming-definition.

#### **MODULE 2**

**10 Hrs**

Evapo-transpiration, potential evapo-transpiration and consumptive use, Reference crop evapo-transpiration (ET<sub>o</sub>) - Crop co-efficient (K<sub>c</sub>) - K<sub>c</sub> values for different crops. Methods of determining water requirement-effective rainfall. Methods of irrigation and their engineering aspects - surface irrigation, sprinkler, drip - Agronomic techniques to improve water use efficiency- factors affecting water use efficiency.

#### **MODULE 3**

**10 Hrs**

Soil erosion- nature and extent of erosion; types- soil erosion by water- different forms- Soil conservation vs. water conservation - agronomic measures- mechanical measures- Role of grasses and pastures in soil conservations; Wind breaks and shelter belts.

#### **MODULE 4**

**10Hrs**

Water harvesting techniques - in situ and ex situ water harvesting methods - Farm ponds, percolation ponds or wells, check basin, minor irrigation tanks.

#### **MODULE 5**

**16 Hrs**

Ploughs like chisel plough, subsoiler and rotary plough etc. Harrows, Cultivators, Puddlers, Bund former, Ridger etc. Seed drill and seed cum fertilizer drill- components-types-calibration. Planter-functions-components. Plant protection equipments-sprayer-types-components-care and maintenance. Harvesters.

#### **Text books:**

1. Dhruvanarayana, V.V. 1993. *Soil and Water Conservation Research in India*. ICAR, New Delhi.
2. Gurmel Singh, C. Venkataraman, G., Sastry, B. and Joshi, P. 1990. *Manual of Soil and Water Conservation Practices*. Oxford and IBH Publishing Co., New Delhi.
3. Hansen, V.Eh., Israelsen, O.W., and Stringham, G.E. 1979. *Irrigation Principles and Practices* (4<sup>th</sup> Ed.). John Wiley and Sons, New York.
4. Lenka, D. 2001. *Irrigation and Drainage*. Kalyani Publishers, New-Delhi.
5. Mal, B. C. 2002. *Introduction to Soil and Water Conservation Engineering*, Kalyani Publishers, New-Delhi.

6. Michael, A.M and Ojha, T.P. 2005. *Principles of Agricultural Engineering-Vol.II*.Jain Brothers, New Delhi.
7. Michael, A.M. 1988. *Irrigation Theory and Practice*.Vikas Publishing House Pvt. Ltd., New Delhi.
8. Kumar,S., Kumar, V. and Sahu, R.K. 2016. *Fundamentals of Agricultural Engineering*. Kalyani Publishers, New Delhi.

### **SAG4S3P - Agricultural Engineering and Farm Machinery -Practical**

**Credit: 2** **36 Hrs**

#### **Objectives**

- To familiarize with fundamentals of water management measures
  - To acquaint with various soil conservation methods
1. Methods of irrigation – border, strip, check basin, ring, and corrugation furrow **8 Hrs**
  2. Drip and sprinkler irrigation, components, design aspects -Erection and operation of drip and sprinkler irrigation system; **8 Hrs**
  3. Cost estimation of drip irrigation system; fertigation, injection and flushing of laterals; **4Hrs**
  4. Studies of different engineering measures of soil conservation **4Hrs**
  5. Visit to a water management research station **12 Hrs**
  6. Study of farm/ homestead friendly equipments and implements
  7. Study of paddy transplanter and harvester
  8. Study of sprayers, repair and its calibration
  9. Operation of brush cutter
  10. Operation of coconut climber
  11. Operation of power tiller

### **SAG4S4T- Commercial vegetable production**

**Credit: 3** **54 Hrs**

#### **Objectives**

- To understand about Types of vegetable farming
- To get a knowledge in importance and scope of vegetable crops of India

**Module 1** **12 Hrs**

Introduction - Importance and scope of vegetable crops of India with special emphasis to Kerala. Nutritional importance- nutrient value of vegetables, ANV. Classification of vegetables - types of classification and their bases - Botanical, cultural, thermo classification, classification based on parts used.

**Module 2** **8 Hrs**

Factors affecting vegetable production- soil, temperature, light, water, nutrients. Basic principles of vegetable production. Nursery, sowing and transplanting, Care and management.

**Module 3** **12 Hrs**

Types of vegetable farming - Kitchen garden; Market garden; Truck garden; vegetable forcing; Vegetable garden for seed production; Hydroponics, aeroponics, Riverbed system, Terrace

Garden etc. Kitchen garden- site selection, principles of layout, cropping schedule. Growth regulators -role of growth regulators in vegetable production and methods of application.

**Module 4**

**12 Hrs**

Production technology of warm season vegetable- Importance, origin, taxonomy, varieties, cultivation, problems and prospects for Solanaceous crops- tomato, brinjal and chilli- Cucurbits- bitter gourd, snake gourd, cucumber, melons, pumpkins, watermelon and ivy gourd. Leguminous crops- vegetable cow pea and winged bean. Other vegetables-okra, amaranthus.

**Module 5**

**8 Hrs**

Production Technology of cool season vegetables- Importance, origin, taxonomy, Varieties, cultivation, problems and prospects of potato, cole crops- cabbage & cauliflower. Root crops- carrot, radish, beetroot. Bulb crops- onion, garlic and Leafy vegetables.

**SAG4S4P - Commercial vegetable Production - Practical**

**Credit: 1**

**18 Hrs**

**Objectives**

- To Familiarize with different vegetable crops
- To understand Main field preparation and planting of transplanted tropical vegetable crops

**(2 Hrs each)**

1. Familiarization of different vegetable crops- through field visits and slide show.
2. Main field preparation and planting of transplanted tropical vegetable crops.
3. Main field preparation and planting of direct sown vegetable crops.
4. Preparation of nursery bed, sowing and aftercare of seeds of vegetable crops.
5. Preparation of growth regulator solutions and application.
6. Maturity indices and harvesting of vegetables for vegetable purpose and seed purpose.
7. Identification and familiarization of cool season vegetables.
8. Main field preparation and planting of cool season vegetables.
9. Visit to the farmer's fields in the vegetable growing areas to study the field problems faced by the farmer.

**FPT4G1T- DAIRY TECHNOLOGY**

**Credit: 3**

**36 Hrs**

**Objectives**

- To know the importance of milk as an agricultural commodity
- To be innovative in exploring various traditional and nontraditional milk products

**Module 1- Introduction**

**10 Hrs**

Definition, different sources of milk and their composition, factors affecting composition of milk. Physio-chemical properties of milk constituents. Microbiology of milk, Collection and transportation of milk. Grading of milk.

**Module 2- Milk Processing**

**10 Hrs**

Pasteurized milk, Sterilized milk, Homogenized milk, Flavored milk, frozen concentrated milk, Fermented milk, Reconstituted milk, Recombined milk, Toned and double toned milk, Vitaminised/ Irradiated milk, milk powder.

**Module 3- Butter and cream** **10 Hrs**

Definition, classification, composition and nutritive value, method of manufacture, packaging & storage. Uses of butter and its defects.

**Module 4- Cheese, Ice cream and condensed milk** **10 Hrs**

Cheese: definition, classification, composition and nutritive value, Manufacture of cheddar cheese and cottage cheese, defects in cheese, their causes and prevention, uses of cheese.

Ice-cream: Definition, composition and nutritive value, role of constituents, method of manufacture & storage. Uses of ice-cream, defects in ice-cream Condensed& Evaporated milk- processing.

**Module 5- Indigenous Dairy Products** **14 Hrs**

Fat rich products- Ghee, Makkan and Malai , Concentrated Products- Khoa , Rabri and Basundi Coagulated Products- Chhana and Paneer, Fermented Products- Dahi , Chakka, Shrikhand and Lassi, Frozen Products- Kulfi and Kulfa, Gulab Jamun, Rasagulla.

**Text books:**

1. Godbole, N.N; Milk – The Most Perfect Food ; Biotechnology books, 2007
2. Manay, N.S, Shadaksharaswamy, M., Foods- Facts and Principles, New Age International Publishers, New Delhi, 2004.
3. Potter, N. N, Hotchkiss, J. H. Food Science. CBS Publishers, New Delhi. 2000.
4. Spreer E and Mixa, A; Milk and Dairy Product Technology; Marcel Dekker, 2005
5. Srilakshmi, B. Food Science (3<sup>rd</sup> edition), New Age International (P) Limited Publishers, New Delhi, 2003.
6. Sukumar De; Outlines of dairy technology; Oxford University Press; 2001
7. Walstra A, Geurts T.J and Noomen, A; Dairy Technology – Principles of milk and Properties and Processes; Marcel Dekker, 2005

**FPT4G1P- DAIRY TECHNOLOGY- PRACTICAL**

**Credit: 1** **18 Hrs**

**Objectives**

- To analyze the chemical constituents of milk as an agricultural commodity
- To be innovative in exploring various traditional and nontraditional milk products

1. **Analysis of milk** **8 hrs**  
Estimation of acidity  
Estimation of lactose  
Estimation of protein by Sorenson formol titration  
Estimation of milk fat  
Adulteration testing- starch, cane sugar, water
2. Processing of ice cream **4 Hrs**
3. Manufacture of paneer **2 Hrs**
4. Manufacture of Rasogulla **2 Hrs**

5. Processing of gulab jamun **2 Hrs**

**Text books:**

1. Godbole, N.N; Milk – The Most Perfect Food ; Biotechnology books, 2007.
2. Kalia, M. Food Analysis and Quality Control. Kalyani Publishers, New Delhi. 2002.  
Winton, A.L and Winton, K.B. Techniques of food analysis. Allied Scientific Publishers, New Delhi. 1999.
3. Nielsen, S.S. Introduction to the chemical analysis of foods. Jones and Bartlett Publishers, Boston, London. 2003.
4. Manay, N.S, Shadaksharaswamy, M., Foods- Facts and Principles, New Age International Publishers, New Delhi, 2004.
5. Potter, N. N, Hotchkiss, J. H. Food Science. CBS Publishers, New Delhi. 2000.

**EE4G1T - ENERGY CONSERVATION TECHNIQUES**

**Credits: 4** **72 hrs**

**Course Objectives:**

- To understand the importance of Energy Conservation.
- To understand the methodology of energy management.
- To understand energy audit and conservation technics.

**Module 1** **16 Hrs**

Energy – Power – Past & Present Scenario of World; National Energy Consumption Data – Environmental Aspects Associated With Energy Utilization. Energy Crisis – Causes and Consequences – Remedial Measures– Impact of Energy Consumption and Production on Environment with illustrations.

**Module 2** **16Hrs**

Energy Planning and Energy Conservation – Meaning, Objectives and Importance – Energy Management – Meaning, Objectives and Importance – Recent Developments – Energy Auditing – Energy Accounting – Energy Pricing and Taxes.

**Module 3** **20 Hrs**

Energy Auditing: Need, Types, Methodology And Barriers. Role of Energy Managers. Energy Audit: Preliminary Energy Audit, Detailed Energy Audit, Investment Grade Energy Audit, Industrial Energy Audit, Utility (Services) Energy Audit, Commercial Energy Audit, Residential Energy Audit. Instruments for Energy Auditing. Energy Audit Strategies: Monitoring and Control, Questioning the Need, Minimizing the Need of End Use, Minimizing the Losses, Operating the Equipment at Optimum Efficiency, Operating the Most Efficient Equipments from Set of Equipments, Proper Maintenance of the Equipment, Fuel Substitutions, Quality Control and Recycling.

**Module 4** **20 Hrs**

Energy Conservation Act 2001 and related policies, Schemes of Bureau of Energy Efficiency (BEE). Heating, ventilation, air conditioning (HVAC) and Refrigeration System: Factors affecting Refrigeration and Air conditioning system performance and savings Opportunities. Components of EB Billing- Illumination – Lux, Lumens, Types Of Lighting, Efficacy, LED Lighting and Scope of Energy conservation in Illumination.

**Text Books:**

1. Energy Manager Training Manual (4 Volumes) Available At [Www.Energymanager Training.Com](http://www.Energymanager Training.Com), A Website Administered By Bureau Of Energy Efficiency (BEE), A Statutory Body Under Ministry Of Power, Government Of India, 2004.
2. Witte. L.C., P.S. Schmidt, D.R. Brown, "Industrial Energy Management AndUtilisation" Hemisphere Publ, Washington, 1988.
3. Callaghn, P.W. "Design And Management For Energy Conservation", Pergamon Press, Oxford, 1981.
4. Dryden. I.G.C., "The Efficient Use Of Energy" Butterworths, London, 1982
5. Turner. W.C., "Energy Management Hand Book", Wiley, New York, 1982.
6. Murphy. W.R. And G. Mc KAY, "Energy Management", Butterworths, London 1987.

**SAG4GI1****Organic vegetable cultivation****Credits: 4****Objectives**

- To familiarize with organic vegetable cultivation in field.

Main field preparation, transplanting, nutrient management, weed management, and plant protection aspects of organic vegetable farming.

**Note:** In addition to practical hours, the students will complete certain time bound operationsafter the regular classhours.

**SEMESTER - 5**  
**SAG5S1T- Landscape designing and indoor gardening**

**Credit: 3**

**54 Hrs**

**Objectives**

- To get awareness on designing and laying out of a landscape.
- To familiarise with different types and features of garden.

**MODULE 1**

**10 Hrs**

Designing of landscape: Principle of landscape design. Selection and use of plants in the landscape. Preparation of landscape plan. Various soft wares used in garden designing. Digitalization in designing. Computer aided landscape designing - GIS.

**MODULE 2**

**10 Hrs**

Maintenance of plants in landscape: Planting and maintenance of plants in the landscape. Methods of irrigation - sprinkler and drip irrigation-pot irrigation, wick irrigation etc. Methods of application of fertilizers to garden plants.

**MODULE 3**

**10 Hrs**

Garden tools: Use of tools and implements. Use of different types of sprayers, lawn mowers, hedge cutters, tree cutters, leveling methods.

**MODULE 4**

**10 Hrs**

Garden structures and garden types: Garden structures, roads and paths, enclosures, paving, garden lights, furniture. Different types of garden and features. Establishment and maintenance of lawn.

**MODULE 5**

**12 Hrs**

Indoor gardening: Selection of indoor plants. Layout and designs of indoor gardens - types of containers used, media composition, preparation of media, planting and placement of plants. Models for interior plant scaping - vertical garden, miniature garden and terrariums. Manuring, irrigation, illumination, grooming and holiday care of indoor plants.

**Text books:**

1. Edmond, JB., Sen, TD, Andrews, TS and Halfacre, RG. 1977. *Fundamentals of Horticulture*. Tata McGraw Hill, New Delhi.
2. Janick, J. 1963. *Horticultural Science*. W.H. Freeman, Sanfrancisco.
3. Kumar, N. 1990. *Introduction to Horticulture*, Rajalekshmi Publication, Nagercoil.
4. Carpenter, P.L., Walker, T.D and Lanphear, F.O. 1975. *Plants in the Landscape*. W.H. Feeman and Co., San Francisco.
5. Desai, B.L. 1979. *Planning and Planting of Home Gardens*. Indian Council of Agricultural Research, New Delhi.
6. Joiner, J.N. 1981. *Foliage Plant Production*. Prentice Hall Inc. London.
7. Nambisan, K.M.P. 1991. *Design elements of landscape gardening*. Oxford & IBH Publishers Pvt. Ltd Calcutta.
8. Swarup, V. 1993. *Indoor Gardening*. ICAR, New Delhi.
9. Trivedi, P.P. 1983. *Home Gardening*. Indian Council of Agricultural research, New Delhi.

## **SAG5S1P - Landscape designing and indoor gardening - Practical**

**Credit: 1**

**18 Hrs**

### **Objectives**

- To develop skill in planning and planting of garden lawn.
- To develop skill in preparation of different types of gardens.

**(1.5 Hrs each)**

1. Preparation of landscape plan, identification of plants.
2. Use of software in landscape designing, computer aided landscape designs.
3. Planting of lawn.
4. Rolling and mowing of lawn - use of different types of lawn mowers.
5. Planting of trees and shrubs, preparation of flower beds. Pruning of shrubs, hedges and trees.
6. Application of manures and fertilizers to garden plants. Practice in different methods of irrigation in landscapes.
7. Practice in application of plant protection chemicals, use of different types of sprayers.
8. Selection and establishment of enclosures and paving.
9. Layout of roads, paths and walks.
10. Preparation of rock garden.
11. Designing indoor garden.
12. Preparation of miniature garden and vertical garden. Preparation of terrarium.

## **SAG5S2T-Commercial Enterprises**

**Credit: 3**

**54 Hrs**

### **Objectives**

- To understand various commercial enterprises in agricultural sector through observation, field visits and presentation.

### **MODULE 1**

**12 Hrs**

Scope and Importance of commercial enterprises related to Agriculture and allied sectors. Important commercial enterprises - Sericulture - history and development. Types of silkworms in India - morphology, biology, rearing of silkworms. Host plants and their cultivation. Diseases and enemies of silkworm and their control.. Scope of sericulture in Kerala

### **MODULE 2**

**10 Hrs**

Beekeeping -history and development. Honey bees- kinds of bees, biology-Hiving and domestication. Seasonal management of bees. Bee pasturage. Bee products- extraction, uses, composition and preservation. Diseases and enemies of honey bees and their control. Bee poisoning. Scope of apiculture in Kerala. Recent advances in apiculture research

### **MODULE 3**

**14 Hrs**

Mushroom cultivation, Importance of mushroom cultivation - definition of mushroom - its importance - general morphological features, taxonomy and identification of different mushrooms-poisonous, hallucinogenic and medicinal .Mushrooms. Pure culture of mushrooms and their nutritional requirements. Definition of spawn, substrate for spawn, types of spawn, methods of spawn production, characteristic of a good spawn, storage of spawn. Cultivation of Agaricus species - composting - its formulation, casing, preparation of casing mixture, sterilization. Identification and management of different pests and diseases of mushrooms.

Methods of harvesting mushrooms, post harvest treatments and preservation of mushrooms. Packing and processing - Different methods of processing, canning and dehydration. Nutritive value of mushrooms and preparation of different recipes.

#### **MODULE 4**

**12 Hrs**

Commercial floriculture, Status and prospects of commercial cultivation of flowers. Cultivation aspects of traditional and cut flowers - jasmine, crossandra, marigold, tuberose, gladiolous, heliconia etc. Commercial cultivation of orchid's and anthurium. Status and prospects of Kerala. Classification and varieties, planting material production, methods of planting, media components and management, shade regulation, irrigation, nutrition, plant protection, stage and method of harvest, postharvest handling and marketing. Economics of cultivation.

#### **MODULE 5**

**6 Hrs**

Introduction to Aquaculture, Production Systems: EP and IP, Species To Farm, Setting Up A Fish Farm, Fish Foods and Feeding, Harvesting

#### **Text books:**

1. Ganga, G. and Sulochanachetty. 1999. *An Introduction to Sericulture* Second edition. IBM and Oxford Publishing Company, New Delhi.
2. Groul, R.A. 1963. *The Hive and the Honeybee*. Dadani and Sons.Inc. Illinois.
3. Krishnaswami, S., Narasimhanna, Suryanarayana and Kumararaj. 1991. *FAO Manuals on Mulberry Cultivation, silkworm rearing and silk reeling*. IBM and Oxford Publishing Company, New Delhi.
4. Mishra, R. C. 1998. *Perspectives in Indian Apiculture*. Agro botanica, Bikaneer, Rajasthan
5. Sardar Singh. 1962. *Bee Keeping in India*. ICAR, New Delhi.
6. Chang, S. T. Miles, P. G. and Hays, W. A. 1978. *The Biology and Cultivation of Edible Mushrooms*. Academic Press, London.
7. Lulu Das. 2002. *Mushroom Recipes*. (Released in the VIII Biennial meeting of AICMIP).
8. Nair, M. C. 1995. *Beneficial Fungi and Their Utilization*. Scientific publishers, New PaliRoad, Jodhpur.
9. Randhawa, G.S. and Mukhopadhyay, A. 1986. *Floriculture in India*. Allied publishers New Delhi.
10. Rogers, J. 1974. *Flower arranging*. Hamlyn, London.
11. Roger C. 2017. *Acquaculture and Fish farming*. Syrawood Publishing House
12. Christenson, K. *Aquaponics: Aquaculture - An Introduction To Aquaculture For Small Farmers*, 3<sup>rd</sup> Edn.

### **SAG5S2P - Commercial Enterprises- Practical**

**Credits: 1**

**18 Hrs**

- **Objectives** To develop awareness on bee keeping, sericulture and lac culture through observation, field visit and reporting.
- To develop skill in cultivation of edible mushrooms and to develop skill in dry flower production and bouquet making.

**(2 Hrs each)**

1. Different types of bees and bee equipments.
2. Handling of bee colonies.
3. Extraction and processing of honey.
4. Visit to apiaries.
5. Identification of silkworms
6. Laboratory rearing of mulberry silkworms and visit to rearing units.
7. Identification of common edible and poisonous mushrooms.
8. Preparation of substrates for mushroom cultivation.
9. Paddy straw mushroom cultivation.
10. Mushroom cultivation in bottles
11. Paddy straw mushroom cultivation.
12. Visit to a commercial mushroom production unit.
13. Visit to a commercial mushroom production unit.
14. Methods of harvesting mushrooms.
15. Mushroom recipes – preparation.
16. Production techniques of dry flowers.
17. Visit to commercial production units of orchids, anthurium and other cut flowers.
18. Different types of fishes used for aquaculture
19. Silpauline pond preparation

**SAG5S3T-Fundamentals of organic farming**

**Credits: 3**

**54 Hrs**

**Objectives**

- To familiarize with the concept of sustainability and sustainable development.
- To acquaint with the fundamentals of organic farming.
- To have the knowledge about the organic certification procedures.

**MODULE 1**

**12 Hrs**

The concept of sustainability and sustainable development-emerging issues- Sustainable agriculture- concept themes- differences between conventional, sustainable, and alternate agriculture- Various alternate agricultural systems- Conventional, sustainable, and alternate agriculture- Alternate agricultural systems- biodynamic farming, natural farming, organic farming, permaculture, homa farming, and other formslimitations- Modernization of agriculture and its relation to sustainability.

**MODULE 2**

**12 Hrs**

Factors affecting ecological balance and ameliorative measures- Indian agriculture in terms of availability of natural resources and their carrying capacity- Strategies for realizing sustainable

agriculture- low vs. high external input agriculture -Natural resource management as a part of sustainable resource management -crop production practices- animal production practices- Basic ecological principles of LEISA - promising LEISA techniques and practices –Good Agricultural Practices(GAP)- GAP certification -Improved manure handling - crop residue management - strategic use of chemical fertilizers and pesticides, traps, repellants and biological control, water conservation measures for sustainability- water harvesting - ITK and farmer centered techniques and practices.

### **MODULE 3**

**10 Hrs**

Organic agriculture-history-concepts- philosophy- objectives, opportunities and priorities- Criticisms- Organic farming and food security-Principles of organic farming. Tools and practices of organic farming: Planned crop rotation, Green manures and cover crops, Manuring and composting, multiple cropping.Intercropping in relation to maintenance of soil productivity.

### **MODULE 4**

**10 Hrs**

Biological pest control: Different traps and pheromones for pest control. Biocontrol of weeds, diseases and insect pests, Sanitation, Tillage and cultivation, Mulching, Supplemental fertilization, Biorational pesticides, Foliar fertilization.

### **MODULE 5**

**10 Hrs**

Socio-economic impacts; Marketing and export potential - Current status of organic farming - Initiatives in India and Kerala- National Programme for Organic Production (NPOP) - Operational structure of NPOP-Accreditation agencies- Certification Agencies - National Standards for Organic Products ( NSOP)-inspection and certification procedures.

### **Text books:**

1. Ananthkrishnan, T.N. (ed.) 1992. Emerging Trends in Biological Control of Phytophagous insects.Oxford & IBH, New Delhi.
2. Chhonkar, P.K. and Dwivedi, B.S. 2004. Organic farming and its implications on India's food security.Fertil. News 49(11): 15-18,21-28,31&38.
3. Gaur, A.C. 1982. A Manual of Rural Composting. FAO/UNDP Regional Project Document, FAO, Rome.
4. Howard, A. 1940. An Agricultural Testament. Oxford University, London. Lampin, N. 1990. Organic Farming. Farming Press Books, Ipswich, U.K.
5. Palaniappan, S.P and Anandurai, K. 1999. Organic Farming- Theory and Practice, Scientific Pub., Jodhpur.
6. Reddy, M.V. (ed.) 1995.Soil organism and Litter decomposition in the Tropics. Oxford &IBH, New Delhi.
7. Singh, S.P. (ed.) 1994. Technology for Production of Natural Enemies, Project Directorate of Biological Control, Bangalore.
8. Trewavas, A. 2004. A critical assessment of organic farming and food assertions with
9. Veeresh, G.K., Shivashankar, K. and Singlachar, M.A. 1997. Organic Farming and Sustainable Agriculture, Association for Promotion of Organic Farming, Bangalore.
10. Woomer, PL. and Swift, M.J. 1994. The Biological Management of Tropical Soil Fertility,.S.B.F. & Wiley.

### **SAG5S3P-Fundamentals of organic farming- Practical**

**Credits: 1**

**18 Hrs**

#### **Objectives:**

- To familiarize with the production and utilization of biofertilizers and biocontrol agents.

**(1.5 Hrs each)**

1. Preparation of enriched farm yard manure.
2. Coir pith composting.
3. Preparation of Vermicompost.
4. Study and field application of biofertilizers.
5. Raising green manure crops and cover crops.
6. Plant protection through bio-agents and traps.
7. Plant protection using pheromones.
8. Azolla cultivation
9. Visit to urban waste recycling unit.
10. Visit to poultry and dairy units to study resource allocation, utilization and economics.
11. Visit to an organic farm to study various components and utilization.
12. Raising of crops and ornamental nursery raising organically through nutrient, diseases and pest management.

### **SAG5G1T- Principles of Agribusiness Management**

**Credits: 4**

**72 Hrs**

#### **Objectives**

- To familiarise with the fundamentals of Agribusiness Management
- To understand entrepreneurship strategies

#### **MODULE 1**

**12 Hrs**

Agribusiness- Scope for Agribusiness in India, Types of Small Businesses, Forms of the Business Organizations. The Importance of Personality in Business. Small business-Small Scale Industry in the Indian Economy Development, Objectives of A Small Business, Growth Stages, Organization and Administration, Development Commissioner (Small Scale Industries)

#### **MODULE 2**

**12 Hrs**

Management- Definition, Importance of Management, Elements of Management, Management as a Decision Making Process. The System Approach to MBO (Managing by Objectives) Quality Circles, SWOT Analysis. Planning- Characteristics, Importance, Limitations and steps. Long Range and Short Range Planning. Types of Plans. Organizing- Characteristics, Process, Importance &Principles. Key Elements of Organization Process. Patterns in Organization Structure

#### **MODULE 3**

**10 Hrs**

Directing- Supervising, Guiding, Leading, Motivating and Communicating. Controlling – needs. Important Devices or Tools of Control. Production management- Functional Areas, Physical Facilities. Implementing the plan. Designing and controlling work, ISO Standards, HACCP, TQM

**MODULE 3****14 Hrs**

Materials management- Types of Inventories, Uses of the model, Prices of materials. Marketing management- Market Segmentation, Strategic Marketing Policies, sources of marketing information, setting a price strategy. Merchandising and Sales Promotion. The Marketing Mix. Personnel management- Planning, Selecting employees for a given job. Methods of training, Purpose of performance appraisal

**MODULE 4****8 Hrs**

Financial management, Working Capital Management, Accurate calculation of working capital, Sourcing of capital for business, NABARD, Balance Sheet, Financial Tests. Management information system- Information system principles

**MODULE 5****16 Hrs**

Government programmes and regulations for agribusiness, Entrepreneurial Training institutes, Fruit Products Order, Codex Alimentarius, Food Quality, Laws relating to food processing industries. Agricultural inputs and agro-processing- Types. Changes in food processing. Agricultural Projects – Definition- Phases of project cycle – identification- formulation, appraisal—implementation – monitoring and evaluation. Risk in agricultural projects. Preparation of a model agricultural project.

**Text books:**

1. Drilon, Dr.J.D, 1971, Introduction to Agri-Business Management (Asian Productivity Organization, Tokyo).
2. Alagumani,T , Chinnaiyan, P and Elangovan, S . 1998. *Agricultural Management* .Publishers K9 International, Madurai
3. Reddy,S., Raghuram,P., Neelakantan,T.V and Bhavani Devi I. 2004.*Agricultural Economics*. Oxford and IBH Publishers, New Delhi.
4. Reddy, S. and Ram, P.R.2005. *Agricultural Finance and Management*. Oxford and IBH Publishers, New Delhi.

**SAG5G2T- Plant Biotechnology****Credit: 3****54 Hrs****Objectives:**

- To get practiced with various aspects of tissue culture.
- To learn applications of tissue culture in crop improvement.

**Module 1****8 Hrs**

Plant biotechnology- concepts, applications, scope and importance. History of plant tissue culture- molecular biology and plant genetic engineering- important landmarks

**Module 2****16 Hrs**

Principles of Totipotency and Morphogenesis, Different types of culture and their applications. Nutritional requirements of in-vitro cultures. Techniques of In-vitro cultures: Micro propagation, Anther culture, Pollen culture, Ovule culture, Embryo culture, Endosperm culture, Factors affecting above in-vitro culture; Applications and Achievements.

**Module 3** **12 Hrs**  
Somaclonal variation, Types, Reasons: Somatic embryogenesis and synthetic seed production technology; Protoplast isolation, Culture, Manipulation and Fusion; Products of somatic hybrids and cybrids.

**Module 4** **10 Hrs**  
Secondary plant metabolites-definition-their value as medicinal, aromatic and industrial materials-plant cell and tissue culture as an alternative source of secondary and natural products.

**Module 5** **8 Hrs**  
Tissue culture as a tool in genetic engineering. Applications in crop improvement.

**Text books:**

1. Chawla H S. 2003. Oxford & IBH Publishing Co. Pvt. Ltd. Chawla H. S. Introduction to Plant Biotechnology.
2. Brown, T.A. 1995. Gene cloning an Introduction (3rd edition). Chapman Hill, U.K.
3. Lehninger. 1993. Principles of Biochemistry. CBS Publications, New Delhi. Lewin, B. Genes VII. Oxford University Press, Inc., New York.
4. Smith, H.R. 2013. Plant tissue culture –Techniques and Experiments (third Ed). Elsevier. 188 p.
5. Singh, B. D. 2013. Molecular biology, genetic engineering and applications of biotechnology. Kalyani Publishers.
6. Slater, A., Scott, N. and Fowler, M. 2003. Plant biotechnology: the genetic manipulation of plants. Oxford University Press, 346 p.

**SAG5G2P- Plant Biotechnology -Practical**

**Credit: 2** **18 Hrs**  
**(2 Hrs for each)**

1. Requirements for Plant Tissue Culture Laboratory.
2. Media components and preparations.
3. Preparation and sterilization of media.
4. Aseptic manipulation and inoculation of various explants.
5. Callus induction, subculturing and plant regeneration.
7. Isolation of DNA
8. Hardening/ acclimatization of regenerated plants.

**CA5G3T – Fundamentals of Computer**

**Credits: 3** **54 Hrs**

**Objectives**

- To facilitate the student with applied working knowledge of computers.
- To understand and make a knowledge in Ms-Office, Excel, Power Point.

**MODULE 1****12 Hrs**

Introduction to computers: History, types of computers-characteristics of computers-five generations of modern computers. Parts of a Computer System- Hardware, Software, Data, Users.

**MODULE 2****12 Hrs**

Interacting with Computers:-Input Devices - Key Board, Mouse, Variants of Mouse, Hand held devices, Optical Input devices. Output Devices: Monitors, Sound Systems, and Printers. Storing Information in a Computer: Types of Storage Devices.

**MODULE 3****18 Hrs**

Introduction to Microsoft Office- MS Word-creating and editing documents-menus, commands, toolbars and icons-formatting documents-creating tables-mail merge. MS-Excel: Spread sheet overview-Menus, toolbars and icons-creating worksheets-editing and formatting-excel formulas and functions-creating a chart-data forms, sort and filter. MS-PowerPoint: Introduction-menus, toolbars-text and formats-animation, art and sound.

**MODULE 4****12 Hrs**

Operating Systems and Networking: Definition of an Operating System - Different types of PC Operating Systems. Computer Networks uses - categories of networks - LAN, WAN, The Internet - Working of Internet - Major Features of Internet.

**Text Books:**

1. "Fundamentals of ComputerScience and Communication Engineering", Alexis Leon, Mathew's Leon, Vikas Publishing House, New Delhi, 1998. (Unit I & II)
2. MS-Office Sanjay Saxena.

**SAG5SI1- Method demonstration****Credit: 6****36 Hrs****Objectives**

- To acquaint with novel trends and technologies in sustainable agriculture

Each student select a recent topic/ technique relevant to sustainable agriculture and demonstrate in the field practically. Performance of student will be evaluated based on field presentation with power point, brochure preparation, and knowledge.

## SEMESTER – 6

### **SAG6S1T-Farming System Approach for Sustainable Crop Production**

**Credit: 4**

**72 Hrs**

**Objectives:**

- Familiarising with the Farming System Approach for Sustainable Crop Production
- To make idea about different non-traditional practices in organic farming.

**MODULE 1**

**16 Hrs**

Introduction-importance of system approach in crop production, different cropping systems- Terms and definition- Cropping pattern - Multiple cropping and various forms- advantages and disadvantages- Intercropping- ecological basis of intercropping systems- types- sequential cropping and crop rotation-planned crop rotation- Mixed farming and farming systems of Kerala.

**MODULE 2**

**14 Hrs**

Crop planning, crop calendar and cropping scheme preparation-factors affecting cropping schemes. Plant interactions- Allelopathy, Competition- Measures to minimize competition- Criteria for assessment of yield advantage, land use efficiency and monetary advantage.

**MODULE 3**

**16 Hrs**

Cropping systems prevalent in Kerala-Rice based cropping system- Coconut based multi-tier cropping system- crop cafeteria for multiple cropping- Tapioca based cropping system- Banana based cropping system. Homestead farming in Kerala, Agro forestry - Silviculture, Agrisilviculture, Agrihorticulture, Agrisilvopastoral system, Alley cropping, and Social forestry definitions and - Organic recycling in cropping systems. Important cropping systems in India.

**MODULE 4**

**14 Hrs**

Farming systems- components- Livestock- poultry- aquaculture- apiculture- sericulture. Incorporation of components of Integrated farming system in homestead farming. Integrated farming system (IFS) models for uplands and low lands for sustainable and organic agriculture- Evaluation of farming systems.

**MODULE 5**

**12 Hrs**

Familiarisation with the organic farming ideas in the book one straw revolution by Masanobu Fukuoka. Introduction to the practices followed by farmers in “zero budget farming”.

### **SAG6S1P-Farming System Approach for Sustainable Crop Production-Practical**

**Credit: 2**

**36 Hrs**

**(6 Hrs each)**

1. Preparation of cropping scheme for irrigated situations.
2. Preparation of crop calendar for vegetables.
3. Multi tier cropping System in Coconut.
4. Preparation of integrated farming system models for wet lands.
5. Preparation of integrated farming system models for dry lands.

6. Visit to research station and farmers field to familiarize with various cropping and farming systems.

### **SAG6G1T- Communication and Agricultural Extension system**

**Credit: 3**

**54 Hrs**

#### **Objectives**

- To improve communication skills of the student
- To make the student aware about the agricultural extension system in India

#### **MODULE 1**

**12 Hrs**

Meaning and definition of communication. Communication process, elements and models of communication process. Types of communication. Key communicator, audio-visual aids, their use and effectiveness

#### **MODULE 2**

**10 Hrs**

Extension teaching methods- Classification, merits and demerits, factors affecting selection and use of extension teaching methods. Mass media in extension.

#### **MODULE 3**

**10 Hrs**

Meaning and definition of innovation, diffusion, adoption, diffusion effect and rate of adoption, factors affecting adoption, difference between diffusion and communication

#### **MODULE 4**

**8 Hrs**

Innovation decision process, categories of adopters, characteristics of innovations

#### **MODULE 5**

**14 Hrs**

First line Extension system – ICAR and its role in technology transfer, Technology transfer-meaning and concept, Brief knowledge about KVK, NATP, NAIP, ATMA and Agriclinic. Other Extension service providers and their role (including private and public sectors)

#### **Text books:**

1. Barun, K.M. 2011. Personality Development and Soft Skills. Oxford publishers
2. Chandrakantan, K. and Palaniswamy. 2000. Advances in Communication Technology. Indian Publishers
3. Dahama, O.P. and Bhatnagar, O.P. 2003. Education and communication for Development. Oxford, IBH, New Delhi
4. Joseph, E.H. and Alan, G. 2010. The Craft of Scientific Communication. Chicago guides to writing, editing, and publishing, 240p.
5. Koprowska, K. 2008. Communication and interpersonal skills in social work (2nd Ed). Exeter, learning matters.
6. Roberts, D.W., Wood, D and Caspy, A. 2010. The Development of Personality traits in adult fuood. Gillford Press, New York

### **SAG6G2T- Agriculture Waste Management**

**Credit: 3**

**54 Hrs**

#### **Objectives**

- To understand different advanced technologies for waste treatment
- To make the student aware about the waste management and derived useful bio fertilizers

## **Module 1**

Introduction – agricultural wastes – source segregation methods -methods of collection and storage of agricultural wastes. Survey of different agricultural production systems – observe types of wastes generated – quantification and classification of wastes – methods of waste processing – reporting. Composting –principles - factors affecting composting- different methods of composting- aerobic - windrow compost preparation - aerated static pile composting

## **Module 2**

Other methods of composting – preparation of different types of compost –Sheet composting –In vessel composting – biodynamic composting - pipe composting

## **Module 3**

Preparation of compost by trench method- NADEP compost - anaerobic composting – merits-demerits. Use of micro organisms in composting - Microbial composts –EM compost - Preparation of Coir pith compost - production technologies

## **Module 4**

Preparation of Vermi compost - mass multiplication of earthworms- indoor vermicomposting (small scale) - outdoor vermicomposting (commercial scale)- insitu vermicomposting. Rapid thermo chemical processing of agricultural wastes- Pyrolysis -Biochar production by the process of pyrolysis from organic waste

## **Module 5**

Biogas plants – different types – designs – visit to nearby biogas production unit and study the operation and production of biogas –advantages – disadvantages. Use of agricultural wastes in preparation of bio fertilizers. Value addition of products - enriched manures - production with biotic and abiotic components

### **Text books:**

1. Ashworth, G.S. and Azevedo, P. 2009. Agricultural Wastes. Nova Science Publishers
2. Cheng, H. H (ed.). 1990. Pesticides in the Soil Environment: Processes, Impacts, and Modeling. SSSA-ASA, Inc., Madison, WI.
3. Das, P.C. 1993. Manures and Fertilizers. Kalyani Publishers, New Delhi.
4. Gupta P.K. 2006. Vermi composting for Sustainable Agriculture. Published by AGROBIOS (India) Jodhpur
5. Powers, J. F. and Dick, W.P. 2000. Land Application of Agricultural, Industrial, and Municipal By-products. SSSA-ASA, Inc., Madison, WI.
6. Ramachandra T.V. 2006. Soil and Groundwater Pollution from Agricultural Activities. Commonwealth Of Learning, Canada and Indian Institute of Science, Bangalore
7. Rattan Lal (ed).2001. Soil carbon sequestration and the greenhouse effect. SSSA Special publication number 57, SSSA Inc . Madison, WI.
8. Sharma, A.K. 2005. Biofertilizers for Sustainable Agriculture .Published by AGROBIOS (India) Jodhpur
9. Stoffella, P. J. and Khan, B.A (ed.). 2001. Compost Utilization in Horticultural Cropping Systems. Lewis Publishers, Boca Raton, FL.
10. Tandon, H.L.S. 1992. Fertilizers, Organic Manures, Recyclable Wastes and Biofertilizers. Fertilizer Development and Consultation Organization
11. Tandon, H.L.S. 1993. Methods of Analysis of Soils, Plants, Waters and Fertilizers. Fertilizer Development and Consultation Organization. 143p.

12. Yawalkar, K.S., Agrawal, J.P. and Bokde,S. 1981. Manures and Fertilizers. Agri-Horticultural Publishing House, Nagpur, India pp 398

### **SAG6S1P- Agriculture Waste Management-Practical**

**Credit: 2**

**36 Hrs**

#### **Objectives**

- To familiarize with different advanced technologies for waste treatment
- To get a practical knowledge in waste management and derived useful bio fertilizers

**(4 Hrs for each)**

1. Aerobic and Anerobic composting
2. Pit method of composting
3. Pipe composting
4. Preparation of E M solution
5. Thumboormuzhi model aerobic composting
6. Different types of compost bins
7. Kitchen waste Composting

### **IBS6G3T - Introduction to Business studies**

**Credits: 4**

**72 Hrs**

#### **Objectives:**

To help students to

- understand the significance of entrepreneurs in the development of a country
- Familiarize with procedures and legal issues involved in setting up an enterprise.
- Get motivated to become an entrepreneur.

#### **Module 1 Introduction**

**22 Hrs**

Concept of entrepreneurship, essential attributes of an entrepreneur, women entrepreneurs, intrapreneurs, entrepreneurs and economic development. Dynamic of opportunity identification, process of selection of the right business, decision making steps and caution. Types of enterprises – demand based, resource based, import substitution and export promotion. Large, Medium, SSI, Partnership and sole proprietorship, Problem solving skills and SWOT techniques, Legal issues and books to be maintained in an industry.

#### **Module 2 Project formulation**

**18 Hrs**

Various approaches principles of product selection and development techno-economic feasibility of the project, structure of project report

#### **Module 3 Financial management**

**18 Hrs**

Financial institutions, role of central and state governments in promoting entrepreneurship – incentives, subsidies and grants, fiscal and tax concessions. Agencies and their role – DIC, SISI, EDII, NIESBUD, NEDB.

#### **Module 4 Resource management**

**16 Hrs**

Management of men, machine and materials. CPM and PERT as planning tools for establishing SSIs.

#### **Module 5 Marketing management**

**16 Hrs**

Marketing for small business, strategies for sales promotion, pricing policy and its implications on sale, after sales service.

**Text books:**

1. Deshpande, M. R. Entrepreneurship of small scale industries concept growth and management. Deep & Deep publication, Rajouri, New Delhi. 2002.
2. Gupta, C. P. Entrepreneurship Development in India. Sultan Chand and Sons, New Delhi. 2005.
3. Abraham, M.M. Entrepreneurship Development & Management, Prakash Publications, Changanacherry. 2000.

**SAG6S11- Agricultural Extension Programme**

**Credit: 4**

**Objective**

To acquaint the student to disseminate the knowledge they have gained during B. Voc. Programme to the farmers.

**Work planned:**

Each student has to arrange and participate in an extension programme like seminar, exhibitions etc. Which is beneficial to farmers and society.

**SAG6SP1**

**Project/Dissertation**

**Credit: 8**

**144 Hrs**

**Objective**

- To train students to improve agricultural productivity.
- To find jobs in both public and private sectors

**Details of Project Work**

Industrial training will be conducted at the industrial premises engaged in agriculture an allied activities. A group of students (5-6 number) will be allotted to each industry. The interest of the students will be one of the major criteria in selecting the category of industry. A project report of the industrial training shall be submitted at the end of sixth semester and a viva-voce will be conducted by a panel of three subject experts.

**Note:** In addition to practical hours, for certain time bound operations; the students will complete the work after the regular class hours.

**MODEL QUESTION PAPERS- FIRST SEMESTER**

**B.VOC. DEGREE EXAMINATION**

**First Semester**

**SAG1S1T- Fundamentals of Agronomy**

**(For B. Voc. Degree in Sustainable Agriculture)**

**Time-Three Hours**

**Maximum-80 Marks**

**Part A**

*(Answer any 10 Question 2 marks Each)*

1. Differentiate between extensive and intensive agriculture
2. What are rabi crops? Give two examples
3. Give classification of crops based on seasons
4. Differentiate dibbling and broadcasting
5. What is the significance of high pressure and low pressure terms in weather reports
6. What are trade winds
7. Differentiate between weather and climate
8. What is Njattuvela calender
9. What is atmospheric humidity
10. Point out the components of electromagnetic spectrum
11. Mention the climatic requirements of Coleus
12. What is crop geometry? List the genetic factors associated with it

**Part B**

*(Answer any 6 question 5 marks each)*

13. Briefly describe rice growing seasons of Kerala
14. Explain dibbling method of sowing and its advantages and disadvantages
15. Write a short note on scope and importance of Agriculture in India
16. Write a note on cultural practices in wet land rice
17. Write a short note on subsistence agriculture
18. Explain scope and importance of Agricultural meteorology
19. Draw crop weather calendar of rice in Kerala
20. Explain any four effects of Global warming
21. Write a note on composition of air

**Part C**

*(Answer any 2 Question 15 marks each)*

22. Write about major farming systems of Kerala
23. Write in detail about agronomic classification of crops
24. Discuss different methods of sowing with its advantages and disadvantages
25. Give an account on monsoon variability across Kerala

## **B.VOC. DEGREE EXAMINATION**

### **First Semester**

#### **SAG1S2T- Fundamentals of Horticulture**

**(For B. Voc. Degree in Sustainable Agriculture)**

**Time-Three Hours**

**Maximum-80 Marks**

#### **Part A**

*(Answer any 10 Question 2 Marks Each)*

1. Define horticulture
2. Write the components of a nursery
3. List out different methods of training
4. Differentiate between hot beds and cold frames.
5. Explain briefly about approach grafting
6. List out different methods of training
7. What are the symptoms of graft incompatibility?
8. What are the advantages of vegetative propagation?
9. Explain briefly about epicotyl grafting
10. What are the objectives of training and pruning in horticultural crops?
11. Differentiate between central leader and open centre systems of training
12. Explain briefly about air layering

#### **Part B**

*(Answer any 6 Question 5 Marks Each)*

13. Briefly describe the factors affecting rooting of cuttings
14. Explain the essential operations in nursery raising
15. Write a short note on seed propagation
16. Briefly explain hexagonal and quincunx system of planting in orchards
17. Write briefly on propagation by different types of cuttings
18. Briefly explain the classification of vegetables
19. Write briefly about different systems of planting
20. Briefly explain the different methods of ground layering with the help of diagrams and give examples for each method
21. List out the applications of budding and grafting in horticulture plants. Explain T-budding with the help of neat diagrams

#### **Part C**

*(Answer any 2 Question 15 marks Each)*

22. Write in detail, the different propagation structures used in horticulture
23. Explain the importance, scope and division of horticulture. Give a brief account of classification of horticultural crops
24. Explain the propagation using specialised plant parts or modified plant parts
25. List out the steps to be followed while planning the lay out, cultivation and management practices for different crops selected.

## **B.VOC. DEGREE EXAMINATION**

### **First Semester**

#### **SAG1S3T- Fundamentals of Entomology and Insect ecology**

**(For B. Voc. Degree in Sustainable Agriculture)**

**Time- Three Hours**

**Maximum-80 Marks**

#### **Part A**

*(Answer any 10 Question 2 marks each)*

1. Distinguish between exarate and obtect type of pupa
2. Biotic factors affecting the insect population
3. List the major pests of brinjal
4. Effect of light on insect development.
5. Role of moulting hormones in insects
6. Distinguish between mandibles and maxillae
7. List the type of damage caused by insects
8. Distinguish between regular and seasonal pest
9. What are pore canals? What are its functions?
10. What is meant by Environmental resistance?
11. List the major pests of banana
12. Write briefly about the sclerotization of insect cuticle

#### **Part B**

*(Answer any 6 Question 5 Marks Each)*

13. Define a pest. What are the different categories of pests?
14. Give the common sampling techniques employed in pest surveillance.
15. Different layers of insect integument
16. Give the external features of grasshopper
17. Differentiate the characters of suborders Homoptera and Heteroptera
18. Give the typical symptoms produced by the major pests of cardamom
19. What is pest surveillance and how is it useful in pest management?
20. Give the reasons for pest outbreak
21. Briefly explain the chewing and lapping type of mouth parts in insects.

#### **Part C**

*(Answer any 2 Question 15 marks Each)*

22. List the important characters of coleopteran and explain economically important families with characters and suitable examples
23. Explain in detail about the abdominal structures in insects with suitable examples
24. Explain the reasons for dominance of insects
25. List the major pests of rice and give the typical symptoms produced by them.

## **B.VOC. DEGREE EXAMINATION**

### **First Semester Model Question Paper**

#### **BOCG101 - LISTENING AND SPEAKING SKILLS IN ENGLISH**

Time-Three Hours

Maximum-80 Marks

#### **PART A**

**Answer any 10 questions. Each question carries 2 marks.**

1. Describe an auto rickshaw.
2. What is intensive reading?
3. What is the difference between a definite article and an indefinite article?
4. What is rising tone?
5. What is an index?
6. What is a phrasal verb?
7. Who is a good reader?
8. What is an embedded question?
9. Write a few phrases which can be used to express mild disagreement.
10. What are the three functions of conjunctions?
11. What are grammatical words?
12. What are people skills?

#### **PART B**

**Answer any 6 questions. Each question carries 5 marks.**

13. What is telephone etiquette?
14. Who is an active listener?
15. Prepare a vote of thanks to be presented for the residents' association meeting.
16. Write short note on conjunctions.
17. What are the features of fluent speech?
18. You are a project leader. Introduce the members of your team to a visiting dignitary.
19. Write a short note on reading for a purpose.
20. What are the steps in cancelling and rescheduling appointments?
21. Describe the qualities of your college to your friends.

#### **PART C**

**Answer any 2 questions. Each question carries 15 marks.**

22. Discuss 'the importance of social media' with two other participants in a group discussion.
23. a) Write a conversation with your panchayath member, complaining about the lack of streetlights.  
b) Write a model interview you make with an actor.
24. Write a note on subject-verb agreement.
25. What are the roles and functions in a group discussion?

## **B.VOC. DEGREE EXAMINATION**

### **First Semester**

#### **FPR1G1T- Basic Principles of Food Processing**

**(For B. Voc. Degree in Sustainable Agriculture)**

**Time –Three Hours**

**Maximum-80 Marks**

#### **Part A**

*(Answer any 10 Question 2 Marks Each)*

1. What is a fabricated food?
2. Explain functions of food.
3. Mention importance of minerals for good health.
4. Write about fiber rich foods.
5. Mention importance of salad dressing.
6. Write a note on space foods.
7. Write about production of margarine.
8. Explain chemical deterioration of food.
9. Write about banana puree.
10. Write a note on impact of fried food on health.
11. Write about processing of mayonnaise.
12. Mention importance of pH in food.

#### **Part B**

*(Answer any 6 Question 5 Marks Each)*

13. Explain packaging techniques for preservation of food.
14. Write an account on major components of food.
15. Explain nutraceuticals with examples.
16. Give an account on GM food. Mention the significance.
17. Write a note on tapioca products.
18. Differentiate healthy food and junk food with examples.
19. Explain methods for long term preservation of food.
20. Write a note on organisms causing biological deterioration and methods to avoid it.
21. Write a note on production of corn flakes and pop corn

#### **Part C**

*(Answer any 2 Question 15 Marks Each)*

22. Write an account on post harvest management of food to avoid deterioration of food quality.
23. Explain classification of food based on origin and nutritive value.
24. Write about processing of various banana products.
25. Explain various steps for converting a harvested food to a preserved product.

**B.VOC DEGREE EXAMINATION,.....**

**First Semester**

EE1G1T- Alternative Energy Sources

(For B.Voc. Degree in Sustainable Agriculture/Food Processing Technology)

[2019 Admission onwards]

{Regular}

Time: Three Hours

Maximum: 80 Marks

**Part A (Very short answer type)**

*Answer any 10 questions.*

*2 marks each.*

1. Make a note on Energy.
2. Define TSR.
3. What are the applications of wind energy.
4. What you mean by Anaerobic Digestion.
5. What is a Fuel Cell.
6. Distinguish between Pyranometer and Pyrheliometer.
7. Distinguish between Renewable and Non-Renewable
8. What are the major energy resources in India?
9. What are the causes of wind flow?.
10. What are the differences between beam and diffuse radiation?
11. Name different biogas plants.
12. List down any four uses of solar energy.

**Part B - Short answer (Not to exceed 60 words)**

*Answer any six questions*

*5 marks each*

13. What are the technologies for Biomass conversion?
14. Site selection considerations for wind energy conversion systems.
15. Discuss the principle and working of a solar pvcell.
16. Briefly explain the workingof a solar water heating system.
17. What is meant by geo-thermal energy? Write down its advantages and disadvantages.
18. Explainthe basic componentsof wind energy conversion system.
19. Give some examples of each with its application.
20. Which are the two types of biogas plants that are used in India?
21. Explain FPC?

**Part C (Long essay)**

*Answer anytwo questions.*

*15 marks each*

22. Explain Solar energy conversion system
23. Make an essay about Different types of biogas plants.
24. What are the Types of wind machines and Application of Wind Energy?
25. Write down the mechanism of tidal energy conversion.

## MODEL QUESTION PAPERS- SECOND SEMESTER

### B.VOC. DEGREE EXAMINATION

#### Second Semester

#### SAG2S1T- PLANTATION CROPS, SPICES AND FRUITS

(For B. Voc. Degree in Sustainable Agriculture)

**Time-Three Hours**

**Maximum-80 Marks**

#### *Part-A*

*(Answer any 10 Question 2 Marks Each)*

1. Name two important pests and diseases of coconut.
2. What is the scientific name and family of coconut?
3. What is a nursery practice?
4. How is tea harvested or collected?
5. Which soil is good for cashew nut cultivation?
6. How to propagate ginger?
7. What are the benefits of cardamom?
8. What are the major challenges facing Indian agriculture?
9. Briefly explain field preparation in banana cultivation.
10. What are the agroclimatic details for growing rambutan?
11. List any four hybrids of mango?
12. Mention the irrigation method in coconut cultivation.

#### *Part B*

*(Answer any 6 Question 5 Marks Each)*

13. What are the importance of plantation crops?
14. Describe the synthetic rubber better than natural rubber.
15. Write notes on the fruit production of rambutan.
16. Mention the production and distribution of tea.
17. Briefly explain planting method of pineapple.
18. Explain area, origin and distribution of cashew cultivation in India.
19. Discuss about the weed management of fruit production.
20. Write about nursery management in pepper.
21. Write Short note on propagation of mango.

#### *Part-C*

*(Answer any 2 Question 15 Marks Each)*

22. Explain about planting and cultural practices of banana
23. Discuss in detail planting and after care treatment of rubber.
24. Write in detail about varieties, planting, cultural practices and harvesting of ginger
25. Discuss in detail about harvesting and various uses of coconut palm

**B.VOC. DEGREE EXAMINATION**

**Second Semester**

**SAG2S2T- Fundamentals of Genetics, Plant Breeding and Seed Technology**

**(For B. Voc. Degree in Sustainable Agriculture)**

**Time: Three Hours**

**Maximum-80 Marks**

**Part A**

*(Answer any 10 question 2 marks each)*

1. Write Mendel's law of dominance
2. What is incomplete dominance?
3. What is Penetrance?
4. What is acclimatization?
5. Write Johannsen's Pureline theory
6. What is apomixis? Give one example
7. State multiple factor hypothesis
8. What is selection? Give one example
9. What is seed index?
10. What is real value of seed?
11. What is isolation distance?
12. What is purity percentage of seeds?

**Part B**

*(Answer any 6 question 5 marks each)*

13. Write the Mendel's law of inheritance
14. Write about duplicate gene action
15. Differentiate sexual reproduction and asexual reproduction in plants
16. Differentiate introduction and selection
17. Briefly explain back cross method
18. Briefly explain hybridization in plants
19. Differentiate mass selection and pureline selection
20. Briefly explain modes of pollination in plants
21. Compare pedigree method and bulk method in Plant breeding

**Part C**

*(Answer any 2 question 15 marks each)*

22. Explain the aims, objectives and importance of plant breeding
23. Explain the Quantitative traits and qualitative traits
24. Write an essay on breeding in rice
25. Discuss different types of pure seeds, seed dormancy and its breaking methods

**B.VOC. DEGREE EXAMINATION**

**Second Semester**

**SAG2S3T- Fundamentals of Soil science**

**(For B. Voc. Degree in Sustainable Agriculture)**

**Time-Three Hours**

**Maximum-80 Marks**

**Part A**

*(Answer any 10 Question each question 2 marks)*

1. Definition of soil
2. Differentiate between top soil and sub soil
3. What is soil texture
4. What is soil structure
5. What is soil density
6. What is soil porosity
7. Define micronutrients. Mention two examples
8. What is soil consistency
9. Name two biofertilizers
10. Name two organic manures
11. Name two green manure crops
12. Name two cover crops

**Part B**

*(Answer any 6 question 5 marks each)*

13. Write about the components of soil
14. Comment on the importance of top soil and sub soil
15. What are the ideal soil conditions for plant growth
16. Write the physical properties of soil
17. Write the factors controlling soil reaction
18. Briefly explain the effect of soil acidity on plants
19. How will you manage soil salinity and soil alkalinity
20. Briefly explain different types of soil erosion
21. Write the classification of nutrients

**Part C**

*(Answer any 2 question 15 marks each)*

22. Explain integrated nutrient management
23. Explain the physical properties of soil and its role in soil fertility
24. Write an essay on soil productivity and fertility
25. Discuss the importance of soil reaction in soil management

**B.Voc Degree Examination  
Second Semester - Model Question Paper**

**BOCG201 - WRITING AND PRESENTATION SKILLS IN ENGLISH**  
**Time: Three Hours** **Maximum: 80Marks**

**PART A**

**Answer any 10 questions. Each question carries 2 marks.**

1. What is a resume?
2. What is a group discussion?
3. What is a project report
4. What is proxemics?
5. What is a letter of enquiry?
6. What is a flip chart?
7. What is a seminar?
8. What is a power of attorney?
9. What is netiquette?
10. What are narrative essays?
11. What are the components of a typical seminar paper?
12. What is paralanguage?

(10x2 = 20)

**PART B**

**Answer any 6 questions. Each question carries 5 marks.**

13. What are the important points to be considered while sending collection letters?
14. What is a channel of communication? What are the different types of channel of communication?
15. Write a letter to the editor about the street dog menace in your city.
16. You want to sell your book collection. Prepare a notice to be put up in the college notice board.
17. Write a short note on Kinesics.
18. Prepare an agenda for the monthly board meeting of your firm.
19. What are the points to be remembered while filling an application form?
20. You are the owner of a supermarket. Write a letter inviting quotations from a wholesale dealer.
21. Write a short note on visual aids that are often used in presentations.

(6x5 = 30)

**PART C**

**Answer any 2 questions. Each question carries 15 marks.**

22. You are Ravi/Jaya. Prepare an application letter and a resume for the post of an assistant engineer.
23. Write an essay arguing for or against single sex educational institutions.
24. What are the barriers to effective communication? How can we overcome them?
25. Write a descriptive essay about your favourite place.

**B.VOC. DEGREE EXAMINATION**

**Second Semester**

**FPR2G1T- Fruit and Vegetable Processing Technology**

**(B. Voc. Degree in Sustainable Agriculture)**

**Time-Three Hours**

**Maximum-80Marks**

**Part A**

*(Answer any 10 Question 2 marks each)*

1. What happens during fruit ripening
2. How to prepare potato crisp chips
3. What types of food is stored in cold storage
4. Formation of jelly
5. Significance of head space in packing jars
6. Basic principles of fruit quality
7. Processing of carrot
8. Lyophilisation
9. Juice clarification methods
10. Transportation of fruits
11. What are the classification of Marmalades
12. What is meant by jelly

**Part B**

*(Answer any 6 question 5 marks each)*

13. Write a note on cold storage
14. Name the processed tomatoes products
15. Storage of green peas
16. Canning of fruit juices
17. Write about apple cider
18. Processing, transportation and storage of onion
19. Canned mango products
20. Explain in detail post harvest chain
21. Describe the classification of vegetable canning

**Part C**

*(Answer any 2 question 15 marks each)*

22. How to prepare mango jam? Explain step-by-step procedure
23. Describe about enzyme action in food processing
24. Write in detail about tomato processing and products
25. Write an essay on pineapple products and its uses

**B.VOC DEGREE Model EXAMINATION, MONTH YEAR**  
**Second Semester**  
**EE2G1T - ENVIRONMENTAL SCIENCE**  
(For B.Voc. Degree in Sustainable Agriculture/Food Processing Technology)  
[2019 Admission onwards]  
{Regular}

Time : Three Hours

Maximum : 80 marks

**Part A (Very short answer type)**

*Answer any 10 questions.*

*2 mark each.*

1. Define Deforestation
2. Describe Food chain
3. Expand UNESCO
4. What is Poaching
5. What are Hot spot of biodiversity
6. What is an Ecosystem
7. Suggest some measures to avoid over exploitation of forest wealth.
8. What is biodiversity?
9. What are the drawbacks of overuse of fertilizers and pesticides in agriculture?
10. What is the difference between endangered and endemic species?
11. Explain steps in solid waste management.
12. Give a brief account of Ozone layer depletion.

**Part B - Short answer (Not to exceed 60 words)**

*Answer any six questions*

*5 marks each*

13. Make report on Chipko movement.
14. Explain the structure and function of ecosystem.
15. Explain different types of forest ecosystems.
16. Comment on the role of individuals in conservation of natural resources.
17. With the help of an ecological pyramid, differentiate between food chain and food web.
18. What is Ozone hole? What are the effects of ozone depletion? How can we reduce ozone depletion?
19. With the help of a case study, explain the effects of modern agriculture on environment and livelihood.
20. Write a note on ecological Succession.
21. What is the difference between in-situ and ex-situ conservation of biodiversity?

**Part C (Long essay)**

*Answer any two questions.*

*15 marks each*

22. Explain the classifications of biodiversity.
23. Explain different types of pollution existing in the environment.
24. Explain the concept of Global warming with the help of a diagram. What are its effects? What are the remedial measures?
25. Explain and indicate the difference between biosphere reserve, national park, and wild life sanctuaries with two examples each.