UNIVERSITY OF CALICUT
G & A - IV - J

No. 153726/GA - IV - J1/2019/Admn

Calicut University.P.O
Dated: 20.08.2019

From

The Registrar

To

Members,
Board of Studies in B.Voc Agriculture.

Sir,

Sub:- Minutes of the Meeting of the Board of Studies in B.Voc Agriculture held on 19.08.2019-Circulated-Reg.

Ref:- Minutes of the meeting of Board of Studies in B.Voc Agriculture held on 19.08.2019.

While forwarding herewith a copy of the minutes under reference, I am to request you to forward your disssent/assent to the undersigned on or before 25.09.2019 otherwise the minutes will be considered as approved.

Encl: 1)Minutes under reference
2) Syllabus of B.Voc in Agriculture

Yours faithfully

Ajitha P.P
Joint Registrar
(For The Registrar)

UNIVERSITY OF CALICUT

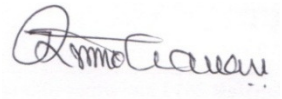
Minutes of the meeting of the Board of Studies in B. Voc. Agriculture held on 19-08-2019 at 10.30 am in the AD block of the University.

Members present:

1. Dr. K.V. Mohanan sd/-
2. Abdul Bari K.K. sd/-

Proceedings:

1. The meeting discussed and approved the syllabus of B. Voc. Agriculture of the University.
2. The meeting resolved to make the syllabus applicable from 2018-19 admission onwards since the course had been already started under the University in 2018-19.
3. The meeting resolved to get the minutes approved by circulation since there was lack of quorum in the meeting.
4. The meeting came to a close by 12.30 pm.



Dr. K.V. Mohanan
Chairman

UNIVERSITY OF CALICUT

Curriculum for B. Voc. Programme in AGRICULTURE

2018-19

UGC Sponsored B. Voc. Programmes

The University Grants Commission (UGC) had launched a scheme for skills development based higher education as part of college/university education, leading to Bachelor of Vocation (B.Voc.) degree with multiple entry and exit points. The B.Voc. programme is focused on universities and colleges providing undergraduate studies which would also incorporate specific job roles along with 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.

PROGRAMME OBJECTIVES

The B. Voc courses are designed with the following objectives:

a) To provide judicious mix of skills relating to a profession and appropriate content of General Education.
b) To ensure that the students have adequate knowledge and skills, so that they are work ready at each exit point of the programme.
c) To provide flexibility to the students by means of pre-defined entry and multiple exit points.
d) To integrate NSQF within the undergraduate level of higher education in order to enhance employability of the graduates and meet industry requirements. Such graduates apart from meeting the needs of local and national industry are also expected to be equipped to become part of the global workforce.
e) To provide vertical mobility to students coming out of 10+2 with vocational subjects

GENERAL PROGRAMME STRUCTURE

The B. Voc Programme is designed to bridge the potential skill gap identified. The curriculum in each of the years of the programme would be a suitable mix of general education and skill development components.

GENERAL EDUCATION COMPONENTS

a The general education component provides emphasis to Communication skill, Presentation skill, Health and Safety, Industrial Psychology, Environmental awareness, Entrepreneurship development and other relevant subjects in the field.

b An option for additional language should be provided which enhances the employability outside the state.

1. General Education Components should not exceed 40% of the curriculum

d All B.Voc Programme should follow the General education component pattern listed below (Common English Courses and Additional language courses of LRP programmes of CUCBCSSUG

No	Semester	Course No	Course Code	Paper
1	1	1.1	GEC1EG01	English A01
2	1	1.2	GEC1ML02	Additional Language A07- Malayalam
			GEC1HD02	Additional Language A 07- Hindi
3	2	2.1	GEC2EG04	English A02
4	2	2.2	GEC2ML05	A08- Malayalam
			GEC2HD05	A08- Hindi
5	3	3.1	GEC3EG07	English A03
6	4	4.1	GEC4EG10	English A04

SKILL DEVELOPMENT COMPONENTS

a) This component should match the skill gap identified.

b) At least 50% of Skill Development Component should be allotted to practical and can grow up to 60% based on the nature of the course. The practical component can be carried out in the college and/or the industry partner premises.

LEVELS OF AWARDS

B. Voc is programme with multiple exits. Following table shows the various certificates and their duration

. **Awards**	**Duration**
Diploma	2 Semester
Advance Diploma	4 Semester
B. Voc Degree	6 Semester

1. Students are free to exit at any point in the duration of the programme.
2. Only those students who successfully complete the courses and clear the examination are eligible for the certificate.
3. Separate certificate will be awarded for each year for successful candidates.
4. Students who fail in any course may be allowed to move the higher level but won't be eligible for any certificates until he/she clears previous courses.

5. B. Voc degree will confer to those whose successfully complete the diploma, higher diploma and internship.

CONDITIONS FOR ADMISSIONS

ELIGIBILITY

- The admission to B Voc programme will be as per the rules and regulations of the University for UG admissions.
- Basic eligibility for B.Voc is 10+2 and above in any stream (No age limit)
- The eligibility criteria for admission shall be as announced by the University from time to time.
- Separate rank lists shall be drawn up for reserved seats as per the existing rules.
- Grace Marks may be awarded to a student for meritorious achievements in co-curricular activities such as Sports/Arts/ NSS/NCC/ Student Entrepreneurship.
- Preferred subjects and index mark calculations will be decided by the respective Boards of Studies.

DIPLOMA HOLDERS

Diploma holders (after 10+2) in the parent courses, approved by the University, who satisfies eligibility criteria can be admitted to the higher diploma(3 rd semester) based on the availability of the seats and is under the sole discretion of the principal of the college/ B. Voc consortium.

RESERVATION/QUOTA

A maximum of 50 students can be admitted to one B. Voc programme. The students can be admitted only to the first semester (except for diploma holders). No students are admitted directly to the Third and Fifth semester in any circumstance except for diploma holders. Diploma holders may be permitted to third semester directly as mentioned above.

The reservation rules for Government/Aided Colleges are as same as that of the regular UG programmes conducted in colleges affiliated to this university.

FEES STRUCTURE

1. The course fee and examination fee for the first three years will be decided by the University. The details of the fee structure for various courses are attached in the annexure 2.

2. The college can collect Caution deposit, PTA fund, special fees, university fees, sports fee etc according to the norms provided by the university at the time of admission.

3. After third year, with the consent of university/UGC, the college can conduct the same programme in self-financing mode (provided UGC not granting further funds).

4. The course fee and examination fee (Regular/ improvement/ supplementary) structure in self financing mode will be decided by the University.

REGISTRATION/RE-REGISTRATION

Every candidate should register for all subjects of the Semester-End examinations of each semester. A candidate who does not register will not be permitted to attend the Semester-End examinations; he/she shall not be permitted to attend the next semester. A candidate shall be eligible to register for any higher semester, if he/she has satisfactorily completed the course of study and registered for the examination. He/she should register for the semester at the start of the semester before the stipulated date. University will notify the starting and closing dates for each semester.

RE-JOINING THE PROGRAMME

1. Rejoining the course will be allowed to only if the candidate has secured a minimum CGPA of 2.5.
2. The candidate should remit the fees prevailing that time.
3. B. Voc governing council will take the decision regarding the rejoining.

COURSE CALENDAR

The B. Voc programme conducted by the affiliated institutions follows a separate calendar from the conversional degree/ PG programme. The programme is distributed over six semesters and each semester constitute 90 working days inclusive of examination.

Note: Within a week after the commencement of classes of each semester, Head of each Institution should forward the list of students, details of faculty members allotted from the college and from industry partners along with their qualification and year of experience, to the University. Also, Head of each Institution shall ensure the availability of sufficient number of faculty members having experience and qualifications in the institution.

ASSESSMENT OF STUDENTS

Assessment of students for each subject will be done by internal continuous assessment and Semester-End examinations. This dual mode assessment will be applicable to both Theory and Practical courses except for internship and project. Total marks in theory course reflect 80 marks external and 20 marks internal assessments. The mark division for practical courses are 20 marks internal and 80 marks external. For internship and project, there is no internal assessment. (Except for Broadcasting and Journalism, annexure attached).

Sl No	Courses	Internal	External
1	Theory	20	80
2.	Practical	20	80
3.	Internship/Project	0	100

INTERNAL

Internal assessment shall be conducted throughout the semester. It shall be based on internal examinations, assignments (such as homework, problem solving, group discussions, quiz, literature survey, seminar, team project, software exercises, etc.) as decided by the faculty handling the course, and regularity in the class. Assignments of every semester shall preferably be submitted in Assignment Book, which is a bound book similar to laboratory

record. The mark distribution to award internal continuous assessment marks for theory subject should be as follows:

Assessment	Mark
Test papers (minimum two, best two out of three is preferred)	10
Assignments (minimum two) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.	5
Regularity in the class	5

The mark distribution to award internal continuous assessment marks for practical subject should be as follows:

Assessment Type	Mark
Evaluation in the lab and Rough Record	10
End-semester Test	4
Viva	1
Regularity	5

Note:

1. No candidate will be permitted to attend the end-semester practical examination unless he/she produces certified record of the laboratory.
2. Full credit for regularity in the class can be given only if the candidate has secured minimum 90% attendance in the subject. Attendance evaluation for each course is as follows

Attendance	Marks
90% and Above	5
85 to 89.9%	4
80 to 84.9%	3
76 to 79.9%	2
75 to75.9 %	1

EXTERNAL

- Semester- End examinations for theory and practical courses will be conducted by the University. There shall be University examinations at the end of each semester for both theory and practical. Failed or improvement candidates will have to appear for the Semester- End examinations along with regular students.
- At the starting of each semester, Colleges should prepare question bank (containing maximum questions from each module of various types mentioned in section 13pattern of question paper.) for the external theory/practical examinations for all courses during that semester and will be sent to the university. University will prepare the question papers and answer keys for each course and will sent back to the college for conducting the examination.

- University will appoint a Chairman for each B.Voc Programme. Chairman will monitor the University Practical Examinations and Evaluation of Theory and Practical papers.
- For the evaluation of theory papers, Chairman should form a team consisting of a chief and required additional Examiners for each course.
- At the starting of each semester, Colleges should prepare a panel of External examiners for conducting Practical examinations. Chairman/University will appoint examiners from the panel proposed by colleges.
- Practical Examinations can be conducted and evaluated from the college or the industry partner premises. The team for conducting and evaluating practical exams should include an examiner appointed from the approved panel of faculties, and an internal examiner.
- Head of Institution/ Chief of Examination of the college should take necessary steps to prevent any malpractices in the Semester-End examinations. If any such instances are detected, they should be reported to the University without any delay.
- University will be issuing mark list, provisional/original certificates to the candidates.

INTERNSHIP AND PROJECT

Internship and the major project should be carried out in the industry, not necessarily with industry partner. The major idea for internship is to implement the things learned and to get a real life experience. The Evaluation process follows 100% external assessment.

1. There will be internship/project at the end of 2nd and 4th semesters and an internship for the whole sixth semester.
2. Every student will be assigned an internal guide, allotted from the parent department concerned or an expert available in the college appointed by the principal or the head of the department.
3. The student has to make regular discussions with the guide while choosing the subject/area and throughout the life time of the project.
4. At least three reviews should be conducted to evaluate the progress of work.
5. An evaluation team is constituted for conducting the evaluation. The team consist of external examiner, allotted by the university from the approved examination panel, representative from the industry and a faculty.
6. Students should submit a report of their work. A valid certificate from the organization should be produced as a proof that the work is carried out in the respective organization.
7. Students are required to demonstrate the working model of their work (if possible) to the panel of examiners. A viva will be conducted based on the report and students are supposed to clarify the queries regarding their work.
8. Mark distribution for internship assessment

Distribution	Marks
Content and relevance of Dissertation	60
Viva	20
Presentation	20

MINIMUM FOR PASS

The successful completion of all the courses prescribed for the diploma/degree programme with E grade (40 %) shall be the minimum requirement for the award of diploma/degree.

Notes:

1. For Project/internship, the minimum for a pass shall be 50% of the total marks assigned to the respective examination.
2. A student who does not secure this pass marks in a subject will have to repeat the respective subject.
3. If a candidate has passed all examinations of B.Voc. Course (at the time of publication of results of last semester) except project/internship in the last semester, a re-examination for the same should be conducted within one month after the publication of results. Each candidate should apply for this Save-A-Year examination within one week after the publication of last semester results.

IMPROVEMENT/SUPPLEMENTARY

Candidates shall be allowed to improve the grade of any two theory courses in a semester. This can be done only in the immediate subsequent chance. If the candidate gets more than 10% mark variations in the improvement chance, marks scored in the improvement chance will be considered for grading of the course; otherwise marks scored in the first attempt will be retained. No candidate shall be permitted to improve the marks scored in practical examinations and internal continuous assessment.

ATTENDANCE

A candidate shall be permitted to appear for the Semester-End examinations only if he/she satisfies the following requirements:

(a) He/she must secure not less than 75% attendance in the total number of working hours in each semester.

(b) He/she must earn a progress certificate from the head of the institution stating that he/she has satisfactorily completed the course of study prescribed in the semester as required by these regulations.

(c) His/her conduct must be satisfactory

It shall be open to the Vice Chancellor to grant condonation of shortage of attendance on the recommendation of the head of the institution in accordance with the following norms.

- The shortage shall not be more than 10%

- Shortage up to 20% shall be condoned once during the entire course provided such shortage is caused by continuous absence on genuine medical grounds.
- Shortage shall not be condoned more than twice during the entire course.

Candidate who is not eligible for condonation of shortage of attendance shall repeat the semester as per university norms.

PATTERN OF QUESTION PAPERS

The question papers of Semester-End examinations of theory subjects shall be able to perform achievement testing of the students in an effective manner. The question paper shall be prepared

(a) Covering all sections of the course syllabus and total marks from each module should be approximately same.
(b) Unambiguous and free from any defects/errors
(c) Emphasizing knowledge testing, problem solving & quantitative methods
(d) Containing adequate data/other information on the problems assigned (e) having clear and complete instructions to the candidates.

Duration of Semester-End examinations will be 3 hours. The pattern of questions for theory subjects shall be as follows

Section	Total No Of Questions	No of Questions to be Answered	Marks for each Question	Total Marks
A: Very Short/ Objective answer questions	10	10	1	10
B: Short answer questions	12	8	2	16
C: Short Essays	9	6	4	24
D: Essays	4	2	15	30
Total				80

And for practicals

Marks Distribution	Total Marks
Theory/ Algorithm/Flow diagram	20
Implementation	30
Result/Output	10
Record	10
Viva	10
Total	80

CREDIT SYSTEM

Each subject shall have a certain number of credits assigned to it depending upon the academic load and the nature and importance of the subject. The credit associated with each subject will be shown in the prescribed scheme and syllabi. Each course shall have an integer number of credits, which reflects its weightage.

a) One Credit would mean equivalent of 15 periods of 60 minutes each, for theory, workshops/IT and tutorials;

b) For internship/field work, the credit weightage for equivalent hours shall be 50% of that for lectures/workshops;

c) For self-learning, based on e-content or otherwise, the credit weightage for equivalent hours of study should be 50% or less of that for lectures/workshops.

INDIRECT GRADING SYSTEM

- Indirect Grading System based on a 7 -point scale is used to evaluate the performance of students.
- Each course is evaluated by assigning marks with a letter grade (A+, A, B, C, D, E or F) to that course by the method of indirect grading.
- An aggregate of E grade with 40 % of marks (after external and internal put together) is required in each course for a pass and also for awarding a degree/diploma.
- Appearance for Internal Assessment and End Semester Evaluation are compulsory and no grade shall be awarded to a candidate if she/he is absent for Internal Assessment / End Semester Evaluation or both.
- For a pass in each course 40% marks or E grade is necessary.
- A student who fails to secure a minimum grade for a pass in a course is permitted to write the examination along with the next batch.
- After the successful completion of a semester, Semester Grade Point Average (SGPA) of a student in that semester is calculated using the formula given below. For the successful completion of a semester, a student should pass all courses. However, a student is permitted to move to the next semester irrespective of SGPA obtained.
- SGPA of the student in that semester is calculated using the formula

$$\text{SGPA} = \frac{\text{Sum of the credit points of all courses in a semester}}{\text{Total credits in that semester}}$$

- The Cumulative Grade Point Average (CGPA) of the student is calculated at the end of a programme. The CGPA of a student determines the overall academic level of the student in a programme and is the criterion for ranking the students. CGPA can be calculated by the following

$$\text{CGPA} = \frac{\text{Total credit points obtained in six semesters}}{\text{Total credits acquired (180)}}$$

- SGPA and CGPA shall be rounded off to two decimal places. CGPA determines the broad academic level of the student in a programme and is the index for ranking students (in terms of grade points).
- An overall letter grade (Cumulative Grade) for the entire programme shall be awarded to a student depending on her/his CGPA

Marks scored	Grade	Remarks
90 and Above	A+	Outstanding
80 to 89	A	Excellent
70 to 79	B	Very Good
60 to 69	C	Good
50 to 59	D	Satisfactory
40 to 49	E	Adequate
Below 40	F	Failure

GRADE CARDS

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
- Title of B.Voc Programme
- Semester concerned
- Name and Register Number of student
- Code number, Title and Credits of each course opted in the semester
- Internal marks, External marks, total marks, Grade point (G) and Letter grade in each course in the semester
- The total credits, total credit points and SGPA in the semester (corrected to two decimal places)

Percentage of total marks 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 including those taken over and above the prescribed minimum credits for obtaining the degree. However, as already mentioned, for the computation of CGPA only the best performed courses with maximum grade points alone shall be taken subject to the minimum credits requirements (180) for passing a specific degree. The final grade card shall show the percentage of marks, CGPA (corrected to two decimal places) and the overall letter grade of a student for the entire programme. The final grade/mark card shall also include the grade points and letter grade of general course and skill developmental courses separately. This is to be done in a seven point indirect scale.

MONITORING CELLS/COMMITTEES

EXAMINATION MONITORING CELL

Head of the each institution should formulate an Examination Monitoring Cell at the institution for conducting and supervising all examinations including the internal examinations. The structure and their collective responsibilities will be as per the university norms.

GRIEVANCE CELL

Each college should setup a Grievance Cell with at least four faculty members to look into grievances of the students, if any.

ANTI-RAGGING CELL

Head of Institution shall take necessary steps to constitute anti-ragging committee and squad at the commencement of each academic year. The committee and the squad shall take effective steps as specified by the Honorable Supreme Court of India, to prevent ragging.

CLASS COMMITTEE

Head of institution shall take necessary steps to form a class committee for each class at the start of classes of each semester. This class committee shall be in existence for the semester concerned. The class committee shall consist of the Head of Department, Staff Advisor of the class, a senior faculty member of the department, a faculty member from another department, and three student representatives (one of them should be a girl).

There should be at least two meetings of the class committee every semester; it shall be the responsibility of the Head of Department to convene these meetings. The decisions of the Class Committee shall be recorded in a register for further reference. Each class committee will communicate its recommendations to the Head of Institution.

The responsibilities of the class committee are:

a) To review periodically the progress and conduct of students in the class.
b) To discuss any problems concerning any courses in the semester concerned.
c) To identify weaker students of the class and suggest remedial measures.
d) To review teaching effectiveness and coverage of syllabus.
e) Discuss any other issue related to the students of the class

COLLEGE TRANSFER

College transfer is not allowed in any circumstances.

B.Voc degree is equal to any degree approved by University of Calicut

TRANSITORY PROVISION

Notwithstanding anything contained in these regulations, the Vice-Chancellor has the power to provide by order that these regulations shall be applied to any program with such necessary modification.

JOB ROLES PROPOSED TO BE COVERED IN EACH YEAR (ALONG WITH NSQF LEVEL) FOR B. Voc. AGRICULTURE

Duration	NSQF level	QP Codes and Job roles	Alignment details with NSDC
6 Months	4	**Qualification Pack: Agriculture Extension Service Provider** Job Roles: An agriculture extension service provider gives talks, guidance and actual demonstrations on latest technologies related to agriculture. He/She also works with other experts in agriculture to learn more or even develop new methods that could advance production	Aligned with NSDC REFERENCE ID: AGR/Q7601 ALIGNED TO: NCO-2015/6116.0102
1 Year	5	**Qualification pack: Agriculture Extension officer** Job Roles: Assist the farmers in plantation crop cultivation. Support for improving the seed quality for enhanced production **Qualification Pack: Nursery Manager for plantation crops** Job Roles: site selection, propogation, production of quality planting material and hybrids. Lay out, planting, after care-irrigation and manure- and harvesting	Not aligned Not aligned
2 Years	6	**Qualifications Pack- Agriculture Extension Executive.** Job Roles: The person is responsible for working with Research and Development team in agriculture industries (including seed, fertilizer, pesticides, and micro irrigation industries) to satisfy the farmer needs. They understand and market the technology to be transferred to farmers by way of demonstrations and training. They also coordinate and motivate the farmers to adapt to modern methods for good returns. **Qualifications Pack- Tissue culture Technician** Job Roles: Setting up of tissue culture laboratory for developments of crop varieties **Qualifications Pack- Crop Plantation manager** Job Roles: Manage the overall running of plantation firms. Design Quality control measures for pest management and weed	Aligned with NSDC REFERENCE ID: AGR/Q7602 ALIGNED TO: NCO-2015/6116.0101 Not aligned Not aligned

		management in plantation crops. Demonstrate various factors affecting the productivity and management of plantation crops. **Qualifications Pack- Live stock farm manager.** Job Roles: Setting up of live stock farms and management. Breeding and other caring of live stock animals. Poultry farm management-design, setting up and after care of poultry farms.	Not aligned
3 Years	7	**Qualifications Pack- Agriculture officer** Job Roles: A commercial enterpriser in various agriculture sectors. Bee keeping, Sericulture, Mushroom cultivation and floriculture. Vegetables Fodder crops Plantation crops etc. **Qualifications Pack- Organic farming consultant** Job Roles: Assist the entrepreneurs for setting up of an organic farming system. Provide proper guidance at multiple stages of cultivation. Provide awareness talks and demonstrations to promote organic farming practices. Support the farmers for marketing and exporting the products. **Qualifications Pack- Agriculture Technical officer** Job Roles: Link the gap between the farmers and Government in terms of Government policies related to Agriculture. Support the farmers for getting the financial assistance from the Government plans. Educate the farmers for proper utilization of agriculture aids. Follow up of financial assistance to empower the farmers.	Not aligned Not aligned Not aligned

B. Voc Programme in Agriculture
Syllabus Outline

C. No.	Course code	Course title	Hours/ week	Credits	Marks		
					Internal	External	Total
Semester I							
1.1	GEC1EG01	English A01	4	4	20	80	100
1.2	GEC1ML02 GEC1HD02	Additional Language A07 (Malayalam) Additional Language A07 (Hindi)	4	4	20	80	100
1.3	GEC1ES03	Fundamentals of Environmental Science	4	4	20	80	100
1.4	SDC1AG01	Fundamentals of Agronomy	4	4	20	80	100
1.5	SDC1AG02	Fundamentals of Horticulture	4	4	20	80	100
1.6	SDC1AG03	Fundamentals of Agricultural Engineering	4	4	20	80	100
1.7	SDC1AG04	Fundamentals of Agronomy and Horticulture – Practicals	6	6	20	80	100
		Total	**30**	**30**			**700**
Semester II							
2.1	GEC2EG04	English A 02	4	4	20	80	100
2.2	GEC2ML05 GEC2HD05	Additional Language A08 (Malayalam) Additional Language A08 (Hindi)	4	4	20	80	100
2.3	GEC2HR06	Human Resource Management	4	4	20	80	100
2.4	SDC2AG05	Plantation Crops, Spices and Fruits	4	4	20	80	100
2.5	SDC2AG06	Fundamentals of Seed technology	4	4	20	80	100
2.6	SDC2AG07	Plantation Crops, Spices and Fruits and Seed technology-Practicals	5	5	20	80	100
2.7	SDC2AG08	Internship/Project (Cultivation of Crops)		5		100	100
		Total	**30**	**30**			**700**
Semester III							
3.1	GEC3EG07	English A03	4	4	20	80	100
3.2	GEC3NS08	Basic Numerical Skills	4	4	20	80	100
3.3	GEC3TC09	Plant Tissue Culture & Biotechnology	4	4	20	80	100
3.4	SDC3AG09	Micropropagation of Plants- Practicals	5	5	20	80	100
3.5	SDC3AG10	Integrated Pest Management in Crops	4	4	20	80	100
3.6	SDC3AG11	Protected Cultivation of Horticultural Crops	4	4	20	80	100

3.7	SDC3AG12	Protected Cultivation of Horticultural crops and Pest Management-Practicals	5	5	20	80	100
		Total	**30**	**30**			**700**
Semester IV							
4.1	GEC4EG10	English A04	4	4	20	80	100
4.2	GEC4IT11	Information Technology	4	4	20	80	100
4.3	GEC4SA12	Soil and Agricultural Microbiology	4	4	20	80	100
4.4	SDC4AG13	Weed Management and Fodder Crop Production	4	4	20	80	100
4.5	SDC4AG14	Livestock Farming	4	4	20	80	100
4.6	SDC4AG15	Weed Management , Fodder Crop Production and Livestock Farming-Practicals	5	5	20	80	100
4.7	SDC4AG16	Internship/Project (Cultivation of Rice)		5		100	100
		Total	**30**	**30**			**700**
Semester V							
5.1	GEC5EM13	Environmental Microbiology and Biotechnology	4	4	20	80	100
5.2	GEC5FD14	Food and Dairy Microbiology	4	4	20	80	100
5.3	SDC5AG17	Commercial Vegetable Production	4	4	20	80	100
5.4	SDC5AG18	Agricultural Enterprises	4	4	20	80	100
5.5	SDC5AG19	Fundamentals of 0rganic Farming	4	4	20	80	100
5.6	SDC5AG20	Government Policies and Programmes Related to Agriculture	4	5	20	80	100
5.7	SDC5AG21	Commercial Vegetable Production, Agricultural Enterprises and Organic farming -Practicals	5	5	20	80	100
		Total	**30**	**30**			**700**
Semester VI							
6.1	SDC6AG22	Major Internship/Main Project and Dissertation		30		700	700
		Total		**30**		**700**	**700**
		Total for General Courses		**56**	**280**	**1120**	**1400**
		Total for Skill Development Courses		**124**	**380**	**2220**	**2800**
		Grand Total		**180**	**660**	**3340**	**4200**

B. Voc Programme in Agriculture
Detailed Syllabus

SEMESTER I

Course No. 1.3
Course Code: GEC1ES03
Course Title: Fundamentals of Environmental Science
Credits: 4
Total Contact Hrs: 60 Hrs

Objectives:

- To enable the students to acquire knowledge on the importance of Environmental Science
- To equip the students as volunteers to guard the environment.

MODULE 1 (15 Hours)

1. Methodology and perspective of science. Types of knowledge, practical, theoretical and scientific knowledge. What is science, what is not science – Hypothesis – Theories and laws of science, observations, evidences and proofs.

2. Definition, Scope and Importance of Environmental Science: Multidisciplinary nature of the environmental Science; Scope and importance; Need of Environmental awareness Interrelationship of ecology with other disciplines. Introduction to global environmental problems.

3. Components of the environment:

a. The atmosphere or the air: Layers of Atmosphere , Composition of air; importance of atmosphere, metereological conditions and air circulation.

b. The hydrosphere or water: Importance of water, distribution of fresh water at global, national and state level. Hydrological Cycle.

c. Lithosphere or the rock and the soil: Elementary composition of rocks in the earth crust.

Types of rocks; Process of soil formation: Physical weathering, Chemical weathering of rocks; Role of soil in shaping the biosphere

MODULE 2 (15 Hours)

1. Environmental Factors:

a. Climatic Factors-Light, Temperature of Air (atmospheric temperature), Rainfall (precipitation), Humidity of air, atmosphere (gases and wind), fire.

b. Topographic Factors: height of mountains, direction of mountains and valleys, steepness of slope and exposure of slope

c. Edaphic factors: Soil-soil formation, soil profile, soil erosion, soil conservation

d. Biotic factors: Intraspecific interactions; Interspecific interactions: Neutralism, Commensalism, Mutualism, Parasitism, and Predation.
e. Ecological adaptations of plants (Hydrophytes, mesophytes, xerophytes, and halophytes) and animals (aquatic conditions-hydrocoles; amphibious conditions or sec. hydrocoles), errestrial (mesocoles and xerocoles)

MODULE 3 (15 Hours)
Ecosystem: Definition; Components of ecosystem; Abiotic components: Light, Temperature, Pressure, Water, Wind, Soil; Biotic components: Energy flow in an ecosystem: Primary production, Secondary production; Food chain: Grazing food chain, Detritus food chain; Ecological pyramids: Pyramid of number, Pyramid of biomass, Pyramid of energy; Food web; Ecological indicators. Biogeochemical cycles: a) Gaseous cycles: Oxygen cycle, Carbon cycle and Nitrogen cycle. b) Sedimentary cycles: Phosphorus cycle, Sculpture cycle.

MODULE 4 (15 Hours)
Population Ecology and Community Ecology: Population characteristics- Population growth and its dynamics; natality, mortality, growth patterns; Age distribution, Malthusian theory; Community structure, succession and climax, Species diversity, ecological dominance, ecotone, niche, guild, edge effect, ecological equivalent, succession and climax
Major Ecosystems: Terrestrial Ecosystem-Forest, grass land, arid, crop land
Wet land-Ponds, lakes, rivers, oceans, estuaries
Major terrestrial Biomes-Tropical Savannah, Tropical rain forest and deserts

References
Ecology and Environment ,2008-2009.P. D. sharma (Rastogi Publications, Meerut)
A text book of Environmental Studies.,2006.D.K.Asthana, Meera Asthana (S.Chand&Co.)
Essential Environmental Studies,2009.S.P.Misra,S.N.Pandey,(Ane Books Pvt.Ltd,Chennai)
Environmental Education – A Conceptual Analysis. P.Kelu,University of Calicut publication
Text Book of Environmental Studies, Erach Bharucha, 2005.Orient Longman Pvt. Ltd., Ernakulam

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Course No. 1.4
Course Code: SDC1AG01
Course Title: Fundamentals of Agronomy
Credits: 4
Total Contact Hrs: 60 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 **12 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 **12Hrs**

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

MODULE 3 **12Hrs**

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

MODULE 4 **12Hrs**

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.

MODULE 5 **12Hrs**

Irrigation: definition and objectives. Role of water in soil and plants- Irrigated agriculture vs. Rainfed agriculture, dry farming and dryland farming-defenition.Water resources and in India and Kerala. Irrigation methods - drip and sprinkle irrigation systems. Water management of different crops like rice, banana, coconut, cowpea, and vegetables.

Text Books:

1. Balasubramaniyan, P and Palaniappan, S.P. 2001. *Principles and Practices of Agronomy* AgroBios(India)Ltd., Jodhpur.
2. Cox, G.W and Atkins, M.D. 1979. *Agricultural Ecology : An Analysis of World Food Production Systems.* W.H. Freeman and Company, San Francisco
3. De, G.C.1989.*Fundamentals of Agronomy*. Oxford & IBH Publishing Co., New Delhi.
4. Grigg, D.B. 1974. *The Agricultural Systems of the World: An Evolutionary Approach*. Cambridge University Press, Cambridge.
5. Harlan, J.R. 1992. *Crops and Man*. American Society of Agronomy& Crop Science Society of America, Madison, WI.
6. 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.
7. ICAR.2006. *Hand book of Agriculture*, ICAR, New Delhi.
8. Janick, J., Schery, R.W., Woods, F.W., and Ruttan, V.W. 1974. *Plant Science: An Introduction to World Crops*. W.H. Freeman and Company, San Francisco.
9. Noor Mohammed.1992. Origin, diffusion and development of agriculture. In: Noor Mohammed (ed.), *New Dimensions in agricultural geography: Vol.1.Historical Dimensions of agriculture*. Concept publishing Co., New Delhi.pp29-75.
10. Reddy.T.Y and Reddy, G.H.S.1995.*Principles of Agronomy*, Kalyani Publishers, Ludhiana.

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

Course No. 1.5
Course Code: SDC1AG02
Course Title: Fundamentals of Horticulture
Credits: 4
Total Contact Hrs: 60Hrs

Objectives

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

MODULE 1 **12 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 **12Hrs**

Phases of growth and development - vegetative/ reproductive balance; Flowering in plants - bearing habit and its classification- factors associated with flowering and fruit set. Fruit set and development - structure and process concerned with setting. Fruit drop - factors affecting and control measures - unfruitfulness - internal and external factors. Seedlessness in horticultural crops; significance and induction.

MODULE 3 **12 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.Choudhury, B.1983. Vegetables. National Book Trust, New Delhi.
7. Das, P. C.1993. Vegetable crops in India.Kalyani Publishers
8. Gopalakrishnan, T. R. 2007. Vegetable Crops.New India Publishing Agency, NewDelhi.
9. Hazra, P. and Som, M. G. 1999. Technology for vegetable Production and Improvement.NayaProkash, Calcutta

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Course No. 1.6
Course Code: SDC1AG03
Course Title: Fundamentals of Agricultural Engineering
Credits: 4
Total Contact Hrs: 60 Hrs

Objectives

- To familiarize with fundamentals of water management.
- To acquaint with various soil conservation methods.

MODULE 1 **12 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 **12 Hrs**

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 **12 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 **12 Hrs**

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

MODULE 5 **12 Hrs**

Surveying: survey equipment, chain survey, cross staff survey, plotting procedure, calculations of area of regular and irregular fields.

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* (4th 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,* KalyaniPublishers, 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.

Course No. 1.7
Course Code: SDC1AG04
Course Title: Fundamentals of Agronomy and Horticulture – Practicals
Credits: 6
Total Contact Hrs: 90 Hrs

Objetives

- To develop skill in propagation and cultivation aspects of horticultural crops.
- To familiarize with cultivation aspects of cereals and millets, pulses and tuber crops.

Contents

1. Identification of cereals and millets, pulses, and tuber crops.
2. Different methods of sowing; direct seeding: broadcasting, dibbling and drilling-transplantation.
3. Seed treatment - Rhizobium inoculation of leguminous crops.
4. Identification of manures -organic manures: bulky and concentrated manures Fertilizers: Straight, complex and mixed fertilizers - identification and preparation.
5. Fertilizer recommendation and calculation for major cereals and pulses.
6. Familiarization with green manure crops and cover crops.
7. Familiarization to Different planting systems and layout
8. Propagation methods - sexual propagation -seed viability tests, dormancy breaking methods.
9. Propagation structures - mist chamber, green house, hot beds etc.
10. Propagation by cuttings.
11. Propagation by layering - types of layering.
12. Propagation by grafting - methods of grafting

SEMESTER II

Course No. 2.3
Course Code: GEC2HR06
Course Title: Human Resource Management
Credits: 4
Total Contact Hrs: 60 Hrs

Objectives

- To acquaint with the principles and practices of human resource management.

Module 1

Introduction to Human Resource Management—Importance--scope and objectives of HRM. Evolution of the concept of HRM- Approaches to HRM- Personal management Vs Human Resource Management-HRM and competitive advantage- Traditional Vs Strategic human resource management.

(15 Hours)

Module 2

Human resource planning, Recruitment and selection—Job analysis---process of job analysis-job discretion- job specification-- methods of job analysis-- Conventional Vs strategic planning—job evaluation—Recruitment--source of recruitment-methods.

(20 Hours)

Module 3

Placement, Induction and Internal mobility of human resource. Training of employees—need for training-objectives- approaches --methods-training environment- areas of training- Training evaluation.

(15 Hours)

Module 4

Performance appraisal and career planning.Need and importance- objectives process- methods and problems of performance appraisal- . Concept of career planning –features- methods –uses career development.

(15 Hours)

Module 5

Compensation management and grievance redressal. Compensation planning objectives- Wage systems- factors influencing wage system-.Grievance redressal procedure-discipline-approachespunishment-essentials of a good discipline system.Labour participation in management.

(15 Hours)

References:

- Human Resource Management- Text and Cases-- VSP Rao
- Human Resource Management – PravinDurai 2. Human Resource Management—Snell, Bohlander
- Personal Management and Human Resources—VenkataRatnam .Srivasthava
- A Hand Book of Personnel Management Practice—Dale Yolder

Course No. 2.4
Course Code: SDC2AG05
Course Title: Plantation Crops, Spices and Fruits
Credits: 4
Total Contact Hrs: 60 Hrs

Objectives

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

Module1 **15 Hrs**

Plantation crops, Introduction - importance - area, production - origin, distribution - botany, 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 **12 Hrs**

Plantation crops, Importance - area, production - origin, distribution - botany, 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 **15Hrs**

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 **6 Hrs**

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

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 (6th 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.

Course No. 2.5
Course Code: SDC2AG06
Course Title: Fundamentals of Seed Technology
Credits: 4
Total Contact Hrs: 60 Hrs

Objectives

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

Module1: Morphology and systematics of crop plants **20 Hrs**

General features of important families - morphology of roots, stem, leaves, flowers, fruits and seeds.Introduction to field crops - Classification of field crops. Botany and economic importance of crops like Rice, Ragi, cowpea, Bitter Gourd, Cucumber, Brinjal, Chilli, Tomato, Soyabean,coconut,Groundnut, Gingelly, Tapioca, Cotton, Sweet potato, Rubber, Mango, Cashew, Pepper, Papaya and Banana.

Module 2: Principles of Seed Technology **20 Hrs**

Introduction to Seed Production, Importance of Seed Production,The concept of a seed-definition-structure of a seed-seed development process, Definition, Characters of good quality seed,Factors

affecting seed quality - ecological influences , packing practices, harvest and post harvest handling, Genetic and agronomic principles of seed production, Seed testing procedures for quality assessment- Physical, Purity, germination and viability test, Principles of establishing a seed testing laboratory, Post harvest seed management techniques seed extraction-seed processing- drying-cleaning-upgrading-seed blending, Dormancy of seed, role of growth regulators in restoring seed viability, physical agents for increased seed germination, seed vigour etc. Seed treatment, Importance of seed treatment, types of seed treatment, equipment used for seed treatment, Seed packing and seed storage, factors affecting seed longevity during storage and conditions required for good storage, General principles of seed storage, measures for pest and disease control, temperature control, Seed production of major crops - field crops , plantation crops , fruit plants ,spices, ornamental plants , medicinal plants, Different classes of seeds- Production of nucleus, breeder's seed, foundation and certified seed production, Seed certification, procedure for seed certification, field inspection and field counts etc.,

Module 3: Legislation of Seed Technology 20 Hrs

Seed Legislation - Seed Act and Seed Act enforcement, Central Seed Committee, Central Seed Certification Board, State Seed Certification Agency, Central and State Seed Testing Laboratories; Seed Act 2000 and other issues related to seed quality regulation, Organizations involved in seed production i.e., public, quasi, co operative, private etc. Planning seed production programme- seed farm organization-procurement and pricing policy-economics of seed production of different crops; government policy in seed production and study of export potential of seeds.

Text books:

1. Albert F-Hill and O.P. Sharma, 1996.Economic Botany. Tata McGraw - Hill Publishing Company Ltd., New Delhi
2. Chalam, G.V., J. Venkateswarlu. 1966. Agricultural Botany in India-Vol. 1. Asia pulishing house, Bombay, New Delhi
3. Daniel Sundararaj, D and G. Thulasidas, 1993. Botany of field crops. Macmillan India Ltd., New Delhi
4. Allard, R.W. 1960. Principles of Plant Breeding.John Wiley & Sons INC. USA. Toppan Co. Ltd. Japan
5. 4. Choudhari, T.C. 1982. Introduction to Plant Breeding. Oxford A& IBH Publishing Co., New Delhi
6. 5. Elliot. 1958. Plant Breeding &Cytogenetics. Mc Grow Hill. New York
7. Sharma, J.R. 1989. Principles and Practice of Plant Breeding. Tata McGraw - Hill Publishing Company Limited, New Delhi.
8. Singh, B.D. 2001. Fundamentals of Genetics.Kalyani Publishers. New Delhi. Ludhiana
9. Singh, B.D. 2003. Plant Breeding Principles and Methods.Kalyani Publishers.New Delhi/ Ludhiana.
10. Agrawal, R.L. 1995. *Seed Technology*. Oxford, IBH Publishing Co., New Delhi.
11. Bose, T. K. and Som, M. G. 1990. Vegetable crops in India.NayaProkash, Calcutta.
12. Das, P. C.1993. Vegetable crops in India.Kalyani Publishers
13. Dahiya, B.S and Rai, K.N., 1997. *Seed Technology*, Kalyani Publishers.

Course No. 2.6
Course Code: SDC2AG07
Course Title: Plantation Crops, Spices and Fruits and Seed Technology- Practicals
Credits: 5
Total Contact Hrs: 60 Hrs

Objectives

- To acquire skill on cultivation aspects of Plantation crops, spices and fruit crops
- To familiarize with the botanical aspects of field crops.
- To develop skill in various aspects of seed production

Plantation Crops

1. Coconut: Nursery techniques, Seedling selection, Production of quality planting materials and hybrids and mother palm selection,
2. Familiarization with varieties, Moisture conservation methods in coconut plantations.
3. Layout and planting, care and management of plantations.
4. Tapping systems in rubber.
5. Training and pruning in tea, coffee.

Spices

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

Fruits (Banana, Pineapple and Mango.)

1. 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.

Seed technology

1. Introduction to field crops and agricultural classification of field crops.
2. Observing general morphology of roots, stem , leaves, inflorescence, flowers
3. Family characters and Botany and economic parts of the crop plants
4. Microscopy
5. Preparation and use of fixatives and stains for light microscopy
6. Preparation of micro slides
7. Identification of seeds of summer vegetables and cool season vegetables
8. Seed sampling principles and procedures
9. Physical purity analysis of seeds
10. Seed Testing: Germination analysis and viability analysis of seeds
11. Seed dormancy and breaking methods
12. Techniques of hybrid seed production in tropical vegetables
13. Seed extraction techniques
14. Seed treatment against systemic diseases
15. Seed production in rice, Hybrid seed production in rice , coconut

Course No. 2.7
Course Code: SDC2AG08
Course Title: Internship/Project (Cultivation of Crops)
Credits: 5

Objectives

- To develop skill and to get experience in the cultivation practices of various crops

Work planned:

Familiarisation with seedling/sucker selection, land preparation, pit making and planting, Nutrient management, irrigation and other intercultural operations, pest and disease management aspects by allotting each student with different crops.

SEMESTER III

Course No. 3.2
Course Code: GEC3NS08
Course Title: BASIC NUMERICAL SKILLS
Credits: 4
Total Contact Hours: 60

Objectives:

- To enable the students to acquire knowledge of Mathematics and Statistics.
- At the end of this course, the students should have understood set operations, matrix and Mathematics of finance, Statistical tools and their applications.

Module 1

Sets and Set Operation - Venn Diagrams - Elements of Co-ordinate system - Matrices - Fundamental ideas about matrices and their operational rules - Matrix multiplication - Inversion of square matrices of not more than 3rd order - Solving system of simultaneous linear equations.

(10 Hours)

Module 2

Theory of Equations : Meaning - types of equations - Simple linear and Simultaneous equations (only two variables) eliminations and substitution method only - Quadratic equation factorization and formula method (ax2 + bx + c = 0 form only) - Problems on business applications.

(10 Hours)

Module 3

Progressions : Arithmetic Progressions - Finding the 'n'th term of an AP and also sum to 'n' terms of an AP - Insertion of Arithmetic means in given terms of AP and representation of AP - Geometric Progression : Finding 'n'th term of GP - Insertion of GMs in given GP and also

representation of GP - Mathematics of Finance - Simple and compound interest (Simple problems only).

(10 Hours)

Module 4

Meaning and Definition of Statistics - Scope and limitations - Statistical enquiries -Scope of the problem - Methods to be employed - Types of enquiries - Presentation of data by Diagrammatic and Graphical Method - Formation of Frequency Distribution.

(15 Hours)

Module 5

Measures of Central Tendency - Arithmetic Mean - Median - Mode - Geometric and Harmonic Mean - Measures of variation and standard, mean and quartile deviations -Skewness and Kurtosis - Lorenz curve. Analysis of Time Series: Methods of measuring - Trend and Seasonal variations - Index number - Unweighted indices -Consumer price and cost of living indices.

(15 Hours)

(Theory and problems may be in the ratio of 20% and 80% respectively. An over view of the topics is expected and only simple problems shall be given)

References:

- Sundaresan and Jayaseelan - An Introduction to Business Mathematics and Statistical Methods.
- Dr. A K Arte & R V Prabhakar - A Text Book of Business Mathematics.
- Sanchethi and Kapoor- Business Mathematics.
- Gupta S.P- Statistical Methods
- Navaneethan P- Business Mathematics
- R.S.N. Pillai, Mrs. Bhagavathi - Statistics
- P.R. Vittal - Business Mathematics and Statistics.

Course No. 3.3
Course Code: GEC3TC09
Course Title: Plant Tissue Culture and Biotechnology
Credits: 4
Total Contact Hrs: 60 Hrs

Objectives:

- To build theoretical foundation in plant tissue culture and biotechnology.

<u>Plant tissue culture</u>

Module-1 (20 hours)

1. Plant tissue culture – Principles and techniques; Cellular totipotency; *invitro* differentiation – de differentiation and re-differentiation.
3. Tissue culture medium – Basic components in tissue culture medium – Solid and liquid medium; Murashige and Skoog medium – composition and preparation.

4. Aseptic techniques in *in vitro* culture – sterilization – different methods –sterilization of instruments and glassware, medium, explants; workingprinciple of laminar air flow and autoclave.

5. Preparation of explants – surface sterilization, inoculation, incubation, subculturing.

6. Micropropagation - Different methods – apical, axillary bud proliferation, direct and indirect organogenesis and somatic embryogenesis.

7. Different phases of micropropagation – multiple shoot induction, shoot elongation, *in vitro* and *in vivo* rooting hardening, transplantation and field evaluation; Advantages and disadvantages of micropropogation. Somaclonal variation.

Module – II (15 hours)

1. Methods and Applications of tissue culture:
    1. Shoot tip and meristem culture
    2. Somatic embryogenesis and synthetic seed production
    3. Embryo culture
    4. Protoplast isolation culture and regeneration – transformation and transgenics
    5. Somatic cell hybridization, cybridization.
    6. *In vitro* secondary metabolite production — cell immobilization, bioreactors
    7. *In vitro* production of haploids – anther and pollen culture
    8. *In vitro* preservation of germplasm

<u>Biotechnology</u>

Module –I (15 hours)

1. Recombinant DNA Technology: Gene cloning strategies – recombinant DNA construction – cloning vectors – plasmids- Ti plasmids, pBR322, bacteriophage based vectors. Restriction endonucleases and ligases- transformation and selection of transformants – using antibiotic resistance markers. Blotting techniques; PCR.
2. Different methods of gene transfer – chemically stimulated DNA uptake by protoplast, electroporation, microinjection, biolistics. Agrobacterium mediate gene transfer- gene library, gene banks.

Module –II (10 hours)

1. Application of Biotechnology in:
    a. Medicine - Production of human insulin, human growth hormones.
    b. Forensics - DNA finger printing.
    c. Agriculture - Genetically modified crops – Bt crops, Golden rice, Flavr Savr tomato, herbicide resistant crops, edible vaccines.
    d. Environment- Bioremediation- use of genetically engineered bacteria- super bugs.
    e. Industry- Horticulture and Floriculture Industry, production of vitamins, amino acids and alcohol.

Course No. 3.4
Course Code: SDC3AG09
Course Title: Micropropagation of Plants- Practicals
Credits: 5
Total Contact Hrs: 75 Hrs

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.
6. Micro propagation of important crops.
7. Preparation of synthetic seeds.
8. Demonstraion of Anther culture.
9. Demonstraion of embryo culture.
10. Hardening/ acclimatization of regenerated plants.

Course No. 3.5
Course Code: SDC3AG10
Course Title: Integrated Pest Management in Crops
Credits: 4
Total Contact Hrs: 60 Hrs

Objective:

- To develop knowledge on the theoretical basis of integrated pest management.

Module 1 **12 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 **12 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. Plant protection equipments - Classification- and working principles- parts of sprayers, dusters and uses.

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. 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.

Course No. 3.6
Course Code: SDC3AG11
Course Title: Protected Cultivation of Horticultural Crops
Credits: 4
Total Contact Hrs: 60 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 **12Hrs**

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 **12 Hrs**

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

Module 5 **12Hrs**

Harvesting methods - postharvest handling - standards - grading - packing and marketing.

Suggested Readings:

1. Foja Singh., 1997. Advances in Floriculture.Media Today Pvt. Ltd., New Delhi-17.
2. Prasad, S. and U.Kumar. 1998. Commercial floriculture. Agro Botanica. Bikaner - 334 004.
3. Roy. A. Larson., 1992. Introduction of Floriculture.International Book Distributing Co., Lucknow.
4. Vishnu Swarup., 1997. Ornamental Horticulture.Macmillan India Ltd., New Delhi-2.Wltez, S., 1972.The world gladiolus, NAGG, USA.
5. Yadav, L.P. and Bose, T.K., 1986. Biology, conservation and culture of orchids. East- West Press Private Limited, New Delhi.E.
6. Yadav.I.S. and M.L. Choudhary., 1997.Progressive floriculture.The House of Sarpan, (Media), Bangalore.

Course No. 3.7

Course Code: SDC3AG12

Course Title: Protected Cultivation of Horticulture crops and Pest Management-Practicals

Credits: 5

Total Contact Hrs: 75 Hrs

Objectives

- To practice with protected cultivation practices of important crops
- Familiarization with cultural methods of pest control.

Contents

Protected cultivation in general:

1. Study of structures utilized for protected culture.
2. Cost estimation of different growing structures
3. Design and orientation of poly/green houses.
4. Study of various inputs used for protected culture
5. Type of containers used in protected culture.
6. Use of substrate and preparation of substrate for protected cultivation
7. Fertigation system in green houses
8. Maitenance of cooling and heating system in green houses.
9. Special horticultural practices in protected cultivation

Protected cultivation aspects of individual crops:

1. Protected cultivation of cowpea,
2. Protected cultivation of capsicum
3. Protected cultivation of cucumber
4. Protected cultivation of tomato
5. Protected cultivation of orchids and anthurium.
6. Protected cultivation of rose.

Pest management

1. Familiarization with Mechanical methods of pest control.
2. Identification of predators.
3. Identification of microbial agents.
4. Familiarization with different formulations of insecticides.
5. Preparation of neem oil garlic emulsion and tobacco decoction.
6. Familiarization with different insecticides.
7. Calculation of doses/concentrations of insecticides.
8. Preparation of spray fluid for field application.
9. Familiarization with Plant protection equipments.
10. Identification, symptoms of damage, collection and preservation of pests of:
    a) Rice, Coconut.
    b) Banana, Cashew.
    c) Pepper, cardamom.
    f) Brinjal, Bittergourd and cowpea.

SEMESTER IV

Course No. 4.3
Course Code: GEC4IT11
Course Title: Information Technology
Credits: 4
Total Contact Hrs: 60 Hrs

Objectives

- To understand the general principles and techniques of information technology
- To acquaint with the applications of IT in Agriculture

Module I (10 Hours)

Introduction to IT: meaning and nature-importance-applications in business and management office automation – objectives – office automation technologies –office equipments- virtual office-office communication methods: tele, audio and video conferencing and tele-presence system.

Module II (10 Hours)

Microsoft Office – components- Word processing - characteristics of word processing – MS Word for word processing – creating, formatting and printing documents in MS Word – inserting objects

from other MS applications – mail merge- Microsoft PowerPoint – creating presentations in PowerPoint- applying templates – recording narration – presenting animation – inserting hyperlink – inserting slide number, date and time – inserting picture into slide – slide transition – running slide show.

Module III (10 Hours)
Spreadsheet-features-advantages-packages-Ms Excel: creating, formatting and printing worksheets-functions in Excel- mathematical: SUM, PRODUCT, SQRT, ROMAN and ROUND statistical: AVERAGE, MEDIAN, MODE, STDEV, CORREL and FORECAST, Financial: DB, SLN, SYD, PMT, NPER, and IPMT- Database: DMAX, DMIN, DAVERAGE, DCOUNT and DSUM- goal seek-scenario management.

Module IV (10 Hours)
Database system– characteristics of database system- DBMS- components – relational database system - Database administrator – functions of database administrator – database security - Microsoft Access – creation of database in MS Access – designing and running tables and queries in Access, types of queries- , Creating forms – report generation in MS Access – creating report in design view - creating report using Wizard –formatting and printing of report.

Module V (10 Hours)
The Internet – Internet protocol suite – domain name system – Internet and its possibilities for business communication – Internet tools –email, FTP, WWW, bulletin boards, telnet- portals – search engines – website– intranet and extranet- Electronic Data Interchange- objectives and advantages of EDI- EDI formats- business applications of EDI.

Module VI (10 hours)
Practical sessions to demonstrate the use of MS Office applications such as Word, Excel, Access and PowerPoint and getting familiarized with web browsing and email communications.

Books:
1. Management Information Systems, Kenneth C. Laudon and Jane P. Laudon, Pearson Education, New Delhi, 2002.
2. Using Microsoft Office, Ed Bott and Woody Leonhard, Prentice Hall of India, New Delhi 1999.
3. Fundamental of Database Systems, Elmasri and Navathe, Adddison Wesley, New Delhi.

Course No. 4.4
Course Code: SDC3AG13
Course Title: Weed Management and Crop Production
Credits: 4
Total Contact Hrs: 60 Hrs

Objectives

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

MODULE 1 **15 Hrs**

Weeds: Introduction, harmful and beneficial effects, classification, propagation and dissemination. Concepts of weed prevention, control and eradication; Methods of weed control: physical, cultural, chemical and biological methods. Integrated weed management (IWM); 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.Aquatic and problematic weeds and their control.

MODULE 2 **15 Hrs**

Origin, geographic distribution, economic importance, soil and climatic requirement , varieties, cultural practices , harvesting and postharvest handling of major Oilseeds , Sugar cane, Fibre crop, Narcotics ,Medicinal plants.

MODULE 3 **10 Hrs**

Crop Production in rice in detail: Methods of sowing, Varieties and their duration, various systems of rice cultivation. Raising of nursery, sowing in the main field, Nutrient and water management. Weed Management in rice. Harvest indices in rice.

MODULE 4 **10 Hrs**

Mechanised farming in Rice. Introduction to various machines employed in mechanised rice cultivation including field preparation, weeding and harvesting.

MODULE 5 **10 Hrs**

Fodder crops: their cultivation and management.

Text books:

1. Agarwal, P.C. 1990.Oilseeds in India. Oxford and IBH, New Delhi
2. Balasuramaniyan, P. and Palaniappan, SP. 2003.Principles and Practices of Agronomy.Agrobios(India)
3. Barnes, A.C. 1964.The Sugarcane.Interscience Publishers, New Delhi
4. ChiddaSnidngh, Prem Singh and Rajbir Singh.2003. Modern Techniques of Raising Field Crops (2 Ed.). Oxford &IBH, New Delhi.
5. ICAR [Indian Council of Agricultural Research].2006. Hand Book of Agriculture. ICAR, New Delhi
6. KAU [Kerala Agricultural University].2007.Package of Practices Recommendations - Crops. Directorate of Extension, Kerala Agricultural University, Thrissur
7. Lekshmikantan, M. 1983.Technology in Sugarcane Growing. Oxford & IBH Publishing Co., Pvt. Ltd., New Delhi
8. Prasad, R. (Ed.). 2001. Field Crop Production. ICAR, New Delhi
9. Purseglove, J.W. 1975. Tropical Crops: Monocotyledons. The English Language Book Society and Longman, London
10. 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.
11. Yadav, D.S. 1992. Pulse Crops. Kalyani Publishers., New Delhi.

12. 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.
13. IARI [Indian Agricultural Research Institute]. 1977. Water Requirement and Irrigation
14. Management of Crops in India, IARI Monograph No.4, Water Technology Centre, IARI, New-Delhi.
15. Lenka, D. 2001.Irrigation and Drainage.Kalyani Publishers, New-Delhi.
16. Mal, B. C.2002. Introduction to Soil and Water Conservation Engineering,Kalyani
17. Michael, A.M. 1988.Irrigation Theory and Practice.Vikas Publishing House Pvt. Ltd., New Delhi.
18. Mishra, R.D. and Ahamed, M. 1993.Manual of Irrigation Agronomy.Oxford and IBH Publishing Company Pvt. Ltd.
19. Prihar, S.S. and Sandhu, B.S. 1987. Irrigation of Field crops - Principles and Practices - ICAR, New-Delhi.
20. SankaraReddi, G.H. and Yellamanda Reddy, T.2003 Efficient Use of Irrigation Water. Kalyani Publishing House, New Delhi.
21. Tideman, E.M. 1996. Watershed Management: Guidelines for Indian Conditions. Omega Scientific Publishers, New Delhi.
22. Aldrich, R.J. and Kramer, R.J. 1997.Principles in Weed Management.Panama Publications, New Delhi.
23. Anderson, P.W. 1983. Weed Science - Principles. West Publishing Con.d New York
24. Ashton, P.M. and Crafts, A.S. 1981. Mode of Action of Herbicides (2 Ed.) Wiley- Inter Science, New York.

Course No. 4.5
Course Code: SDC3AG14
Course Title: Livestock Farming
Credits: 4
Total Contact Hrs: 60 Hrs

Objectives

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

MODULE 1 **12 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, Sheep and Goat management- Housing of sheep and goat, General management practices.

MODULE 3 **12 Hrs**

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, Milk Chemistry and Milk constituents- Definition of Milk, Composition of Milk, Constituent of Milk, Factors affecting Quality and Quantity of milk, Nutritive value of milk, Physico-chemical properties of milk. Clean milk production: Source of contamination.

MODULE 4 **12 Hrs**

Poultry management: - Housing of Poultry, General Management practices, Pig Farming, Rabbit Farming, Duck Farming- Breeds of duck, General management practices. Quail management.

MODULE 5 **12 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, Babesiasis, Theleriosis. 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) Hanbook 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

Course No. 4.6

Course Code: SDC3AG15

Course Title: Weed Management, Crop Production and Livestock Farming - Practicals

Credits: 5

Total Contact Hrs: 75 Hrs

Objectives

- To familiarize with the general characters of weeds and their management.
- To familiarize with cultivation of rice, fibre crops, fodder crops etc.
- Familiarization with cultural methods of pest control.
- To familiarize with practices in livestock farming.
- To acquaint with the management of important farm animals and birds

Weed management

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. Hand weeding and hoeing using conoweeder in rice.
8. Hoeing and after cultivation in cassava plots.
9. Economics of weed control practices.
10. Visit to areas with problem weeds.
11. Familiarization and planting of various fodder crops and their preservation.
12.After cultivation operations of major crops.

Pest management

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

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

Live stock farming

1. Morphology of cattle, buffalo and poultry
2. Classification of Cattle Breeds
3. Study of Cattle, Breeds
    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
5. Study of Sheep and Goat breeds: Osmanabadi, Jamnapuri, Saanem

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Course No. 4.7
Course Code: SDC4AGI6
Course Title: Internship/Project (Cultivation of Rice)
Credits: 5

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 V

Course No. 5.1
Course Code: GEC5EM13
Course Title: Environmental Microbiology and Biotechnology
Credits: 4
Total Contact Hrs: 60 Hrs

Objectives

- To understand various aspects of environmental microbiology and biotechnology

Module-I

Introduction to Microbiology-History-scope-Types –structure, biology and classification of bacteria, mycoplasma, fungi, algae and virus-identification (10 Hours)

Module-II

Rules, regulations and tools in Microbiology- Basic principles of Autoclave, Hot air oven, laminar air flow. Microscopy-Bright field-phase contrast-dark field-fluorescent-con-focal-electron microscopy (SEM,TEM) Centrifuge-spectrophotometer (10 Hours)

ModuleIII

Sampling Techniques: Preparation of samples, types of media-sterilization techniques-cultivation and preservation of microorganism-methods of estimation and isolation of microorganism in soil, water and milk(10 Hours)

Module-IV

Microbiology of soil-microbial flora of soil-interaction among soil microorganism-role of soil microorganisms-nitrogen, carbon, sulphur cycles-microbiology of aquatic micro organism- Air microbiology-distribution, techniques and role of air microorganisms.(10 Hours)

Module-V

Microbial Genetics-concept of the gene mutations, transformation, conjugation, transduction, plasmids, microbial control of environmental pollution; genetic engineering and recombinant DNA techniques.(brief study only)(10 Hours)

Module-VI

Microbial growth process-major products of Industrial microbiology-alcoholic beverages, amino acids and antibiotics,, Recombinant DNA technique in Biotechnology-Gene cloning-cloning vectors, organic synthesis and degradation, Environmental Applications (10 Hours)

Text Books:

Microbiology-Paul.A.Ketchum.1984.John wiley and Sons,New york.
Microbiology-L.M.Prescott,J.P.Harley,D.A.Klein,1993.2nd Ed.Wm.C.Brown Publishers
Microbiology-M.J.Pelczar,E.C.S.Chan,N.R.Kreig.1996. Mc Graw Hill Books Co.,New york
Microbiology-Fundamentals and Applications. Atlas,R.M.Macmillian Pub. Co.,N ew York

References:

Bacterial Metabolism. Doelle,N.W.1975.2nd Ed.Academic Press
Microbial Genetics-D.Freigelder,1987.Jones Bartkett Publishers,Inc,Boston
Introduction to Environmental Microbiology.Mitchell,R.1974.Prentice Hall Int.
Introduction to Soil Microbiology.M.Alexander.1977Ny. John Wiley and Sons
Aquatic Microbiology –G.Rheinheimer.1991.4th Ed. John Wiley and Sons
Microbial Biotechnology-A.N.Glazer,H.Nikadio.1995.W.H.Freeman & Co.,New York
Bacteriology- Salle
A text book of Microbiology. Ananthanarayanan,R and Jayaram Panicker

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Course No. 5.2
Course Code: GEC5FD14
Course Title: Food and Dairy Microbiology
Credits: 4
Total Contact Hrs: 60 Hrs

Objectives

- To understand various aspects of food and dairy microbiology

Module 1 (10 hours)

Food as a substrate for microorganisms. Types of microorganisms in food - Source of contamination - Factors influencing microbial growth in foods (extrinsic and intrinsic) Microbial examination of food- viable colony count, examination of fecal Streptococci.

Module 2 (10 hours)

Physical and chemical properties of milk. Milk as a substrate for microorganisms. Types of microorganisms in Milk- bacteria, fungi and yeast. Sources of microbial contamination of milk. Microbiological analysis of milk. Rapid platform testsorganoleptic, Clot on boiling (COB), turntable acidity alcohol test, DMC, sedimentation test and pH. Standard plate count, MBRT.

Module 3 (10 hours)

Food fermentations: Cheese, bread, yoghurt, idli, fermented pickles and fermented vegetables, Ice cream, - methods and organisms used. SCP, Probiotics and prebiotics.

Module 4 (10 hours)

General principles underlying spoilage, different kinds of foods, cereals and cereal products - sugar and sugar products - vegetable and fruits - meat and meat products - fish and other sea foods - eggs and poultry - dairy and fermentative products (ice cream/milk/bread/wine).

Module 5 (10 hours)

Food Poisoning : food borne infections (a) Bacterial: Staphylococcal, Brucella, Bacillus, Clostridium, Escherichia, Salmonella (b) Fungal : Mycotoxins including aflatoxins, ergotism (c) Viral: Hepatitis, (d) Protozoa - Amoebiasis.

Module 6 (10 hours0

Food preservation : Principles of food preservation - methods of preservation. a. Physical (irradiation, drying, heat processing, pasteurization, chilling and freezing, high pressure and modification of atmosphere) b. Chemical (Sodium benzoate Class I & II). Food Sanitation: Good manufacturing practices - HACCP, Presonnel hygiene.

Suggested Readings

1. Food Microbiology by Adams, M R . and Moss, M.O.1995.The Royal Society of Chemistry, Cambridge.
2. Food Microbiology by Frazier, W.C. and Westhoff, D.C.1988.TATA McGraw HillPublishing company ltd., New Delhi.
3. Modern Food Microbiology by Jay, J.M.1987.CBS Publishers and distributors, New Delhi.
4. Basic Food Microbiology by Banwart, G.J.1989.Chapman & Hall New York.
5. A Modern Introduction to Food Microbiology by Board, R.C.1983.Blackwell Scientific Publications, Oxford.
6. Dairy Microbiology by Robinson, R.K.1990. Elsevier Applied Science, London.
7. Food Poisoning and Food Hygiene, Hobbs, B.C. and Roberts, D.1993. Edward Arnold.
8. MICROBIOLOGICAL EXAMINATION METHODS OF FOOD AND WATER by SILVA
9. Lund BM, Baird Parker AC, and Gould GW. (2000). *The Microbiological Safety and Quality of Foods.* Vol. 1-2, ASPEN Publication, Gaithersberg, MD.
10. Gould GW. (1995). *New Methods of Food Preservation.* Blackie Academic and Professional, London.

Course No. 5.3
Course Code: SDC3AG17
Course Title: Commercial Vegetable Production
Credits: 4
Total Contact Hrs: 60 Hrs

Objectives

- To understand various principles and practices of commercial vegetable production.

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 **12 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 **12 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.

Course No. 5.4
Course Code: SDC3AG18
Course Title: Agricultural Enterprises
Credits: 4
Total Contact Hrs: 60 Hrs

Objectives

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

MODULE 1 **12Hrs**

Bee keeping -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 2 **10 Hrs**

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. Use of biotechnology in sericulture.Scope of sericulture in Kerala. Recent advances in sericulture research.

MODULE 3 **23 Hrs**

Mushroom cultivation, Importance of mushroom cultivation - definition of mushroom - its importance - present scenario of mushroom cultivation - 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, cultivation of pleurotus, Volvariella, Lentinus, Calocybe and Auricularia. Different types of substrates, substrate preparation and sterilization, Spawning, methods of spawning, spawn run phase, cropping. 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 **15 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. Protected cultivation of rose, gerbera, chrysanthemum etc. - general concepts and practices. 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.

Text books:

1. David, B. V. and Kumarawami, T. 1978. *Elements of Economic Entomology* Popular Book Depot, Madras.
2. Ganga, G. and Sulochanachetty. 1999. *An Introduction to Sericulture* Second edition. IBM and Oxford Publishing Company, New Delhi.
3. Groul, R.A. 1963.*The Hive and the Honeybee.*Dadani and Sons.Inc. Illinois.
4. Krishnaswami, S., Narasimhanna, Suryanarayana and Kumararaj. 1991. *FAO Manuals on Mulberry Cultivation, silkworm rearing and silk reeling*. IBM and Oxford Publishing Company, New Delhi.
5. Mishra, R. C. 1998.*Perspectives in Indian Apiculture*. Agro botanica, Bikaneer, Rajasthan
6. Sardar Singh. 1962. *Bee Keeping in India*. ICAR, New Delhi.
7. Chang, S. T. Miles, P. G. and Hays, W. A. 1978.*The Biology and Cultivation of Edible Mushrooms.* Academic Press, London.
8. Lulu Das. 2002. *Mushroom Recipes*. (Released in the VIII Biennial meeting of AICMIP).
9. Nair, M. C. 1995.*Beneficial Fungi and TheirUtilization.*Scientific publishers, New PaliRoad, Jodhpur.
10. Randhawa, G.S. and Mukhopadhyay, A. 1986.*Floriculture in India*. Allied publishers New Delhi.
11. Rogers, J. 1974.*Flower arranging*. Hamlyn, London.

Course No. 5.5
Course Code: SDC3AG19
Course Title: Fundamentals of Organic Farming
Credits: 4
Total Contact Hrs: 60 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 **12Hrs**

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 **12 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 **12 Hrs**

Biological pest control: Biological agents -Mass multiplication and familiarization with field application, 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 **12 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. Ananthakrishnan, 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, Ipswitch, 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. Trivedi, R.N. 1993. A Text Book of Environmental Sciences, Anmol Pub., New Delhi.
10. Veeresh, G.K., Shivashankar, K. and Singlachar, M.A. 1997. Organic Farming and Sustainable Agriculture, Association for Promotion of Organic Farming, Bangalore.
11. Woomer, PL. and Swift, M.J. 1994. The Biological Management of Tropical Soil Fertility,.S.B.F. & Wiley.

Course No. 5.6
Course Code: SDC3AG20
Course Title: Government Policies and Programmes Related to Agriculture
Credits: 5
Total Contact Hrs: 60 Hrs

Objectives

- To acquaint with various Government Policies related to Agriculture in Kerala and India.
- To familiarise with five year plans and Panchayathiraj system in India.

MODULE 1 Introduction to agricultural policies 10 Hrs

Introduction to agricultural policies of Kerala and of India - need and importance - National Agricultural Policy in brief.

MODULE 2 Agricultural policies regarding land and labour 20 Hrs

Agricultural policies regarding land - need and scope for land reforms - Abolition of intermediaries - Tenancy reforms - Ceiling on land holdings - appraisal of land reforms.-Size pattern of operational holdings, problem of sub-division and fragmentation of holdings.

Agricultural policies regarding labour - present position of agricultural labour - minimum wages - abolition of bonded labour - Recommendations of the National Commission on Rural Labour – NREGP.

MODULE 3 Agricultural policies regarding seeds and fertilizers 20 Hrs

Agricultural policies regarding seeds - National Seeds Policy -varietal development and plant variety protection - seed production - quality assurance - seed distribution and marketing - infrastructure facilities - transgenic plant varieties - import of seeds and planting material - export of seeds - promotion of domestic seed industry Agricultural policies regarding fertilizers

- Fertilizer pricing policy - payment of subsidy. Agricultural policies regarding plant protection chemicals - pesticide production and consumption in India - protection of consumers from adverse impacts of pesticides. Agricultural policies regarding irrigation, machinery, technology etc.

MODULE 4 Agricultural policies regarding credit 15 Hrs

Agricultural policies regarding credit - Co-operatives and rural credit - Commercial banks and rural credit - Regional Rural Banks - Lead Bank Scheme - NABARD. Agricultural policies of Kerala and of India- regarding agricultural products and their marketing, export and prices - food security.

MODULE 5 Five Year plans and Panchayathiraj 15 Hrs

Concept of planned growth- Five Year Plans-Government policies and programs in agriculture and rural development. IADP - IAAP- IWDP- Watershed development Programmes- IRDP- NREGP- SGSY - Kudumbasree- etc. Peoples' Plan- Decentralised planning- current Plans - Agricultural development programmes and schemes of the dept. of Agriculture- liaison with Local Self Government. Panchayati raj system and institutions- gramasabha- Preparation of plan projects in agriculture.

Text books:

1. Government of India. Five year Plan Documents.
2. Government of India.Economic Survey. Published by Planning Commission (various issues)
3. Government of India.Economic Review. Published by State Planning Board (various issues)

Course No. 5.7
Course Code: SDC3AG21
Course Title: Commercial Vegetable Production, Agricultural Enterprises and Organic Farming -Practicals
Credits: 5
Total Contact Hrs: 75 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.
- To familiarize with the production and utilization of biofertilizers and biocontrol agents.

Commercial vegetable production

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

Commercial Enterprises

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 lac insects and their natural enemies.
8. Identification of common edible and poisonous mushrooms.
9. Preparation of substrates for mushroom cultivation.
10. Oyster mushroom cultivation.
11. Paddy straw mushroom cultivation.
12. Button mushroom cultivation.
13. Visit to a commercial mushroom production unit.
14. Methods of harvesting mushrooms.
15. Mushroom recipes – preparation.
16. Production techniques of dry flowers.
17. Value addition in cut flowers and loose flowers, hands on training in preparation of garlands, bouquet, flower arrangements etc.

Organic farming

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. Visit to urban waste recycling unit.
9. Study of profitable utilization of agricultural wastes.
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.

SEMESTER VI

Course No. 6.1
Course Code: SDC6AG22
Course Title: Major Internship/Main Project/Dissertation
Credits: 30

Details of Project Work

Industrial training will be conducted at the industrial premises engaged in agriculture and 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.

SYLLABUS

(FOR THE STUDENTS ADMITTED FROM THE ACADEMIC YEAR 2021–22 ONWARDS)

CARMEL COLLEGE (AUTONOMOUS)
MALA

B.VOC DEGREE PROGRAMME

IN

AGRICULTURE

UNDER

FACULTY OF AGRICULTURE

2022

CONTENTS

REGULATIONS

FOR THE DEGREE OF B.Voc AGRICULTURE

1. TITLE OF THEPROGRAMME:

This programme shall be called Bachelor of Vocational studies in Agriculture under Choice Based Credit and Semester System for Vocational Under Graduate Curriculam 2021(CBCSSVUG2021)

2. PROGRAMME – AN OVERVIEW

The University Grants Commission (UGC) had launched a scheme for skills development based higher education as part of college/university education, leading to Bachelor of Vocation (B.Voc.) degree with multiple entry and exit points. The B.Voc. programme is focused on universities and colleges providing undergraduate studies which would also incorporate specific job roles along with 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.

B. Voc is a three year undergraduate degree programme in agriculture. The above mentioned course deals with agriculture science. Agriculture science deals with applying scientific knowledge, technology and principles to boost agricultural productivity. It has a multidisciplinary scope. This course consists of elements such as chemistry, biology, animal husbandry, technology, management, and marketing. Agriculture is a broader concept within itself. It constitutes of many sub-disciplines and sub-branches such as, floriculture, horticulture, poultry farming, organic farming and many more.

The programme will make the student an agriculture professional who can deal with the various aspects of agriculture and farming.

Broad Objectives

Upon successful completion of the programme, students will:

- To provide judicious mix of skills relating to a profession and appropriate content of General Education.
- To ensure that the students have adequate knowledge and skills, so that they are work ready at each exit point of the programme.
- To provide flexibility to the students by means of pre-defined entry and multiple exit points.
- To integrate NSQF within the undergraduate level of higher education in order to enhance employability of the graduates and meet industry requirements. Such graduates apart from meeting the needs of local and national industry are also expected to be equipped to become part of the global work force.
- To provide vertical mobility to students coming out of 10+2 with vocational subjects
- Accommodate insightful information of Agriculture principles necessary for the applications of Agriculture.
- Graduates of the program will acquire knowledge of recent trends in technology and solve problem in industry and farmers.

Programme Outcome (PO)

PO-1To impart first hand knowledge on agriculture and allied sciences

PO-2 Understand the impact of the professional agricultural solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO-3 To demonstrate research based knowledge of the legal and ethical environment impacting agriculture organizations and exhibit an understanding and appreciation of the ethical implications of decisions.

PO-4 To demonstrate an understanding of and appreciation for the importance of the impact of globalization and diversity in modern agriculture organizations. Understanding of globalization, and NGO working.

PO-5To understand and analyze the current events and issues that are occurring in agriculture and how they affect futuristic agriculture.

PO-6 To understand and analyze the current events and issues that are occurring in agriculture and how they affect futuristic agriculture.

PO-7 Able to recognize and examine the relationships between inputs and outputs in their agricultural field to make effective and profitable decisions. To understand mechanics of a agripreneurship

Programme Specific Outcome (PSO)

PSO-1 To acquire knowledge on importance of agriculture and various types of farming.

PSO-2 To acquaint with importance, division and classification of horticultural crops and to understand the basic principles and types of plant propagation.

PSO-3 To familiarize with fundamentals of water management and to acquaint with various soil conservation methods.

PSO-4 To understand the fundamentals of Plant breeding, Basics of Seed technology and cultivation aspects of Plantation crops, spices and fruit crops.

PSO-5 To build theoretical foundation in plant tissue culture and biotechnology and to develop knowledge on the theoretical basis of integrated pest management and also to familiarize with protected cultivation structures and cultivation practices.

PSO-6 To understand the general characters of weeds and their management and to acquaint with cultivation of rice, fibre crops, fodder crops, etc

PSO -7 To develop practical skill in propagation and cultivation aspects of horticultural crops,Plantation crops, spices and fruit crops

PSO-8 To develop skill in various aspects of seed production and to do the micropropagation of plants.

3. ELIGIBILITY CRITERIA FOR ADMISSION

- The admission to this programme will be as per the rules and regulations of the University for UG admissions.
- Basic eligibility for B. Voc is 10+2 and above in any stream (No age limit).
- A weightage of 25 marks will be given to VHSE students from the concerned area of specialization
- The eligibility criteria for admission shall be as announced by the University from time to time.
- Separate rank lists shall be drawn up for reserved seats as per the existing rules.
- The candidates admitted for B.Voc. Degree (without multiple exit) shall subsequently undergo the prescribed courses of study in a college affiliated to the University for six semesters within a period of not less than three years; clear all the examinations prescribed and fulfil all such conditions as prescribed by the University from time to time.
- The college shall make available to all students admitted a prospectus listing all the courses offered in various departments during a particular semester. The information so provided shall contain title of the courses, the semester in which it is offered and credits for the courses. Detailed syllabi shall be made available in the University/college websites.
- There shall be a uniform calendar prepared by the University for the registration, conduct/schedule of the courses, examinations and publication of results. The University shall ensure that the calendar is strictly followed.
- Grace Marks may be awarded to a student for meritorious achievements in co-curricular activities such as Sports/Arts/ NSS/NCC/ Student Entrepreneurship.
- Preferred subjects & index mark calculations will be decided by the respective Board of Studies

4. DURATION OF THE PROGRAMME

- Duration of an undergraduate programme is six semesters distributed over a period of3 academic years.
- An academic week is a unit of five working days in which distribution of work is organized from Monday to Friday with six contact periods of one hour duration on each day.
- A sequence of 18 such weeks (16 instructional weeks and 2 weeks for

examination) constitutes a semester.

5. COURSESTRUCTURE

- **Programme** means the entire course of study and examinations for the award of a degree.

- **Courses:** Course means a segment of subject matter to be covered in a semester. This undergraduate programme includes 3 types of courses,*viz.,*

i. **General Education Components (GEC):** Common course means a course that comes under the category of courses, including compulsory English and additional language courses and a set of General courses applicable for Language Reduced Pattern (LRP) programmes, the selection of which is compulsory for all students undergoing UG programmes.

ii. **Skill Development Components (SDC):**

a) This component should match the skill gap identified.

b) At least 50% of Skill Development Component should be allotted to practical and can grow

up to 60% based on the nature of the course. The practical component can be carried out in the college and/or the industry partner premises

iii. **Audit courses** are courses which are mandatory for a programme but not conducted for the calculation of SGPA or CGPA. There shall be one audit course each in the first 4 semesters. Audit courses are not meant for class room study. The students can attain only pass(Grade

P) for these courses. At the end of each semester there shall be examination conducted by the college from a pool of questions (Question Bank).

iv. **Electives**: Students are permitted to take elective subjects provided along with the syllabus of the programme.

6. CREDIT

- Each course shall have certain credits. **Credit** is a unit of academic input measured in terms of weekly contact hours/course contents assigned to a course.
- A student is required to acquire a minimum of 180 credits for the completion of the UG programme which shall only be counted for SGPA andCGPA.
- The maximum credit for a course shall not exceed 5 and the minimum credit for a course is 2.

- Each subject shall have a certain number of credits assigned to it depending upon the academic load and the nature and importance of the subject.
- Audit course shall have 4 credits as per course and a total of 16 credits in the entire programme. The credit of audit course or extra credits are not counted for SGPA or CGPA.
- **Extra credits** are mandatory for the programme. Extra credits will be awarded to students who participate in activities like NCC, NSS and Swatch Bharath. Those students who could not join in any of the above activities have to undergo Calicut University Social Service Programme (CUSSP). Extra credits are not counted for SGPA or CGPA. The maximum credits acquired under extra credits shall be 4. If more Extra credit activities are done by a student that may be mentioned in the Grade card.

7. SCHEME OF EVALUATION

The evaluation scheme for each courses hall contain two parts 1)internal evaluation 2)external evaluation. 20% weight shall be given to the internal evaluation. The remaining 80% weight shall be for the external evaluation. The marks secured for internal evaluation only need to be sent to University by the colleges concerned. The internal evaluation shall be based on a predetermined transparent system involving written tests, classroom participation based on attendance in respect of theory courses and lab involvement/records attendance in respect of practical courses. Internal evaluation of the project will be based on its content, method of presentation, final conclusion and orientation to research aptitude. Components with percentage of marks of internal evaluation of theory Courses are-Test paper 40%, Assignment 20%, Seminar 20% and Class room participation based on attendance20%.

For practical courses - Record 60% and lab involvement 40% as far as internal is concerned. (If a fraction appears in internal marks, nearest whole number is to be taken) For the test paper marks, at least one test paper should be conducted. If more test papers are conducted, the mark of the best one should be taken. To ensure transparency of the evaluation process, the internal assessment marks awarded to the students in each course in a semester shall be notified on the notice board at least one week before the commencement of external examination. There shall not be any chance for improvement for internal marks.

The course teacher(s) shall maintain the academic record of each student registered for the course, which shall be forwarded to the University by the college Principal after obtaining the signature of both course teacher and Head of the Department. The split up of marks for Test paper and Classroom Participation (CRP) for internal evaluation are as follows.

Split Up of Marks for Test paper

Range of Marks in Test paper	Out of 8 (Maximum marks is 20)	Out of 6 (Maximum marks is 15)
Less than 35%	1	1
35%- 45%	2	2
45% - 55%	3	3
55% - 65%	4	4
65% -85%	6	5
85% -100%	8	6

Split Up of Marks for Classroom Participation

Range of CRP	Out of 4 (Maximum marks is 20)	Out of 3 (Maximum marks is 15)
50% ≤CRP <75%	1	1
75% ≤CRP <85%	2	2
85 % and above	4	3

External Evaluation

External evaluation carries 80% of marks. All question papers shall be set by the

University. The external question papers may be of uniform pattern with 80/60 marks. The courses with 2/3 credits will have an external examination of 2 hours duration with 60 marks and courses with 4/5 credits will have an external examination of 2.5 hours duration with 80 marks. The external examination in theory courses is to be conducted by the University with question papers set by external experts. The evaluation of the answer scripts shall be done by examiners based on a well-defined scheme of valuation and answer keys shall be provided by the University. The external examination in practical courses shall be conducted by two examiners – one internal and an external, the latter appointed by the University. The project evaluation with viva also shall be conducted by two examiners – one internal and an external, the latter appointed by the University.

The model of question papers may be prepared by the concerned Board of Studies. Each question should aim at – (1) assessment of the knowledge acquired (2) standard application of knowledge (3) application of knowledge in new situations. Different **types of questions** shall posses different marks to quantify their range. A general scheme for the question paper is given below.

Question paper type 1

Scheme of Examinations:

The external QP with 80 marks and internal examination is of 20 marks. Duration of each external examination is 2.5 Hrs. The pattern of External Examination is as given below. The students can answer all the questions in Sections A&B. But there shall be Ceiling in each section.

Section A

Short answer type carries 2 marks each- 15 questions	Ceiling 25

Section B

Paragraph /Problem type carries 5 marks each- 8 questions	Ceiling 35

Section C

Essay type carries 10 marks (2 out of 4)	2 X 10- 20
Total	80

Question paper type 2

Scheme of Examinations:

The external QP with 60 marks and internal examination is of 15 marks. Duration of each external examination is 2 Hrs. The pattern of External Examination is as given below. The students can answer all the questions in Sections A&B. But there shall be Ceiling in each section.

Section A

Short answer type carries 2 marks each-12 questions Ceiling -20

Section B

Paragraph/Problem type carries 5 marks each-7 questions Ceiling -30

Section C

Essay Typer Carries 10 Marks(1 out 2) 1X10= 10

Total 60

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B.Voc PROGRAMMESTRUCTURE

SEMESTER I										
C.No	**CourseCode**	**CourseName**	**Credit**	**Marks**			**Hrs/wk**		
				Int	**Ext**	**Tot**	**T**	**P**	**Tot**
1.1	A01	English	3	15	60	75	3		3
1.2	A02	English	3	15	60	75	3		3
1.3	A07(3)	Mal/Hindi/Arabic	4	20	80	100	4		4
1.4	SDC1AG01	Fundamentals of Agronomy	4	20	80	100	4		4
1.5	SDC1AG02	Fundamentals of Horticulture	4	20	80	100	4		4
1.6	SDC1AG03	Fundamentals of Soil Science	4	20	80	100		4	4
1.7	SDC1AG04(P)	Fundamentals of Agronomy and Horticulture– Practicals	4	20	80	100	1	3	4
1.8	SDC1AG05(P)	Fundamentals of Soil Science– Practicals	4	20	80	100	1	3	4
1.9	AuditCourse1	Environmental Studies	4						
Semester Total			**30**			**750**	**20**	**10**	**30**

SEMESTERII									
C.No	**CourseCode**	**CourseName**	**Cre**	**Marks**			**Hrs/wk**		
				Int	**Ex**	**To**	**T**	**P**	**Tot**

			dit		**t**	**t**			
2.1	A03	English	4	20	80	100	4		4
2.2	A04	English	4	20	80	100	4		4
2.3	A08(3)	Mal/Hindi/Arabic	4	20	80	100	4		4
2.4	SDC2AG06	Plantation Crops, Spices and Fruits	4	20	80	100	4		4
2.5	SDC2AG07	Fundamentals of Seed technology	4	20	80	100	4		4
2.6	SDC2AG08(P)	Plantation Crops, Spices and Fruits -Practicals	3	15	60	75		3	3
2.7	SDC2AG09(P)	Fundamentals of Seed technology-Practicals	3	15	60	75		3	3
2.8	SDC2AG10(Pr)	Internship/Project (Cultivation of Crops)		20	80	100		4	4
2.9	AuditCourseII	Disaster management	4						
SemesterII Total			**30**			**750**	**20**	**10**	**30**

SEMESTER III

C.No	**CourseCode**	**CourseName**	**Credit**	**Marks**			**Hrs/wk**		
				Int	**Ext**	**Tot**	**T**	**P**	**Tot**
3.1	A11	Biodiversity- scope and relevance	4	20	80	100	4		4
3.2	A12	Research Methodology	4	20	80	100	4		4
3.3	SDC3AG11	Plant Tissue Culture & Biotechnology	4	20	80	100	4		4
3.4	SDC3AG12	Integrated Pest Management in Crops	4	20	80	100	4		4
3.5	SDC3AG13	Fundamentals of Agricultural Engineering	4	20	80	100	4		4

3.6	SDC3AG14(P)	Agricultural Engineering –Practicals	4	20	80	100	4/	4	4
3.7	SDC3AG15(P)	Micropropagation of Plants-Practicals	3	15	60	75		3	3
3.8	SDC3AG16(P)	Integrated Pest Management-Practicals	3	15	60	75		3	3
	Audit course **AUD3E03**	Human Rights	4						
SemesterIIITotal			**30**			**750**	**20**	**10**	**30**
SEMESTER IV									
C.No	**CourseCode**	**CourseName**	**Credit**	**Marks**			**Hrs/wk**		
				Int	**Ext**	**Tot**	**T**	**P**	**Tot**
4.1	A13	Natural Resource Management	4	20	80	100	4		4
4.2	A14	Intellectual Property Rights	4	20	80	100	4		4
4.3	SDC4AG17	Protected Cultivation of HorticulturalCrops	3	15	60	75	3		3
4.4	SDC4AG18	Weed Management and Fodder Crop Production	4	20	80	100	4		4
4.5	SDC4AG19	Livestock Farming	4	20	80	100	4		4
4.6	SDC4AG20(P)	Protected Cultivation of Horticultural Crops- Practicals	4	20	80	100		4	4
4.7	SDC4AG21(P)	Weed Management and Fodder Crop Production and Livestock Farming- Practicals	3	15	60	75		3	3
4.8	SDC4AG22(Pr)	Internship/Project (Cultivation of Rice)	4	20	80	100		4	4
	AuditCourseIV **(AUD4E04)**	**GENDER STUDIES**	4						

SemesterIVTotal			**30**			**750**	**19**	**11**	**30**
SEMESTER V									
C.No	**CourseCode**	**CourseName**	**Credit**	**Marks**			**Hrs/wk**		
				Int	**Ext**	**Tot**	**T**	**P**	**Tot**
5.1	SDC5AG23E1/E2	E1-Environmental Microbiology and Biotechnology/ E2-Government Policies and ProgrammesRelated to Agriculture	4	20	80	100	4		4
5.2	SDC5AG24E3/E4	E3-Food and Dairy Microbiology/ E4-Landscaping and Gardening	4	20	80	100	4		4
5.3	SDC5AG25	Commercial Vegetable Production	4	20	80	100	4		4
5.4	SDC5AG26	Agricultural Enterprises	3	15	60	75	3		3
5.5	SDC5AG27	Fundamentals of organic Farming	4	20	80	100	4		4
5.6	SDC5AG28(P)	Agricultural Enterprises-Practicals	3	15	60	75		3	3
5.7	SDC5AG29(P)	Commercial Vegetable Production- Practicals	4	20	80	100	1	3	4
5.8	SDC5AG30(P)	Fundamentals of organic Farming- Practicals	4	20	80	100		4	4
SemesterVTotal			**30**			**750**	**20**	**10**	**30**
SEMESTER VI									
C.No	**CourseCode**	**CourseName**	**Credit**	**Marks**			**Hrs**		
				Int	**Ex**	**Tot**	**T**	**P**	**Tot**

					t				
6.1 6.2	SDC6AG31(Tp) SDC6AG32(Pr)	Term paper Internship & Project (900 hrs.) Internship Project	30	50 40 40	-- 160 160	50 200 200		900	900
SemesterVITotal			**30**	130	320	**450**			**900**
GrandTotal			**180**			**4200**			

B. Voc Programme in Agriculture

Detailed Syllabus

SEMESTER I

CourseNo: 1**.4** CourseCode: SDC1AG01 CourseName**:** Fundamentals of Agronomy	Credits:4 Hours Per Week:4 Totalhours: 60

CourseObjectives

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

CourseOutcomes

CO1: Describe the importance of agriculture in India and Kerala

CO2: To understand the agricultural classification of crops

CO3: Explain the Soil productivity and fertility

CO4: Describe the crop nutrition and nutrient cycling through manures and fertilizers.

CO5: Explain the Integrated Nutrient Management.

CO6: Explain the irrigation and irrigation methods.

MODULE1 **12 Hrs**

Importance of agriculture in India and Kerala, Agronomy, Sustainable agriculture, Subsistence agriculture, commercial agriculture, Extensive and intensive agriculture,

Peasant farming, Urban agriculture, Agribusiness, Agricultural seasons in India and Kerala.

MODULE2 **12Hrs**

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.

MODULE3 **12Hrs**

Soil and climatic requirements, varieties, cultural practices including water management, special systems of cultivation, harvesting and processing of major cereals and millets, pulses, tuber crops, rice, maize, finger millet, cowpea, tapioca, sweetpotato, amorphop hallus, yams, coleus, arrowroot etc

MODULE4 **12Hrs**

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

MODULE5 **12Hrs**

Irrigation: definition and objectives. Role of water in soil and plants- Irrigated agriculture vs. Rainfed agriculture, dry farming and dryland farming-defenition.Water resources in India and Kerala. Irrigation methods - drip and sprinkle irrigation systems.

Text Books:

1. Balasubramaniyan, P and Palaniappan, S.P. 2001. Principles and Practices ofAgronomy
   AgroBios(India)Ltd., Jodhpur.
2. Cox, G.W and Atkins, M.D. 1979. Agricultural Ecology : An Analysis of World Food Production Systems. W.H. Freeman and Company, SanFrancisco
3. De, G.C.1989.Fundamentals of Agronomy. Oxford & IBH Publishing Co., NewDelhi.
4. Grigg, D.B. 1974. The Agricultural Systems of the World: An Evolutionary Approach. Cambridge University Press,Cambridge.
5. Harlan, J.R. 1992. Crops and Man. American Society of Agronomy& CropScience Society of America, Madison,WI.
6. 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.

7. ICAR.2006. Hand book of Agriculture, ICAR, NewDelhi.
8. Janick, J., Schery, R.W., Woods, F.W., and Ruttan, V.W. 1974. Plant Science:An Introduction to World Crops. W.H. Freeman and Company, SanFrancisco.
9. Noor Mohammed.1992. Origin, diffusion and development of agriculture. In: Noor Mohammed (ed.), New Dimensions in agricultural geography: Vol.1.Historical Dimensions of agriculture. Concept publishing Co., NewDelhi.pp29-75.
10. Reddy.T.Y and Reddy, G.H.S.1995.Principles of Agronomy, KalyaniPublishers, Ludhiana.
11. Chatterjee, B.N. and Maiti, S.1985.Principles and Practices of Rice Growing. Oxford & IBH Publishing Co., NewDelhi.

CourseNo: 1**.5** CourseCode: SDC1AG02 CourseName**:**Fundamentals of Horticulture	Credits:4 Hours Per Week:4 Total hours: 60

CourseObjectives

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

CourseOutcomes

CO1: Describe the definition, importance, division and classification of horticultural crops.

CO2: Explain the layout, planting systems and management practices in an orchard.

CO3: Describe the training and pruning in horticultural crops

CO4: Describe the fruit drop and seedlessness in horticultural crops..

CO5: Describe the different types of plant propagation methods

CO6: Describe the components of nursery and its various aspects.

MODULE1 **12 Hrs**

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

MODULE2

Phases of growth and development - vegetative/ reproductive balance; Flowering in plants - bearing habit and its classification- factors associated with flowering and fruit set. Fruit set and development. Fruit drop - factors affecting and control measures - unfruitfulness - internal and external factors. Seedlessness in horticultural crops; significance and induction.

MODULE3 **12 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.

MODULE4 **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.

MODULE5 **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.

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, NewYork.
3. Edmond, JB., Sen, TD, Andrews, TS and Halfacre, RG. 1977. *Fundamentals of Horticulture.* Tata McGraw Hill, NewDelhi.
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., NewDelhi.
6. Chadha, K. L. 2003. Handbook of Horticulture, ICAR, New Delhi.Choudhury,B.1983. Vegetables. National Book Trust, NewDelhi.

7. Das, P. C.1993. Vegetable crops in India.KalyaniPublishers
8. Gopalakrishnan, T. R. 2007. Vegetable Crops.New India PublishingAgency, NewDelhi.
9. Hazra, P. and Som, M. G. 1999. Technology for vegetable Production And Improvement.NayaProkash,Calcutta

CourseNo: 1**.6** CourseCode: SDC1AG03 CourseName**:**Fundamentals of Soil Science	Credits:4 Hours Per Week:4 Totalhours: 60

CourseObjectives

1. To provide the student with a formalized way to build their fundamental knowledge and skills within the different areas of soil science to enhance their professional skills
2. To provide a better appreciation of the distribution and variability of soils and their properties across the landscape.
3. To impart knowledge to the students on the Fundamentals of Soil Science and impart skills in collecting and analyzing soils for basic physical, physico-chemical and chemical properties for using it as a medium for plant growth.

CourseOutcomes

CO1:Understand the fundamentals and principles of Soil Science

CO2:Explain how different soils are formed and how does soils act as a medium for plant growth.

CO3:Explain soils of India and Land use capability, soil pollution and its effect on crop and mitigation of soil pollution

CO4: Analyze the soils for basic physical, physico-chemical & chemical properties.

Module 1

Soil –formation and classification and need for classification. Soil forming minerals – primary, secondary, accessory minerals – classification. Weathering of rocks and minerals types of weathering, factors affecting weathering.

Module 2

Soil physical properties – soil texture, importance of soil texture, textural classification of Soils.

Soil structure – definition, classification. Aggregation of soil particles – factors controlling them. Soil consistency - Soil crusting. Soil compaction -Soil air – importance – composition – comparison with atmospheric air.

Module 3

Soil classification, need for classification, comparison of different systems of classification. Soil taxonomy and its characteristics. Soil survey-importance, objectives- different types -Land capability classification. Soils of India – soils of Kerala – characterization.

Module 4

Soil organic matter – composition - properties - decomposability, influence on soil properties. Humus fractions of soil Organic matter – carbon cycle - Transformation of organic matter – C:N ratio. Soil biology - soil organisms- their beneficial and harmful roles. Role of organic matter in maintaining the physical and chemical properties of soils- importance in plant nutrition.

Suggested Readings

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. Gupta, P.K. 2007. Soil, Plant, Water and Fertilizer Analysis. Published by AGROBIOS (India), Jodpur
7. Jackson, M.L. 1973 Soil Chemical Analysis. Prentice hall of India, New Delhi
8. Jaiswal, P.C. 2006. Soil, Plant and Water Analysis. 2nd Edn. Kalyani Publishers, Ludhiyana
9. Page, A.L. 1982. Methods of Soil Analysis, Part II, ASA Madison, USA
10. Sehgal, J.2005. Pedology – Concepts and Applications. Kalyani Publishers New Delhi
11. Tisdale,S.L., Nelson,W.L.,Beaton, J.D. and Havlin, J.L. 1995. Soil fertility and Fertilizers. 5th Edn. Macmillan publishing company, USA

Course No: 1.7 **Course Code: SDC1AG04 (P)** **Course Name: Fundamentals of Agronomy and Horticulture- Practicals**	**Credits:4** **Hours Per Week:4** **Total hours: 60**

Course Objectives

1. To develop skill in propagation and cultivation aspects of horticultural crops.
2. To familiarize with cultivation aspects of cereals and millets, pulses and tuber crops.

Course Outcomes

CO1- Identification of cereals and millets, pulses, and tuber crops.

CO2. Explain the different methods of sowing; direct seeding: broadcasting, dibbling and drilling- transplantation.

CO3. Describe the seed treatment - Rhizobium inoculation of leguminous crops.

CO4. Identification of manures and fertilizers and their preparation

CO5- Explain the fertilizer recommendation and calculation for major cereals and pulses.

CO6. Fertilizer recommendation and calculation for major cereals and pulses

CO7-Familiarization with green manure crops and cover crops, Different planting systems and layout and the propagation methods

Contents

1. Identification of cereals and millets, pulses, and tuber crops.
2. Different methods of sowing; direct seeding: broadcasting, dibbling and drilling transplantation.
3. Seed treatment - Rhizobium inoculation of leguminous crops.
4. Identification of manures -organic manures: bulky and concentrated manures

Fertilizers: Straight, complex and mixed fertilizers - identification and preparation.

5. Fertilizer recommendation and calculation for major cereals and pulses.
6. Familiarization with green manure crops and cover crops.
7. Familiarization to Different planting systems and layout
8. Propagation methods - sexual propagation -seed viability tests, dormancy breaking methods.
9. Propagation structures - mist chamber, green house, hot beds etc.
10. Propagation by cuttings.
11. Propagation by layering - types of layering.
12. Propagation by grafting - methods of grafting

Course No: 1.**8** Course Code: SDC1AG05 (P) Course Name**:** Fundamentals of Soil Science-Practicals	Credits:4 Hours Per Week:4 Total hours: 60
Course Objectives	
1. To familiarize with soil properties related to crop production 2. To familiarize with soil sampling and estimation of different soil nutrients	
Course Outcomes	
CO1- Identification of soil properties for crop production CO2- How to collect and prepare soil samples CO3. Describing the methods of determination of different nutrient contents in soil	

Contents

1. Identification of different types of soils
2. Determination of Soil moisture constants - Field capacity, PWP
3. Measurement of soil temperature variations
4. Collection and preparation of soil samples
5. Determination of Organic C
6. Determination of soil pH, and electrical conductivity of soil
7. Total elemental analysis -Determination of total N
8. Determination of total P, K
9. Visit to soil science laboratory

Audit Course 1 (AEC /AC): (Environment Studies)

Module 1

Introduction – Environment in the Indian context: Concept of an ecosystem, Multidisciplinary nature of environmental studies. Components of environment- Atmosphere, hydrosphere, lithosphere and biosphere. Definition, scope and importance. Concept of sustainability and sustainable development.

Module 2

Natural Resources : Renewable and non-renewable resources : Natural resources and associated

problems.

(a) Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.

(b) Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

(c) Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

(d) Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. (e) Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.

(f) Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Carbon footprint Water conservation, rain water harvesting, watershed management

Module 3

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 following ecosystem : (a) Forest ecosystem

(b)Grassland ecosystem

(c)Desert ecosystem

(d)Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Module 4

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

Module 5

Environmental Pollution Definition,Cause, effects and control measures of :- (a) Air pollution (b)Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution ((f) Thermal pollution (g)Nuclear hazards , Solid waste Management : Causes, effects and control measures of urban and

industrial wastes.Role of an individual in prevention of pollution.

Module 6

Environmental Policies and practices: Climate change, Climate change, Global warming, acid rain, ozone layer depletion, nuclear accidents

SEMESTER II

Course No: 2.4 Course Code: SDC2AG06 Course Name**:** Plantation Crops, Spices and Fruits	Credits:4 Hours Per Week:4 Total hours: 60

Course Objectives

1. To acquaint with the cultivation aspects of Plantation crops, spices and fruit crops.
2. To provide technical and scientific cultivation practices of different fruit and plantation crops.
3. To provide field knowledge and acquaint the students with practical field

Course Outcomes

CO1- Explain the importance - area, production ,origin, distribution of plantation crops.

CO2:Students will get knowledge on technical cultivation techniques of different fruits and plantation crops.

CO3:Students will able to identify different practical issues related to fruits and plantation crops

CO4: Analyze the propagation, planting, irrigation ,and manuring of Coconut and Rubber.

Module1 **15 Hrs**

Plantation crops, Introduction - importance - area, production - origin, distribution - botany, 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 **12Hrs**

Plantation crops, Importance - area, production - origin, distribution - botany, 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.

Module3 **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.

Module4 **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.

Module5 **6 Hrs**

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

Text books:

1. Chadha, K.L.2001. Hand Book of Horticulture,ICAR, NewDelhi.
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. IndianCentral 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 HarvestTechnology, ICAR, NewDelhi.
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, NewDelhi.
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 (6th 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.

CourseNo: 2.5 Course Code: SDC2AG07 CourseName**:** Fundamentals of Seed technology	Credits:4 Hours Per Week:4 Totalhours: 60

CourseObjectives

- To familiarize with the fundamentals of plant breeding.
- To familiarize with the basics of seed technology.
- . To strengthen undergraduate student in the field of seed science & technology.
- To impart training for entrepreneurship programme .
- To initiate basic research related to genetic purity, seed health and seed storage.

CourseOutcomes

CO1:Core competency in the subject & comparative evidence on development of seed.

CO2:High analytical ability in understanding the application of scientific principles and students will acquire skills & handling operations of different equipments in seed science laboratory.

CO3:Develop an understanding of seed development, germination,vigour,deterioration and the relationship between laboratory tests and field performance

CO4:Understand seed increase systems, seed testing and the laws and regulations related to marketing high quality seed.

Module1: Morphology and systematics of crop plants **20 Hrs**

General features of important families - morphology of roots, stem, leaves, flowers, fruits and seeds.Introduction to field crops - Classification of field crops. Botany and economic importance of crops like Rice, Ragi, cowpea, Bitter Gourd, Cucumber, Brinjal, Chilli, Tomato, Soyabean,coconut,Groundnut, Gingelly, Tapioca, Cotton, Sweet potato, Rubber, Mango, Cashew, Pepper, Papaya and Banana.

Module 2: Principles ofSeed Technology 20 Hrs

Introduction to Seed Production, Importance of Seed Production,The concept of a seed-definition- structure aseed-seed development process,Definition,Charactersofgoodqualityseed, Factors affecting seed quality - ecological influences , packing practices, harvest and post harvest handling, Genetic and agronomic principles of seed production, Seed testing procedures for quality assessment- Physical, Purity, germination and viability test, Principles of establishing a seed testing laboratory, Post harvest seed management techniques seed extraction-seed processing- drying-cleaning- upgrading-seed blending, Dormancy of seed, role of growth regulators in restoring seed viability, physical agents for increased seed germination, seed vigour etc. Seed treatment, Importance of seed treatment, types of seed treatment, equipment used for seed treatment, Seed packing and seed storage, factors affecting seed longevity during storage and conditions required for good storage, General principles of seed storage, measures for pest and disease control, temperature control, Seed production of major crops - field crops , plantation crops , fruit plants ,spices, ornamental plants , medicinal plants, Different classes of seeds- Production of nucleus, breeder's seed, foundation and certified seed production, Seed certification, procedure for seed certification, field inspection and field counts etc.,

Module 3: Legislation ofSeed Technology **20 Hrs**

Seed Legislation - Seed Act and Seed Act enforcement, Central Seed Committee, Central Seed Certification Board, State Seed Certification Agency, Central and State Seed Testing Laboratories; Organizations involved in seed production i.e., public, quasi, co operative, private etc. Planning seed production programme- seed farm organization-procurement and pricing policy-economics of seed production of different crops; government policy in seed production and study of export potential of seeds.

Text books:

1. Albert F-Hill and O.P. Sharma, 1996.Economic Botany. Tata McGraw - Hill Publishing Company Ltd., NewDelhi
2. Chalam, G.V., J. Venkateswarlu. 1966. Agricultural Botany in India-Vol. 1. Asia pulishing house, Bombay, NewDelhi
3. Daniel Sundararaj, D and G. Thulasidas, 1993. Botany of field crops. Macmillan India Ltd., NewDelhi
4. Allard, R.W. 1960. Principles of Plant Breeding.John Wiley & Sons INC. USA. Toppan Co. Ltd.Japan
5. 4. Choudhari, T.C. 1982. Introduction to Plant Breeding. Oxford A& IBH Publishing Co., NewDelhi
6. 5. Elliot. 1958. Plant Breeding And Cytogenetics. Mc Grow Hill. NewYork
7. Sharma, J.R. 1989. Principles and Practice of Plant Breeding. Tata McGraw -Hill Publishing Company Limited, NewDelhi.
8. Singh, B.D. 2001. Fundamentals of Genetics.Kalyani Publishers. New Delhi.Ludhiana
9. Singh, B.D. 2003. Plant Breeding Principles and Methods.Kalyani Publishers.New Delhi/ Ludhiana.
10. Agrawal, R.L. 1995. *Seed Technology*. Oxford, IBH Publishing Co., NewDelhi.
11. Bose, T. K. and Som, M. G. 1990. Vegetable crops in India.NayaProkash,Calcutta.
12. Das, P. C.1993. Vegetable crops in India.KalyaniPublishers
13. Dahiya, B.S and Rai, K.N., 1997. *Seed Technology*, KalyaniPublishers.

CourseNo: 2.6 CourseCode: SDC2AG08(P) CourseName**:** Plantation Crops, Spices and Fruits -Practicals	Credits:3 Hours Per Week:3 Totalhours: 45

CourseObjectives

- To acquire skill on cultivation aspects of Plantation crops, spices and fruit crops
- To familiarize with the botanical aspects of field crops.
- To develop skill in various aspects of seed production

CourseOutcomes

CO1: Demonstrate preparation and application of plant growth regulators to the crops, etc. Investigate the various problems with the production technology of fruit and plantation crops such as disorder, diseases and pests, etc.

CO2: Distinguish different fruits and plantation crops, symptoms of disorders, diseases, insects and pests, etc.

CO3: Discuss various concepts of high density planting, new techniques of high density planting, plant propagation, seed propagation, etc.

CO4: Acquaint the knowledge on the method of field preparation for crop production and arrange the resources required in the field.

CO5: Apply the production techniques of crops in the practical crop production field.

CO6: Examine the production of sown crops in the practical crop production field

Plantation Crops

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.

Layout and planting, care and management of plantations.

Tapping systems in rubber.

Training and pruning in tea, coffee.

Spices

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

Fruits (Banana, Pineapple and Mango.)

1. 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.

CourseNo: 2.7 **CourseCode: SDC2AG09(P)** **CourseName:Fundamentals of Seed technology-Practicals**	**Credits:3** **Hours Per Week:3** **Totalhours: 45**

CourseObjectives

- Ensured by adhering to quality checks during production, post production and distribution
- Enhance the knowledge of seed biology, seed quality, seed production, seed storage and seed certification
- Possess sufficient knowledge on seed quality, its production strategy, processing methodology, distribution links and even legal issues.
- Provide students with the methodology of conducting and applying the industrial tests for monitoring seed quality.
- To provide students with steps required for controlling seed quality during seed production in the field.

CourseOutcomes

CO1: Acquaint with scope and importance of seed technology in agriculture and the role of officials and legislation, seed act and seed order in quality seed production

CO2: Able to learn the main steps in seed production and certification

CO3: To learn about the important chemical components of seeds and their importance as source of human food and germinating embryo after planting

CO4: Develop an understanding of various seed production techniques for different field crops, the importance of maintenance of purity of crop varieties, and factors causing deterioration of variety.

CO5: Execution of various phases of seed certification, field inspection, and seed purity testing

CO6: Analyze the factors related to genetic and physical purity of seed and its health status of seeds of a variety during seed processing.

Seed technology

1. Introduction to field crops and agricultural classification of field crops.
2. Seed production in Cereals and Pulses
3. Microscopy
4. Preparation and use of fixatives and stains for light microscopy
5. Preparation of microslides
6. Identification of seeds of summer vegetables and cool season vegetables
7. Seed sampling principles and procedures
8. Physical purity analysis of seeds
9. Seed Testing: Germination analysis and viability analysis of seeds
10. Seed dormancy and breaking methods
11. Techniques of hybrid seed production in tropical vegetables
12. Seed extraction techniques

13. Seed treatment against systemic diseases

CourseNo: 2.8 **CourseCode: SDC2AG10(Pr)** **CourseName: Internship/Project (Cultivation of Crops)**	**Credits:4** **Hours Per Week:4** **Totalhours: 60**

CourseObjectives

- To develop skill and to get experience in the cultivation practices of various crops
- Provides opportunities for the students to attach with the agri related industries and make them know about the functioning them.
- Students will be oriented with the principles of crop planning and selection of crop
- Students will be given practical experience on raising of crops in their field with special emphasis on the agronomic management of the crop
- Familiarized with the calculation of economics of crop cultivation

CourseOutcomes

CO1: Acquaint with the knowledge of principles of crop planning and selection of crop

CO2:Developed the field experience on raising of crops in their field with special emphasis on the agronomic management of the crop

CO3:familiarized with the calculation of economics of crop cultivation

CO4:Demonstrate the ability to apply the scientific method to problems in crop

Work planned:

Familiarisation with seedling/sucker selection, land preparation, pit making and planting, Nutrient management, irrigation and other intercultural operations, pest and disease management aspects by allotting each student with different crops.

AUDIT COURSE – 2nd Semester

DISASTER MANAGEMENT(AUD2E02)

MODULE 1

Introduction – Hazard and Disaster. Concepts of Hazard, Vulnerability, Risks. Different Types of Disaster : **A)** Natural Disaster: such as Flood, Cyclone, Earthquakes, Landslides etc**B)** Manmade Disaster: such as Fire, Industrial Pollution, Nuclear Disaster, Biological Disasters, Accidents (Air, Sea, Rail & Road), Structural failures(Building and Bridge), War & Terrorism etc. Slow Disasters (famine, draught, epidemics) and Rapid Onset Disasters(Air Crash, tidal waves, Tsunami) Causes, effects and practical examples for all disasters. Water and Climate Disaster: flood, hail storms, cloudburst, cyclones, heat and snow avalanches, cold waves, droughts, sea erosion, thunder and lightning. Geological Disaster: landslides, earthquakes, Tsunami, mine fires, dam failures and general fires. Biological Disaster: epidemics, pest attacks, cattle epidemic and food poisoning. Nuclear and Industrial Disaster: chemical and industrial disasters, nuclear accidents. Accidental Disaster: urban and forest fires, oil spill, mine flooding incidents, collapse of huge building structures.

MODULE 2

Natural disasters- Earthquakes, Tsunami, Floods, Drought, Landslides, Cyclones and Volcanic eruptions. Their case studies. Coastal disasters. Coastal regulation Zone. Risk and Vulnerability Analysis **1.**Risk : Its concept and analysis **2**. Risk Reduction **3**. Vulnerability : Its concept and analysis **4**. Strategic Development for Vulnerability Reduction . Disaster Prevention and Mitigation. Refugee operations during disasters, Human Resettlement and Rehabilitation issues during and after disasters, Inter-sectoral coordination during disasters, Models in Disasters.

MODULE 3

Disaster Preparedness and Response Concept and Nature Disaster Preparedness Plan Prediction, Early Warnings and Safety Measures of Disaster. Role of Information, Education, Communication, and Training, Disaster Management : Role of Government, International and NGO Bodies. Role of

IT in Disaster Preparedness Role of Engineers on Disaster Management. Response Disaster Response : Introduction Disaster Response Plan Communication, Participation, and Activation of Emergency Preparedness Plan Search, Rescue, Evacuation and Logistic Management Role of Government, International and NGO Bodies Psychological Response and Management (Trauma, Stress, Rumor and Panic) Relief and Recovery Medical Health Response to Different Disasters.

MODULE 4

Rehabilitation, Reconstruction and Recovery Reconstruction and Rehabilitation as a Means of Development. Damage Assessment Post Disaster effects and Remedial Measures. Creation of Long-term Job Opportunities and Livelihood Options, Disaster Resistant House Construction Sanitation and Hygiene Education and Awareness, Dealing with Victims' Psychology, Longterm Counter Disaster Planning Role of Educational Institute.

MODULE 5

The vulnerability atlas of India. Disaster Prevention and Mitigation. Agencies involved in Disaster Management. Warning and Prediction

ESSENTIAL READING:

1. Pandey, M., 2014. Disaster Management, Wiley India Pvt. Ltd., 240p.

2. Tushar Bhattacharya, Disaster Science and Management, McGraw Hill Education (India) Pvt. Ltd

3. Jagbir Singh, Disaster, Management: Future Challenges and Opportunities, K W Publishers Pvt. Ltd. 4. J.P. Singhal, Disaster Management, Laxmi Publications

5. C. K. Rajan, NavalePandharinath, Earth and Atmospheric Disaster Management : Nature and Manmade, B S Publication

6. Shailesh Shukla, ShamnaHussain, Biodiversity, Environment and Disaster Management, Unique Publications

SEMESTER III

Course No. 3.1 **Course Code: A11** **Course Title: Biodiversity- scope and relevance**	**Credits: 4** **Total Contact Hrs: 72 Hrs**

Unit 1 Defining Biodiversity (Hours: 12)

The concept of biodiversity. Biodiversity crisis. Importance of biodiversity in daily life. Biodiversity and climate change. India as mega biodiversity nation. Hot spots of biodiversity in India.

Unit 2 Components of Biodiversity. (Hours: 12)

Genetic diversity, species diversity and ecosystem diversity. Brief outlines of the magnitude of bacterial, fungal, protist, animal and plant diversity.

Unit 3 Loss of Biodiversity (Hours: 12)

Factors causing loss of genetic-, species- and ecosystem diversity. Processes responsible for species extinction. Threatened species and IUCN Red List categories. Loss of agrobiodiversity. Significance of wild relatives of cultivated plants and domesticated animals.

Unit 4 Values and uses of biodiversity (Hours: 12)

Ethical and aesthetic values of biodiversity. Direct and indirect economic benefits of biodiversity. Bio-prospecting – micro-organisms and plants as a source of novel enzymes, antibiotics, antiviral agents, Immunosuppressive agents and other therapeutic agents.

Unit 5 Inventorying and Monitoring of Biodiversity (Hours: 12)

The need for inventorying and monitoring of biodiversity. Methods of inventorying and monitoring of biodiversity and their limitations.

Unit 6 Conservation of biodiversity (Hours: 12)

Conservation of genetic-, species- and ecosystem diversity. In situ and ex situ conservations: biosphere reserves, national parks, wild-life sanctuaries, gene banks, seed banks, botanical gardens, microbial culture collections.

SUGGESTED READING

1. Patent, D. H., Munnoz W. 1996. Biodiversity. Clarion Books.

2. Maiti, P. K., Maiti, P. 2011. Biodiversity: Perception, Peril and Preservation. Prentice Hall India.

3. Maclaurin, J. 2008. What is biodiversity? University of Chicago Press.
4. Krishnamurthy, K. V. 2003. Textbook of Biodiversity. SciencePublishers Inc.
5. Wilson E. O. 2010. The Diversity of Life. Harvard University Press.
6. Hosetti B.B., Ramkrishna, S. 2016. Biodiversity: Concepts and Conservation. Aavishkar Publishers.
7. Kumar A. 2011. Understanding Biodiversity. Discovery Publishing House.
8. Hendon, J. 2017. Textbook of Biodiversity. Syrawood Publishing House.
9. Adom, D. Umachandran, K., Ziarati, P., Sawicka, B., Sekyere, P. 2019. The Concept of Biodiversity and its Relevance to Mankind: A Short Review. Journal of Agriculture and Sustainability 12(2): 219-231.
10. Ehrlich, P.R., Ehrlich, A.H. 1992. The Value of Biodiversity. Stanford University Press.

Course No. 3.2	**Credits: 4**
Course Code: A12	**Total Contact Hrs: 72**
Course Title: Research Methodology	**Hrs**

Unit I (Hours: 13)

Topic selection - Planning research – defining objectives - Preparation of work plans. Identification of suitable methodology - Preparation of project proposal –Summer Schools – Training in research institutes

Unit II (Hours: 14)

Collection of literature- News articles – Newsletters – Magazines – Books - Journals. Digital library and search of articles - Keywords and search - Internet – Google Scholar – PubMed – Inflibnet – Medline – Agricola – Science direct -Open access Journals - virtual sources – other sources. Short communications –review articles

Unit III (Hours: 15)

Collection of protocols and selection of suitable methods according to work plan. Observational and experimental research. Data analysis – Construction of tables – headings - footer - Tabulation – Presentation of results - Use of statistical software to analyze the results- SPSS.

Unit IV (Hours: 15)

Thesis structure –Components - Writing Introduction – review of literature – Materials & Methods – Presentation of results – Discussion of Results based on literature – Arriving at conclusions – Preparation of Summary/abstract – Arrangement of Bibliography and how to quote reference in thesis - Appendix.

Unit V (Hours: 15)

Publishing of Articles in newspapers /newsletters - Selection of journals – ISSN Number – Peerreviewed

Journals – Science citation index – impact factor and importance. Manuscripts preparation for Journals – components – Plagiarism - Submission and Publication – reprints and pdf formats. Paper presentation in Conferences.

SUGGESTED READING

1. Anderson, Durston & Polle 1970: Thesis and assignment, writing. Wiley Eastern Limited.
2. Booth W. C. et al. 2016. The Craft of Research. University of Chicago Press.
3. Rajendrakumar C. 2008. Research Methodology. APH publishing Corporation.
4. Kothari C. R. 2004. Research Methodology. New Age International Publishers.
5. Gurumani, N. 2006. Research Methodology for Biological Sciences. MJP. Publishers.
6. Marczyk, G., DeMatteo, D., Festinger, D. 2005. Essentials of research design and methodology. John Wiley.
7. Katz, M. J. 2009. From Research to Manuscript: A Guide to Scientific Writing. Springer.
8. Michael Alley. The Craft of Scientific Writing (3rd Edition) Publisher: Springer.

9. Cargill, M., O.Connor, P. 2013. Writing Scientific Research Articles: Strategy and Steps. Wiley-Blackwell.
10. Blake, G. and Bly, R. W. 2000. The Elements of Technical Writing. Pearson.
11. Reep, D. C. 2014. Technical Writing: Principles, Strategies, and Readings. Longman.

Course No. 3.3 **Course Code: SDC3AG11** **Course Title: Plant Tissue Culture and Biotechnology**	**Credits: 4** **Total Contact Hrs: 60 Hrs**
Objectives • To build theoretical foundation in plant tissue culture and biotechnology.	
Course Outcomes	
CO1- Describe the principles and techniques of plant tissue culture	
CO2- Explain the Tissue culture medium	
CO3- Describe the preparation of explants and different methods of micropropagation	
CO4- Explain the different phases of micropropagation	
CO5- Explain the methods and applications of tissue culture	
CO6- Describe the recombinant DNA Technology	
CO7- Explain the cloning vectors and PCR	
CO8- Describe the different methods of gene transfer	

Plant tissue culture

Module-1 (20 hours)

1. Plant tissue culture – Principles and techniques; Cellular totipotency; *invitro* differentiation – de differentiation and re-differentiation.

3. Tissue culture medium – Basic components in tissue culture medium – Solid and liquid medium; Murashige and Skoog medium – composition and preparation.

4. Aseptic techniques in *in vitro* culture – sterilization – different methods –sterilization of instruments and glassware, medium, explants; workingprinciple of laminar air flow and autoclave.

5. Preparation of explants – surface sterilization, inoculation, incubation, subculturing.

6. Micropropagation - Different methods – apical, axillary bud proliferation, direct and indirect organogenesis and somatic embryogenesis.

7. Different phases of micropropagation – multiple shoot induction, shoot elongation, *in vitro* and *in vivo* rooting hardening, transplantation and field evaluation; Advantages and disadvantages of micropropogation. Somaclonal variation.

Module – II (15 hours)

1. Methods and Applications of tissue culture:

1. Shoot tip and meristem culture
2. Somatic embryogenesis and synthetic seed production
3. Embryo culture
4. Protoplast isolation culture and regeneration – transformation and transgenics
5. Somatic cell hybridization, cybridization.
6. *In vitro* secondary metabolite production — cell immobilization, bioreactors
7. *In vitro* production of haploids – anther and pollen culture
8. *In vitro* preservation of Germplasm

Biotechnology

Module –I (15 hours)

1. Recombinant DNA Technology: Gene cloning strategies – recombinant DNA construction – cloning vectors – plasmids- Ti plasmids, pBR322, bacteriophage based vectors. Restriction endonucleases and ligases- transformation and selection of transformants – using antibiotic resistance markers. Blotting techniques; PCR.
2. Different methods of gene transfer – chemically stimulated DNA uptake by protoplast, electroporation, microinjection, biolistics. Agrobacterium mediate gene transfer- gene library, gene banks.

Module –II (10 hours)

1. Application of Biotechnology in:

a. Medicine - Production of human insulin, human growth hormones.

b. Forensics - DNA finger printing.

c. Agriculture - Genetically modified crops – Bt crops, Golden rice, Flavr Savr tomato, herbicide resistant crops, edible vaccines.

d. Environment- Bioremediation- use of genetically engineered bacteria- super bugs.

e. Industry- Horticulture and Floriculture Industry, production of vitamins, amino acids and alcohol.

Textbooks

1. Bhojwani, S.S. and Razdan, S.K. 1993. *Plant tissue culture: Theory and Practice*. Elsever

Science Publications, Netherlands.

2. Chawla, H.S.2012. *Introduction to plant biotechnology*. IBH publishing Co.

3. Christou, P. and Klee, H. (eds.). 2004. *Handbook of Plant Biotechnology*.Wiley, 768 p.

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 manipulationof plants.* Oxford University Press, 346 p.

Course No. 3.4 **Course Code: SDC3AG12** **Course Title: Integrated Pest Management in Crops**	**Credits: 4** **Total Contact Hrs: 60 Hrs**
Objectives • To develop knowledge on the theoretical basis of integrated pest management.	
Course outcomes CO1- Describe the concepts, principles and tools of IPM	
CO2- Explain the different types of IPM Methods	
CO3- Describe the important groups of micro organisms used in insect pest control.	
CO4- Explain the mass multiplication techniques of important biocontrol agents	

Module 1 **12 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 **12 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. Plant protection equipments - Classification- and working principles- parts of sprayers, dusters and uses.

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. 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.

Course No. 3.5 **Course Code: SDC3AG13** **Course Title: Fundamentals of Agricultural Engineering**	**Credits: 4** **Total Contact Hrs: 60 Hrs**
Objectives	

1.To familiarize with fundamentals of water management.

2.To acquaint with various soil conservation methods.

Course outcomes

CO1- Describe the irrigation with definition and objectives

CO2-Explain the methods of irrigation and their engineering aspects

CO3- Describe the agronomic techniques to improve water use efficiency

CO4-Describe the soil erosion and its relative aspects

CO5-Describe the water harvesting techniques - in situ and ex situ methods

CO6- Explain surveying: survey equipment, chain survey, cross staff survey, plotting procedure, calculations of area of regular and irregular fields.

MODULE 1 **12 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 **12 Hrs**

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 **12 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 **12 Hrs**

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

MODULE 5 **12 Hrs**

Surveying: survey equipment, chain survey, cross staff survey, plotting procedure, calculations of area of regular and irregular fields.

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* (4th 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 ConservationEngineering,* KalyaniPublishers, 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.

Course No. 3.6 **Course Code: SDC3AG14 (P)** **Course Title: Agricultural Engineering- Practicals**	**Credits: 4** **Total Contact Hrs: 60 Hrs**
Objectives 1. To familiarize with fundamentals of water management	

Contents

1. Study of soil loss by multi slot device
2. Estimation of runoff -problems
3. Study of water flow measuring devices
4. Study of water harvesting techniques
5. Study of ground water recharge techniques
6. Design of water harvesting ponds
7. Problems on drip irrigation systems
8. Problems on sprinkler irrigation systems
9. Study of fertigation equipments
10. Irrigation pump selection - problems
11. Field visit

Course No. 3.7	Credits: 3
Course Code: SDC3AG15 (P)	Total Contact Hrs: 45
Course Title: Micropropagation of plants- Practicals	Hrs

Course outcomes

CO1-Explain the requirements for Plant Tissue Culture laboratory and media components and preparations.

CO2- Describe the preparation and sterilization of media and aseptic manipulation and inoculation of various explants

CO3- Explain the micro propagation of important crops

CO4- Describe the preparation of synthetic seeds

CO5- Explain the demonstration of anther culture and embryo culture.

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.
6. Micro propagation of important crops.
7. Preparation of synthetic seeds.
8. Demonstration of Anther culture.
9. Demonstration of embryo culture.
10. Hardening/ acclimatization of regenerated plants.

Course No. 3.8	Credits: 3
Course Code: SDC3AG16 (P)	Total Contact Hrs: 60
Course Title: Integrated Pest Management- Practicals	Hrs

Objective- Familiarization with methods of pest control

Contents

1. Familiarization with Mechanical methods of pest control.
2. Identification of predators.
3. Identification of microbial agents.

4. Familiarization with different formulations of insecticides.

5. Preparation of neem oil garlic emulsion and tobacco decoction.

6. Familiarization with different insecticides.

7. Calculation of doses/concentrations of insecticides.

8. Preparation of spray fluid for field application.

9. Familiarization with Plant protection equipments.

10. Identification, symptoms of damage, collection and preservation of pests of:

a) Rice, Coconut.

b) Banana, Cashew.

c) Pepper, cardamom.

f) Brinjal, Bittergourd and cowpea

AUDIT COURSE – 3rd SEMESTER (AUD3E03)

Human Rights

SYLLABUS

Module I - INTRODUCTION TO HUMAN RIGHTS

Evolution, Nature, Philosophical and Historical foundation of Human Rights, National Human Rights Commission, State Human Rights Commission

Module II – CONSTITUTION OF INDIA AND FUNDAMENTAL RIGHTS

Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and educational rights, Rights to Constitutional Remedies.

Module III - INTERNATIONAL HUMAN RIGHTS

Evolution of human rights and duties on the international plane, The United Nations Charter and the development of human rights Provisions of the Charter, Universal Declaration of Human Rights 1948, International Covenant on Civil and Political Rights 1966 and other major UN instruments on human rights (Conventions on Women's Rights, Rights of the Child, Torture)

Module IV - HUMAN RIGHTS COMMISSION FOR WOMEN AND CHILDREN

Women Rights - National Commission for Women (NCW), Kerala Women Commission (KWC), Legal Aid for Women, Laws for protection of women

Child Rights - National Child Rights Protection Council, National Commission for Protection of Protection of Child Rights (NCPCR), Legal Aid, LokAdalats, Public Interest Litigation Laws for

the Protection and Care of Children

Module V - HUMAN RIGHTS FOR MINORITIES, SC AND ST

Special Laws and Policies: National Commission for Minorities Act (1992). Minority Rights in India, The Nation- Building Project and Minorities, Communal Mobilization and Minority's Rights. National Commission for Scheduled Tribes (NCST), National Commission for Scheduled Castes (NCSC)

SEMESTER IV

Course No. 4.1	**Credits: 4**
Course Code: A13	**Total Contact Hrs: 72**
Course Title: Natural Resource Management	**Hrs**

Unit 1: Introduction to natural resources (Hours: 8)

Definition of natural resources. Types of natural resources. Need for protecting natural resources

Unit 2: Sustainable utilization (Hours: 8)

Concept of sustainable utilization. Economic, ecological and socio-cultural approaches.

Unit 3: Land (Hours: 8)

Agricultural, pastoral, horticultural and silvicultural land utilization. Soil degradation and soil management.

Unit 4: Water (Hours: 8)

Fresh water (rivers, lakes, groundwater); Marine; Estuarine; Wetlands; Threats and management strategies.

Unit 5: Biological Resources (Hours: 8)

Biodiversity-definition and types; Significance; Threats; Management strategies. Bioprospecting. National Biodiversity Action Plan.

Unit 6: Forests (Hours: 8)

Definition. Types of forests. Forest cover and its significance (with special reference to India); Major and minor forest products; Forest depletion. Forest Management.

Unit 7: Energy (Hours: 8)

Renewable and non-renewable sources of energy.

Unit 8: Contemporary practices in natural resource management (Hours: 8)

Environmental Impact Assessment, Remote Sensing, Geographic Information System, Participatory Resource Appraisal. Ecological footprint with emphasis on carbon footprint. Resource Accounting. Waste management.

Unit 9: National and international efforts in natural resource management and conservation (Hours: 8)

SUGGESTED READING

1. Singh K. K. 2008. Natural Resources Conservation & Management. M D Publications Pvt. Ltd.

2. Singh, J. S., Singh, S.P. and Gupta, S. 2006. Ecology, Environment and Resource Conservation. Anamaya Publications.
3. Rogers, P.P., Jalal, K.F. and Boyd, J.A. 2008. An Introduction to SustainableDevelopment. Prentice Hall of India.
4. Pandey, B. W. 2005. Natural Resource Management. Mittal Publications.
5. Lynch D. R. 2011. Sustainable Natural Resource Management. Cambridge University Press.
6. Nuberg, I., George, B., Reid, R. 2009. Agroforestry For Natural Resource Management. CSIRO Publishing.
7. Camp, W. G., Heath-Camp, B. 2016. Managing Our Natural Resources. Cengage Learning Pte. Ltd
8. Chiras, D. D., Reganold, J. P. 2009. Natural Resource Conservation: Management for a Sustainable Future. Pearson.
9. Campbell, B. M., Sayer, J. A. 2003. Integrated Natural Resource Management: Linking Productivity, the Environment and Development. CABI Publishing.
10. Deal, K. H. 2011. Wildlife and Natural Resource Management. Delmar Cengage Learning.

Course No. 4.2	**Credits: 4**
Course Code: A14	**Total Contact Hrs: 72**
Course Title: Intellectual Property Rights	**Hrs**

Module 1: Overview of intellectual property (Hours: 4)
Introduction and the need for intellectual property right (IPR). IPR in India – Genesis and Development. Some important examples of IPR.

Module 2: Patents (Hours: 10)
Macro-economic impact of the patent system. Patent and kind of inventions protected by a patent. Patent document. How to protect your inventions? Granting of patent. Rights of a patent. How extensive is patent protection? Why protect inventions by patents? Searching a patent. Drafting of a patent. Filing of a patent

Module 3: Copyright (Hours: 10)
What is copyright? What is covered by copyright? How long does copyright last? Why protect copyright?

Related rights: What are related rights? Distinction between related rights and copyright. Rights covered by copyright.

Module 4: Trademarks (Hours: 14)

Definition of trademark. Rights of trademark. Kinds of signs that can be used as trademarks. Types of trademark. Function that a trademark performs. How is a trademark protected? How is a trademark registered? How long is a registered trademark protected for? How extensive is trademark protection? What are well-known marks and how are they protected? Domain name and how does it relate to trademarks?

Module 5: Geographical Indications (Hours: 4)

What is a geographical indication? How is a geographical indication protected? Why protect geographical indications?

Module 6: Industrial Designs (Hours: 10)

What is an industrial design? How can industrial designs be protected? What kind of protection is provided by industrial designs? How long does the protection last? Why protect industrial designs?

Module 7: Biotechnology and IPR (Hours: 20)

Rationale for Intellectual Property Protection in biotechnology. Concept of Novelty in Biotechnological Inventions. Concept of Inventive Step in Biotechnological Inventions. Microorganisms as Biotechnological Inventions. Patenting biological inventions. Patenting microorganisms. Patenting other biological processes and products. Protection of new varieties of plants. Justification for Protection. Biotechnology and International Treaties such as Convention on Biological Diversity and TRIPs.

SUGGESTED READING

1. T. M Murray, M.J. Mehlman. 2000. Encyclopaedia of Ethical, Legal and Policy issues in Biotechnology, John Wiley & Sons.

2. P.N. Cheremisinoff, R.P. Ouellette and R.M. Bartholomew.1985. Biotechnology Applications and Research, Technomic Publishing Co., Inc.

3. D. Balasubramaniam, C.F.A. Bryce, K. Dharmalingam, J. Green and K. Jayaraman, 2002. Concepts in Biotechnology, University Press (Orient Longman Ltd.).

4. Bourgagaize, Jewell and Buiser. 2000. Biotechnology: Demystifying the Concepts, Wesley Longman.

5. Ajit Parulekar, Sarita D' Souza. 2006. Indian Patents Law – Legal & Business Implications; Macmillan India,

6. B.L. Wadehra. 2000. Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications; Universal law Publishing Pvt. Ltd.

7. P. Narayanan. 2010. Law of Copyright and Industrial Designs; Eastern law House.

8. N.S. Gopalakrishnan, T.G. Agitha. 2009. Principles of Intellectual Property. Eastern Book Company.

9. T. Ramakrishan (Ed.).2003. Biotechnology and Intellectual Property Rights. CIPRA, NLSIU, Bangalore.

10 N.K. Acharya. 2012. Text Book on Intellectual Property Rights, 6th ed. Asia Law House.

11 M. M. S. Karki. 2009. Intellectual Property Rights: Basic Concepts. Atlantic Publishers.

12 N. S. Sreenivasalu. 2007. Intellectual Property Rights. Neha Publishers & Distributors.

13 Pal P. 2008.Intellectual Property Rights in India: General Issues and Implications. Regal Publications

Course No. 4.3 **Course Code: SDC4AG17** **Course Title: Protected Cultivation of Horticultural Crops**	**Credits: 3** **Total Contact Hrs: 45 Hrs**

Objectives

• To familiarize with protected cultivation structures and cultivation practices

Course outcomes

CO1- Describe the introduction, scope and important of problems and prospects of protected culture in India

CO2- Explain the basic considerations in establishment and operation of greenhouses

CO3- Explain the environmental control systems in green house.

CO4- Describe the type of containers used in protected culture

CO5- Explain the use of substrate and preparation of substrate for protected cultivation

CO6- Describe the Crop regulation

CO7- Explain the harvesting methods

Module1 **12 Hrs**

Introduction - scope and importance - problems and prospects of protected culture in India - growing structures - green house - polyhouse –hot bed, cold frame, lath house, mist chamber, 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 **12Hrs**

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 **12 Hrs**

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

Module 5 **12Hrs**

Harvesting methods - postharvest handling - standards - grading - packing and marketing.

Suggested Readings:

1. Foja Singh., 1997. Advances in Floriculture.Media Today Pvt. Ltd., New Delhi-17.
2. Prasad, S. and U.Kumar. 1998. Commercial floriculture. Agro Botanica. Bikaner - 334 004.
3. Roy. A. Larson., 1992. Introduction of Floriculture.International Book Distributing Co., Lucknow.
4. Vishnu Swarup., 1997. Ornamental Horticulture.Macmillan India Ltd., New Delhi-2.Wltez, S., 1972.The world gladiolus, NAGG, USA.
5. Yadav, L.P. and Bose, T.K., 1986. Biology, conservation and culture of orchids. East- West Press Private Limited, New Delhi.E.
6. Yadav.I.S. and M.L. Choudhary., 1997.Progressive floriculture.The House of Sarpan, (Media), Bangalore.

Course No. 4.4 Course Code: SDC4AG18 Course Title: Weed Management and Fodder Crop Production	Credits: 4 Total Contact Hrs: 60 Hrs

Objectives

1.To understand the general characters of weeds and their management

2.To acquaint with cultivation of rice, fibre crops, fodder crops, etc.

Course outcomes

CO1- Explain the classification, propagation and dissemination of weeds

CO2- Describe the Integrated weed management

CO3- Describe the herbicide classification, formulations, methods of application.

CO4- Describe the soil and climatic requirement , varieties, cultural practices , harvesting and postharvest off major oil crops

CO5- Explain the Crop Production in rice

CO6- Describe the mechanised farming in rice

CO7- Describe the cultivation and management of fodder crops

MODULE 1 **15 Hrs**

Weeds: Introduction, harmful and beneficial effects, classification, propagation and dissemination. Concepts of weed prevention, control and eradication; Methods of weed control: physical, cultural, chemical and biological methods. Integrated weed management (IWM); 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. Aquatic and problematic weeds and their control.

MODULE 2 **15 Hrs**

Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, Culturalpractices, harvesting and postharvest handling of major Oilseeds , Sugar cane, Fibre crop, Narcotics,Medicinal plants.

MODULE 3 **10 Hrs**

Crop Production in rice in detail: Methods of sowing, Varieties and their duration, various systems of rice cultivation. Raising of nursery, sowing in the main field, Nutrient and water

MODULE 4 **10 Hrs**

Mechanised farming in Rice. Introduction to various machines employed in mechanised rice cultivation including field preparation, weeding and harvesting.

MODULE 5 **10 Hrs**

Fodder crops: their cultivation and management- value addition and nutrient enrichment in fodder crops

Text books:

1. Agarwal, P.C. 1990.Oilseeds in India. Oxford and IBH, New Delhi
2. Balasuramaniyan, P. and Palaniappan, SP. 2003.Principles and Practices of Agronomy.Agrobios(India)
3. Barnes, A.C. 1964.The Sugarcane.Interscience Publishers, New Delhi
4. ChiddaSnidngh, Prem Singh and Rajbir Singh.2003. Modern Techniques of Raising Field Crops (2 Ed.). Oxford &IBH, New Delhi.
5. ICAR [Indian Council of Agricultural Research].2006. Hand Book of Agriculture. ICAR, New Delhi
6. KAU [Kerala Agricultural University].2007.Package of Practices Recommendations - Crops. Directorate of Extension, Kerala Agricultural University, Thrissur
7. Lekshmikantan, M. 1983.Technology in Sugarcane Growing. Oxford & IBH Publishing Co., Pvt. Ltd., New Delhi
8. Prasad, R. (Ed.). 2001. Field Crop Production. ICAR, New Delhi
9. Purseglove, J.W. 1975. Tropical Crops: Monocotyledons. The English Language Book Society and Longman, London
10. 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.
11. Yadav, D.S. 1992. Pulse Crops. Kalyani Publishers., New Delhi.
12. 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.
13. IARI [Indian Agricultural Research Institute]. 1977. Water Requirement and Irrigation
14. Management of Crops in India, IARI Monograph No.4, Water Technology Centre, IARI, New-Delhi.
15. Lenka, D. 2001.Irrigation and Drainage.Kalyani Publishers, New-Delhi.
16. Mal, B. C.2002. Introduction to Soil and Water Conservation Engineering,Kalyani
17. Michael, A.M. 1988.Irrigation Theory and Practice.Vikas Publishing House Pvt. Ltd., New

18. Mishra, R.D. and Ahamed, M. 1993.Manual of Irrigation Agronomy.Oxford and IBH Publishing Company Pvt. Ltd.
19. Prihar, S.S. and Sandhu, B.S. 1987. Irrigation of Field crops - Principles and Practices - ICAR, New-Delhi.
20. SankaraReddi, G.H. and Yellamanda Reddy, T.2003 Efficient Use of Irrigation Water. Kalyani Publishing House, New Delhi.
21. Tideman, E.M. 1996. Watershed Management: Guidelines for Indian Conditions. Omega Scientific Publishers, New Delhi.
22. Aldrich, R.J. and Kramer, R.J. 1997.Principles in Weed Management.Panama Publications, New Delhi.
23. Anderson, P.W. 1983. Weed Science - Principles. West Publishing Con.d New York
24. Ashton, P.M. and Crafts, A.S. 1981. Mode of Action of Herbicides (2 Ed.) Wiley- Inter Science, New York.

Course No. 4.5 **Course Code: SDC4AG19** **Course Title: Livestock Farming**	**Credits: 4** **Total Contact Hrs: 60 Hrs**
Objectives 1. To familiarize with fundamentals of livestock farming. 2. To acquaint with the management of various farms.	
Course Outcomes CO1- Describe the role of Livestock in National economy	
CO2- Describe the general management Practices in Dairy farming	
CO3- Describe the cattle and buffalo management	
CO4- Explain the general management practices	
CO5- Explain the dairy development in India-	
CO6- Describe the composition of milk, Constituent of Milk, Factors affecting Quality and Quantity of milk, Nutritive value , and Physico-chemical properties of milk	
CO7- Describe the poultry management	
CO8- Detailed study of major animal diseases	

MODULE 1 12 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, Sheep and Goat management- Housing of sheep and goat, General management practices.

MODULE 3 12 Hrs

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, Milk Chemistry and Milk constituents- Definition of Milk, Composition of Milk, Constituent of Milk, Factors affecting Quality and Quantity of milk, Nutritive value of milk, Physico-chemical properties of milk. Clean milk production: Source of contamination.

MODULE 4 12 Hrs

Poultry management: - Housing of Poultry, General Management practices, Pig Farming, Rabbit Farming, Duck Farming- Breeds of duck, General management practices. Quail management.

MODULE 5 12 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, Babesiasis, Theleriosis. 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) Hanbook 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

Course No. 4.6 **Course Code: SDC4AG20 (P)** Course Title: **Protected cultivation of Horticultural crops- Practicals**	**Credits: 4** **Total Contact Hrs: 60 Hrs**
Objectives • To practice with protected cultivation practices of important crops	

Contents

Protected cultivation in general:

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

Protected cultivation aspects of individual crops:

1. Protected cultivation of cowpea,
2. Protected cultivation of capsicum
3. Protected cultivation of cucumber
4. Protected cultivation of tomato
5. Protected cultivation of orchids and anthurium.
6. Protected cultivation of rose.

Course No. 4.7 **Course Code: SDC4AG21 (P)** **Course Title: Weed Management and Fodder crop Production and Livestock Farming- Practicals**	**Credits: 3** **Total Contact Hrs: 45 Hrs**

Objectives

- To familiarize with the general characters of weeds and their management.
- To familiarize with cultivation of rice, fibre crops, fodder crops etc.
- Familiarization with cultural methods of pest control.
- To familiarize with practices in livestock farming.
- To acquaint with the management of important farm animals and birds

Weed management

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. Hand weeding and hoeing using conoweeder in rice.
8. Hoeing and after cultivation in cassava plots.
9. Economics of weed control practices.
10. Visit to areas with problem weeds.
11. Familiarization and planting of various fodder crops and their preservation.
12. After cultivation operations of major crops.

Pest management

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

a) Rice, Coconut.

b) Banana, Cashew.

c) Pepper, cardamom.

d) Brinjal, Bittergourd and cowpea.

Live stock farming

1. Morphology of cattle, buffalo and poultry
2. Classification of Cattle Breeds
3. Study of Cattle, Breeds

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
5. Study of Sheep and Goat breeds: Osmanabadi, Jamnapuri, Saanem

Course No. 4.8 **Course Code: SDC4AG22(Pr)** **Course Title: Internship/Project(Cultivation of Rice)**	**Credits: 4** **Total Contact Hrs: 60 Hrs**

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.

AUDIT COURSE 4th SEMESTER

GENDER STUDIES (AUD4E04)

Objectives

1. To provide basic understanding of the importance of Gender studies

2. To introduce basic concepts relating to gender and to provide logical understanding of gender roles.

3. To provide an analytical understanding of gender differences and major gender issues

4. To consceintise the students on cultural construction of masculinity and femininity

5. To provide an analytical understanding of women empowerment and gender equality

6. To provide a critical understanding of women developmental policies and programmes.

MODULE I : Gender and Gender Studies

I.1. Origin and Development of Gender Studies, Gender Studies in National and International Settings, Objectives and Relevance of Gender Studies

I.2. Social Construction of Gender: Sex and gender, Gender Difference, Gender Inequality, Gender Bias, Gender Discrimination

I.3. Gender Socialization: Construction of Femininity and Masculinity, Equality and Difference, Gender Identity and Self Image, Gender Roles, Segregation and Ranking.

MODULE II : Gender and Economy

II.1. Gender and Economy: Economic Inequality, Productive and Unproductive work, Visible and Invisible Work, Paid and Unpaid Work

II.2. Sexual Division of Labor: Private-Public Dichotomy, organized and unorganized sector. Feminization of Work, New Economic Policy and its impact on Women.

II.3. Women and Work: Production vs. Reproduction, Household Work, Women's Work and Technology

MODULE III : Major Gender Issues

III-1. Gender and Family: Gender Role Divisions, Domestic violence: physical, sexual, psychological and verbal, Denial of reproductive rights, Female Genital Mutilation (FGM), Dowry harassment and death, Child abuse.

III-2. Gender issues: Sexual exploitation, Rape, Prostitution, Sex Tourism, Sexual Harassment, Media violence

III.3. Women and Health: Early marriage and early motherhood. Ill-health, Mortality and Morbidity, Factors influencing health, Problems of destitute and aged women

MODULE IV: Status of women and Challenges to Development

V.1. Social and Economic Status of Women: Women in third world societies with special reference to India.

V.I Political and Religious Status of Women: Cultural and Religious prominence, Political participation and Power.

V.2. Factors influencing the status of women: Illiteracy and low education, Denial of access to resources, Selective abortion and female infanticide.

MODULE V: Women Empowerment and gender equality

IV.1. Empowerment and need for empowerment: Quality of Life Perspective and Contribution of Women

IV.2. Various facets for empowerment: social, economic, educational, legal, political empowerment

IV: 3. Empowerment Programmes: Government Empowerment Schemes and hindrances in the path of Women empowerment.

MODULE VI : Women and Development policies and programmes

VI-1. Gender and Politics: Political Role and Participation of Women in India, Women's Reservation Bill, and Laws related to women's property rights and inheritance, conditions of work and pay.

VI.2. National policies and programs: Feminist standpoint of development policy, Gender analysis of development policy, engendering development policies.

VI.3. Critical review of women development programs in India-Role of non-state actors, Role of NGOs – Development initiatives, Self Help Groups, Micro finance and micro enterprises,

VI.4. Women development: International initiatives, Copenhagen conference, Nairobi Conference, Beijing Conference, Mexico City conference

SEMESTER V

Course No. 5.1 **Course Code: SDC5AG23 E1** **Course Title: Environmental Microbiology and Biotechnology**	**Credits: 4** **Total Contact Hrs: 60 Hrs**
Objectives • To understand various aspects of environmental microbiology and biotechnology	

Module-I

Introduction to Microbiology-History-scope-Types –structure, biology and classification of bacteria, mycoplasma, fungi, algae and virus-identification (10 Hours)

Module-II

Rules, regulations and tools in Microbiology- Basic principles of Autoclave, Hot air oven, laminar air flow. Microscopy-Bright field-phase contrast-dark field-fluorescent-con-focal electron microscopy (SEM,TEM) Centrifuge-spectrophotometer (10 Hours)

ModuleIII

Sampling Techniques: Preparation of samples, types of media-sterilization techniques-cultivation and preservation of microorganism-methods of estimation and isolation of microorganism in soil, water and milk(10 Hours)

Module-IV

Microbiology of soil-microbial flora of soil-interaction among soil microorganism-role of soil microorganisms-nitrogen, carbon, sulphur cycles-microbiology of aquatic micro organism- Air microbiology-distribution, techniques and role of air microorganisms.(10 Hours)

Module-V

Microbial Genetics-concept of the gene mutations, transformation, conjugation, transduction, plasmids, microbial control of environmental pollution (10 Hours)

Module-VI

Microbial growth process-major products of Industrial microbiology-alcoholic beverages, amino acids and antibiotics, genetic engineering,Recombinant DNA technique in Biotechnology-Gene

Text Books:

Microbiology-Paul.A.Ketchum.1984.John wiley and Sons,Newyork.

Microbiology-L.M.Prescott,J.P.Harley,D.A.Klein,1993.2nd Ed.Wm.C.Brown Publishers

Microbiology-M.J.Pelczar,E.C.S.Chan,N.R.Kreig.1996. Mc Graw Hill Books Co.,Newyork

Microbiology-Fundamentals and Applications. Atlas,R.M.Macmillian Pub. Co.,New York

References:

Bacterial Metabolism. Doelle,N.W.1975.2nd Ed.Academic Press

Microbial Genetics-D.Freigelder,1987.Jones BartkettPublishers,Inc,Boston

Introduction to Environmental Microbiology.Mitchell,R.1974.Prentice Hall Int.

Introduction to Soil Microbiology.M.Alexander.1977Ny. John Wiley and Sons

Aquatic Microbiology –G.Rheinheimer.1991.4th Ed. John Wiley and Sons

Microbial Biotechnology-A.N.Glazer,H.Nikadio.1995.W.H.Freeman &Co.,New York

Bacteriology- Salle

A text book of Microbiology. Ananthanarayanan,R and JayaramPanicker

Course No. 5.1 **Course Code: SDC5AG23 E2** **Course Title: Government Policies and Programmes Related to Agriculture**	**Credits: 4** **Total Contact Hrs: 60 Hrs**
Objectives • To acquaint with various Government Policies related to Agriculture in Kerala and India. • To familiarise with five year plans and Panchayathiraj system in India.	

MODULE 1 Introduction to agricultural policies **10 Hrs**

Introduction to agricultural policies of Kerala and of India - need and importance - National Agricultural Policy in brief.

MODULE 2 Agricultural policies regarding land and labour **20 Hrs**

Agricultural policies regarding land - need and scope for land reforms - Abolition of

pattern of operational holdings, problem of sub-division and fragmentation of holdings.

Agricultural policies regarding labour - present position of agricultural labour - minimum wages- abolition of bonded labour - Recommendations of the National Commission on Rural Labour –NREGP.

MODULE 3 Agricultural policies regarding seeds and fertilizers 20 Hrs

Agricultural policies regarding seeds - National Seeds Policy -varietal development and plant variety protection - seed production - quality assurance - seed distribution and marketing – infrastructure facilities - transgenic plant varieties - import of seeds and planting material - export of seeds - Agricultural policies regarding fertilizers- Fertilizer pricing policy - payment of subsidy. Agricultural policies regarding plant protection chemicals - protection of consumers fromadverse impacts of pesticides. Agricultural policies regarding irrigation, machinery, technologyetc.

MODULE 4 Agricultural policies regarding credit 15 Hrs

Agricultural policies regarding credit - Co-operatives and rural credit - Commercial banks and rural credit - Regional Rural Banks - Lead Bank Scheme - NABARD. Agricultural policies of Kerala and of India- regarding agricultural products and their marketing, export and prices – food security.

MODULE 5 Five Year plans and Panchayathiraj 15 Hrs

Concept of planned growth- Five Year Plans-Government policies and programs in agriculture and rural development. IADP - IAAP- IWDP- Watershed development Programmes- IRDPNREGP-SGSY - Kudumbasree- etc. Peoples' Plan- Decentralised planning- current Plans -Agricultural development programmes and schemes of the dept. of Agriculture- liaison with Local Self Government. Panchayati raj system and institutions- gramasabha- Preparation of plan projects in agriculture.

Text books:

1. Government of India. Five year Plan Documents.
2. Government of India.Economic Survey. Published by Planning Commission (various issues)
3. Government of India.Economic Review. Published by State Planning Board (various issues)

Course No. 5.2 **Course Code: SDC5AG24 E3** **Course Title: Food and Dairy Microbiology**	**Credits: 4** **Total Contact Hrs: 60 Hrs**
Objectives • To understand various aspects of food and dairy microbiology	

Module 1 **(10 hours)**

Food as a substrate for microorganisms. Types of microorganisms in food - Source of contamination - Factors influencing microbial growth in foods (extrinsic and intrinsic) Microbial examination of food- viable colony count, examination of fecal Streptococci.

Module 2 **(10 hours)**

Milk as a substrate for microorganisms. Types ofmicroorganisms in Milk- bacteria, fungi and yeast. Sources of microbial contamination of milk.Microbiological analysis of milk. Rapid platform testsorganoleptic, Clot on boiling (COB),turntable acidity alcohol test, DMC, sedimentation test and pH. Standard plate count, MBRT.

Module 3 **(10 hours)**

Food fermentations: Cheese, bread, yoghurt, idli, fermented pickles and fermented vegetables, Ice cream, - methods and organisms used. SCP, Probiotics and prebiotics.

Module 4 **(10 hours)**

General principles underlying spoilage, different kinds of foods, cereals and cereal products - sugar and sugar products - vegetable and fruits - meat and meat products - fish and other sea foods - eggs and poultry - dairy and fermentative products (ice cream/milk/bread/wine).

Module 5 **(10 hours)**

Food Poisoning : food borne infections (a) Bacterial: Staphylococcal, Brucella, Bacillus, Clostridium, Escherichia, Salmonella (b) Fungal : Mycotoxins including aflatoxins, ergotism (c)Viral: Hepatitis, (d) Protozoa - Amoebiasis.

Module 6 **(10 hours)**

Food preservation : Principles of food preservation - methods of preservation. a. Physical (irradiation, drying, heat processing, pasteurization, chilling and freezing, high pressure and modification of atmosphere) b. Chemical (Sodium benzoate Class I & II). Food Sanitation: Good manufacturing practices - HACCP, Presonnel hygiene.

Suggested Readings

1. Food Microbiology by Adams, M R . and Moss, M.O.1995.The Royal Society of Chemistry, Cambridge.
2. Food Microbiology by Frazier, W.C. and Westhoff, D.C.1988.TATA McGraw HillPublishing companyltd., New Delhi.
3. Modern Food Microbiology by Jay, J.M.1987.CBS Publishers and distributors, New Delhi.
4. Basic Food Microbiology by Banwart, G.J.1989.Chapman & Hall New York.
5. A Modern Introduction to Food Microbiology by Board, R.C.1983.Blackwell Scientific Publications,

Oxford.

6. Dairy Microbiology by Robinson, R.K.1990. Elsevier Applied Science, London.

7. Food Poisoning and Food Hygiene, Hobbs, B.C. and Roberts, D.1993. Edward Arnold.

8. MICROBIOLOGICAL EXAMINATION METHODS OF FOOD AND WATER by SILVA

9. Lund BM, Baird Parker AC, and Gould GW. (2000). *The Microbiological Safety and Quality of Foods.*

Vol. 1-2, ASPEN Publication, Gaithersberg, MD.

10. Gould GW. (1995). *New Methods of Food Preservation.* Blackie Academic and Professional, London.

Course No. 5.2 **Course Code: SDC5AG24 E4** **Course Title: Landscaping and Gardening**	**Credits: 4** **Total Contact Hrs: 60 Hrs**
Objectives • To familiarize with landscaping, gardening and commercial floriculture	

Module 1

Introduction to landscaping, gardening and commercial Floriculture. Components of landscapes and gardens, descriptions and functional uses – Living components – Non living components – Enrichment item. Garden enclosures, surfacing materials, roads and paths, enrichment items

Module 2

Types of gardens – Styles in gardening – characteristics and components of gardens. Principles of landscaping. Designing and Preparation of landscape and garden plans.Functional uses of plants for different purposes.

Module 3

Lawn Types of lawn grasses, methods of establishing, maintenance and rejuvenation of lawns. Annuals and herbaceous perennials Function and selection colour schemes, planting designs, Cultural practices

Module 4

Specialized gardening techniques. Indoor gardening of plants Bonsai, vertical garden, tray garden, terrarium *etc*. Flower arrangement, flower shows and judging flower shows and arrangement, styles and designs

Suggested Readings

1. Bose,T.K. and Mukherjee, D. 1972. *Gardening in India*. Oxford and IBH Publishing Company, Calcutta.

2. Bose, T.K., Maiti, R.G., Dhuna, R.S. and Das., P. (eds) 1909. *Floriculture and Landscaping*. Naya Prakash, Calcutta, India.

3. Bhattacharjee,S.K.(ed). 2006. *Advances in Ornamental Horticulture* Vol. I to VI. Pointer Publishers, Jaipur.

4. Chadha, K.L. and Choudhury, B. 1992. *Ornamental Horticulture in India*., ICAR, New Delhi.

5. Gilbert, R. 1988. *200 House plants any one can grow*. Dorling Kindersley Ltd., London. 144p.

6. Jindal, S.L. 1987. *Flowering shrubs in India.* Publications Division, Govt. of India, New Delhi. 175p.

7. Joiner.J.N. 1981. *Foliage Plant Production*. Prentice Hall Inc., London.

8. KAU(Kerala Agricultural University) 2011. Package of Practices Recommendations: Crops(14th Ed). Kerala Agricultural University, Thrissur. 360p.

9. Pal, B.P. 1972. *The rose in India*. Indian Council of Agricultural Research, New Delhi. 73

10. Randhawa, M.S. 1983. *Flowering Trees*. National Book Trust, India, New Delhi. 208p.

11. Randhawa.G.S. and Mukhopadhyay. A. 1986. *Floriculture in India*. Allied Publishers, New Delhi. 656p.

12. Rajeevan, P.K., Singh, K.P. and Valsalakumari, P.K .2003. ed. *Bulbous Flowers*. Indian Society of Ornamental Horticulture Division of Floriculture & Landscaping, IARI, New Delhi.

13. Sabina, G.T. 2009. *Ornamental plants*. New India Publishing Agency- 324p.

14. Santapau, H. and Heary, A.N. 1984. *A Dictionary of flowering plants in India*. CSIR, New Delhi. 198p.

15. Sheela, V.L. 2008. *Flowers for trade.* New India Publishing Agency, New Delhi.379p.

16. Sidhu, S.S. 2016.*Ornamental Horticulture.* New India Publishing Agency,New Delhi. 485p.

17. Swarup.V. 1993. *Indoor Gardening*, ICAR, New Delhi.

Course No. 5.3 **Course Code: SDC5AG25** **Course Title: Commercial Vegetable Production**	**Credits: 4** **Total Contact Hrs: 60 Hrs**

Objectives

• To understand various principles and practices of commercial vegetable production.

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 **12 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 and its site selection, principles of layout, cropping schedule; Market garden; Truck garden; vegetable forcing;Vegetable garden for seed production; Hydroponics, aeroponics, Riverbed system, Terrace Gardenetc. Growth regulators -role ofgrowth regulators in vegetable production and methods of application.

Module 4 **12 Hrs**

Production technology of warm season vegetable- Importance, origin, 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 **12 Hrs**

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

Course No. 5.4 **Course Code: SDC5AG26** **Course Title: Agricultural Enterprises**	**Credits: 3** **Total Contact Hrs: 45 Hrs**

Objectives

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

MODULE 1 **12Hrs**

Bee keeping -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 2 **10 Hrs**

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. Recent advances in sericulture research.

MODULE 3 **23 Hrs**

Mushroom cultivation, Importance of mushroom cultivation - definition of mushroom - its importance - present scenario of mushroom cultivation - general morphological features, taxonomy and identification of different 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, cultivation of pleurotus, Volvariella, Lentinus,Calocybe and Auricularia. Different types of substrates, substrate preparation and sterilization,Spawning, methods of spawning, spawn run phase, cropping. Identification and management of different pests and diseases of mushrooms. Methods of harvesting mushrooms, post harvesttreatments and preservation of mushrooms. Packing and processing - Different methods of processing, canning and dehydration. Nutritive value of mushrooms and preparation of differentrecipes.

MODULE 4 **15 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. Protected cultivation of rose, gerbera, chrysanthemum etc. - general concepts and practices.

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.

Text books:

1. David, B. V. and Kumarawami, T. 1978. *Elements of Economic Entomology* Popular Book Depot, Madras.
2. Ganga, G. and Sulochanachetty. 1999. *An Introduction to Sericulture* Second edition. IBM and Oxford Publishing Company, New Delhi.
3. Groul, R.A. 1963.*The Hive and the Honeybee.*Dadani and Sons.Inc. Illinois.
4. Krishnaswami, S., Narasimhanna, Suryanarayana and Kumararaj. 1991. *FAO Manuals on Mulberry Cultivation, silkworm rearing and silk reeling*. IBM and Oxford Publishing Company, New Delhi.
5. Mishra, R. C. 1998.*Perspectives in Indian Apiculture*. Agro botanica, Bikaneer, Rajasthan
6. Sardar Singh. 1962. *Bee Keeping in India*. ICAR, New Delhi.
7. Chang, S. T. Miles, P. G. and Hays, W. A. 1978.*The Biology and Cultivation of Edible Mushrooms.* Academic Press, London.
8. Lulu Das. 2002. *Mushroom Recipes*. (Released in the VIII Biennial meeting of AICMIP).
9. Nair, M. C. 1995.*Beneficial Fungi and TheirUtilization.*Scientific publishers, NewPaliRoad, Jodhpur.
10. Randhawa, G.S. and Mukhopadhyay, A. 1986.*Floriculture in India*. Allied publishers New Delhi.
11. Rogers, J. 1974.*Flower arranging*. Hamlyn, London

Course No. 5.5 **Course Code: SDC5AG27** **Course Title: Fundamentals of Organic Farming**	**Credits: 4** **Total Contact Hrs: 60 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 **12Hrs**

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 **12Hrs**

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 productionpractices-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 **12 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, organic Manuring and composting, multiple cropping. Intercropping in relation to maintenance of soil productivity.

MODULE 4 **12 Hrs**

Biological pest control: Biological agents -Mass multiplication and familiarization with field application, Different traps and pheromones for pest control. Biocontrol of weeds, diseases and insect pests, Sanitation, Tillage and cultivation, Mulching, Supplemental fertilization, Biorationalpesticides, Foliar fertilization.

MODULE 5 **12 Hrs**

Socio-economic impacts; Marketing and export potential - 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. Ananthakrishnan, 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.

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Course No. 5.6 **Course Code: SDC5AG28(P)** **Course Title: Agricultural Enterprises -Practicals**	**Credits: 3** **Total Contact Hrs:60**

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

Commercial Enterprises

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 lac insects and their natural enemies.

8. Identification of common edible and poisonous mushrooms.

9. Preparation of substrates for mushroom cultivation.

10. Oyster mushroom cultivation.

11. Paddy straw mushroom cultivation.

12. Button mushroom cultivation.

13. Visit to a commercial mushroom production unit.

14. Methods of harvesting mushrooms.

15. Mushroom recipes – preparation.

16. Production techniques of dry flowers.

17. Value addition in cut flowers and loose flowers, hands on training in preparation of garlands, bouquet, flower arrangements etc.

Course No. 5.7 **Course Code: SDC5AG29 (P)** **Course Title: Commercial Vegetable Production- Practicals**	**Credits: 4** **Total Contact Hrs:60 hrs**
Objectives • To develop skills in cultivation of vegetable crops	

Commercial vegetable production

1. Main field preparation and planting of transplanted tropical vegetable crops.

2. Main field preparation and planting of direct sown vegetable crops.

3. Preparation of nursery bed, sowing and aftercare of seeds of vegetable crops.

4. Preparation of growth regulator solutions and application.

5. Maturity indices and harvesting of vegetables for vegetable purpose and seed purpose.

6. Identification and familiarization of cool season vegetables.

7. Main field preparation and planting of cool season vegetables.

8. Visit to the farmer's fields in the vegetable growing areas to study the field problems faced by the farmer.

Course No. 5.8 **Course Code: SDC5AG30(P)** **Course Title: Fundamentals of Organic Farming- Practicals**	**Credits: 4** **Total Contact Hrs:60 hrs**

Objectives

- To familiarize with organic production of various crops
- To gain skill with different composting techniques

Organic farming

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. Visit to urban waste recycling unit.
9. Study of profitable utilization of agricultural wastes.
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.

SEMESTER VI

Course No. 6.1
Course Code: SDC6AG32
Course Title: Major Internship/Main Project/Dissertation
Credits: 30

Details of Project Work

Industrial training will be conducted at the industrial premises engaged in agriculture and 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.

Model Question papers- First semester Courses

SDC1AG01- FUNDAMENTALS OF AGRONOMY

Time-2.5Hrs **Maximum-80 Marks**

Section A Each question carries 2 marks (Ceiling 25)

1. Comment on Water use Efficiency.
2. What do you mean by Selective herbicides?
3. Write a short note on Tillage.
4. Give a note on Post harvest Technology.
5. Write about Allelopathy.
6. Differentiate Sustainable and Subsistence Agriculture.
7. What is the use of cover crops?
8. Comment on Drip Irrigation.
9. Mention about Rain fed Agriculture.
10. What do you mean by Integrated Nutrient Management?
11. Organic fertilizers
12. Dry farming
13. INM
14. Biofertilizers
15. Pesant farming

Section B Each question carries 5 marks (Ceiling 35)

16. Describe Biological Nitrogen Fixation.
17. Define Growth and Devlopment. Describe the factors affecting Growth and Development.
18. Comment on Crop rotation and its Principles.
19. What do you mean by Manure and Fertilizer? Describe about the different types of manure and Fertilizer application?
20. Write a brief note on Soil Water Plant Relationship.
21. Enlist the major soil factors which affect the plant Growth.
22. Briefly explain the importance of agriculture in India.
23. Briefly describe about the different agricultural seasons in Kerala.

Section C Answer any two. Each Question carries 10 marks .(2x10=20)

24. Define Irrigation. Explain about the different types of Irrigation methods?
25. What do you mean by Crop? Explain about various types of crop classifications?
26. Elucidate the various methods employed in sowing /planting of crops?
27. Enumerate the special systems of cultivation and harvesting methods of major Cereals and Millets.

SDC1AG02- FUNDAMENTALS OF HORTICULTURE

Time-2.5Hrs **Maximum-80 Marks**

Section A Each question carries 2 marks (Ceiling 25)

1. Briefly describe the scope of Horticulture in India?
2. Comment on kitchen garden and roof garden/
3. Give a brief note on Pruning.
4. Describe about Growth Regulators.
5. Explain about various preplanting treatments.
6. What are the major advantages of asexual propagation?
7. What do you mean by the term fruit thinning?
8. Give the major differences between Green House and Glass house?
9. Comment on Graft Incompatability?
10. What are the major apical grafting methods?
11 .Hot Beds
12. Greenhouses
13. Repotting
14.IAA
15. Ripening Hormone

Section B Each question carries 5 marks (Ceiling 35)

16. Compare the differences between Grafting and Budding?
17. Explain different irrigation methods and add a note on their merits and demerits?
18. Discuss briefly the different types of planting orchards?
19. Give a brief account on divisions of horticulture and nutritive value of horticultural crops?
20. Discuss about different training techniques of fruit crops and their merits and demerits.
21. Give a brief note on various cropping systems.
22. Write a brief account on plant propagation by Layering?
23. Write a critical note on unfruitfulness and various factors affecting them?

Section C Answer any two. Each Question carries 10 marks . (2x10=20)

24. Define Propagation .Discuss about the various techniques of propagation by cuttings?
25. Briefly explain about various plant propagating structures?
26. Illustrtate the various grafting techniques employed in plant propagation?
27. Define Nursery? Write a brief note on three types of nursery beds with examples?

SDC1AG05- Fundamentals of Soil Science

Time-2.5Hrs **Maximum-80 Marks**

Section A Each question carries 2 marks (Ceiling 25)

1. How soil is formed? What are major factors which affect soil formation?
2. Write a short note on soil profile showing different Horizons?
3. Comment on the physical, chemical and biological effects of organic matter in the soil.
4. How soils are classified on the basis of their texture?
5. Comment on the formation of rocks.
6. Which are the major factors which affect weathering of soil?
7. Mention the importance of soil texture in agriculture.
8. Write a short note on the aggregation of soil particles.
9. Give a comparative note on soil air and atmospheric air.
10. Define soil
11. Mineralization
12. Humas
13. Porosity of soil
14. Pedology
15. Cation Exchange capacity

Section B Each question carries 5 marks (Ceiling 35)

16. Describe about the major physical properties of soil.
17. What do you mean by soil air? Which are the various factors which affect soil air?
18. Comment on soil survey and its importance?
19. Describe about the role of organic matter in plant nutrition.
20. Discuss the importance of humus in soil fertility?
21. Mention the importance of soil components in Agriculture.
22. Describe about Land Capability and its classification.
23. Types of soil

Section C Answer any two. Each Question carries 10 marks . (2x10=20)

24. Briefly explain the different soil forming processes and the importance of soil in agriculture.
25. Describe about various micro biota present in the soil. Enlist the various beneficial and harmful roles of microorganisms present in the soil.
26. Describe about the various types of soils in Kerala.
27. What do you mean by Organic matter? Explain about the formation of organic matter in the soil with the help of Carbon Cycle?

MODEL QUESTION PAPER- Second semester

SDC2AG06 - Plantation Crops, Spices and Fruits

Time-2.5Hrs **Maximum-80 Marks**

Section A Each question carries 2 marks (Ceiling 25)

1. Motherpalm selection in coconut
2. Climate and soil in rubber cultivation.
3. Brown budding
4. Epicotyl grafting in cashew.
5. Top working in cashew.
6. Inflorescence of banana.
7. Major pests of mango
8. Major diseases of Banana
9. Floral biology of pepper.
10. Forking and mulching in cardamom.
11. Propagation of pineapple
12. Processed products in cashew
13. Varieties of pepper
14. Major pests of rubber
15. Major diseases of coconut

Section B Each question carries 5 marks (Ceiling 35)

16. Propagation methods in pepper.
17. Use of bioregulators in mango'
18. Pest, diseases and control measures in cardamom.
19. Mangosteen fruit cultivation aspects.
20. Industrial and export potential of pineapple.
21. Cultural practices for quality improvement in banana.
22. List out pest and diseases of major spices in Kerala. Suggest some control measures
23.. Write down the characteristics of tall and Dwarf varieties of coconut.

Section C Answer any two. Each Question carries 10 marks . (2x10=20)

24. Write elaborate note on propagation, production of quality plant materials, nursery management, planting and aftercare of coconut.

25. Propagation methods of Rubber

26. Write elaborately on mangosteen,. Rambutan and durian cultivation in Kerala.

MODEL QUESTION PAPER

SDC2AG07 – Fundamentals of Seed Technology

Time-2.5Hrs **Maximum-80 Marks**

Section A Each question carries 2 marks (Ceiling 25)

1. Define hybrid seed
2. Objectives of Seed act 1966
3. Write on different classes of seeds
4. Differentiate seed and grain
5. Characters of a good quality seed
6. Differentiate Breeder seed and Registered seed
7. Emasculation and dusting
8. Storage conditions for seed storage
9. Differentiate single cross hybrid and double cross hybrid
10. NSC
11 Off- Types
12. Certified seed
13. Tetrazolium test
14. Truthfully labeled seeds
15. Breeder seeds

Section B Each question carries 5 marks (Ceiling 35)

16. Explain the structure of a seed with a neat diagram
17. Write on the factors affecting seed quality
18. Dormancy of a seed and methods to break seed dormancy
19. Factors affecting seed longevity during storage
20. Seed Act
21. Public organizations involved in seed production
22. Government policy in seed production.
23. Seed certification

Section C Answer any two. Each Question carries 10 marks . (2x10=20)

21. Hybrid seed production in rice
22. Seed Certification and procedure of seed certification
23. Seed production in coconut
24. Write a brief essay on storage godowns and their maintenance

Model Question Paper- Third Semester
SDC3AG11- Plant Tissue Culture and Biotechnology

Time-2.5Hrs **Maximum-80 Marks**

Section A Each question carries 2 marks (Ceiling 25)

1. Plant tissue culture
2. MS Media
3. Autoclave
4. Cybridization
5. Ligases
6. pBR322
7. Somatic embryogenesis
8. Gene cloning
9. Agrobacterium mediate gene transfer
10. LAF
11. Expression vectors
12. Transformation
13. YAC
14. Gelling agents in tissue culture medium
15. Meristem culture

Section B Each question carries 5 marks (Ceiling 35)

16. Different sterilization methods in tissue culture
17. Different phases of micropropagation
18. Synthetic seed production
19. Differentiate between inoculation and incubation
20. Protoplast culture
21. Direct methods of gene transfer
22. Liquid and solid tissue culture media
23. Embryo culture

Section C Answer any two. Each Question carries 10 marks . (2x10=20))

21. Basic components in tissue culture medium
22. Application of Biotechnology
23. Recombinant DNA Technology
24. Briefly explain

    a. Callus culture
    b. Endosperm culture
    c. Anther culture
    d. Shoot tip culture

SDC3AG12- Integrated Pest Management in Crops

Time-2.5Hrs **Maximum-80 Marks**

Section A Each question carries 2 marks (Ceiling 25)

1. Define pest. Write down the classification of pest
2. Principles of IPM
3. Define Host Plant Resistance
4. What is antixenosis?
5. Define physical method of pest control.
6. Define cultural method of pest control.
7. List out major pest of pepper.
8. Define plant quarantine.
9. What is phytosanitary certificate?
10. Define wettable powder.
11. List out major pestof brinjal.
12. Preparation of neem oil garlic emulsion.
13. *Bt* Cotton
14. IPM
15. Cultural method of pest control

Section B Each question carries 5 marks (Ceiling 35)

16. Describe Host Plant Resistance in IPM.

17. Describe mechanical method of control of pest.

18. Describe management practices of major pest of cardamom

19. Write elaborate note on Entomopathogenic bacteria.

20. Write note on Botanical insecticide.

21. Chemical control-importance, hazards and limitations

22. Write down the symptoms of damage and management practices of pests in banana

23. Write a note on Parasites and predators used in pest control.

Section C Answer any two. Each Question carries 10 marks . (2x10=20)

24. Write elaborate note on Integrated Pest Management.

25. Write detailed note on distribution, hostrange, symptom of damage and management practices of major pest of rice.

26. Write elaborate note on insecticides, its classification, organic insecticides and botanical insecticides.

27. Write a detailed note on various Plant protection equipments, their classification and working principles.

SDC3AG13- Fundamentals of Agricultural engineering

Time-2.5Hrs **Maximum-80 Marks**

Section A Each question carries 2 marks (Ceiling 25)

1. Define dryland farming
2. Sprinkler irrigation
3. Irrigated *vs* rainfed agriculture
4. Chain survey
5. Windbreaks
6. Dry farming
7. Methods of irrigation
8. *Ex situ* irrigation
9. List out the factors affecting water use efficiency
10. Role of water in soil
11. Gully Erosion
12. Rainwater harvesting
13. Surface irrigation
14. Rill erosion
15.Drip Irrigation

Section B Each question carries 5 marks (Ceiling 35)

16. What is soil erosion? What are the types of soil erosion?
17. How wind breaks and shelter belts help in soil conservation
18. Role of grasses and pastures in soil conservation
19.. Explain

a. Farm ponds
b. Check basin
c. Percolation ponds

20.. Cross staff survey
21. What is Surface irrigation? Give examples of crops irrigated through surface irrigation
22. Agronomic techniques to improve water use efficiency.
23. *In situ* water harvesting methods

Section C Answer any two. Each Question carries 10 marks . (2x10=20)

24. Write on water harvesting methods
25. Explain the mechanical measures on soil conservation
26.. Write briefly on surveying, survey equipments and survey procedure.

Model Question Paper- Fourth semester

SDC4AG17 - Protected cultivation of horticulture crops

Time-2.5Hrs **Maximum-80 Marks**

Section A Each question carries 2 marks (Ceiling 25)

1. Greenhouse effect
2. Briefly explain packaging
3. Rules of watering in green houses
4. Advantages of Greenhouses
5. Even span type greenhouse
6. Shade nets
7. Benches in greenhouses
8. Advantages of containers in greenhouse production
9. Briefly explain different types of alternative containers
10. Green house ventilation
11. Write a short note on site selection for greenhouse construction
12. Briefly describe boom watering
13. Green house
14. Substrates for Protected cultivation
15. Fertigation

Section B Each question carries 5 marks (Ceiling 35)

16. Greenhouse type based on covering materials
17. Types of containers

18. Fertigation in greenhouses
19. Substrates used for greenhouse cultivation
20. Grading
21. Explain different greenhouse types based on construction?
22. Special horticultural practices in green houses
23.Cooling systems in green houses

Section C Answer any two. Each Question carries 10 marks . (2x10=20)

24. Classification of greenhouses
25. Environmental control systems in greenhouses
26. Water and nutrient management in protected cultivation

SDC4AG18- Weed management and fodder crop production

Time-2.5Hrs **Maximum-80 Marks**

Section A Each question carries 2 marks (Ceiling 25)

1. Conoweeder
2. Tillage
3. Hoeing
4. Mechanical Weeders
5. Crop rotation
6. Soil solarization
7. Explain Mulching
8. What is Stale seed bed
9. Merits of cultural methods
10. Write on Herbicidemixtures
11. Define weeds withexamples
12. ABS
13. Major weeds of coconut plantation
14. Glyphosate
15. List out any four commonly used chemical herbicides used to control weeds

Section B Each question carries 5 marks (Ceiling 35)

16. Weeds affecting vegetable crops and their management
17. Advantages and disadvantages of use ofherbicides
18. Biological methods ofWeed control
19. Integrated weed management
20. Soil and Climatic requirements forsugarcane
21. Production technology of tobacco
22. Nursery management in rice

23. Mechanized farming in rice

Section C Answer any two. Each Question carries 10 marks . (2x10=20)

24. Production technology of Rice
25. Methods of weed control
26. Aquatic and problematic weeds and their control

SDC4AG19- Livestock Farming

Time-2.5Hrs **Maximum-80 Marks**

Section A Each question carries 2 marks (Ceiling 25)

1. Write down the physio- chemical properties of milk
2. List out the systems of housing for cattle.
3. Holstein Friesian
4. Military Dairy farm
5. Anthrax
6. Principles of milking
7. Poultry Diseases
8. Average composition of cattle milk

9. Draw the diagram of Tail to Tail system ofhousing

10. List out the factors affecting selection of site for cattle shed.

11. Cross breeding

12. Give example for milch, Drought and Dual purpose cattle breeds

13. NDRI

14. List out viral diseases of Cattle

15. Define Milk

Section B Each question carries 5 marks (Ceiling 35)

16. Define operation flood programme

17. Write down the major diseases oflactating cow.

18. List out and write a note on breeds of duck

19. Write a note on clean milk production

20. Explain Foot and Mouth Disease (FMD)

21. Briefly explain housing of Goat.

22. Explain Dairy cooperatives structure and functions.

23. Write a note on adulterants in milk and sources of contamination.

Section C Answer any two. Each Question carries 10 marks . (2x10=20)

24. Write an elaborate note on care and management of new born calf and heifers

25. Write an essay on parasitic diseases of animals.

26. Write an essay on the role of livestock in national economy

27. Define Poultry farming - Breeds and general management practices.

MODEL QUESTION PAPER
Fifth Semester
SDC5AG23 – E1- Environmental Microbiology and Biotechnology

Time-2.5Hrs **Maximum-80 Marks**

Section A Each question carries 2 marks (Ceiling 25)

1. Laminar air flow chamber
2. Autoclave
3. Spectrophotometer
4. SEM
5. Preservation of bacterial culture
6. Bacterial Conjugation
7. Growth curve
8. Wine
9. Viruses
10. Binary fission
11. Scope of Microbiology
12. Plasmids
13. Bacteriophage.
14. Vector
15. Restriction enzymes

Section B Each question carries 5 marks (Ceiling 35)

16. What is recombinant DNA technology?
17. What do you mean by gene mutation and what are the different types of gene mutation
18. What are antibiotics? Name any two antibiotics produced by microorganism?
19. Explain the role of microorganisms in carbon cycle
20. Bioremediation
21. Centrifugation
22. Need for preservation of bacterial cultures
23. Differentiate between Bright field microscopy and Dark field microscopy

Section C Answer any two. Each Question carries 10 marks . (2x10=20)

24. Write on
a. Structure of bacteria
b. Classifications of bacteria
c. Bacterial Recombination
25. Elaborate the role of microorganisms in the production of alcoholic beverages, aminoacids and antibiotics
26. Write an essay on Nitrogen fixation? Explain the role of microorganisms in nitrogen cycle

SDC5AG23- E2- Government Policies and Programmes Related to Agriculture

Time-2.5Hrs **Maximum-80 Marks**

Section A Each question carries 2 marks (Ceiling 25)

1. Write down the objective of price policy

2. Food security

3. Types of watersheds

4. Non- institutional credit agencies

5.List out the functions of Zilla Paishad

6.Explain PPV and FR act

7. Describe the size pattern of operational holdings

8.Write a note on IAAP

9.What is Minimum wages act

10.Decentralized planning

11.NRGEP

12. NABARD

13TRYSEM

14. Agricultural Price commission

15.Lead bank Schemes

Section B Each question carries 5 marks (Ceiling 35)

16. Characteristic features of RRBs

17. Write a note on nationalisation of banks

18.Write a note on Fertilizer pricing policy

19. Agricultural policies regarding labour

20. Write down the need and scope for land reforms

21. Steps in preparation of project plan in agriculture

22. Write the different tiers of Panchayati Raj

23. Features of NABARD

Section C Answer any two. Each Question carries 10 marks . (2x10=20)

24. Write an elaborate note on Five Year Plans in India

25. Write an essay on National Seeds Policy

26. Write an essay on the IADP, IAAP, IWDP

27. Give a detailed note on Kudumbasree, its features and functions

SDC5AG24- E3- Food and Dairy Microbiology

Time-2.5Hrs **Maximum-80 Marks**

Section A Each question carries 2 marks (Ceiling 25)

1. Briefly explain the *E. coli* strains involved in foodborne illness
2. Differentiate between homofermenters and heterofermenters
3. Viable colony count in Microbial examination
4. Mucor and Rhizopus contamination in food
5. Explain Fecal *Streptococci* test
6. Food poisoning by bacteria
7. What is pasteurization
8. Food spoilage
9. What is Amoebiasis
10. Write on Probiotics and prebiotics
11. Kefir grains
12. Mastitis
13. SCP
14. HACCP
15. Fermented dairy

Section B Each question carries 5 marks (Ceiling 35)

16. Explain microbial examination of food
17. Factors influencing microbial growth in foods
18. Methods of preservation
19. Food borne infection
20. Dairy and Fermentative products
21. Write on Fermented pickles and Fermented Vegetables
22. Meat and Meat products
23. Microbiological analysis of milk

Section C Answer any two. Each Question carries 10 marks . (2x10=20)

24. Write on Food borne infections caused by bacteria, fungus, virus and protozoan
25. Write briefly on methods of preservation using physical and chemical methods
26. Microorganisms causing food contamination and the factors influencing microbial growth

SDC5AG24- E4- Landscaping and Gardening

Time-2.5Hrs **Maximum-80 Marks**

Section A Each question carries 2 marks (Ceiling 25)

1. Describe Lawn
2. What is enrichment items?
3. Define terrariums and write the name of two suitable plants
4. What is commercial floriculture?
5. What is mowing?
6. What is shrubs and give two examples
7. What is flower arrangement?
8. Give two suitable examples for Hanging basket plants
9. What is turf plastering?
10. Define mobility?
11. What is carpet bedding?
12. List out any two type of Lawn grass along with its Botanical name.
13. Tray Garden
14. Pergolas
15. Mughal garden

Section B Each question carries 5 marks (Ceiling 35)

16. Write a short notes about vertical gardening and its classification
17. Explain the following terms along with its examples

    a) Hedge
    b) Pergola
    c) Topiary
    d) Climbers

18. Enlist the different styles of garden and explain any two
19. Write the difference between Formal and Informal garden
20. Explain about various methods of Lawn establishment
21. Write about potting media preparation for indoor and aftercare.
22. Write the names of two suitable plants for the following terms

    a) Terrariums
    b) Indoor garden
    c) Bonsai
    d) Annuals

23. Write about the important point to be taken up during the land preparation for a garden

Section C Answer any two. Each Question carries 10 marks . (2x10=20)

24. Explain about bonsai and different styles of bonsai with suitable diagrams
25. Describe the various principles of landscaping
26. Write an essay about scope and limitation of commercial floriculture in India
27. Enlist the various living and non living components of a garden and explain it

SDC5AG25- Commercial Vegetable Production

Time-2.5Hrs Maximum-80 Marks

Section A Each question carries 2 marks (Ceiling 25)

1. Briefly explain hydroponics.

2. Vegetable forcing

3. Classification of vegetables based on the parts used with examples

4. Name two PGR and their role

5. Riverbed cultivation

6. List the vegetables rich in vitamin A and Vitamin C

7. Write down a brief note on ivy gourd

8. Factors determining nursery location

9. List out Solanaceous crops and their varieties

10. Methods of sowing in nurserry

11. Define thinning

12. Define mulching

13. Soilless culture

14. Botanical classification of ridge gourd

15. Long day plants

Section B Each question carries 5 marks (Ceiling 35)

16. Draw the layout of kitchen garden

17. List and briefly describe the various protected structures used for vegetable cultivation

18. Describe botanical classification of vegetables

19. Explain the nutritive value of vegetables

20. Onion and Garlic - scientific name, family, seed rate, season, varieties and important cultural operations

21. Briefly explain types of vegetable farming

22. List out four cucurbitaceous crops with examples

23. List put two cool season crops, their scientific name, family, seed rate and varieties

Section C Answer any two. Each Question carries 10 marks . (2x10=20)

24. Write an essay on the types of vegetable farming

25. Describe the Production Technology of Okra

26. Describe the Production Technology of Bitter gourd

27. Write an essay on the role of growth regulators in vegetable production and methods of application.

SDC5AG26- Agriculture Enterprises

Time- 2hrs **Marks-60**

Section A Each question carries 2 marks (Ceiling 20)

1. Bee space
2. Brushing
3. Bee pasturage
4. Reeling
5. Sericulture
6. Pinching in chrysanthemum
7. Pulsing
8. Bending in roses
9. Apiary
10. Give two examples each for loose flower and cut flower
11. Worker bees
12. Mounting in sericulture

Section B Each question carries 5 marks (Ceiling 30)

13. Methods of communication in honey bees
14. Explain production technology of Jasmine
15. Cultivation practices of mulberry
16. Seasonal management of honey bees
17. Processing of cocoons
18. Special cultural practices to improve the quality of roses
19. Explain different value added products f mushroom

Section C Answer any one questions out of two (1 x 10 = 10)

20. Explain in detail about different bee keeping equipment
21. Write an essay on different enemies and diseases of silk worm

SDC5AG27- Fundamentals of Organic Farming

Time-2.5Hrs **Maximum-80 Marks**

Section A Each question carries 2 marks (Ceiling 25)

1. Biological weed control
2. Mechanical weed control
3. Bacterial bio-pesticides
4. Crop residue burning
5. NPOP
6. Need for certification in organic farming
7. Sustainable agriculture and social sustainability
8. GAP certification
9. Briefly explain crop rotation
10. Describe composting and enlist its different types
11. Relay inter cropping and strip inter cropping
12. Briefly describe permaculture
13. Define composting
14. Sex pheromones
15. Fungal Biopesticide

Section B Each question carries 5 marks (Ceiling 30)

16.. Need for Sustainable agriculture

17.. Briefly describe

a. Row intercropping
b. Mixed inter cropping
c. Relay intercropping
d. Strip intercropping

18.. Briefly explain

a. Sustainable utilization of land resources
b. Sustainable utilization of water resources

19. Briefly describe the soil health management in GAP
20. Discuss the challenges in marketing and export of organic products
21. Briefly describe the operational structure of NPOP
22. Briefly describe biological weed control
23. Briefly describe:

a. Allelopathy
b. Bio- rationals
c. Pheromones

Section C Answer any two questions (2 x 10 = 20)

24. Write an essay on Good Agricultural Practices
25. Write an essay on tools and practices of organic farming
26. Write an essay on marketing and export potential of organic products
27. Write an essay on organic weed management and organic disease and pest management