



UNIVERSITY OF CALICUT

Abstract

General & Academic - B.Voc Programme in Agriculture under Modified B.Voc Regulations 2014 - Anomalies rectified - Question Bank and Pattern of Question Paper of GEC4IT11 Information Technology and GEC5EM13 Environmental Microbiology and Biotechnology with effect from 2018 Admission onwards- Implemented subject to ratification of Academic Council- Orders Issued.

G & A - IV - J

U.O.No. 8566/2021/Admn

Dated, Calicut University.P.O, 31.08.2021

- Read:-*1. U.O No. 15512/2019/Admn, Dated 02.11.2019.
2. U.O No.12818/2020/Admn, Dated 21.12.2020.
3.U.O.No. 5391/2021/Admn Dated, 19.05.2021.
4. U.O Note No.121030/EX-I-ASST-1/2019/PB Dated: 29.07.2021.
5. Remarks of the Chairman, Board of studies in B.Voc Agriculture, Dated 03.08.2021.
6. Remarks of the Dean, Faculty of Science, Dated 08.08.2021.
7. Orders of the Vice Chancellor in the file of even no. Dated 11.08.2021.

ORDER

1. The Scheme and syllabus of B.Voc Agriculture Programme has been implemented vide paper read (1) above, and Question Bank & Pattern of QP of IV & V Semester B.Voc Programme in Agriculture (2018 Admn) under modified B.Voc Regulations 2014 in the University has been implemented vide paper read (2) & Question Bank and Pattern of Question Paper of Plant Tissue Culture & Biotechnology (GEC3TC09) in third semester of B.Voc Programme in Agriculture has been implemented vide paper read (3)above.
2. Pareeksha Bhavan vide paper read (4) above, has requested to pay attention on the matter that " On verifying the Syllabus of B Voc Agriculture-2018 Admn, it is noticed that neither the source course nor programme is mentioned for the general courses for which the question banks are not provided.
3. The Chairman, Board of Studies in B.Voc Agriculture, vide paper read (5) above, has forwarded anomaly rectified syllabus of B.Voc Agriculture including source code & approved the Question Bank and Pattern of Question Paper of GEC4IT11, Information Technology and GEC5EM13, Environmental Microbiology and Biotechnology in 4th& 5th semester B.Voc Programme in Agriculture (2018 Admn) .
4. Vide paper read (6) above, the Dean, Faculty of Science has approved the recommendation of Chairman, Board of Studies in B.Voc Agriculture and the same has been approved by the Vice Chancellor, vide paper read (6) above.
5. Sanction is therefore accorded for implementing anomaly rectified syllabus of B.Voc Agriculture including source code & approved the Question Bank and Pattern of Question Paper of GEC4IT11 Information Technology and GEC5EM13 Environmental Microbiology and Biotechnology in 4th&5th semester B.Voc Programme in Agriculture under modified B.Voc Regulations 2014, w.e.f 2018 admissions.
6. Orders are issued accordingly. (Syllabus & Question Bank are appended)

Ajitha P.P

Joint Registrar

To

1. The Controller of Examinations
2. The Principal, Pazhassi Raja College, Pulpally

Forwarded / By Order

Section Officer

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 who 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).

SI 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 to 75.9 %	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 13 pattern 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

- Covering all sections of the course syllabus and total marks from each module should be approximately same.
- Unambiguous and free from any defects/errors
- Emphasizing knowledge testing, problem solving & quantitative methods
- 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	<p>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</p>	Aligned with NSDC REFERENCE ID: AGR/Q7601 ALIGNED TO: NCO-2015/6116.0102
1 Year	5	<p>Qualification pack: Agriculture Extension officer Job Roles: Assist the farmers in plantation crop cultivation. Support for improving the seed quality for enhanced production</p> <p>Qualification Pack: Nursery Manager for plantation crops Job Roles: site selection, propagation, production of quality planting material and hybrids. Lay out, planting, after care-irrigation and manure- and harvesting</p>	Not aligned Not aligned
2 Years	6	<p>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.</p> <p>Qualifications Pack- Tissue culture Technician Job Roles: Setting up of tissue culture laboratory for developments of crop varieties</p> <p>Qualifications Pack- Crop Plantation manager Job Roles: Manage the overall running of plantation firms. Design Quality control measures for pest management and weed</p>	Aligned with NSDC REFERENCE ID: AGR/Q7602 ALIGNED TO: NCO-2015/6116.0101 Not aligned Not aligned

		<p>management in plantation crops. Demonstrate various factors affecting the productivity and management of plantation crops.</p> <p>Qualifications Pack- Live stock farm manager. Job Roles: Setting up of live stock farms and management. Breeding and other caring of live stock animals.</p> <p>Poultry farm management-design, setting up and after care of poultry farms.</p>	Not aligned
3 Years	7	<p>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.</p> <p>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.</p> <p>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.</p>	<p>Not aligned</p> <p>Not aligned</p> <p>Not aligned</p>

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 (Source Code: EWM1B01T- Adopted from B.Sc programme in Environmental Science and Water Management under CUCBCSS UG-2014 Admission)	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 (Source Code: BC3C03- Adopted from B.Com Syllabus, CUCBCSS UG- 2017-18 Admission)	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 (Common Paper for UG Programmes-Adopted from	4	4	20	80	100

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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 (Source Code: MB4B04- Adopted from B.Sc. Microbiology Syllabus- CUCBCSS UG-2018)	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 (Source Code: MB5B07- Adopted from B.Sc. Microbiology Syllabus- CUCBCSS UG-2018)	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 Organic 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		100	100
Total				30		100	100
Total for General Courses				56	280	1120	1400
Total for Skill Development Courses				124	380	1620	2200
Grand Total				180	660	2740	3600

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, meteorological 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-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), terrestrial (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, Sulfur 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

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

MODULE 3

12Hrs

Soil and climatic requirements, varieties, cultural practices, special systems of cultivation, harvesting and processing of major cereals and millets, pulses, tubercrops, rice, maize, finger millet, cowpea, tapioca, 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-definition.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. Balasubramanian, 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 Nelsohn, 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.
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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, New Delhi.
9. Hazra, P. and Som, M. G. 1999. *Technology for vegetable Production and Improvement*. NayaProkash, Calcutta

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*, Kalyani Publishers, New-Delhi.
 6. Michael, A.M and Ojha, T.P. 2005.*Principles of Agricultural Engineering-Vol.II*. Jain Brothers, New Delhi.
 7. Michael, A.M. 1988.*Irrigation Theory and Practice*. Vikas Publishing House Pvt. Ltd., New Delhi.
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Course No. 1.7

Course Code: SDC1AG04

Course Title: Fundamentals of Agronomy and Horticulture – Practicals

Credits: 6

Total Contact Hrs: 90 Hrs

Objectives

- 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
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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. Purselove. 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.
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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
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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 ($ax^2 + bx + c = 0$ 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:

- Sundaesan 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.
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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.

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 micropropagation. 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.
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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. Demonstration of Anther culture.
 9. Demonstration of embryo culture.
 10. Hardening/ acclimatization of regenerated plants.
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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.
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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.
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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. 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.

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. 4.2

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, Addison Wesley, New Delhi.

Course No. 4.3

Course Code: GEC4SA12

Course Title: Soil and Agricultural Microbiology

Credits: 4

Total Contact Hrs: 60 Hrs

Module 1

4 hrs

Introduction to soil Microbiology – Properties of soil (structure, texture, formation). Types

and significance of soil microbes – Factors affecting microbial population - Soil fertility test.

Module 2

6 hrs

Biogeochemical cycle – Role of microorganisms in Carbon, Phosphorous, Nitrogen and sulfur cycles.

Module 3

10 hrs

Biological Interactions Microbe–Microbe Interactions. Mutualism, Synergism, Commensalism, Competition, Amensalism, Parasitism, Predation. Microbe–Plant Interactions. Roots- Rhizosphere and Mycorrhizae, Aerial Plant surfaces, Microbe–Animal Interactions. Role of Microbes in Ruminants, Nematophagous fungi, Luminescent bacteria as Symbiont

Module 4

12 hrs

Plant pathology (symptoms, disease cycle and control measures) – Bacterial diseases - Angular leaf spot of cotton, bacterial leaf blight of rice, crown galls, bacterial cankers of citrus Fungal disease- Wilt of tomato - Fusarium oxysporum Red rot of sugarcane - Colletotrichum falcatum, Early blight of potato - Alternaria solani Wilt of cotton , Viral diseases- Papaya ring spot, tomato yellow leaf curl, banana bunchy top

Module 5

13 hrs

Applications of microbes in agriculture : Biofertilizers. Symbiotic nitrogen fixation – (Rhizobium, Frankia) –Symbiotic nutrient mobilizers – Endomycorrhizae and Ectomycorrhizae. Non symbiotic microbes – Azotobacte . Associative Symbiosis – Azospirillum. Cyanobacteria (Nostoc. Gloeocapsa), Azolla-Anabaena System Bio pesticides- bacterial, fungal and viral, Advantages over the chemical counter parts.

Suggested Readings.

1. Microbial Ecology. John Wiley & Sons, Inc., New York 2.
2. Introduction to Soil Microbiology by Alexander, M.(1977). John Wiley & Sons, Inc.,
3. Agricultural microbiology, 2nd edition. Rangaswami G., Bagyaraj D. J. Prentice hall of India.
4. Ronald M. Atlas., Richard Bartha. Microbial Ecology. Benjamin Cummings. 1998
5. Robert, L Tate (1995). Soil Microbiology. First edition, John Wiley and Sons, Inc. New York edition. Pearson Education.
6. Rangaswami G and Mahadevan A (2002). Disease of Crop Plants in India. Fourth edition, PHI Learning (P) Ltd., New Delhi.
7. Subba Rao NS (2004). Soil Microbiology. Fourth edition, Oxford and IBH Publishing Co.Pvt. Ltd., New Delhi.
8. Mishra RR (2004). Soil Microbiology. First edition, CBS Publishers and distributors, New

Delhi.

9. Devlin RM. (1975). Plant Physiology. 3rd edition, Willard Grant Press.

10. Stolp H. (1988). Microbial Ecology: Organisms Habitats Activities. Cambridge University Press, Cambridge, England.

11. Agrios GN. (2006). Plant Pathology. 5th edition. Academic press, San Diego,

12. Lucas JA. (1998). Plant Pathology and Plant Pathogens. 3rd edition. Blackwell Science, Oxford.

13. Mehrotra RS. (1994). Plant Pathology. Tata McGraw-Hill Limited.

14. Rangaswami G. (2005). Diseases of Crop Plants in India. 4th edition. Prentice Hall of India Pvt. Ltd., New Delhi.

15. Singh RS. (1998). Plant Diseases Management. 7th edition. Oxford & IBH, New Delhi.

Course No. 4.4

Course Code: SDC4AG13

Course Title: Weed Management and Fodder Crop Production

Credits: 4

Total Contact Hrs: 60 Hrs

- 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 Co. New York
24. Ashton, P.M. and Crafts, A.S. 1981. Mode of Action of Herbicides (2 Ed.) Wiley-Inter
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Course No. 4.5

Course Code: SDC4AG14

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, Babesiosis, Theileriosis. Diseases of lactating cow: Mastitis, Dystokia Milk fever, Prolaps, Ketosis. Diseases of Calves: Pneumonia, Calf score, Diarrhoea. Poultry Diseases- Ranikhet, Coccidiosis, Bird flu, Parasites of poultry. First aid measures. Disposal of carcasses.

Text books:

- 1) A Text Book of Animal Husbandry by G.C. Banarjee

- 2) A Text Book of Animal Science by. Dr. A.U. Bhikane and Dr. S.B. Kawitkar
 - 3) Advances in Dairy Animal Production by V.D. Mudgal, K.K. Singhal and D.D. Sharma
 - 4) Handbook of animal Husbandry, The I.C.A.R. publication
 - 5) Animal Husbandry & Dairy Science by. Jagdish Prasad.
 - 6) Dairy India Yearbook - 2007 by. P.R. Gupta
 - 7) Handbook of Veterinary Physician by V.A. Sapre
 - 8) Farm Animal management and feeding practices in India by Thomas & Shashtri
 - 9) Dairy Microbiology by K.C. Mahanta
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Course No. 4.6

Course Code: SDC4AG15

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

Credits: 5

Total Contact Hrs: 75 Hrs

- 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.
7. Recording observations on the effect of herbicides on crops and weeds.
8. Hand weeding and hoeing using conoweeder in rice.
9. Hoeing and after cultivation in cassava plots.
10. Economics of weed control practices.
11. Visit to areas with problem weeds.
12. 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. 4.7
Course Code: SDC4AGI6
Course Title: Internship/Project (Cultivation of Rice)
Credits: 5
Total Contact Hrs: 75 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.

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

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 tests organoleptic, 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, Personnel 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: SDC5AG17
Course Title: Commercial Vegetable Production
Total 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: SDC5AG18
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, Bikaner, 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 Their Utilization*. Scientific publishers, New Pali Road, 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: SDC5AG19

Course Title: Fundamentals of Organic Farming

Total 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 forms/limitations- 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. Ananthkrishnan, T.N. (ed.) 1992. Emerging Trends in Biological Control of Phytophagous insects.Oxford & IBH, New Delhi.
2. Chhonkar, P.K. and Dwivedi, B.S. 2004. Organic farming and its implications on India's food security.Fertil. News 49(11): 15-18,21-28,31&38.
3. Gaur, A.C. 1982. A Manual of Rural Composting. FAO/UNDP Regional Project Document, FAO, Rome.

4. Howard, A. 1940. An Agricultural Testament. Oxford University, London. Lampin, N. 1990. Organic Farming. Farming Press Books, Ipswich, U.K.
 5. Palaniappan, S.P and Anandurai, K. 1999. Organic Farming- Theory and Practice, Scientific Pub., Jodhpur.
 6. Reddy, M.V. (ed.) 1995. Soil organism and Litter decomposition in the Tropics. Oxford & IBH, New Delhi.
 7. Singh, S.P. (ed.) 1994. Technology for Production of Natural Enemies, Project Directorate of Biological Control, Bangalore.
 8. Trewavas, A. 2004. A critical assessment of organic farming and food assertions with
 9. 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. Woome, PL. and Swift, M.J. 1994. The Biological Management of Tropical Soil Fertility, S.B.F. & Wiley.
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Course No. 5.6

Course Code: SDC5AG20

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: SDC5AG21

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.

QUESTION BANK

FOURTH SEMESTER B.VOC DEGREE EXAMINATION (CUCBCSS-UG)

AGRICULTURE

GEC4 IT11 - Information Technology

Part I

1. Information Technology has a greater role in the world of
2.is an important IT application in Business.
3. provides a simple and inexpensive means to communicate.
4. Companies are using IT to design and manage..... relationship.
5. MIS stands for.....
6. The information system developed to make offices more efficient is called
7. The typewriter is the most commonly used Machine for correspondence work.
8. Photocopier is also called.....
9. DTP stands for
10. Systems that allow information to be shared by many users are also called
11. leads in saving labour.
12. Document imaging is widely used to store documents in the form of
13. is the International telegraphic message transfer service.
14. Telex is consisting of a network of
15. Telegraph is invented by
16. printers print one character at a time.
17.is the most popular type of serial printer.
18. Ink-jet printers work by spraying ink at a sheet of paper.
19. The panel at the top of the MS-Word is called
20. Ctrl+Left Arrow key is used to navigate the cursor
21. Replace command is available on
22. Text alignment options are available under
23. Ctrl+E button is used to align the text.....
24. The is the panel at the top portion of the document.
25. Header is used to insert some information at the of the document.
26. When we cut text, it is stored on the
27. A word can be bolded with CTRL+..... button.
28. The Find command is available on the On the Ribbon.
29. Provides a way to crate custom documents for mass mailings.
30. Microsoft Excel is Program.
31. The F5 function key is used to
32. Typed data goes to the Cell.
33. Formulas OR Functions must begin with an sign.
34. Microsoft Excel has a set of prewritten formulas called

35. The intersection of rows and columns are called
36. STDEV calculates
37. PMT(rate,,pv,fv,type)
38. The status bar appears at the of the Excel window.
39. DBMS means
40. DML stands for
41. Duplication of data is called
42. DDL means
43. DBA stands for
44. The number of attributes in a relation is called
45. A group of interconnected node is called
46. Database models are also known as
47. database model is one of the oldest database models.
48. All records in hierarchy are called in hierarchical database model.
49. Microsoft Access is a Package.
50. A database is an organized collection of
51. There are three valid types of relationships: one-to-one, one-to-many and
52. A table is a set of columns and rows, with each column referred to as a
53. Is a field or combination of fields that uniquely identify each record in a table.
54. Microsoft PowerPoint is a software package.
55. A PowerPoint presentation is made up of a series of
56. IRTF means
57. Telnet is an internet that enables internet users to connect to another computer linked to the internet.
58. WAIS stands for.....
59. ISDN stands for
60. HTTP stands for.....

Part II (Short Answer Questions)

1. What do you mean by Office automation?
2. What is a virtual office?
3. Write a note on postal service?
4. What is a spreadsheet program?
5. What is text handling?
6. What is audio conferencing?
7. What is e-mail?
8. What is telex?
9. What is a telegraph?
10. What do you mean by voice mail?
11. What is a duplicating machine?
12. Mention at least three types of duplicating machines?
13. What is a line printer?
14. What is a dot-matrix printer?

15. What are accounting machines?
16. What is a inkjet printer?
17. What is a chain printer?
18. What is a transceiver?
19. What are personal computers?
20. What is a cellular phone?
21. What do you mean by workstations?
22. What is PDA?
23. What is backstage view in Word 2010?
24. What is Ribbon in Word?
25. What is a Quick Access toolbar?
26. What is a text area?
27. What are Undo and Redo commands?
28. What is hyperlink? How we can create a hyperlink?
29. Name any four word processors?
30. What is mail merge?
31. What is a spread sheet?
32. Explain the basic formulas in excel?
33. What do we mean by auto fill?
34. What are workbook and worksheet?
35. Write a note on the formatting of worksheet?
36. What is a row? How its height can be changed?
37. What is IRR? How it is used in spread sheets?
38. What is CORREL function?
39. Name any two statistical functions in Excel?
40. What is database?
41. What is DBMS?
42. What is primary key?
43. Mention the advantages of database?
44. Explain the fields and records in MS Access?
45. What do you mean by attributes?
46. What are the DBMS languages?
47. What are the objects in MS Access?
48. What is a query? What are its types?
49. What is sorting? Explain steps?
50. Who are the users of database?
51. What is intranet?
52. What is a slide?
53. What is slide transition?
54. What is slide show?
55. What do you mean by themes?
56. Which are the power point presentation views?
57. What is a URL?
58. What is IP address?

59. What is modem?
60. What is domain name?
61. What you mean by DSL?
62. What is Usenet?
63. What is FTP?
64. What is internet?
65. What is a Web?

Part III (Short Essays)

1. What are the objectives of office automation?
2. Why office automation is needed?
3. What is a telex? How it works?
4. What are the components of a telephone?
5. What do you mean by cyclostyling?
6. Discuss the role of computer in decision making?
7. What are the different types of computer networks?
8. What are the different kinds of printers?
9. Distinguish between impact and non impact printers?
10. Discuss the office automation process?
11. What are the advantages of office automation?
12. Discuss paragraph formatting in MS Word?
13. State the method of saving a document?
14. Explain the use of find and replace command in word?
15. Give a brief account of the functions used in Excel?
16. What are the advantages of spread sheet? Explain?
17. Explain the following?
CORREL, PMT Function, SQRT Function, SUM Function.
18. What is an active cell? How cells, columns and rows can be selected using mouse?
19. Explain DDL? What are its functions?
20. What is DML? Explain its functions?
21. What are the limitations of a database?
22. What is network database model?
23. Explain the functions of DBMS?
24. Explain fields and records in MS Access?
25. What are the various data types available in MS Access?
26. What are the main components of DBMS?
27. Discuss the types of queries in MS Access?
28. How Information travels across the internet?
29. What are the most commonly used protocols?
30. What are the benefits of EDI?
31. What is FTP and HTTP?
32. What is the TCP/IP and how does it work?
33. Explain TELNET, GOPHER and WIAS?
34. What is an IP address and what are its characteristics?

35. What is the difference between a dial-up connection and a direct connection?
36. What is a domain name? Mention important domain names generally used?
37. How internet is useful for education?
38. What is the role of internet in business?
39. Give an account of internet administration?
40. What is web portal? Mention the commonly used web portals?

Part IV (Long Essays)

1. Explain the components of word processing?
2. What is office automation? Explain the objectives and process of office automation?
3. Define office automation? Discuss the various technologies used in office automation?
4. Discuss the different statistical functions available in MS Excel?
5. Discuss different financial function available in Excel?
6. What is a database? Discuss its advantages?
7. Explain the components of DBMS?
8. Explain different database models?
9. Discuss report generation and printing in MS Access?
10. Explain the objectives and advantages of EDI?
11. What is EDI? Explain the EDI formats?
12. Explain the internet protocol suit?
13. Explain different internet access methods?
14. Explain intranet and extranet?
15. What is DBMS? Explain the benefits of Database?

Model Question paper
GEC4 IT11 - Information Technology

B.Voc. – Agriculture (2018 syllabus)
Semester 4

Section – A

Answer all questions (10x 1= 10 Marks)

1. leads in saving labour.
2. Document imaging is widely used to store documents in the form of
3. is the International telegraphic message transfer service.
4. Microsoft Excel is Program.
5. The F5 function key is used to
6. Typed data goes to the Cell.
7. WAIS stands for.....
8. ISDN stands for
9. Microsoft Access is a Package.
10. A database is an organized collection of

Section – B

Answer any eight questions out of twelve (8x2= 16Marks)

1. Write a note on postal service?
2. What is e-mail?
3. What is telex?
4. What is a line printer?
5. What is a transceiver?
6. What is a Quick Access toolbar?
7. Write a note on the formatting of worksheet?
8. What is DBMS?
9. What is slide transition?
10. What is a URL?

Section – C

Answer any six questions out of eight (6 x4= 24 Marks)

1. Why office automation is needed?
2. What are the different kinds of printers?
3. Discuss paragraph formatting in MS Word?
4. Explain the following?
CORREL, PMT Function, SQRT Function, SUM Function.
5. Explain the functions of DBMS?

6. What are the benefits of EDI?
7. Explain TELNET, GOPHER and WIAS?
8. How internet is useful for education?

Section – D

Answer any two questions out of four (2 x15= 30 Marks)

1. What is a database? Discuss its advantages?
2. Explain intranet and extranet?
3. Explain different database models?
4. Explain the components of word processing?

University of Calicut
Question Bank
GEC5EM13: Environmental Microbiology and Biotechnology
B.Voc. – Agriculture
Semester 5

Section – A
Answer all questions (10x 1= 10 Marks)

1. The extrachromosomal genetic material in bacteria is called.....
2.is the enzyme complex associated with nitrogen fixation
3. is known as Father of Soil Microbiology.
A. Hiltner B Ruinen C Winogradsky D. Beijernickia
4.do not have cell wall
 - a. Bacteria
 - b. Mycoplasma
 - c. Fungus
 - d. None of the above
5. is a common denitrifying bacteria?
 - a. Pseudomonas b. Nitrobacter c. frankia d. Azospirillum
6. The bacterial size is expressed in.....
 - a. Micrometer
 - b. Nanometer
 - c. Meter
 - d. Millimeter
7. Nitrogenase enzyme complex contains
 - a. Nitrogenase and Nitrogenasereductase b. MoFe protein and Fe protein
 - c. Both of the above d. None of the above
8. The sudden heritable changes in genetic material is defined as.....
9. Lactobacillus is one of the normalflora of
10. The agent used for transfer of gene to host cell
 - a. Vector
 - b. Restriction enzymes
 - c. Mutant
 - d. All the above
11. Open plate technique is used for sampling of bacteria from
 - a. Soil
 - b. Soil
 - c. Water

- d. Milk
12. The 'droplet nuclei' is seen in
- Air
 - Water
 - Soil
 - All the above
13. Which of the following contains structures composed of N-acetylmuramic acid and N-acetylglucosamine?
- Mycoplasmas
 - Amoeba
 - E.coli
 - Spheroplast
14. Algae is eukaryote (true or False)
15. Chemoautotrophy is discovered by,
- Hiltner
 - Ruinen
 - Winogradsky
 - Beijernickia
16. Who disproved spontaneous generation theory
17. Penicillin was discovered by.....
18. Excess growth of algae in ponds and lakes are termed as.....
19. Leghemoglobin is
- a type of hemoglobin responsible for carrying oxygen to tissues
 - red, iron containing protein, which has role in Nitrogen fixation
 - hemoglobin with sickle shape
 - hemoglobin responsible for phosphate solubilization
20. Expand TEM
21. A bacterium containing prophage is called as
- Lytic
 - Lysogen
 - Lytogen
 - None of these
22. In Gram staining the bacteria are classified based on difference in
23. Virus is a intracellular parasite (True or False)
24. Eutrophication leads to excessive growth ofin ponds
25. Pure culture consists of different types of bacteria (True or False)
26. The sudden heritable change in genetic material is defined as.....
27. Give an example of sulphur oxidising bacteria
28. A change in sequence of DNA but no change in amino acid is the.....mutation
29. Penicillin cleave theof bacteria inorder exert the antimicrobial activity
30. The background colour of the image formed in bright field microscopy
31. The scientist who disproved spontaneous generation theory?
32. James Watson and Francis Crick are famous for their discovery of
33. The resolution power of a microscope is increased when oil is used (True or False)
34. Name a fungus
35. Expand SEM
36. The working temperature of autoclave is.....
37.is an example for materials to be sterilized in hot air oven
38. The enzymes that cut DNA during in to fragments
39. Autoclave is an example of moist heat method (True or False)
40. Bacteria multiply by

- a. Spore formation b. Simple binary fission
- c. Conjugation d. Gametes
41. Bacterial locomotion is accomplished by
 a. Endospore b. Flagella c. Plasmids d. Both a and b
42. The virus that attack bacteria is termed as
 a. Cyanophage
 b. Mycorrhizae
 c. Bacteriophage
 d. Bacterial pathogen
43. Hanging drop method is used for.....determination of bacteria
44. Name a Virus
45. *Pseudomonas putida* is popularly known as.....
46. Virus will contain
 a. Cell membrane b. Cell wall
 c. DNA d. DNA or RNA
47. Bacterial transformation was discovered by
 a. Ederberg and Tatum b. Beadle and Tatum
 c. Griffith d. None of these
48. In electron microscope, what material is used as an objective lense?
 a. Magnetic coils b. Superfine glass
 c. Aluminium foils d. Electrons
49.is a method used for isolation of bacteria from soil
50. The ability of Microscope to distinguish two objects into two separate objects is called.
 a. Resolving power b. Wave length
 c. N.A. d. None of these
51. Lederberg and Tatum (1946) described the phenomena of
 a. Conjugation b. Transformation
 c. Mutation d. Plasmids

Section – B

Answer any eight questions out of twelve (8x2= 16Marks)

1. Droplet and droplet nuclei
2. Plasmids
3. Symbiosis
4. Indoor air
5. Binary fission
6. Define 'virus'
7. Centrifugation
8. Pure culture
9. Resolution power of microscope
10. Spread plate techniques
11. HEPA filters
12. Air sanitisation
13. Mycorrhizea
14. Bacterial capsule
15. Differential media
16. Autoclave
17. pBR 322
18. Mycoplasma
19. Mutualism
20. Oil immersion objective
21. Gene
22. Endospore
23. Bacterial reproduction
24. Cloning vector
25. Dark field microscope
26. Need for preservation of bacterial cultures
27. Aspergillus
28. Specialised transduction

29. Transmission Electron Microscope

30. Secondary metabolites

31. Objective lens

32. Growth curve
33. Colony forming unit
34. Applications of electron microscope
35. Staphylococcus
36. Microbiology of milk
37. Nitrogenase enzyme complex
38. Microflora
39. Phase contrast microscope
40. Centrifugation
41. Selective media
42. Artificial transformation
43. Mycoplasma
44. Culture media
45. Antibiotic resistance
46. List any two methods to control environmental pollution by using microbes
47. Scanning Electron Microscope
48. HEPA filter
49. Magnetic lenses
50. Write a note on preparation of medium.

Section – C

Answer any six questions out of eight (6 x4= 24 Marks)

1. Write on cloning vectors in recombinant DNA technology
2. Differentiate between dark field and bright field microscope
3. Write a short note on industrially important microorganisms
4. Discuss the methods used for isolation of bacteria from soil
5. Differentiate between prokaryote and eukaryote
6. Discuss microbial production of alcohol
7. Discuss the role of microorganisms in carbon cycle
8. Write a brief note on gene mutations

9. How the recombinant DNA technology is used for environmental sustainability
10. Describe the applications of spectrophotometer
11. Discuss the soil microbes important in agriculture
12. Explain the process of bacterial conjugation

13. Write a short note on microbial interactions in soil
14. What are the different methods used for the isolation and enumeration of bacteria from soil
15. Differentiate between the applications of hot air oven and autoclave
16. Briefly describe the recombinant DNA technology
17. Differentiate between light microscope and electron microscope
18. What are the various methods for culture preservation
19. Differentiate Phase contrast and dark field microscopy
20. Classification of bacteria based on structure
21. Write about the working of autoclave
22. Discuss the events in sulphur cycle
23. Write on classification of bacteria
24. Write on the microbial synthesis of antibiotics
25. What are the methods for the estimation of microorganisms from soil?

Section – D

Answer any two questions out of four (2 x15= 30 Marks)

1. Discuss the concept of recombinant DNA technology
2. Write an essay on nitrogen fixation
3. Write an essay on bacterial conjugation
4. Write an essay on the environmental applications of microorganisms
5. Describe the role of microorganisms in carbon and sulphur cycles
6. Write a short essay on the major events and scientists in the development of microbiology
7. Elaborate the role of micro organisms in the production of alcoholic beverages, amino acids and antibiotics.
8. Write brief notes on the following
 - a. Restriction enzymes
 - b. Lytic and lysogenic cycle
 - c. Transformation
9. Discuss the applications of DNA technology in Biotechnology
10. Discuss the importance of the following in Microbiology
 - a. Autoclave

- b. Hot air oven
- c. Laminar airflow cabinet

University of Calicut
Model Question paper
GEC5TC13: Environmental Microbiology and Biotechnology
B.Voc. – Agriculture (2018 syllabus)
Semester 5

Section – A

Answer all questions (10x 1= 10 Marks)

1.do not have cell wall
 - a. Bacteria
 - b. Mycoplasma
 - c. Fungus
 - d. None of the above
2. is a common denitrifying bacteria?
 - a. Pseudomonas
 - b. Nitrobacter
 - c. frankia
 - d. Azospirillum
3. The bacterial size is expressed in.....
 - a. Micrometer
 - b. Meter
 - c. Nanometer
 - d. Millimeter
4. Nitrogenase enzyme complex contains
 - a. Nitrogenase and Nitrogenasereductase
 - b. MoFe protein and Fe protein
 - c. Both of the above
 - d. None of the above
5. The sudden heritable changes in genetic material is defined as.....
6. Algae is eukaryote (true or False)
7. Who disproved spontaneous generation theory
8. Penicillin was discovered by.....
9. Expand TEM
10. What is a pure culture

Section – B

Answer any eight questions out of twelve (8x2= 16Marks)

1. Plasmids
2. Symbiosis
3. HEPA filters
4. Autoclave
5. Mycoplasma
6. Secondary metabolites
7. Microflora
8. Centrifugation

9. Mycoplasma
10. Phase contrast microscopy
11. Culture media
12. Write a note on preparation of medium.

Section – C

Answer any six questions out of eight (6 x4= 24 Marks)

1. Discuss the methods used for isolation of bacteria from soil
2. Write a short note on microbial interactions in soil
3. Differentiate between hot air oven and autoclave
4. Briefly describe the recombinant DNA technology
5. What are the various methods for culture preservation
6. Differentiate Phase contrast and dark field microscopy
7. Classification of bacteria based on structure
8. What are the methods for the estimation of microorganisms from soil?

Section – D

Answer any two questions out of four (2 x15= 30 Marks)

1. Discuss the concept of recombinant DNA technology
2. Write an essay on the environmental applications of microorganisms
3. Elaborate the role of micro organisms in the production of alcoholic beverages, amino acids and antibiotics.
4. Discuss the importance of the following in Microbiology
 - a. Autoclave
 - b. Hot air oven
 - c. Laminar airflow cabinet

