

MAHATMA GANDHI UNIVERSITY KOTTAYAM



B.VOC. DEGREE PROGRAMME

SCHEME AND SYLLABUS

B. Voc. AGRICULTURE TECHNOLOGY

(2018 ADMISSION ONWARDS)

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

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

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

The **Mahatma Gandhi University** gave a strong momentum to the initiatives of UGC-NSQF in the very beginning itself. This University provides

opportunities to its affiliating colleges since Academic Year 2014-15 to start skill based vocational Graduate programmes strictly under the guidelines of UGC and NSQF.

1. Scope

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

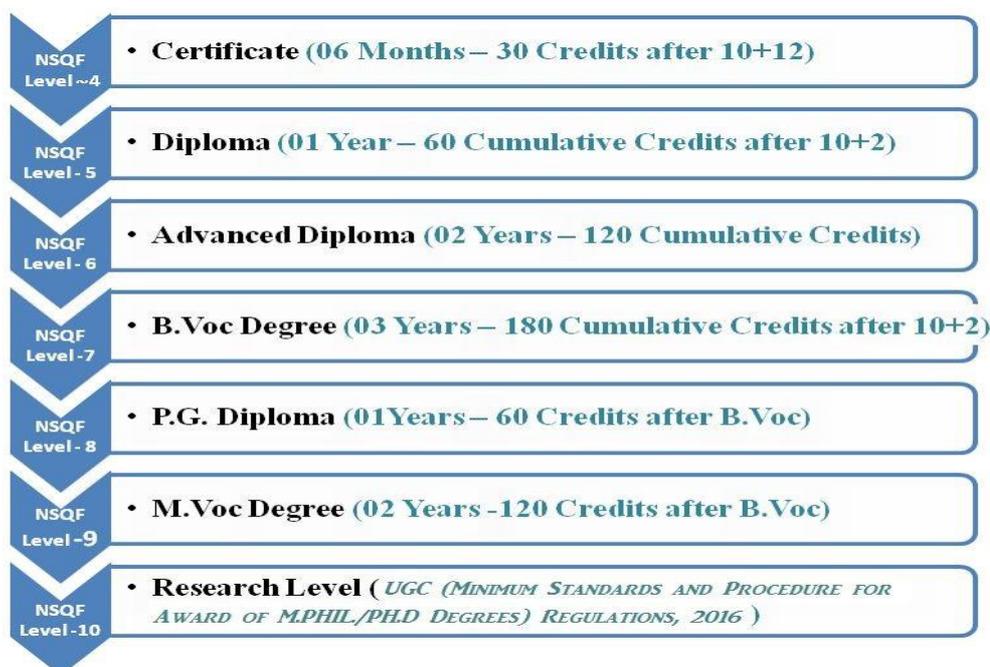
During the academic year 2019-20 admission onwards, all regular B.Voc Programme in affiliating colleges under MG University should strictly follow *Mahatma Gandhi University Regulations for B.Voc Programme 2018*.

2. Eligibility for Admission

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

3. Type of Courses and Awards:

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



The multiple entry and exit enables the learner to seek employment after any level of Award and join back as and when feasible to upgrade qualifications / skill competencies either to move higher in the job profile or in the higher educational system. This will also provide the learner an opportunity for vertical mobility to second year of B.Voc degree programme after one year diploma and to third year of B.Voc degree programme after a two year advanced diploma. The students may further move to Masters and Research degree programmes mapped at NSQF Level 8 – 10.

4. Curricula and Credit System for Skill Based Courses

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

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

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

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

5. Structure of the Programme

Skill Development Components - 60% Weightage

General Education Component - 40% Weightage

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

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

Table 1

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

6. Scheme and Syllabus

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

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

7. Assessment and Evaluation by MG University.

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

8. Assessment and Certification by Sector Skill Council(SSC)

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

9. Examinations

The evaluation of each paper shall contain two parts:

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

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

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

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

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

10. Credit Point and Credit Point Average Credit Point

(CP) of a paper is calculated using the formula:-

$CP = C \times GP$, where *C* is the Credit and *GP* is the Grade point

Semester Grade Point Average (SGPA) of a Semester is calculated

using the formula:- $SGPA = TCP/TC$, where *TCP* is the Total

Credit Point of that semester.

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

CGPA = TCP/TC, where TCP is the Total Credit Point of that programme.

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

GPA = TCP/TC, where TCP is the Total Credit Point of a category of course. TC is the total credit of that category of course

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

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

11.Marks Distribution for External and Internal Evaluations

The external theory examination of all semesters shall be conducted by the University at the end of each semester. Internal evaluation is to be done by continuous assessment. For all courses total marks of external examination is 80 and total marks of internal evaluation is 20. Marks

distribution for external and internal assessments and the components for internal evaluation with their marks are shown below:

For all Theory Courses

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

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

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

For all AOC Courses

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

Components of Internal Evaluation –AOC	Marks
Attendance	5

Record	5
Skill Test	5
Lab Performance / Punctuality	5
Total	20

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

All three components of internal assessments are mandatory.

Project Evaluation

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

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

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

Components of External Evaluation	Marks
Dissertation (External)	50
Viva-Voce (External)	30
Total	80

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

Internship

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

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

Attendance Evaluation for all papers

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

Assignments

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

Internal Assessment Test Papers

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

Grievance Redressal Mechanism

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

Level 1: Department Level:

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

Level 2: College level

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

Level 3: University Level

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

The College Council shall nominate a Senior Teacher as coordinator of internal evaluations. This coordinator shall make arrangements for giving awareness of the internal evaluation components

to students immediately after commencement of first semester

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

External Examination

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

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

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

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

- There will be no supplementary exams. For reappearance/

improvement, the students can appear along with the next batch.

- Student who registers his/her name for the external exam for a semester will be eligible for promotion to the next semester.
- A student who has completed the entire curriculum requirement, but could not register for the Semester examination can register notionally, for getting eligibility for promotion to the next semester.
- A candidate who has not secured minimum marks/credits in internal examinations can re-do the same registering along with the University examination for the same semester, subsequently.

11. Pattern of Questions

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

Pattern of questions for External examination – Theory paper

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

Pattern of questions for external examination –AOC

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

Mark division for external AOC/ LABexamination

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

12. Rank Certificate

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

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

13. Mark cum Grade Card

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

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

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

14. Readmission

Readmission will be allowed as per the prevailing rules and regulations of the university. There shall be **3 level monitoring** committees for the successful conduct of the scheme. They are:

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

15. Transitory Provision

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

B.Voc. Agriculture Technology

Detailed Scheme and Distribution of Credits

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

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

Total credits for skill Development courses = 108

Total credits for General courses = 72

First Semester					
Sl. No	Course code	Title of course	General/Skill	Credit per course	Class hours per week
1	BAT1S01	Fundamentals of Agronomy	SC	5	5
2	BAT1S02	Fundamentals of Horticulture	SC	4	5
3	BAT1S03	Fundamentals of Soil science	SC	5	5
4	BOCG101	Listening and speaking skills in English	GC	4	4
5	BOCG102	Information technology for business-(AOC)	GC	4	3
6	AFP1G03	Basic Principles of Food processing	GC	4	3
7	BAT1S04	Setting up of crop museum (AOC)	SC	4	
TOTAL				30	25
Second semester					
Sl. No	Course code	Title of course	General/Skill	Credit per course	Class hours per week
1	BAT2S01	Fundamentals of Entomology and Insect ecology	SC	5	4
2	BAT2S02	Plantation Crops, Spices and Fruits	SC	4	4
3	BAT2S03	Fundamentals of Agricultural Engineering	SC	5	4
4	BOCG201	Writing & Presentation skills in English	GC	4	4
5	AFP2G02	Fruit and vegetable processing technology	GC	4	4
6	BAT2G03	Cultivation of coconut, pepper and banana(AOC)	GC	4	5
7	BAT2S04	Internship - Nursery Management	SC	4	
TOTAL				30	25

Third Semester					
Sl. No	Course code	Title of course	General/Skill	Credit per course	Class hours per week
1	BAT3S01	Fundamentals of Plant Pathology and crop disease management	SC	5	5
2	BAT3S02	Plant Physiology	SC	5	5
3	BAT3S03	Integrated pest management in crops	SC	4	5
4	BOCG301	Principles of management	GC	4	4
5	AFP3G02	Cereals and pulses processing technology	GC	4	3
6	BAT3G03	Protected cultivation of Horticultural crops	GC	4	3
7	BAT3S04	Work Experience-Cultivation of Vegetable(AOC)	SC	4	
Total				30	25
Fourth Semester					
Sl. No	Course code	Title of course	General/Skill	Credit per course	Class hours per week
1	BAT4S01	Weed management and fodder Crop Production	SC	5	4
2	BAT4S02	Farm Power and Machinery	SC	5	4
3	BAT4S03	Livestock Farming	SC	4	4
4	BOCG401	Soft Skills and Personality Development	GC	4	4
5	AFP4G02	Fat and oil processing technology	GC	4	4
6	BAT4G03	Commercial vegetable production	GC	4	5
7	BAT4S04	INTERNSHIP- Farm Machinery operation	SC	4	
		Total		30	25

Fifth Semester					
Sl. No	Course code	Title of course	General/Skill	Credit per course	Class hours per week
1	BAT5S01	Landscape designing and indoor gardening	SC	5	5
2	BAT5S02	Commercial enterprises	SC	5	5
3	BAT5S03	Tissue Culture and crop improvement	SC	4	5
4	BOCG501	Environmental studies	GC	4	4
5	BAT5G02	Principles of Agribusiness Management	GC	4	3
6	BAT5G03	Fundamentals of organic farming	GC	4	3
7	BAT5S04	Work Experience - Organic farming (AOC)	SC	4	
TOTAL				30	25
Sixth Semester					
Sl. No	Course code	Title of course	General/Skill	Credit per course	Class hours per week
1	BAT6S01	Agro Meteorology	SC	4	4
2	BAT6S02	Information technology and networking for Agriculture	SC	4	4
3	BAT6S03	Disease management in commercial crops	SC	4	4
4	BOCG601	Entrepreneurship development	GC	4	4
5	BAT6G02	Government Policies and Programmes related to agriculture	GC	4	4
6	BAT6G03	Farming System Approach for Sustainable Crop Production	GC	4	5
7	BAT6S04	Internship ,Project/Dissertation	SC	6	
TOTAL				30	25

DETAILED SYLLABUS
B.Voc. AGRICULTURE TECHNOLOGY

Semester 1

BAT1S01- Fundamentals of Agronomy

Credits: 5

90 hrs

Objectives:

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

Module 1

6hrs

Importance of agriculture in India and Kerala, Importance of food security, Divisions of Agriculture, 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

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, tuber crops, rice, maize, finger millet, cowpea, tapioca, sweet potato, 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.

ACTIVITY ORIENTED CLASS (AOC)

Objectives

To familiarize with cultivation aspects of cereals and millets, pulses and tuber crops.

1. Identification of cereals and millets, pulses, and tuber crops. **4 hrs**
2. Different methods of sowing; direct seeding: broadcasting, dibbling and drilling - transplantation. **5 hrs**
3. Seed treatment, germination test - Rhizobium inoculation of leguminous crops **5 hrs**
4. Identification of manures - organic manures: bulky and concentrated manures Fertilizers: Straight,

- complex and mixed fertilizers - identification and preparation of fertilizer mixtures. **6 hrs**
5. Fertilizer recommendation and calculation for major crops. **5hrs**
6. Familiarization with green manure crops and cover crops. **5 hrs**
7. Practice of methods of fertilizer applications- broadcasting, placement, foliar application and fertigation. **6 hrs**

Text Books:

1. Balasubramaniyan, P and Palaniappan, S.P. 2001. Principles and Practices of Agronomy AgroBios(India)Ltd., Jodhpur.
2. Cox, G.W and Atkins, M.D. 1979. Agricultural Ecology : An Analysis of World Food Production Systems. W.H. Freeman and Company, San Francisco
3. De, G.C. 1989. Fundamentals of Agronomy. Oxford & IBH Publishing Co., New Delhi.
4. Grigg, D.B. 1974. The Agricultural Systems of the World: An Evolutionary Approach. Cambridge University Press, Cambridge.
5. Harlan, J.R. 1992. Crops and Man. American Society of Agronomy & Crop Science Society of America, Madison, WI.
6. Havlin, J. L., Beaton, J. D., Tisdale, S.L., and Nelson, W.L. 2006. Soil Fertility and Fertilizers: An Introduction to Nutrient Management (7ed.). 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. pp 29-75.
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.

BAT1S02- Fundamentals of Horticulture

Credits: 4

72 hrs

Objectives

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

Module 1

10 hrs

Horticulture - definition, importance, division and classification of horticultural crops. Importance of horticulture in India and Kerala. Orchard planning, layout, planting systems – canopy management practices. Tree forms and functions - Training and pruning in

horticultural crops - principles and methods, techniques of training and pruning, fruit thinning, top working.

Module 2 **10 hrs**

Phases of growth and development; 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.

Module3 **5 hrs**

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

Module4 **6 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 **5 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.

ACTIVITY ORIENTED CLASS (AOC)

Objectives

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

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

Text books:

1. Bose, TK., Mitra, SK. and Sadhu, K. 1986. Propagation of tropical and subtropical horticultural crops. Naya Prokash, 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 McGraw Hill 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.KalyaniPublishers
 8. Gopalakrishnan,T.R.2007.Vegetable Crops.NewIndiaPublishingAgency,New Delhi.
 9. Hazra,P.andSom,M.G.1999.TechnologyforvegetableProductionand Improvement.NayaProkash,Calcutta
 10. Peter, K. V. 1998. Genetics and Breeding of vegetables. ICAR, New Delhi.

BAT1S03-Fundamentals of Soil Sciences

Credits 5

90hrs

Objectives

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

Module 1

10hrs

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

Module2

12 hrs

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

Module 3

12 hrs

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

Module 4

10hrs

Important soil types of Kerala including problem soils. Soil erosion – definition – different types of erosion-Variou measures for conservation of soil and water – agronomic measures. Soil testing-procedure for soil sample collection- preparation of soil sample. Importance of organic matter in soil – organic manure,green manuring-composting –biofertilizers

Module 5

10 hrs

Elements in plant nutrition – what are plant nutrients—criteria of essentiality-classification of plant nutrients-physiological role of nutrients- deficiency symptoms of nutrients-control of deficiency-foliar nutrition of plants-available forms in which nutrients are available in soil - toxicity of N,P,K – Integrated Nutrient management.

ACTIVITY ORIENTED CLASS (AOC)

Objectives

- To study soil testing procedure and identify deficiency symptoms

1.soil testing-procedure for soil sample-collection and preparation of soil sample

6hrs

2.study of soil profile

3 hrs

3.identification of deficiency symptoms

4 hrs

4. Estimation of pH	5 hrs
5. fertilizer calculation of different crops	3hrs
6. Visit to soil testing lab	5hrs
7. Soil mapping	4 hrs
8. Soil testing and familiarization of nutrient supplements.	6 hrs

Text books:

1. Das, D. K. Introductory Soil Science. Kalyani Publishers, New Delhi. 2009.
2. Biswas, T. D. and Mukharjee, S.K. Text Book of Soil Science. Mc Grow Hill Education Private Ltd, 2014.

GENERAL EDUCATION COURSES

BOCG101- Listening and Speaking Skills in English

(Adopted from existing M. G. University Syllabus)

Credits: 4

72 hrs

MODULE – I

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

Sample activities:

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

MODULE – II

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

Sample activities:

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

MODULE – III

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

Sample activities:

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

MODULE– IV

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

Sample activities:

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

MODULE – V

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

Making inferences – Reading graphics – Reading critically – Reading for research.

Books for Reference:

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

University.

For Further Activities

1. *A Course in Listening and Speaking I & II*, Sasikumar, V.,KiranmaiDutt and Geetha

Rajeevan, New Delhi: CUP, 2007

2. *Study Listening: A Course in Listening to Lectures and Note-taking* Tony Lynch New

Delhi: CUP,2007.

3. *Study Speaking: A Course in Spoken English for Academic Purposes.* Anderson,

Kenneth, Joan New Delhi: OUP, 2008

BOCG102 - INFORMATION TECHNOLOGY FOR BUSINESS [AOC]

Credits 4

72 hrs

Module – 1

18 hrs

Introduction to Information Technology: Information and Communication Technology (ICT), Information systems E-World - Computer Architecture: Input Hardware - Processing & Memory Hardware, Storage Hardware, Output Hardware, Communication Hardware - Concept of operating systems - Understanding your computer customization configuring screen, mouse, printer.

Module – 2

12 hrs

Word Processing Package: Introduction - Features - Word User Interface Elements; Creating new Documents; Basic Editing, Saving a Document; Printing a Document; Print Preview, Page Orientation - Viewing Documents; Setting tabs - Page Margins; Indents; Ruler, Formatting Techniques; Font Formatting, Paragraph Formatting; Page Setup; Headers & Footers; Bullets and Numbered List; Borders and Shading; Find and Replace; Page Break & Page Numbers; Mail Merging-Spelling and Grammar Checking; Tables; Formatting Tables;

Module – 3

12 hrs

Spreadsheet Package: Introduction, Excel User Interface, Working with cell and cell addresses, Selecting a Range, Moving, Cutting, Copying with Paste, Inserting and Deleting cells, Freezing cells, Adding, Deleting and Copying Worksheet within a workbook, Renaming a Worksheet. Cell Formatting Options, Formatting fonts, Aligning, Wrapping and Rotating text, Using Borders, Boxes and Colors, Centering a heading, Changing row/column height/width, Formatting a Worksheet Automatically, Insert Comments, Clear contents in a cell. Using print Preview, Margin and Orientation, Centering a Worksheet, Using header and footer.

Module – 4

12 hrs

Advanced Features of Spreadsheet Package: All Functions in Excel, Using Logical Functions, Statistical functions, Mathematical etc. Elements of Excel Charts, Categories, Create a Chart,

Choosing chart type, Edit chart axis - Titles, Labels, Data series and legend, Adding a text box, Rotate text in a chart, Saving a chart.

Module – 5

18 hrs

Presentation Package: Ms-PowerPoint: Advantages of Presentation Screen layout creating presentation inserting slides adding sounds & videos-formatting slides -slide layout views in presentation -slide transition Custom animation Managing slide shows - using pen Setting slide intervals

Text Book:

1. Antony Thomas. Information Technology for Office. Pratibha Publications
Gini Courter & Annette Marquis. Ms-Office 2007: BPB Publication

Complementary course

AFP1G03- BASIC PRINCIPLES OF FOOD PROCESSING

Credit: 4

72 hrs

Objectives

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

Module 1- Classification of Food

8 hrs

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

Module 2-Fundamentals of Food Processing

8 hrs

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

Module 3- Post Harvest Management

6 hrs

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

Module 4-Ethnic Foods and its Processing

7 hrs

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

Module 5-Processing of Modern Foods

7hrs

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

ACTIVITY ORIENTED CLASS (AOC)

Objectives

- To study the manufacture of various food products
 1. Preparation of mayonnaise **6 hrs**
 2. Preparation of peanut butter **8 hrs**
 3. Preparation of potato chips **8 hrs**
 4. Preparation of tapioca chips **6 hrs**
 5. Preparation of banana chips **4 hrs**
 6. Preparation of banana puree **4 hrs**

Text Books:

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

WORK EXPERIENCE

BAT1S04-Setting up of crop museum [AOC]

Credits: 4

72 hrs

Objectives

- To develop skill in setting up of a crop museum formajor field crops

Work plan:

Familiarization with main field preparation, sowing/planting, nutrient management and other intercultural operations of major vegetable crops such as chillies, tomato, brinjal, okra, cole crops etc by allotting one crop to a batch of students.

Familiarize with tissue culture activities by visiting laboratory, preparation of root inducing media, primary and secondary hardening.

Preparation of potting mixtures and filling of polythene bags for producing rooted pepper cuttings.

JOB CHART

1. Hardening of Tissue culture banana as commercial venture
2. Preparation of rooted pepper cuttings and distribute to public.

SEMESTER-II

BAT2S01-Fundamentals of Entomology and Insect ecology

Credits: 5

90 hrs

Objectives

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

Module 1

12hr

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

Module2

16 hrs

Insect orders of agricultural importance- Lepidoptera, coleoptera, hemiptera, diptera and hymenoptera.

Module 3**8 hrs**

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

Module 4**9hrs**

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

Module 5**9 hrs**

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

ACTIVITY ORIENTED CLASS (AOC)**Objectives**

- To develop skill in different IPM practices in insect pest management and to familiarize with insect morphology

1. Types of insect mouthparts.	4 hrs
2. Structure and modifications of insect antennae	3 hrs
3. Structure and modifications of insect legs	3 hrs
4. Types of insect larvae and pupae.	3 hrs
5. Identification of different types of insect damages on crop plants	4 hrs
6. Identification, symptoms of damage, collection and preservation of pests of Rice, Coconut, Banana, Pepper, cardamom, Brinjal, Bitter gourd and cowpea.	8 hrs
7. Identification of Pests of stored food grain/products	3 hrs
8. Sampling techniques for the estimation of insect population in selected crops	4 hrs
9. Estimation of insect damage in selected crops	4 hrs

Text books:

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

BAT2S02- Plantation Crops, Spices and Fruits

Credits: 4

Objectives

72 hrs

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

Module1

12 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

10 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

15 hrs

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

Module 5

5 hrs

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

ACTIVITY ORIENTED CLASS (AOC)

Objectives

18 hours

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

Plantation Crops

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

Spices

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

Fruits (Banana, Pineapple and Mango.)

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

Text books:

1. Chadha, K.L.2001. Hand Book of Horticulture,ICAR, New Delhi.
2. Kumar.N, Abdul Khader.J.B.M.Rangaswami.P. andIrlulappan., 1993. Introduction tospices
3. Menon.K.P.V. and Pandalai.K.M. 1960. The coconut Palm - a monograph. Indian Central Coconut Committee,Ernakulam.
4. Purseglove. J.W., Brown, E.G.Green, C.L. and Robbins, S.R.G.1981.SpicesVol-I &II.
5. Pruthi.J.S. 1993.Major Spices of India, Crop Management - Post Harvest Technology, ICAR, New Delhi.
6. Pruthi, J.S.2001 Minor Spices and Condiments-Crop Management and Post HarvestTechnology, ICAR, New Delhi,India.
7. AmarSingh,1986.FruitPhysiologyandProduction.KalyaniPublishers,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 (6thEdition).Introduction to Horticulture.RajhalakshmiPublications, Nagercoil
11. Mitra,S.K, Bose,T.K and Rathore, D.S. 1991. Temperate Fruits. Horticulture andAllied Publishers ,Calcutta.
12. Naik,K.C.1949. South Indian Fruits and Their Culture.VaradachariCo.Madras.
13. Samson, J.A. 1980. Tropical Fruits.Longmangroup,London.

BAT2S03- Fundamentals of Agricultural Engineering

Credit:5

90Hrs

Objectives

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

Module1

6 Hrs

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

Module2

10Hrs

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

Module3

10Hrs

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.

Module4

5Hrs

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

Module5

5Hrs

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

ACTIVITY ORIENTED CLASS (AOC)

Objectives

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

- | | |
|---|---------------|
| 1. Basic calculations for water management | 5 Hrs |
| 2. Determination of soil moisture by thermo-gravimetric method and volumetric methods | 8Hrs |
| 3. Methods of irrigation - border strip, check basin, ring, and corrugation furrow | 8Hrs |
| 4. Drip and sprinkler irrigation, components, design aspects -Erection and operation of drip and sprinkler irrigation system; | 10 Hrs |
| 5. Cost estimation of drip irrigation system; fertigation, injection and flushing of laterals; | 6Hrs |
| 6. Studies of different engineering measures of soil conservation | 8Hrs |
| 7. Visit to a water management research station | 9 Hrs |

Text books:

2. Dhruvanarayana, V.V. 1993. Soil and Water Conservation Research in India. ICAR, New Delhi.
3. 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.
4. Hansen, V.E., Israelsen, O.W., and Stringham, G.E. 1979. Irrigation Principles and Practices (4th Ed.). John Wiley and Sons, New York.
- 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.

GENERAL EDUCATION COURSE
BOCG201- Writing and Presentation skills in English

(Adopted from existing M. G. University Syllabus)

Credits: 4

72hrs

MODULE – I

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

MODULE II

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

MODULE – III

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

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

MODULE IV

Non-verbal communication - Body language - Kinesics, Proxemics - Para language

Channels - Barriers - Principles of effective communication

MODULE V

Online writing and Netiquette- Writing e-mails- use of language – writing for blogs – social media etiquette- professional networking online (LinkedIn, E-factor etc.)

Compulsory activity: Each student should create a blog and/or profile in LinkedIn.

Books for Reference:

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

COMPLEMENTARY COURSE

AFP2G02- FRUIT AND VEGETABLE PROCESSING TECHNOLOGY

Credit: 4

72 Hrs

Objectives

- To acquire knowledge about the selection of fruits for processing and value addition
- To introduce the latest technologies, manufacturing processes and tools for effective control of safety and quality during processing

Module 1- Introduction

6 Hrs

Classification of Fruits and Vegetables. Composition and nutritive value of fruits and vegetables, factors effecting composition and quality of fruits and vegetables, harvesting and transportation,

cold storage of fruits, selection and preparation of fruits for processing, deskinning, enzyme inactivation, packing and processing.

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

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

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

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

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

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

Module 5- Processing of Agro – Food Products **12 Hrs**

Processing of Tapioca, Banana, Jackfruit, & its value addition, Scope of value-added products.

ACTIVITY ORIENTED CLASS (AOC)

Objectives **18hrs**

- To be innovative in exploring various processed and value added from agricultural commodities

1. Processing of mango squash and mango pickle. **3Hrs**
2. Processing of pineapple jam. **5Hrs**
3. Manufacture of tomato puree. **2Hrs**
4. Manufacture of tomato sauce **4Hrs**
5. Manufacture of tomato ketchup **4Hrs**

Text books:

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

BAT2G03-Cultivation of coconut, pepper and banana [AOC]**Credit:4**

72 hrs

Objectives

To develop skill and to get experience in the cultivation practices of coconut, pepper and banana.
To practice High density planting of Banana Precision farming, Fertigation of Banana

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 2 coconut palms 5 standards of pepper and by planting 5 bananas.

BAT2S04-INTERNSHIP - NURSERY MANAGEMENT**Credit: 4**

72 hrs

Industry visit will be arranged at Home grown Gardens and Nurseries Vizhikkithodu for 10 days for all students. They have to submit reports and assignments and viva will be conducted by external examiner. Skill assessment by Agricultural Skill council of India [ASCI] on Nursery Manager AGR/Q0807 shall be conducted for students under NSQF.

JOB ROLLS

1. Lay out of drip irrigation and plastic mulching technology.
2. High density and ultra-highdensity planting and management expert.
3. Layout and management of coconut and pepper garden.

SEMESTER-III**BAT3S01- Fundamentals of Plant Pathology and crop disease management****Credit:5**

90 hrs

Objectives

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

Module I Introductory plant pathology

18 hrs

Concept of plant disease- Definition- classification of plant diseases-types of diseases based on symptom. Plant Pathology - introduction - definitions of terminology - bacteria, fungi, viruses, varroids, phytoplasmas, fastidious vascular bacteria, parasites, pathogens, biotrophs, semibiotrophs, necrotrophy. Pathogenicity, pathogenesis, virulence, infection, inoculum, invasion, colonization, inoculum potential, symptoms, incubation period. Survival and dispersal of plant pathogens. Phenomenon of infection and pathogenesis. Role of enzymes, toxins, growth regulators and polysaccharides. Disease cycle, disease syndrome, monocyclic diseases, polycyclic diseases, alternate host, collateral host. Predisposition, physiological race, biotype, symbiosis, mutualism, antagonism. General characters of fungi, classification of fungi, methods of reproduction. General characters, taxonomy, somatic structures, reproduction, life cycle and pathological significance of major plant pathogenic fungus. General characters of bacteria- taxonomy, structure, reproduction and plant pathological significance - Characters and classification of phytopathogenic bacteria- symptoms of bacterial diseases, mode of entry and spread. General characters of Virus - definition- nature, properties, classification, and virus - vector relationships- common symptoms of virus, viroid and phytoplasmal diseases of crops. Characters of algal and phanerogamic plant parasites - symptoms.

Module 2 Principles of crop disease management 16 hrs

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

Module 3 Strategies of Plant Disease management 16 hrs

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

Module 4 10 hrs

Biotechnological approach in plant disease management - tissue culture - soma clonal variation, transgenic plants etc.

Module 5

12 hrs

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

ACTIVITY ORIENTED CLASS (AOC)

Objective

18 hrs

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

1 Hrs each for every practical

1. Common symptoms of plant diseases caused by fungi.
2. Symptomatology of viral diseases
3. Symptomatology of bacterial & phyto-plasmal diseases.
4. Estimation of losses due to diseases
5. Method of scoring for diseases and Scoring for important fungal/Viral/bacterial diseases
6. Mass multiplication of important plant pathogens on cheap substrates and application on soil/plant –
7. Common laboratory techniques in mycology, preservation of plant disease specimens.
8. Microscopic slide culture, common media and mountants used in mycology.
9. Familiarization with different groups of fungicides.
10. Preparation of Bordeaux mixture, Bordeaux paste and cheshunt compound
phytotoxicity of fungicides
11. Preparation of fungicidal spray solutions- methods of application of fungicides -
spraying and soil drenching.
12. Seed treatment with systemic and contact fungicides.
13. Root feeding, post harvest treatment.
14. Solarization for management of soil borne pathogens.
15. Demonstration of physical methods for crop disease management
16. Preparation and application of botanicals
17. Familiarization with plant protection equipment.
18. Field visits, survey and collection of disease sample.

Text books:

1. Agrios, G.N. 2003...Plant Pathology Academy Press. NewYork.
2. Mehrotra,R.S.1980. Plant Pathology Tata Mc. Graw Till Publ.Co.,New Delhi.
3. Nene,Y.L. and Thapliyal,P.N. 1998.Fungicides in Plant Disease Control. Oxford and
IBH NewDelhi
4. Prakasam,V.Reguchander,T. and Prabakar,K. 1998.Plant diseases
management. A.E. Publication,Coimbatore.
5. Singh.R.S 2002.Introduction to Principles of Plant Pathology. Oxford and IBH
Publishing, NewDelhi.
6. Sharma, P. D. 2001. Plant Pathology, Rastogi publications, shivaji Road,Meerut.

BAT3S02-Plant Physiology

Credit: 5

90 hrs

Objectives:

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

Module 1

16 hrs

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

Module 2

16 hrs

Plant water relations: Crop water relations, physiological importance of water to plants, water potential and its components, measurement of water status in plants. Transpiration, significance, transpiration in relation to crop productivity, water use efficiency, WUE in C₃, C₄ and CAM plants. Factors effecting WUE.

Module 3

12 hrs

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

Module 4

16 hrs

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

Module 5

12 hrs

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

ACTIVITY ORIENTED CLASS (AOC)

Objectives:

18 hrs

- To practise with the estimation of physiological parameters in plants
(1-7: 2 Hrs each and 8:- 4 Hrs)
1. Growth analysis; calculation of growth parameters, Yield analysis.
 2. Measurement of leaf area by different methods.
 3. Measurement of water status in plant parts.
 4. Measuring light intensity in canopies.
 5. Stomata; structure; frequency and index.
 6. Identification of plant nutrient deficiency symptoms.
 7. Detection of NPK deficiencies in plant samples by rapid tissue testing.

- PGRs - quantification and its effect on plant growth-auxins, GA.

Text books:

- Devlin R.M. 1979. Plant Physiology II Edn. Affiliated East West Press, New Delhi.
- Noggle G.R. & Fritz G.J. 1992. Introductory Plant Physiology II Edn Prentice Hall of India (P) Ltd., New Delhi
- Bidwill R.G.S. Plant Physiology II Edn. Macmillan, Publishing Co., Inc. New York.
- Salisbury, F. B. & Ross. C.W. Plant Physiology, CBS Publishers & Distributors, New Delhi
- Milthorpe, F.L. and Marby, J. 1979. An introduction to Crop Physiology, Cambridge University Press, London
- Devlin R. M. and Witham F. H. 1983. Plant Physiology 4th Edn. CBS Publishers and Distributors, New Delhi.
- Gupta .N.K and Sunita Gupta. 2002. Plant Physiology. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.
- Malick, C.P and Srivastava, A. K. 2000. Text book of Plant Physiology. Kalyani publishers, New Delhi.

BAT3S03-Integrated Pest management in crops

Credits:4

72 hrs

Module 1

8 hrs

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

Module 2

12 hrs

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

Module 3

10hrs

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.

ACTIVITY ORIENTED CLASS (AOC)

- | | |
|--|--------------|
| 1. Familiarization with cultural methods of pest control. | 1 Hr |
| 2. Familiarization with Mechanical methods of pest control. | 2 Hrs |
| 3. Identification of predators. | 1 Hr |
| 4. Identification of microbial agents. | 1 Hr |
| 5. Familiarization with different formulations of insecticides. | 1 Hr |
| 6. Preparation of neem oil garlic emulsion and tobacco decoction. | 1 Hr |
| 7. Familiarization with different insecticides. | 1 Hr |
| 8. Calculation of doses/concentrations of insecticides. | 2 Hrs |
| 9. Preparation of spray fluid for field application. | 2 Hrs |
| 10. Familiarization with Plant protection equipments. | 2 Hrs |
| 11. Identification, symptoms of damage, collection and preservation of pests of: | 4 Hrs |
| a) Rice, Coconut. | |
| b) Banana, Cashew. | |
| c) Pepper, cardamom. | |
| d) 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.

GENERAL EDUCATION COURSES

BOCG301 -PRINCIPLES OF MANAGEMENT

Credit :4 72 hrs
Module 1

16 hrs

Nature and Process of Management: Schools of Management Thought – Management Process School, Human Behavioral School, Decision Theory School, Systems Management School, Contingency School – Managerial Role – Basics of Global Management.

Module 2

16 hrs

Planning: Objectives – Types of plans - single use plan and repeated plan – MBO, MBE– strategic planning and formulation. Decision making - types and process of decision making – forecasting.

Module3

12 hrs

Organising: Types of organization - formal and informal, line and staff, functional – organization structure and design – span of control, delegation and decentralization of authority and responsibility – organizational culture and group dynamics.

Module 4

16 hrs

Staffing: Recruitment, Selection, Induction training, Maintenance, Retrenchment.

Systems approach to HRM – Performance appraisal and career strategy – HRD - meaning and concept.

Module 5 12 hrs

Directing: Motivation – meaning - need for motivation. Theories of motivation - Herzberg and McGregor. Leadership- importance – styles of leadership, Managerial Grid by Blake and Mouton, Leadership as a Continuum by Tannenbaum and Schmidt, Path Goal Approach by Robert House (in brief) Controlling - Concept, Significance, Methods of establishing control.

Text Books:

1. Moshal.B.S . Principles of Management, Ane Books India,New Delhi.
2. Bhatia R.C. Business Organization and Management, Ane Books Pvt. Ltd., New Delhi.
3. Richard Pettinger. Introduction to Management , Palgrave Macmillan, New York.
4. Koontz and O'Donnel. Principles of Management ,Tata McGraw-Hill Publishing Co.Ltd. New Delhi.
5. Terry G.R. Principles of Management, D.B.Taraporevala Sons &Co.Pvt.Ltd., Mumbai.
6. Govindarajan.M and Natarajan S. Principles of Management, PHI, New Delhi.

7. Meenakshi Gupta . Principles of Management, PHI, New Delhi.

COMPLEMENTRY COURSE

AFP3G02- CEREALS AND PULSES PROCESSING TECHNOLOGY

Credit: 4

72 Hrs

Objectives

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

Module 1- Rice

12 Hrs

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

Module 2- Wheat

12 Hrs

Classification of wheat, structure and composition, Harvesting and storage: Harvesting the grain, cleaning the grain and storage, wheat milling, wheat products: whole wheat flour, maida, semolina, macaroni products.

Module 3- Millets

12 Hrs

Corn- types of corn, structure and composition, nutritive value, processing of corn: dry milling, wet milling and alkali processing.

Module 4- Breakfast cereals

8 Hrs

Definition, Nutritive value of breakfast cereals, and classification of breakfast cereals: uncooked breakfast cereals and ready to eat cereals: processing of ready –to-eat cereals (Batch cooking, continuous cooking and extrusion cookers)

Module 5- Pulses

10 Hrs

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

ACTIVITY ORIENTED CLASS (AOC)

Objectives**18 hrs**

To learn the method of processing of various cereals and pulses.

1. Manufacture of bread
2. Manufacture of cake
- 3 . Manufacture of biscuit

Text books:

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

BAT3G03 -Protected Cultivation of Horticultural crops**Credits:4****72 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.

Module2**10hrs**

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.

Module3**10 hrs**

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

Module 4**12 hrs**

Crop regulation - special horticultural practices in protected cultivation for commercially

important crops: vegetable crops, flowering plants, seedlings, etc

Module 5

10 hrs

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

ACTIVITY ORIENTED CLASS (AOC)

Work planned:

Setting up a polyhouse for vegetable production with drip irrigation facility and a hardening unit with mist propagation in college field as a part of earn while you learn programme.

- To practice with protected cultivation practices of important crops

Practical Schedule

Protected cultivation aspects of individual crops: 18 hrs

- | | | |
|-----|---|-----------|
| 1. | Study of structures utilized for protected culture. | 3Hrs |
| 2. | Cost estimation of different growing structures | 3Hrs |
| 3. | Design and orientation of poly/green houses. | 2Hrs |
| 4. | Study of various inputs used for protected culture | 2Hrs |
| 5. | Type of containers used in protected culture. | 1Hrs each |
| 6. | Use of substrate and preparation of substrate for protected cultivation | |
| 7. | Fertigation system in green houses, cooling and heating system in green houses. | |
| 8. | Special horticultural practices in protected cultivation | |
| 9. | Protected cultivation of cowpea, | |
| 10. | Protected cultivation of capsicum | |
| 11. | Protected cultivation of cucumber | |
| 12. | Protected cultivation of tomato | |

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. Yadav, L.P. and Bose, T.K., 1986. Biology, conservation and culture of orchids. East-West Press Private Limited, New Delhi. E.
5. Yadav, I.S. and M.L. Choudhary., 1997. Progressive floriculture. The House of Sarpan, (Media), Bangalore.

WORK EXPERIENCE/TRAINING [AOC]

BAT3S04-Cultivation of vegetable

Credit:5

90 hrs

Objectives

- To understand the sustainable cultivation aspects of vegetable under rain fed condition

Vegetable, Nursery raising, seed treatment, sowing, water management, nutrient management, and plant protection Main field preparation, transplanting, nutrient management, water management, Identification of insect pests and diseases and plant protection, harvesting, postharvest handling of produce, storage and marketing of produce.

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

SEMESTER- 4

BAT4S01- Weed Management and Fodder crop production

Credit: 5

90 hrs

Objectives

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

Module1

10 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 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.

Module2

8 hrs

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

Module3

8 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.

Module4

12 hrs

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

Module5

16 hrs

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

and Forage preservation.

ACTIVITY ORIENTED CLASS (AOC)

Objectives

36 hrs

- To familiarize with the general characters of weeds and their management.
 - To familiarize with cultivation of rice, fibre crops, fodder crops etc.(3 Hrs each)
1. Techniques of weed collection, identification and preparation of herbarium of weeds.
 2. Herbicide formulation and identification- Herbicide label information.
 3. Study of herbicide application equipments and calibration.
 4. Computation of herbicide doses.
 5. Field practice of spraying herbicides in the field.
 6. Recording observations on the effect of herbicides on crops and weeds.
 7. Hand weeding and hoeing using conoweeder in rice.
 8. Hoeing and after cultivation in cassava plots.
 9. Economics of weed control practices.
 10. Visit to areas with problem weeds.
 11. Familiarization and planting of various fodder crops and their preservation.
 12. After cultivation operations of major crops.

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. Chidda Snidng, 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.

BAT4S02-Farm Power and Machinery

Credit:5

90 hrs

Objectives

- To acquaint with principles of farm machineries and their working.

Module 1

4 hrs

Status of farm power in India and Kerala- sources of farm power - merits and demerits of different forms of power. Farm mechanization-scope of farm mechanization- present status of mechanization-limiting factors and suggestions of farm mechanization.

Module2

10 hrs

Thermodynamic cycle. Principle of working of internal combustion engines. Terminology connected with engine power. Fuel system, lubrication system and cooling system of IC engines.

Module3

10 hrs

Farm tractor -classification-components and selection. Power transmission system of a tractor- clutch-governor-differential. Hydraulic control system of tractor. Tractor testing-performance characteristics of tractor engines. Power tiller-components of power tiller. Principles of operation of electric motor-types-components-care and maintenance.

Module4

15hrs

Tillage. Plough-classification-types-components-adjustments and repairs of mould board plough and disc plough. Plough accessories like coulter, jointer, scraper, land wheel and gauge wheels. Terminology connected with ploughs-advantages and disadvantages of different ploughs.

Module5

15 hrs

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

ACTIVITY ORIENTED CLASS (AOC)

Objective

36Hrs

- To acquaint with principles of farm machineries and their working (3Hrs each)
1. Study of tools and equipments in a farm machinery workshop.
 2. Study of different components of an IC engine.
 3. Study of different components, operation and maintenance of power tiller.
 4. Study of farm / homestead friendly equipment and implements.
 5. Study of different components and operation of tractor.

6. Study of Mould Board plough and disc plough and its adjustments.
7. Study of seed-cum-fertilizer drills-furrow opener, metering mechanism, and calibration; adjustments.
8. Study of cultivators and harrows and its adjustment.
9. Study of different parts, registration, alignment and operation of mowers and its adjustments.
10. Study of paddy transplanter and harvester, registration and alignment.
11. Study of planters and different metering mechanisms.
12. Study of sprayers, repair and its calibration.

Text books:

1. Chakraverty, A. and D. S. De. 1981. Post-harvest technology of cereals and pulses. Oxford and IBH Publishing Co., Calcutta.
2. Mohsenin, N. N. 1970. Physical properties of plant and animal materials, Gordon and Breach publishers, New York.
3. Pande, P. H. 1994. Principles of agricultural processing, Kalyani Publishers, Ludhiana.
4. Sahay, K. M. and K. K. Singh. 1994. Unit operations in agricultural processing, Vikas Publishing House Pvt. Ltd., New Delhi.

BAT4S03 - Livestock Farming

Credit:4

72Hrs

Objectives

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

Module 1

10Hrs

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

12Hrs

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

12Hrs

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.

Module4

10Hrs

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

Module5

10 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.

ACTIVITY ORIENTED CLASS (AOC)

Objectives

- To familiarize with practices in livestockfarming.
- To acquaint with the management of important farm animals andbirds

1. Morphology of cattle, buffaloandpoultry	2hrs
2. Classification ofCattleBreeds	1hr
3. Study ofCattle,Breeds	2hrs
4. Study of Buffalo Breeds: Murrah, Jaffrabadi, NagpuriandSurti	2hrs
5. Study of Sheep and Goat breeds: Osmanabadi,Jamnapuri, Saanem	2hrs
6. Study of Duck breeds: CharaChemballi, Khaki,Campbell,Vigova	2hrs
7. Identification marks offarmanimals	1hr

8. Handling and casting of far animals	1hr
9. Study of milking dairy animals	2hrs
10. Visit to Dairy farm/ Poultry farm/Goat farm/Duck Farm	3hrs

Text books:

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

GENERAL EDUCATION COURSES

BOCG401 - SOFTSKILLS AND PERSONALITY DEVELOPMENT

Credits - 4

72 Hrs

Module – I

18 Hrs

Personal Skills: Knowing oneself- confidence building- defining strengths- thinking creatively- personal values- time and stress management.

Module – II

16Hrs

Social Skills: Appropriate and contextual use of language- non-verbal communication- interpersonal skills- problem solving.

Module – III

10Hrs

Personality Development: Personal grooming and business etiquettes, corporate etiquette, social etiquette and telephone etiquette, role play and body language.

Module – IV

16 Hrs

Presentation skills: Group discussion- mock Group Discussion using video recording - public speaking.

Module – V

12 hrs

Professional skills: Organisational skills- team work- business and technical correspondence- job oriented skills- professional etiquettes.

Books for Reference:

1. Matila Treece: Successful communication: Allyun and Bacon
2. Jon Lisa Interatid skills in Tourist Travel Industry Longman Group Ltd.
3. Robert T. Reilly – Effective communication in tourist travel Industry Publication.
4. Boves. Thill Business Communication Today Mcycans Hills
5. Dark Studying International Communication Sage Publication.
6. Murphy Hilderand Thomas Effective Business Communication Mc

COMPLEMENTARY COURSE

AFP4G02- FAT AND OIL PROCESSING TECHNOLOGY

Credit: 4

72 Hrs

Objectives

To enable the students

- To understand various aspects of oil processing technology employed in food industry.
- To learn various chemical and packaging of oils.

Module1- Introduction

5 hrs

Fats and oils, classification, properties, uses in food industry, shortenings, recent processing techniques.

Module 2- Processing of oil

8 hrs

Steps involved in oil processing, oil extraction, methods of oil extraction, oil refining, hydrogenation, winterization, deodorizing, bleaching.

Module 3- Oil extraction from oil seeds

6 hrs

Major and minor oil seeds, sources, examples, Extraction of oil from oil seeds, hydrogenated vegetable oils, margarine.

Module 4- Fat Characterization

10 hrs

Importance of fat analysis, refractive index, melting point, solid fat index, cold test, smoke, flash and fire points, iodine value, saponification number, acid value and free fatty acids, polar

components in frying fats, lipid oxidation, peroxide value, Thiobarbituric acid test, Schaal Oven test, active oxygen method.

Module 5- Packing and storage

7 hrs

Packing, packaging materials, factors to be considered during packing, antioxidants, storage.

ACTIVITY ORIENTED CLASS (AOC)

Objectives

36HRS

- To give foundation to fat analysis
 1. Refractive index
 2. Melting point
 3. Solid fat index
 4. Cold test
 5. Iodine value
 6. Saponification number
 7. Acid value and free fatty acids

Text books:

8. Manay, N.S, Shadaksharaswamy, M., Foods- Facts and Principles, New Age International Publishers, New Delhi, 2004.
9. Meyer, L H-Food Chemistry. CBS publishers & distributors, New Delhi. 2002
10. Potter, N. N, Hotchkiss, J. H. Food Science. CBS Publishers, New Delhi. 2000.
11. Nielsen, S.S. Introduction to the chemical analysis of foods. Jones and Bartlett Publishers, Boston, London. 2003
12. Lawson, G. L, Food oils and fats
13. Fereidoon Shahidi, Functional properties of proteins and lipids
Clyde, E. Stauffer, Fats and oils

BAT4G03- Commercial vegetable production

Credit: 4

72 hrs

Module 1

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

Module 2

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

Module 3

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

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

Module 5

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.

ACTIVITY ORIENTED CLASS (AOC)

Credit: 1

18 hrs

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

BAT4S04-INTERNSHIP- Farm Machinery Operation

Credits: 4

Objectives

72 HRS

- To acquaint with use of farm machineries in field.

Main field preparation, transplanting, nutrient management, weed management, and plant protection aspects by allotting each student 5 cent land for setting up of a Kitchen

garden purely in mechanized ways: use of tractors and tillers, cultivators and harrows, seed drill, sprayer etc.

- To develop skill in setting up of a mechanised Kitchen Garden, Wick irrigation preparation, transplanting trees, nutrient management, water management, and plant protection aspects by allotting each student 5 cent land for setting up of a Kitchen garden

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

SEMESTER - 5

BAT5S01- Landscape designing and indoor gardening

Credit:5

90hrs

Objectives

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

Module 1

10hrs

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

Module 2 10hrs

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

Module 3 12 hrs

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

Module 4 12 hrs

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

Module 5 10 hrs

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

ACTIVITY ORIENTED CLASS (AOC)

Objectives

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

(3 Hrs each)

36 Hrs

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

Text books:

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

BAT5S02-Commercial Enterprises

Credit: 5

90 hrs

Objectives

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

Module 1

12 hrs

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

Module2**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.

Module3**10 hrs**

Lac culture - Behaviour and development of lac insects. Different strains and their host plants. Inoculation, harvesting and processing of lac and its uses. Enemies of lac insect and their control. Scope for cultivating lac in Kerala. Recent advances in lac culture research.

Module4**10 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.

Preparation of 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.

Module5**12 hrs**

Commercial floriculture, Status and prospects of commercial cultivation of flowers. Cultivation aspects of traditional and cut flowers - jasmine, crossandra, marigold, tuberose, gladiolous, heliconia etc. 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.

ACTIVITY ORIENTED CLASS (AOC)**Objectives 36 Hrs**

- 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.
1. Different types of bees and bee equipments. (2 hrs each)
 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.
18. Visit to commercial production units of orchids, anthurium and other cut flowers.

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. Rogers, J. 1974. Flower arranging. Hamlyn, London.
- 11.

BAT5S03- Tissue Culture and Crop improvement

Credit: 4

72hrs

Objectives:

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

Module 1

8 hrs

Principles of Totipotency and Morphogenesis, Nutritional requirements of in-vitro cultures.

Module 2

14 hrs

Techniques of In-vitro cultures: Micro propagation, Anther culture, Pollen culture, Ovule culture, Embryo culture, Test tube fertilization, Endosperm culture, Factors affecting above in-vitro culture; Applications and Achievements.

Module 3

12 hrs

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

Module 4

10 hrs

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

Module 5

10 hrs

Tissue culture as a tool in genetic engineering. Applications in crop improvement

ACTIVITY ORIENTED CLASS (AOC)

Objective

To familiarise various activities involved

(2 Hrs each)

1. Requirements for Plant Tissue Culture Laboratory.
2. Media components and preparations.
3. Preparation and sterilization of media.
4. Aseptic manipulation and inoculation of various explants.
5. Callus induction, subculturing and plant regeneration.
6. Micro propagation of important crops.
7. Demonstration of Anther culture.
8. Demonstration of embryo culture.
9. Hardening/ acclimatization of regenerated plants.

Text books:

1. Chawla H S. 2003. Oxford & IBH Publishing Co. Pvt. Ltd. Chawla H. S. Introduction to Plant Biotechnology.
2. Brown, T.A. 1995. Gene cloning an Introduction (3rd edition). Chapman Hill,U.K.
3. Lehninger. 1993. Principles of Biochemistry. CBS Publications, New Delhi. Lewin,B. Genes VII. Oxford University Press, Inc., NewYork.
4. Watson, J.D., N.H. Hopkins, J.W. Roberts, J.A. Steits and A.M. Weiner. 1987.Molecular
5. Biology of the Gene. The Benjamin/Cummings Publishing Co. Inc. MenloPark
6. Singh, B.D. 1998. Biotechnology. Kalyani Publications, New Delhi
7. Bhojwani, S.S. and Razdan, M.K. 1993. Plant Tissue Culture. Theory and Practice. Elsevier Science Publications,Netherlands.

GENERAL EDUCATION COURSES

BOCG501-ENVIRONMENTAL STUDIES

Credit: 4

72 hrs

AIM

1. To bring in proper awareness among the students on Environmental Issues

OBJECTIVES

1. To build a pro-environmental attitude and a behavioral pattern in society based on sustainable lifestyles
2. To impart basic knowledge on pollution and environmental degradation.

MODULE 1

(15 hrs)

Introduction to Environment Science : Development and Environment

Human Population and the Environment : Population growth, variation among nations- Population explosion –Case Studies.

Sustainable Development – Concept, Policies, Initiatives and Sustainability strategies, Human Development Index, Gandhian Principles on sustainability.

Natural systems

Earth –structure, soil formation- factors affecting, soil types

Atmosphere – structure and composition

Hydrosphere – Oceans, rivers, estuaries, Lakes etc.

Physical environment of aquatic systems

Resource utilization and its impacts on environment

Renewable and non-renewable resources

Forest resources : Use and over-exploitation, Timber extraction, mining, dams and their effects on forest and associated biota.

Water resources : Use and over-utilization of surface and ground water, conflicts over water, River valley projects and their environmental significance- Case studies – Sardar Sarovar

Mineral resources : Use and exploitation, environmental impacts of extraction and use of mineral resources,

case studies – sand mining, metal mining, coal mining etc.

Food resources : World food issues, changes caused by - overgrazing, effects of

modern agriculture, fertilizer-pesticide problems, water logging, and salinity. Case studies

Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.

Land resources : Land as a resource, land degradation, soil erosion and desertification.

MODULE 2

(15 hrs)

Ecosystems

Concept of an ecosystem-Structure and function of an ecosystem-Producers, consumers and decomposers-Energy flow in the ecosystem-Ecological succession-Food chains, food webs and ecological pyramids.

Ecological interactions Types, characteristic features, structure and function of the following ecosystem : Forest, Grassland, Desert, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Significance of wetland ecosystem – Classification, Ecology and Biogeochemistry. Threats and Management

Biodiversity and its conservation

Introduction – Definition : genetic, species and ecosystem diversity, Biogeographical classification of India, Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation Hot-spots of biodiversity, Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts., Endangered and endemic species of India, Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity. People's participation in biodiversity conservation- Biodiversity Register; Global Climate change and Biodiversity.

MODULE 3

(15 hrs)

Environmental Pollution

Air pollution: sources- mobile, stationary, fugitive; type of pollutants- primary and secondary air pollutants, Smog- classical smog and photochemical smog, Acid rain; Ozone depletion; impacts of air pollutants on environment; control measures.

Water pollution: Sources- Point and non-point sources; Types – chemical, biological and physical; impacts on the environment; water quality – water quality standards ; control measures.

Soil pollution: sources and impacts

Noise pollution: sources, impacts on health, management strategies

Thermal pollution and Nuclear pollution - sources and impacts

Solid wastes – types, sources, impacts on Environment.

Municipal Solid waste Management: Essential steps- source segregation , collection ,Processing and Disposal of residues.

Environmental Pollution - case studies

Natural and anthropogenic Disasters and their management : floods, earthquake, cyclone and landslides.

MODULE 4

(15 hrs)

History of environment protection

Silent spring, Ramsar Convention, Stockholm conference, Montreal protocol, Kyoto protocol, earth summit, Rio+10, Rio+20

Brundtland commission Report, Sustainable development

Environmental movements in India

Global initiatives for Environmental protection

Environmental education –basics

Tbilisi conference,

Environment Management Systems

Environment Information Systems

Environmental Impact assessment (EIA) – definition and significance, EIA notification; National and state level Authorities; role of public in EIA of a development project

MODULE 5

(12hrs)

Social Issues and the Environment

Environmental movements

From Unsustainable to Sustainable development-Urban problems related to energy-

Water conservation- Rain water harvesting; Watershed management

Environmental ethics : Issues and possible solutions.

Environmental Economics

Green house effect and Climate change

Natural and Anthropogenic disasters

Disaster Management

Wasteland reclamation-Consumerism and waste products-

Environmental Laws – General introduction; Major laws in India.Environment Protection Act-Air (Prevention and Control of Pollution) Act-Water (Prevention and control of Pollution) Act-Wildlife Protection Act-Forest Conservation Act-Issues involved in enforcement of environmental legislation-Public awareness

TEXT BOOK

Textbook for Environmental Studies For Undergraduate Courses of all Branches of Higher Education - ErachBharucha for University Grants Commission

Further activities

1. Field work
2. Visit to a local area to document environmental assets river/forest/grassland/hill/mountain
3. Visit to a local polluted site-Urban/Rural/Industrial/Agricultural/ Solid waste dump yards
4. Study of common plants, insects, birds.
5. Study of simple ecosystems-pond, river, hill slopes, etc. (Field work Equal to 5 lecture hours)

BAT5G02- Principles of Agribusiness Management

Credits: 4

72 hrs

Objectives

- To familiarise with the fundamentals of information and communication management.
- To understand entrepreneurship strategies.

Module 1

11 hrs

Information and communication management, Fundamentals of information and communication- solving agricultural problems with information systems- a managerial overview of information and communication, Information- characteristics, Information Vs Knowledge, ABC nature of information, Information as a crucial resource, Different channels of information - communication- Radio, TV, Video, E-mail, Network connecting devices-intranet, internet, Photography, basics -its use in ICM, Digital Photography -its advantages, Agricultural Information System - Agricultural databases - Definition and objectives, Decision Support system, Expert system, Remote Sensing - Geographic data and maps, Geographical information system.

Module 2

15 hrs

Management of agro based industries, Understanding entrepreneurship-need for EDP, entrepreneurial process, entrepreneurial traits and competence-dynamics of entrepreneurship.Agribusiness-concept, nature and scope of agri. Business-status-present role and future prospects, forms of agribusiness organizations-their advantages and disadvantages. Special economic zone-It's advantages and disadvantage.Preparing business plan-what is a business plan. Characteristics of a good business plan, elements of business plan, why some plans fail, licensing- government policies and sanction, certification and patent law. Agribusiness development, steps in setting up a small enterprise analysis of opportunities.Small business management, the process of management, organizing the enterprise.

Module 3**10 hrs**

Financial accounting and manpower management, Basic principles of financial accounting. Basic principles of financial management- book keeping, accounting records, People management- man power planning, recruitment and selection, orientation, training and development, creating a positive work environment, building up a team of advisors, networking for entrepreneurs, employment regulations.

Module 4**18 hrs**

Marketing management, Concept of marketing management - Marketing - new concept - business marketing - ,holistic marketing - scope- marketing management process, Marketing mix - Market structure and Consumer buying behavior. Marketing environment- Responding to market environment. Marketing opportunities analysis - marketing management tasks, Marketing Planning Process. New product development process - Challenges in new product development, Organizational arrangements, managing the development process, consumer adoption process. Marketing segmentation, Product, Brand, Selection of Market and product, Source of Information, Global Sourcing, Marketing intelligence. Basic principles of international trade, foreign exchange and export.

Module 5**18 hrs**

Agricultural Projects, Project concept- definitions- project approach to development, Agricultural projects. Characteristics- relationship of projects with plans and programmes. Phases of project cycle- identification- formulation, appraisal- implementation- monitoring and evaluation- Risk in agricultural projects- methods of handling risk projects. Preparation of a model agricultural project.

Text books:

1. Drilon, Dr.J.D, 1971, Introduction to Agri-Business Management (Asian Productivity Organization, Tokyo).
2. Developing Entrepreneurship, Asiapacific Theories and practices ASEED, New Delhi.
3. Alagumani, T , Chinnaiyan, P and Elangovan, S . 1998. Agricultural Management .Publishers K9 International, Madurai
4. Reddy, S., Raghuram, P., Neelakantan, T.V and Bhavani Devi I. 2004. Agricultural Economics. Oxford and IBH Publishers, New Delhi.
5. Reddy, Subba, S. and Raghu Ram. P. 1996. Agricultural Finance and Management. Oxford IBH, New Delhi.
6. Book Keeping and Accountancy. Choudhari, Chopde
7. Dahama. O.P. and O.P. Bhatnagar, 1980. Education and Communication for development, Oxford and IBH, New Delhi.
8. Fuller. R, 2000. Special Edition using MS Power point, McMillan Publishing Company, USA.
9. Boctor. B.S., 2000. MS Office 2000- Microsoft Press Release, USA.
10. Chandrakanthan. K and Palanichamy. S., 2002. Advances in Communication Technology, Indian publishers and distributor, New Delhi.

BAT5G03-Fundamentals of organic farming

Credits: 4

72 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

6 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

10 hrs

Factors affecting ecological balance and ameliorative measures- Indian agriculture in terms of availability of natural resources and their carrying capacity- Strategies for realizing sustainable agriculture- low vs. high external input agriculture -Natural resource management as a part of sustainable resource management -crop production practices- animal production practices-Basic ecological principles of LEISA - promising LEISA techniques and practices –Good Agricultural Practices(GAP)- GAP certification - Improved manure handling - crop residue management - strategic use of chemical fertilizers and pesticides, traps, repellants and biological control, water conservation measures for sustainability- water harvesting - ITK and farmer centered techniques and practices.

Module 3

8 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

8 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

4 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.

ACTIVITY ORIENTED CLASS (AOC)

Objectives:

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

(3 hrs each)

36 hrs

1. Preparation of enriched farm yard manure.
2. Coir pith composting.
3. Preparation of Vermicompost.

4. Study and field application of bio fertilizers.
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.

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
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. Wooster, P.L. and Swift, M.J. 1994. The Biological Management of Tropical Soil Fertility, S.B.F. & Wiley.

BAT5S04 -WORK EXPERIENCE [AOC]

Organic farming

Credit:4

72 Hrs

Objectives

- To acquaint with organic cultivation of vegetables
- To acquaint with aquaculture with high density fish farming

Main field preparation, transplanting, nutrient management, water management, and plant protection aspects by allotting each student group 5 cent land for setting up of aquaculture with high density fish farming or organically grown vegetable field and maintaining in sustainable way.

SEMESTER - 6

BAT6S01-Agro Meteorology

Credit:4

72hrs

Objectives:

- To study various meteorological aspects in relation with crop production

Module1

10 hrs

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

Module2

10 hrs

Electromagnetic Spectrum - Nature and properties of solar radiation - shortwave radiation and long wave radiation - Radiation balance - Response of plants to solar radiation and photosynthetically active radiation - Thermal structure of atmosphere - vertical profiles - factors affecting surface air temperature - spatial and temporal variations in surface air temperature - soil temperature and its variations - Atmospheric pressure and its variation with height - Global distribution of pressure and wind - Atmospheric humidity - saturation and actual vapour pressure - relative humidity and dew point temperature.

Module3

12 hrs

Cloud classification and measurements - cloud seeding - Rainfall and its mechanisms - forms and types of rainfall - Indian monsoons - southwest monsoon - northeast monsoon - monsoon variability across Kerala and India - Rainfall over India and Kerala Rainfall and its mechanisms - forms and types of rainfall - Indian monsoons - southwest monsoon - northeast monsoon - monsoon variability across Kerala and India - Rainfall over India and Kerala Role of weather on insect pest and diseases.

Module4

12 hrs

Importance of weather forecasting in Agriculture - weather service to farmers - agricultural seasons - crop weather diagrams and calendars - crop weather relationships - Role of weather on insect pest and diseases.

Module5

10 hrs

Meteorological and Agrometeorological Stations, Types of agrometeorological Stations. Crop weather diagrams and calendars Preparation of crop weather calendars –Njattuvella calendar-- weather and climate related natural disasters, risk and management - Climate change and global warming - weather modification - Introduction to Remote Sensing.

ACTIVITY ORIENTED CLASS (AOC)

Objectives:

- To study the practical meteorological aspects in relation with crop production.

Credits: 1

18 hrs

Practical schedule: (2 Hrs each)

1. Selection of site and layout of agrometeorological stations and meteorological instruments.
2. Installation of soil thermometers and measurement and recording of soil temperature.
3. Measurement of Relative humidity and vapour pressure and Measurement of Air temperature.
4. Dew point temperature and dew fall.
5. Measurement of rainfall and measurement of wind speed and direction.
6. Measurement of open pan evaporation.
7. Sunshine Recorder and measurement of sunshine.
8. Recording of weather data - tabulation- Processing and presentation Meteorological data.
9. Preparation of crop weather calendars.

Text books:

1. Das.P.K. 1968.The Monsoons. NBT, New Delhi.
 2. Khadekar, S.R. 2001.Meteorology.Agromet publishers,Nagpur.
 3. Mavi,H.S.1986.IntroductionofAgrometeorolgy.Oxford&IBHPublishingCo.NewDelhi
 4. Menon,P.A.andRajan, C.K.1989.ClimateofKerala.Classicpublishinghouse,Kochi.
 5. PrasadaRao, G.S.L.H.V. 2005. Agricultural Meteorology. Second Edition.KeralAgriculturalUniversity,Thrissur.
 6. Sachati, A.K. 1985. Agricultural Meteorology - Instruction-cum-practical manual, NCERT, NewDelhiVarshneya, M.C. and BalakrishnaPillai, B. 2003.Textbook ofAgriculturalMeteorology.ICAR, New Delhi.
 7. Venketaraman, S. and Krishnan, A. 1992.Crops and weather. ICAR, New Delhi.
- Wilsie, P.C. 1961.Crop Adaptation and distribution. Eurasia Publishing House (P) Ltd., NewDelhi

BAT6S02 - INFORMATION TECHNOLOGY ANDNETWORKING FOR AGRICULTURE

Credit- 4

72 hrs

Objectives – Smart farming familiarizing concept, integration of advanced technology in order to increase production efficiency and quality of agriculture produce.

Module 1- Automation of Irrigation positive effects

10 hrs

Monitor weather and soil conditions, evaporation and plant status. Censurers and timers for irrigation controls and mechanisation in water gun and sprinklers to save labour and water.

Module 2- Automation of fertilizer application

10 hrs

Precision farming, fertilizer scheduling and automation of fertigation to get greater controls on maximum production. Scheduling for off season production.

Module 3- Serial Devices for forecasting diseases and pests 10 hrs

Meteorological data analysis and interpretation for forecasting diseases and pests.

Module 4- Storage Devices controls agriculture robotics for harvesting 16 hrs

Ripening chamber, storage incubators and their automation Storage Devices controls agriculture robotics for fruit and vegetable harvesting

Module 5-Parallel Devices for harvesting sorting and grading 16 hrs

Printers: Working of DMP, Ink Jet, Laser Printer, line printer, MFP (Multi Functional Printer and its Trouble shooting, Scanners, imported machineries for harvesting sorting and grading

Module 6 - Introduction to LAN and WAN networking 10 hrs

Emergence and history of network, What is network, Need of network or benefits of network, Types of networks -LAN and WAN, How to assign IP address mask and gateway, Familiar with ping, ipconfig/all netstat and tracert commands, Types of wan technologies, Explain about structure of intranet and internet.

BAT6S03 -Disease Management in Commercial Crops

Credit:4

72 Hrs

Objectives

- To understand the sustainable disease management strategies in plantation crops and spices.
- To understand the sustainable disease management strategies in vegetables, fruits and field crops.

Module 1

10 Hrs

Introduction to sustainable Disease Management in crops, importance and history of crop disease management. Different strategies of sustainable disease management- Cultural, Biological, Physical, Chemical control methods, Cross protection and Biotechnological methods, Economic importance - symptoms- causal agents - disease cycle of major plant pathogens.

Module 2

12 Hrs

Diseases of plantation crops, Economic importance, symptoms, cause, disease cycle and sustainable management of diseases of: Coconut - Root (wilt) disease, bud rot, leaf rot, stem bleeding, other diseases of unknown etiology in coconut-lethal yellowing. Rubber - Abnormal leaf fall and powdery mildew Tea-Blister blight - grey blight - and thread blight.

Module3

10 Hrs

Diseases of Spices, Economic importance, symptoms, cause, disease cycle and sustainable management of diseases of: Black pepper- foot rot and slow wilt, bacterial leaf spot Ginger: soft rot, leaf spot, and bacterial wilt. Cardamom - azhukal/ capsule rot, clump rot and katte.

Module4

10 Hrs

Diseases of vegetables and their management Economic importance, symptoms, cause, disease cycle and sustainable management of diseases of solanaceous vegetables ,bhindi , vegetable cowpea and cucurbits. Diseases of fruits and their management Economic importance, symptoms, cause, disease cycle and integrated management of diseases of Banana: Viral diseases-Bunchy top, Mosaic, heart rot and Kokkan. Post -harvest diseases- Anthracnose, crown rot and cigar end rot. Mango- mango malformation, anthracnose, powdery mildew, die back, pink disease, sooty mould, blacktip.

Module5

12 Hrs

Diseases of field crops and their management Economic importance, symptoms, causal organisms, epidemiology and sustainable management of diseases of Rice- blast, sheath blight, sheath rot, other diseases of rice - brown spot, false ,udbatta , Bacterial diseases of rice
- BLB and bacterial leaf streak; Viral and phytoplasmal diseases - tungro, grassy stunt, mineral deficiency diseases Wheat: rusts, smuts and bunts,tundu.

ACTIVITY ORIENTED CLASS (AOC)

Objectives 18 hrs

- To familiarize with the major diseases in plantation crops, spices, vegetables, fruits and field crops. (2 Hrs each)
 1. Field visits, survey and collection of disease samples and their preservation.
 2. Diseases of coconut - economic importance, distribution and symptoms on crown and roots - etiology, disease cycle and integrated management of Root (wilt) disease and budrot.
 3. Economic importance, symptoms, cause, disease cycle and integrated management of

diseases of rubber - Abnormal leaf fall, powderymildew.

4. Economic importance, symptoms, cause, disease cycle and integrated management of Diseases of black pepper - foot rot and slow wilt.

5. Economic importance, symptoms, cause, disease cycle and integrated management of diseases of ginger - soft rot- leaf spot and bacterialwilt.

6. Study of symptoms, etiology, host-parasite relationship and specific control measures of diseases of solanaceousvegetables.

7. Study of symptoms, etiology, host-parasite relationship and specific control measures of diseases of Bhindi andcowpea

8. Study of symptoms, etiology, host-parasite relationship and specific control measures of diseases ofcucurbits.

9. Study of symptoms, etiology, host-parasite relationship and specific measures of management of diseases of Banana

Text book:

1. Agrios, G.N.1994. Plant Pathology Academy Press. NewYork.
2. Dasgupta, M.K. 1998. Principles of Plant Pathology. Allied Publishers Pvt.Ltd.Bangalore
3. Maloy.O.C. 1993. Plant Disease control. Principles and Practice. John Wileyand Sons. Inc. NewYork
4. Singh.R.S 2002.Introduction to Principles of Plant Pathology. Oxford and IBHPublishing, New Delhi.
5. Sharma, P. D. 2001. Plant Pathology, Rastogi publications, shivajiRoad,Meerut.

GENERAL EDUCATION COURSES

BOCG601 - ENTREPRENEURSHIP DEVELOPMENT

CREDIT -4

72 HRS

Module – I

To make the students understand about entrepreneurs and different classifications. Entrepreneur and entrepreneurship - Definition; traits and features; classification; Entrepreneurs; Women entrepreneurs; Role of entrepreneur in Entrepreneurs in India.

Module – II

Create an awareness about EDP. Entrepreneurial development programme concept; Need for training; phases of EDP; curriculum & contents of Training Programme; Support systems, Target Groups; Institutions conducting EDPs in India and Kerala.

Module – III

General awareness about identification of project financing new enterprises. Promotion of a venture; opportunity Analysis Project identification and selection; External environmental analysis economic, social, technological and competitive factors; Legal requirements for establishment of a new unit; loans; Overrun finance; Bridge finance; Venture capital; Providing finance in Approaching financing institutions for loans.

Module – IV

To identify different business opportunities, Discuss opportunities in small business. Small business Enterprise - Identifying the Business opportunity in various sectors - formalities for setting up of a small business enterprise - Institutions supporting small business enterprise - EDII (Entrepreneurship Development Institute of India), SIDCO (Small Industries Development Organization NSIC (National small Industries Corporation Ltd. (CNSIC) NIESBUD (National Institute for Entrepreneurship and small Business Development) Sickness in small business enterprise causes and remedies.

Module – V

To understand about a project report relating to a small business. Project formulation - Meaning of a project report, significance of contents formulation planning commissions guidelines for formulating a project report - specimen of a project report, problems of entrepreneurs case studies of entrepreneurs.

Books for Reference:

1. Clifton, Davis S. and Fyvie, David E., Project Feasibility Analysis, John Wiley, New York, 1977.
2. Desai A. N., Entrepreneur and Environment, Ashish, New Delhi, 1990.
3. Drucker, Peter, Innovation and Entrepreneurship, Heinemann, London, 1985
4. Jain Rajiv, Planning a Small Scale Industry: A guide to Entrepreneurs, S.S. Books, Delhi, 1984
5. Kumar S. A., Entrepreneurship in Small Industry, Discovery, New Delhi, 1990

BAT6G02-Government Policies and Programmes related to Agriculture

Credit: 4

72 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

8 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

15 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.

Module3

Agricultural policies regarding seeds and fertilizers 15 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.

Module4

Agricultural policies regarding credit 16 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 Panchayathiraj18 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)

BAT6G03-Farming System Approach for Sustainable Crop Production

Credit:4

72 Hrs

Objectives:

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

Module 1 *12Hrs*

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

Module 2 *10Hrs*

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

Module 3 *12Hrs*

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

Module 4 *15Hrs*

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

Module 5 *5Hrs*

Familiarisation with the organic farming ideas in the book one straw revolution by Masanobu

Fukuvoka. Introduction to the practices followed by farmers in “zero budget farming”.

ACTIVITY ORIENTED CLASS (AOC)

(3Hrs each)

18 Hrs

1. Preparation of cropping scheme for irrigated situations.
2. Preparation of cropping scheme for dry land situations.
3. Study of existing farming systems in nearby villages.

4. Preparation of integrated farming system models for wetlands.
5. Preparation of integrated farming system models for drylands.
6. Visit to research station and farmers field to familiarize with various cropping and farming systems.

BAT6S04- INTERNSHIP - Project and Dissertation

Credit:6

108 hrs

Project Work in Selected Industries.

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

Note: In addition to practical hours, in the activity oriented class certain time bound agricultural operationsthe students are bound to complete after the regular class hours.

Table 1. Graduate Attributes

Job Roles proposed in each year (Along with NSQF level)

Agricultural Skill Council of India (ASCI) and National Skill Development corporation (NSDC) working under Ministry of Skill Development and Entrepreneurship (MSDE) will conduct yearly qualification assessment and the following attributes were given to eligible students.

Year	NSQF Level and Job Rolls
First Year	<p><u>Level 5</u></p> <ol style="list-style-type: none"> 1. Hardener of tissue culture banana: Reference ID: AGR/Q8101 Hardening tissue culture banana involves two levels of hardening. Primary hardening in mist chamber and secondary hardening in shade house. Practical training is given for care full washing sterilizing and primary and secondary hardening. They are capable of setting mist chamber and shade house as per requirements. 2. Soil sample analyzer: Reference ID: AGR/Q8104 A Soil sample Analyzer is capable of ascertaining crop density, fertility status, present soil fertility level of a cultivating land by visiting a farmers field, Taking soil sample scientifically and analyzing various parameters. The soil analysis result shall be analyzed as per crop stand and future crops and able to give suitable recommendations. 3. Nursery Manager: Reference ID: AGR/Q0807 A Nursery manager is trained for managing a commercial nursery. They are trained in various grafting ,budding and layering methods. Various propagating structures like green house, mist house, net house as per requirement shall be set out technical standards. 4. Identification of deficiency symptoms: Reference ID: AGR/ Q1001 Various deficiency symptoms occurred in crops shall be identified in early stage and rectify by corrective sprays. Application of straight fertilizers and micro nutrients for successful cropping. 5. INM Specialist ID: AGR/ Q1004 INM Specialist is trained for maintaining a balanced nutrient level in soil by incorporating different nutrient sources such as organic manures, biofertilizers, green manure crops etc along with chemical fertilizers.

Seco nd Year	<p><u>Level 6</u></p> <p>6. Plantation Management: Reference ID: AGR/Q0503 Plantation manager is aware about the cultivation practices of plantation crops. They can identify pest and diseases in the plantation and give proper management practices against them. The awareness about improved varieties and cultivars of plantation crops is very important in plantation management.</p> <p>7. Heritage Gardener: Reference ID: AGR/Q0810 Heritage gardener can make garden design . They are trained in lawn making and they have knowledge about different styles of garden and they can identify ornamental plants, herbs, shrubs etc. A Soil sample Analyzer is capable of ascertaining crop density, fertility status, present soil fertility level of a cultivating land by visiting a farmers field, Taking soil sample scientifically and analyzing various parameters. The soil analysis result shall be analyzed as per crop stand and future crops and able to give suitable recommendations.</p> <p>8. Precision farming specialist; Reference ID: AGR/Q0702 Able to schedule fertigation and layout of drip irrigation and plastic mulching</p> <p>9. Irrigation service Technician: Reference ID: AGR/ Q1001 Capable of automation of irrigation system. Various types of sprinklers and drips layout and installation of pump sets.</p> <p>10. IPM Specialist ID: AGR/ Q1004 IPM Specialist is trained for maintaining a balanced pest management by incorporating different methodology such as organic pesticides, mechanical control, light traps ,pheromone traps etc along with chemical controls.</p>
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Third Year	<p><u>Level 7</u></p> <p>11. Hydroponics Technician: Reference ID: AGR/Q0808 Hydroponics structures and aquaculture structures designing and fabricating are skilled works with high demand in urban agriculture.</p> <p>12. Mushroom Technician: Reference ID: AGR/Q7803 Button mushroom and milky mushrooms are fetching high price and needs technical knowledge for successful cultivation. Various structures</p> <p>13. Bee keeper/Apiculture expert: Reference ID: AGR/Q5301 An Apiculture expert is trained for managing commercial Bee hives. They are trained in various processing of honey as per requirement and marketing shall be set out technical standards.</p> <p>14. Protected cultivation Expert: Reference ID: AGR/ Q0701 Various protected structure construction and layout of beds and irrigation and mist systems. Application of straight fertilizers and micro nutrients are scheduled for successful cropping.</p> <p>15. Research assistant ; Reference ID: AGR/ Q7701 He is trained for maintaining records of crop stages and making observations and layout of trial plots.</p>
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Table 2. DETAILS OF INDUSTRY SELECTED FOR INTERNSHIP

Year	Name of Industry	Activity
First Year	<ol style="list-style-type: none"> 1. Homegrown Nursery and Farms Vizhikkithodu 2. Peermedu Development Society Kuttikkanam 3. Vadakel Nursery Kozhuvanalkottayam 4. Agro biotech Poovanthuruthelkottayam 	<p>Nursery making and Production of planting materials of commercial crops</p> <p>Soil fertility assessment and soil testing</p>
Second Year	<ol style="list-style-type: none"> 1. Jain Irrigation Systems Coimbatore. T.N 2. Synthite Industries (P) Ltd Kolenchery 3. Ezhuvelil Gardens PulikalkavalaKottayam. 4. Tropical Bioscience Pala Kottayam 	<p>Value addition in important agricultural produce packing and marketing</p> <p>Hardening of tissue culture banana and marketing</p>
Third Year	<ol style="list-style-type: none"> 1. Central Nursery Kerala Agricultural University MannuthyThrisur. 2. Indian Institute Horticulture Research (IIHR) HassarghattKarnadaka 	<p>Advanced propagation methods Production of microbial consortium</p> <p>Precision farming</p>

(Pages : 2)

B. Voc. DEGREE MODEL EXAMINATION, 2019

First Semester

Core Course : FUNDAMENTALS OF AGRONOMY

(For B. Voc. Programme in Agriculture Technology)

(2018-2019 Admissions)

Time : 3 Hours

Maximum

Mark :80

PART A (Short Answer Questions)

Answer any 10 questions, 2 mark each

1. Define agriculture ?
2. Define sustainable agriculture ?
3. What is soil productivity ?
4. What are cover crops ?
5. Differentiate between extensive and intensive agriculture ?
6. Define Micronutrient ? Mention two examples
7. What are rabi crops? give two examples .
8. What is crop geometry? Discuss the effect on growth and yield.
9. Differentiate between fibre crop and oil seed crop
10. Mention the role of green manure crops in soil fertility management
11. List out the components of drip irrigation
12. Differentiate dry farming and dry land farming

PART B (Brief Answer Questions)

Answer any six questions, 5 marks each

13. What are the advantages and disadvantages of green manuring
14. Write a note on cultural practices in wet land rice
15. Write a short note on sustainable agriculture
16. Write varieties suited for Kerala and fertilizer requirement for rice
17. Briefly describe rice growing seasons in Kerala
18. Write a short note on scope and importance of agriculture in India
19. Briefly explain components and advantages of INM
20. Briefly explain water management of rice
21. Give a concise account of harvest and processing of cowpea

PART C

Answer any 2 questions , 15 marks each

22. Explain cultivation, harvesting and processing of tapioca
23. Write about major farming system in Kerala .
24. Write in detail about agronomic classification of crops
25. Write about importance of water in plant and soil

(Pages : 2)

B. Voc. DEGREE MODEL EXAMINATION , 2019

First Semester

Core Course : FUNDAMENTALS OF HORTICULTURE

(For B. Voc. Programme in Agriculture Technology)

(2018-2019 Admissions)

Time : 3 Hours

Maximum Marks :80

PART A (Short Answer Questions)

Answer any 10, 2 marks each

1. Define plant propagation ?
2. List out the methods of layering ?
3. What are the different methods of grafting ?
4. What is budding ?
5. What is parthenocarpy?
6. What is pruning ?
7. What is a green house ?
8. Define Horticulture ?
9. What is a rhizome ?
10. What are the different propagation media used in plant propagation ?
Write the components of nursery ?
12. Write about fruit drop and its control measures ?

PART B (Brief Answer Questions)

Answer any six questions, 5 marks each

13. Write briefly about the different systems of planting
14. List out the applications of budding and grafting in horticultural plants. Explain T-budding with the help of neat diagram ?
15. What is seedlessness ? What is its significance ? How will you induce seedlessness?
16. Write briefly on propagation by different types of cuttings ?
17. Briefly explain essential operations in raising a nursery ?
18. Write a short note on seed propagation ?
19. What are the different types of layering ?
20. Explain bearing habit and its classification ?
21. Calculate number of plants in 1 Ha if coconut is planted at 9 x 5 x 5 m and 7 x 7 m spacing ?

PART C

Answer any 2 questions , 15 marks each

22. Discuss the importance of horticultural crops in Kerala and India ?
23. Explain orchard planning and the different layouts and planting systems in orchard ?
24. Explain different methods of grafting , stock – scion relationship and graft incompatibility ?
25. Write in detail about propagation structures used in horticulture ?

(Pages : 2)

B. Voc. DEGREE MODEL EXAMINATION - 2019

First Semester

Core Course : FUNDAMENTALS OF SOIL SCIENCE

(For B. Voc. Programme in Agriculture Technology)

(2018-2019 Admissions)

Time : 3 Hours

Maximum

Mark :80

PART A (Short Answer Questions)

Answer any 10 question , 2 marks each

1. Define soil ?
2. Soil particles having size less than 0.002 mm is called
3. Vertical section of the soil is called
4. Soil with andstructure are ideal for plant growth
5. The soil carried in saltation consists of particles ranging from tomm in diameter
6. Criteria for essentiality is proposed by
7. Soil texture can be changed by soil management practices (True/ False)
8. Soils of Kerala is acidic in nature (True/ False)
9. What is pH ?
10. Give examples for secondary elements ?
11. Define soil profile with a neat diagram ?
12. Differentiate between soil texture and soil structure ?

PART B (Brief Answer Questions)

Answer any six questions, 5 marks each

13. What is soil structure ?describe different type of soil structures?
14. Briefly describe soil water and its classification ?
15. Briefly describe soil forming process ?
16. Calculate quantity of straight fertilizers required for NPK 7:10:5 and 10:10:10 ?
17. Write a short note on different types of rock ?

18. Write a short note on wind erosion ?
19. What is soil acidity, reason and management in cultivation ?
20. Write a short note on problematic soil?
21. Describe agronomic measures used for the conservation of soil and water ?

PART C

Answer any 2 questions , 15 marks each

22. Explain role of physical properties in soil fertility .
23. Explain the measures taken for soil water conservation.
24. Write a note on soils of Kerala.
25. What are the different type of soil erosion observed in India ? Explain factors affecting soil erosion by water

(Pages : 2)

B. Voc. DEGREE MODEL EXAMINATION, 2019

Second Semester

**Core Course BAT2S01- FUNDAMENTALS OF ENTOMOLOGY AND INSECT
ECOLOGY**

(For B. Voc. Programme in Agriculture Technology)

(2018-2019 Admissions)

Time : 3 Hours

Maximum

Mark :60

PART A

Answer any 10 questions (2 marks each)

- 1 Define ETL
2. A pest which is found infesting both at the field and storage conditions
3. What is meant by environmental resistance ?
4. Give the symptoms produced by coconut eriophyid mite.
5. List the major pests of Banana.
6. Differentiate between Scarabaciform and Eruciform larva.
7. Write briefly about the sclerotization of insect cuticle.
8. Effect of temperature on insect development.
9. List the characters of the order 'Hymenoptera'
10. Write the systematic position of house flies.
11. List the type of damage caused by sucking pests.
12. Write briefly on the direct and indirect losses caused by insect pests.

PART B
Answer Any six questions
5 marks each

13. Give the common sampling techniques employed in pest surveillance.
14. Define a pest, What are the different categories of pests ?
15. Different layers of insect integument.
16. Give the external features of grasshopper.
17. Differentiate the characters of suborders Homoptera and Heteroptera.
18. Give the typical symptoms produced by the major pests of cardamom.
19. Give the typical symptoms produced by the major pests of coconut.
20. Give the symptoms produced by the major pests of rice.
21. Write a short note on importance of ecology in pest management.

PART C
Answer Any two questions
15 marks each

22. Briefly describe the plant parasitic nematodes infesting major crops in Kerala with their characteristic symptoms
23. List the important characters of Lepidoptera and explain economically important families with characters and suitable examples.
24. Draw and label neatly the different types of mouth parts with suitable examples.
25. List the major pest of rice and give the typical symptoms produced by them.

(Pages : 2)

B. Voc. DEGREE MODEL EXAMINATION, 2019

Second Semester

Core Course BAT2S03 - FUNDAMENTALS OF AGRICULTURAL ENGINEERING

(For B. Voc. Programme in Agriculture Technology)

(2018-2019 Admissions)

Time : 3 Hours

Maximum

Mark : 80

PART A

Answer any 10 questions

2 marks each

- 1 Write a note on irrigated agriculture.
- 2 Explain ET_o
3. Mention the survey equipments.
4. What is dry farming
5. What is Gunter's Chain ?
6. Differentiate between plane and geodetic surveying.
7. Write a short note on survey stations
8. Explain effective precipitation
9. What is keylinedesign ?
10. Explain positive displacement pump.
11. What is a change point?
12. What are check basins?

PART B

Answer Any 6 questions
5 marks each

13. Explain calculations of area of a regular field under surveying
14. Describe the procedure in chain survey
15. Differentiate between contour plowing and terrace farming
16. Briefly explain agronomic measures of water conservations
17. Write a short note on role of grasses and pastures in soil conservation
18. Describe the importance of farm pond in agriculture
19. Explain the cross staff survey
20. Briefly explain factors for water use efficiency
21. Discuss the importance of surveying in agriculture

PART C

Answer Any two questions
15 marks each

22. Describe briefly in situ and ex situ water harvesting methods
23. Discuss in detail different type of soil erosion
24. Explain different method of irrigation
25. Write an essay on role of water in soil and plant

(Pages : 2)

B. Voc. DEGREE MODEL EXAMINATION, 2019

Second Semester

Core Course BAT2S02 - Plantation Crops, Spices and Fruits

(For B. Voc. Programme in Agriculture Technology)

(2018-2019 Admissions)

Time : 3 Hours

Maximum Mark : 80

PART A

Answer any 10 questions

2 marks each

1. Differentiate between white pepper and black pepper
2. Mention the climatic requirement of Rubber
3. List any two varieties of rambutan
4. What are the ideal growing conditions for pineapple
5. List the features of a mangosteen plant and its fruits.
6. How will you prevent birds from eating your crop?
7. Explain irrigation methods of coconut plantations
8. Mention the soil preparation in cardamom cultivation
9. How can you kill perennial weeds
10. Mention any two uses of durian
11. List the name of any two hybrids of cardamom
12. List any two growth regulators used in the cultivation of fruits

PART B

Answer Any 6 questions

5 marks each

13. Briefly describe origin, distribution and climate requirement of coconut
14. List the importance of good planting materials
15. Comment on different propagation methods of rambutan
16. Write a short note on varieties and uses of mangosteen
17. Write a short note on global scenario of fruit production
18. Write about post harvest management of durian
19. Write about propagation and harvesting of pepper
20. Briefly explain field preparation in the cultivation of spices
21. Write a short note on planting and cultural operations of banana cultivation

PART C

Answer Any two questions

15 marks each

22. Explain propagation, planting and management of cardamom
23. Discuss in detail nursery management, aftercare and uses of coconut
24. Write in detail about problems and prospects of fruit production in kerala
25. Write about crop management practices of pineapple

B.VOC. DEGREE EXAMINATION, JANUARY 2019

First Semester

General Course – BASIC PRINCIPLES OF FOOD PROCESSING

(B. Voc Programme in Agriculture technology)

Time: 3 Hours

Maximum

Marks: 80

PART A

1. What are the causes of mechanical losses in post harvest period?
2. What is the use of mulching in fruits & vegetables?
3. How will relative humidity affect post harvest losses?
4. What do you mean by Ethnic foods?
5. Define Post harvest loss?
6. What are the unit operations in a packing house?
7. What is Banana Puree?
8. Define Food processing?
9. What do you mean by Salad dressing?
10. Define Extrusion?
11. What is Dough resting?
12. List some health benefits of Banana?

PART B

(Answer any 6 questions. Each question carries 5 marks.)

- 13 Write a note on Sausage?
- 14 What do you mean by Corn flakes & Popcorn?
- 15 Write a short note on Macaroni?
- 16 Explain the primary causes for post harvest losses?
- 17 Explain the processing of Banana puree & Banana powder?
- 18 Explain the different tapioca products?
- 19 What are the different Fermented products?
- 20 Explain the processing of pasta with flow chart?
- 21 Write a note on Marmalade?

PART C

(Answer any 2 questions. Each question carries 15 marks.)

- 22 Discuss the measures to control post harvest losses?
- 23 Discuss the factors affecting post harvest loss?
- 24 Describe the following products Mayonnaise & Salad dressing with its processing steps?
- 25 Explain the processing steps of Tapioca products?

(Pages : 2)

B. Voc. DEGREE MODEL EXAMINATION, 2019

Second Semester

Core Course AFP2G02- FRUIT AND VEGETABLE PROCESSING TECHNOLOGY

(For B. Voc. Programme in Agro-Food Processing Technology)

(2018-2019 Admissions)

Time : 3 Hours

Maximum Mark : 80

PART A

Answer any 10 questions

2 marks each

1. Write about concentration of fruit juices.
2. Explain procedure for squash preparation.
3. What is tomato powder?
4. Mention importance of de-skinning.
5. Write about uses of amchur.
6. Explain how fruit candy can be made.
7. Write about tomato ketchup.
8. What are canned fruits?
9. List out uses of frozen mango pulp.
10. Explain packaging of onions.
11. Write about significance of thawing.
12. What is apple cidar.

PART B
Answer Any 6 questions
5 marks each

13. Explain production of fruit juices and pulps.
14. Give an account on different types of packaging.
15. Write a note on tomato products.
16. Write about apple products and preservation of these products.
17. Give an account on selection and preparation of fruits for processing.
18. Explain aseptic processing of fruits and its significance.
19. Write about major products of tomato.
20. Describe packaging and warehousing of potato and carrot.
21. Explain theory and production of jellies.

PART C
Answer Any two questions
15 marks each

22. Give an account on processing of various pineapple products.
23. Explain processing, storage, transportation and warehousing of okra and green peas.
24. Describe preparation of various mango products.
25. Explain processing and storage of ripe fruits.