

MAHATMA GANDHI UNIVERSITY KOTTAYAM



B.VOC. DEGREE PROGRAMME

SCHEME AND SYLLABUS

B.Voc. AGRO FOOD PROCESSING

(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.

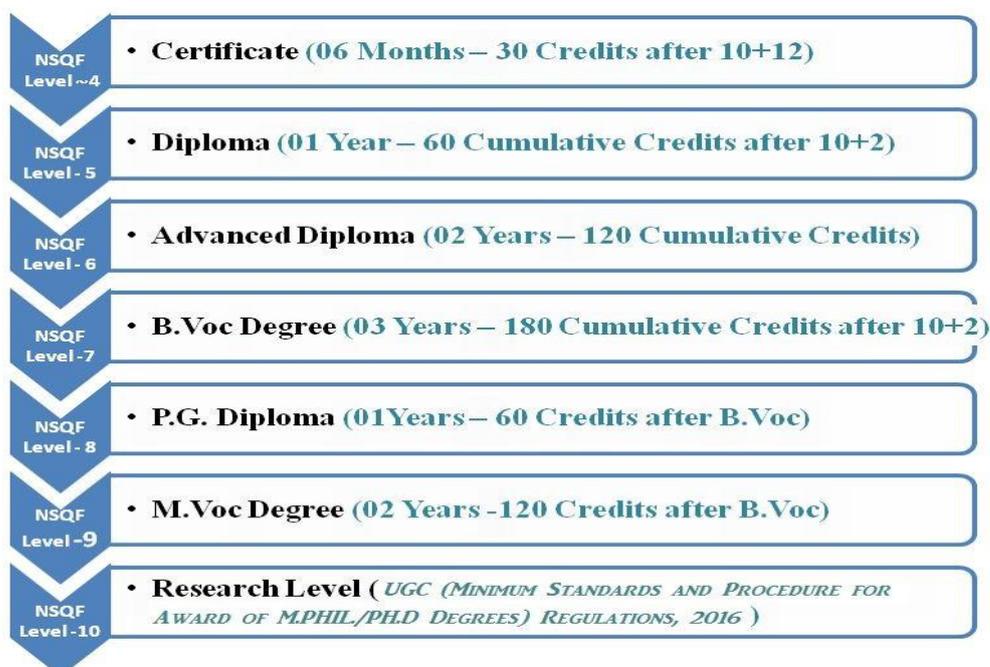
During the academic year 2019-20 admission onwards, all regular B.Voc Programme in affiliating colleges under MG University should strictly follow *Mahatma Gandhi University Regulations For B.Voc Programme 2018*.

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 Skill Component.

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

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

5. Structure of the Programme

Skill Development Components - 60% Weight age

General Education Component - 40% Weight age

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

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

Table 1

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:-

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

Semester Grade Point Average (SGPA) of a Semester is

calculated using the formula:- $SGPA = TCP/TC$, where *TCP* is the Total Credit Point of that semester.

Cumulative Grade Point Average (CGPA) is calculated using the

formula:- $CGPA = TCP/TC$, 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:-

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

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/ LAB examination

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 – Agro Food Processing

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	Skill/General	Credit per course	Class hours per week
1	AFP1S01	Basic Principles of Food Processing	SC	4	5
2	AFP1S02	Basic Principles of Food Preservation	SC	5	5
3	AFP1S03	Food Chemistry	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	BAT1G03	Fundamentals of Horticulture	GC	4	3
7	AFP1S04	Work Experience / Industry visit (AOC)	SC	4	-
TOTAL				30	25
SECOND SEMESTER					
Sl. No	Course code	Title of course	Skill/General	Credit per course	Class hours per week
1	AFP2S01	Food Additives	SC	4	4
2	AFP2S02	Basic Principles of Food Engineering	SC	5	4
3	AFP2S03	Basic Microbiology	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	AFP2S04	Internship - Industry visit	SC	4	-
TOTAL				30	25

THIRD SEMESTER					
Sl. No	Course code	Title of course	Skill/General	Credit per course	Class hours per week
1	AFP3S01	Food Processing Machineries	SC	5	5
2	AFP3S02	Bakery and Confectionary Technology	SC	4	5
3	AFP3S03	Food Analysis & Adulteration Testing	SC	5	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	AFP3S04	Work experience/Industry visit (AOC)	SC	4	-
TOTAL				30	25

FOURTH SEMESTER					
Sl. No	Course code	Title of course	Skill/General	Credit per course	Class hours per week
1	AFP4S01	Dairy technology	SC	5	4
2	AFP4S02	Meat, Fish and Poultry Processing Technology	SC	5	4
3	AFP4S03	Food science & Nutrition	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	AFP4S04	Internship - Industry visit	SC	4	-
TOTAL				30	25

FIFTH SEMESTER

Sl. No	Course code	Title of course	Skill/General	Credit per course	Class hours per week
1	AFP5S01	Food Packaging	SC	5	5
2	AFP5S02	Technology of Beverages	SC	5	5
3	AFP5S03	Sensory Evaluation	SC	4	5
4	BOCG501	Environmental studies	GC	4	4
5	AFP5G02	Sanitation and Hygiene	GC	4	3
6	AFP5G03	Drying Technology	GC	4	3
7	AFP5S04	Work experience/Industry visit (AOC)	SC	4	-
TOTAL				30	25

SIXTH SEMESTER

Sl. No	Course code	Title of course	Skill/General	Credit per course	Class hours per week
1	AFP6S01	Analytical methods in food Processing	SC	6	6
2	AFP6S02	Food Plant Design	SC	6	6
3	BOCG601	Entrepreneurship Development	GC	4	4
4	AFP6G02	Computer Hardware and networking	GC	4	4
5	AFP6G03	Food Toxicology	GC	4	5
6	AFP6S03	Internship - Project/Dissertation	SC	6	-
TOTAL				30	25

DETAILED SYLLABUS
B.Voc. AGRO FOOD PROCESSING

SEMESTER – I

AFP1S01- BASIC PRINCIPLES OF FOOD PROCESSING

Credit 4

72 Hrs

Objectives

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

Module 1- Classification of Food

12 Hrs

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

Module 2-Fundamentals of Food Processing

10 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 Loss and Its Management

12 Hrs

Post-harvest loss-Definition, Primary Causes-Chemical, physical and biological deterioration, Secondary causes, Control of post-harvest losses.

Module 4-Ethnic Foods and its Processing

10 Hrs

Banana products- banana puree, banana chips, banana powder, Banana jam, banana flour; Tapioca products- Tapioca chips, tapioca flour; Fermented Products- Dosa, Idli, Appam, Vada.

Module 5-Processing of Modern Foods

10 Hrs

Pasta, Macaroni, Noodles, Sausage, Mayonnaise, Salad Dressing, Margarine, Potato wafers, Potato chips, Marmalade, Corn flakes, Popcorn.

ACTIVITY ORIENTED CLASS(AOC)

Objectives

18 HRS

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

Text Books:

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

AFP1S02- BASIC PRINCIPLES OF FOOD PRESERVATION

Credit: 5

90 Hrs

Objectives

- To enable the students to acquire knowledge on different preservation techniques used to enhance the shelf span of food product.
- To study the different mode of spoilage in foods and minimize the contamination by different preservation technology.

Module 1- Food Spoilage **10 Hrs**

Food spoilage- definition, types of spoilage- physical, chemical, biological, and enzymatic.

Module 2- Basic Principles of Food Preservation **20 Hrs**

Definition, principles and importance of food preservation, general classification on the methods of food preservation, class I and class II preservatives, combination of preservatives, preservation by irradiation and fermentation.

Module 3- Preservation by use of High Temperature **20 Hrs**

Pasteurization-types of pasteurization, sterilization, canning- history and steps involved, types of cans and bottles. Spoilage encountered.

Module 4- Preservation by use of Low Temperature **20 Hrs**

Refrigeration- Advantages, difference between refrigeration and freezing, methods of freezing, steps involved in freezing, types of freezing, common spoilage during freezing.

Module 5- Preservation by Removal of Moisture **20 Hrs**

Drying and dehydration-merits and demerits, factors affecting drying, preparation of food for drying, Freeze drying, dehydrofreezing-advantages, Types of dryers, Concentration and types of concentrated foods.

Text Books:

1. Subalakshmi, G and Udipi, S.A. Food processing and preservation. New Age International Publishers, New Delhi, 2001.
2. Srilakshmi, B. Food Science. New Age International Publishers, New Delhi, 2003.
3. Potter, N.N. and Hotchkiss J. H. Food Science. CBS publishers and distributors. 1996.
4. Srivastava, R.P.O and Kumar, S. Fruit and vegetable preservation, International Book distribution Company, Lucknow, 1994.
5. MC.Williams, M and Paine, H. Modern Food preservation. Surjeet Publications, Delhi,
6. Cruess, W.V. Commercial fruits and vegetable products, Anees Offset press, New Delhi.

AFP1S03- FOOD CHEMISTRY

Credit:5

90 Hrs

Objectives

- To acquaint various functional chemical constituents of food.

- To build a relationship between the dynamic forces of food and the dynamic forces of digestion and growth.

Module 1- Introduction **10 Hrs**

Introduction to chemistry of foods composition and factors affecting foods, chemistry of water, water activity, moisture determination.

Module 2- Carbohydrates **10 Hrs**

Properties and classification, starch, cellulose, pectic substances, enzymes and its use in foods, gel formation and starch degradation, dextrinization, Browning reactions – Enzymatic & Non-enzymatic browning.

Module 3 –Proteins **12 Hrs**

Classification, physical and chemical properties of proteins and amino acids, confirmation, functional properties, hydrolysis of proteins, changes of proteins during processing.

Module 4-Oils and Fats **12 Hrs**

Classification, composition, physical and chemical properties, hydrolysis, hydrogenation, rancidity and flavor reversion, winterization, refining of oils, rendering, emulsions.

Module 5- Vitamins & Minerals **10 Hrs**

Classification- Fat soluble & water soluble, structure, sources, functions, causes for losses of vitamins in foods, bioavailability. Minerals, classifications, sources, functions.

ACTIVITY ORIENTED CLASS (AOC)

Objectives **36Hrs**

- To test the presence of carbohydrates and proteins in food samples.
- To estimate the nutrients in different food samples.

1. Standardization of Solutions **5 Hrs**

- Standardization of Fehling’s solution.
- Standardization of Sodium hydroxide with standard oxalic acid.

2. Estimation of Sugar Solutions **14 Hrs**

- Estimation of Glucose by Lane and Eynon’s method.
- Estimation of Sucrose by Lane and Eynon’s method.
- Estimation of Aldose by Willstalter’s Iodometric titration

- Estimation of starch.
- 3. Estimation of Protein** **7 Hrs**
- Biuret method
 - Lowry's method
- 4. Estimation of Vitamin.** **6 Hrs**
- Estimation of vitamin C
- 5. Qualitative Test** **4 Hrs**
- Qualitative tests for carbohydrates
 - Qualitative tests for proteins.

Text books:

1. Campbell, M K and Farrell, S O-Biochemistry 5th edition-international student, 2006
2. Damodaran,S., Parkin , K L.,Fennema, O R., Fennema's Food Chemistry- 4th edition, CRC press Taylor and Francis Group, New York 2008.
3. Fennema, O R. -Food Chemistry 3rd edition, Marcel Dekker Inc, New York., 1996.
4. Manay, N.S, Shadaksharaswamy, M., Foods- Facts and Principles, New Age International Publishers, New Delhi, 2004.
5. Meyer, L H-Food Chemistry. CBS publishers & distributors, New Delhi. 2002
6. Potter, N. N, Hotchkiss, J. H. Food Science. CBS Publishers, New Delhi. 2000.
7. Srilakshmi, B. Food Science (3rd edition), New Age International (P) Limited Publishers, New Delhi, 2003.
8. Nielsen, S.S. Introduction to the chemical analysis of foods. Jones and Bartlett Publishers, Boston, London. 2003
- 9 . Sadasivam,S. Manickam, A. Biochemical Methods, 2nd edition. New Age International (P) Limited, New Delhi. 2001

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

12 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

18 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

18 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**14 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**10 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

COMPLIMENTRY COURSE**BAT1G03-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**9 Hrs**

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

Module 2**12 Hrs**

Phases of growth and development - vegetative/ reproductive balance; Flowering in plants - bearing habit and its classification- factors associated with flowering and fruit set. Fruit set and development - structure and process concerned with setting.

Module 3 **12 Hrs**

Plant propagation - definition and basic concepts, sexual and asexual types - advantages and disadvantages. Asexual propagation - propagation by cuttings, types of cuttings, factors affecting rooting of cuttings. Propagation by layering - types of layering.

Module 4 **12 Hrs**

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

Module 5 **9 Hrs**

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

ACTIVITY ORIENTED CLASS (AOC)

Objectives

- To develop skill in propagation and cultivation aspects of horticultural crops. **18Hrs**

- 1. Familiarization to Different planting systems and layout **2 Hrs**
- 2. Propagation methods - sexual propagation -seed viability tests, dormancy breaking methods. **2 Hrs**
- 3. Propagation structures - mist chamber, green house, hot beds etc. **2 Hrs**
- 4. Propagation by cuttings. **2 Hrs**
- 5. Propagation by layering - types of layering. **3 Hrs**
- 6. Propagation by grafting - methods of grafting **4 Hrs**
- 7. Propagation by budding, methods of budding **3 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. Kalyani Publishers
8. Gopalakrishnan, T. R. 2007. Vegetable Crops. New India Publishing Agency, New Delhi.
9. Hazra, P. and Som, M. G. 1999. Technology for vegetable Production and Improvement. Naya Prokash, Calcutta
10. Peter, K. V. 1998. Genetics and Breeding of vegetables. ICAR, New Delhi.

AFP1S04-WORK EXPERIENCE/INDUSTRY VISIT [AOC]

Credits 4

72Hrs

Industrial visit at Malanadu Development Society (MDS) for making students expert in production processing and packing of different dairy and honey products. Students have to submit a report on scope, marketing, procedure of processing and various steps in production of different milk honey and bakery products.

SEMESTER-2

AFP2S01- FOOD ADDITIVES

Credit: 4

72Hrs

Objectives

- To attain knowledge regarding the use of additives in the food industry, laws related to food additives and to prevent the involuntary infringement of analytical procedures.

Module 1- Introduction**12 hrs**

Food additives, definition, objectives, functional classification, natural and synthetic additives, health and safety aspects of food additives

Module 2- Major Food Additives**14 hrs**

Preservatives- class I&II, antioxidants, Sweeteners- natural and artificial, permitted food colours- natural and artificial, Food flavours – natural and artificial, Stabilizers and thickeners

Module 3- Minor Food Additives**18 hrs**

Aerating agents, Antistaling agents, bodying agents, Clouding agents, Curing agents, Clarifiers, Dietary supplements, Dietary fibre, Emulsifiers, Enzymes, Fat replacers, Leavening agents, Surfactants, Tenderizers, Texurizers, Thickeners, Viscosity modifiers, Whipping agents

Module 4- Food Laws and Standards**14 hrs**

Food standards - Voluntary and mandatory food laws and Food Safety and Standards Act of India, 2006

Module 5- Permitted Levels**14 hrs**

Permitted level of food additives, present status of various food additives, controversial food additives, GRAS

Text books:

1. Manay, N.S, Shadaksharaswamy, M., Foods- Facts and Principles, New Age International Publishers, New Delhi, 2004.
2. Meyer, L H-Food Chemistry. CBS publishers & distributors, New Delhi. 2002.
3. Potter, N. N, Hotchkiss, J. H. Food Science. CBS Publishers, New Delhi. 2000.
4. Srilakshmi, B. Food Science (3rd edition), New Age International (P) Limited Publishers, New Delhi, 2003.

AFP2S02- BASIC PRINCIPLES OF FOOD ENGINEERING

Credit: 5

90 Hrs

Objectives

- Students will be able to apply material balances and energy balances to the field of food engineering.
- Students will be able to understand equipment used in the food industry.

Module 1- Engineering Units

15hrs

Dimensions – Primary, secondary, engineering units- Base units, derived and supplementary units System – state of system, extensive properties, intensive properties.

Module 2- Heat Transfer in Food Processing

20hrs

Modes of heat transfer -conductive heat transfer, convective heat transfer, radiation heat transfer Systems for heating and cooling food products, plate heat exchanger, tubular heat exchanger, scraped surface heat exchanger, steam infusion heat exchanger.

Module 3- Mechanical Operations

20hrs

Mixing-different type of mixers used in food in industry, Clarification and concentration process- evaporation, diffusion concentration.

Module 4- Mechanical Separation

20hrs

Ssedimentation, centrifugation, distillation, Filtration- batch filtration, continuous filtration, ultra filtration, reverse osmosis.

Module 5- Irradiation

15hrs

Definition, principle, advantages and disadvantages, application of radiation in food industry, doses, effect of radiation in food- direct and indirect.

Text books:

1. Dincer, I. Heat Transfer Food Cooling Applications. Taylor and Francis Publishers, USA. 1997.
2. Heldman, D. R. and Lund, D.B. Handbook of Food Engineering 2nd edition. CRC press, Newyork. 2007.
3. Singh, R.P. Introduction to Food Engineering 3rd edition. Academic Press, London. 2004

AFP2S03- BASIC MICROBIOLOGY

Credit: 5

90 Hrs

Objectives

- Acquire an elementary knowledge about micro organisms.
- Develop an understanding of industry and in maintenance of health.

Module 1- Introduction to microbiology

15 Hrs

Microbiology in daily life, Characteristics and morphology of bacteria, fungi, virus, protozoa & algae.

Module 2- Microbial Growth

6 Hrs

Growth curve, Effect of pH, Water activity, O₂ availability & temperature on the growth of microorganisms.

Module 3- Cultures and Media

9 Hrs

Different type of media- Selective media and differential media; Preparation of media- PDA media, Nutrient agar, Mac Conkey agar, Culturing techniques- Spread plate and streak plate, pour plate.

Module 4- Beneficial micro-organisms

12 Hrs

SCP- Microorganisms used, raw materials used as substrate, condition for growth and production, nutritive value and use of SCP Micro organisms of industrial importance, biomass, fermentation, enzymes & hormones, Antibiotics & vaccines, Microorganisms & effluent treatment

Module 5- Food Borne Diseases

12 Hrs

Food intoxication- Staphylococcal intoxication, botulism, Food infection- Salmonellosis, Clostridium perfringens, Bacillus cereus gastroenteritis, E. coli infection and others

ACTIVITY ORIENTED CLASS (AOC)

Objectives

36hrs

- To study the basic rules and requirements of a microbiology laboratory.
- Give emphasis towards the preparation of biological stains, reagents, media and their composition.

- To get thorough different methods for staining of microorganisms.

Module-1 Microbiology laboratory basic rules and requirements **4 Hrs**

Laboratory rules- basic rules of a microbiology lab, basic requirements of a microbiological lab- common glass ware; test tube, culture tube and screw capped tubes, Petri dish, pipette, Pasteur pipette, glass spreader, inoculation needle, Bunsen burner, water bath, autoclave, laminar air flow, incubator, hot air oven, Quebec colony counter, centrifuge, microscope. Disposal of laboratory waste and culture.

Module 2 Staining of microorganisms **11 Hrs**

Methods for detection of specific bacteria: wet mount preparation for motile bacteria, hanging drop mount method, Methods for staining of micro organism: Simple staining (Monochrome staining) Gram staining for differentiation of bacteria Negative staining of bacteria Endospore staining.

Module-3 Composition, preparation and sterilization of media **7 Hrs**

PDA media Nutrient agar media Mac-Conkey agar media

Module-4 Demonstration of techniques for pure culture of microorganisms **5 Hrs**

Streak plate method Pour plate method, Serial dilution agar plate method.

Module -5 Microbiology of milk: enzymatic test of milk by methylene blue reductase test, quality testing of milk by resazurin test, determination of phosphatase activity of milk, detection of mastitis through milk test.

Microbiology of Meat, Fish, Fruit, Vegetable. **9 Hrs**

Text books:

1. Frazier, W.C. Food Microbiology. 4th edition. Mc Graw Hill. New York, 2008
2. Khetarpaul, N. Food microbiology, Daya publishing house, New Delhi, 2009
3. Narayanan, L.M. and Mani,L. Microbiology.Saras Publications, Nagercoil.
4. Pelzar, H.J. and Rober, D. Microbiology 5th edition Mc Graw Hill. NewYork, 2009
5. Prescott, L.M., Harley, J.P. and Klein, D.A. Microbiology. 4th edition McGraw-Hill, NewYork. 1999
6. Dubey, R.C. and Maheshwari, D.K. Practical microbiology. S.Chand and Company Limited, Ramnagar. New Delhi 2002.

GENERAL EDUCATION COURSES

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

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

COMPLIMENTRY COURSE

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.

AFP2S04-INTERNSHIP - INDUSTRY VISIT

Credits 4

72 hrs

Industrial visit at Kissan fruits Thrissur, Peermedu Development Society (PDS) and MDS Parathodu to get acquainted with processing of fruits and value additions in various fruits. They are made aware of modern trends in organic products industry. The students were sent to 10 days internship in the above industries as per their choice. Students must submit a report on scope, marketing, procedure of processing and various steps in production of different organic fruit products. Skill assessment by Agriculture Skill Council of India [ASCI] on job roll Agri Commodity Quality Analyzer AGR/Q7901 will be conducted under NSQF.

SEMESTER-3

AFP3S01- FOOD PROCESSING MACHINERIES

Credit: 5

90 Hrs

Objectives

- To study the design of food process and food plant design, based on the established chemical process designed.

- To discuss the various processing equipment on the basis of unit operations of mechanical processes.

Module 1-Design and selection of food processing equipment **16 Hrs**

Materials of construction-metals, steel, stainless steels, aluminum, copper, plastic, and glass

Module-2-Mechanical processing equipment **18 Hrs**

Size reduction- cutting, crushing and grinding, size enlargement-agglomeration, homogenization-pressure homogenization, colloid mills, ultrasonic homogenizers, forming-extrusion and forming equipment

Module-3-Thermal Processing Equipment **18 Hrs**

Canning-basic canning operations, batch sterilizers-still retorts, batch rotary sterilizers, crateless retorts, retorts for glass and flexible containers, continuous flow sterilizers-direct heating and indirect heating

Module 4-Refrigeration and Freezing Equipment **20 Hrs**

Refrigeration –refrigeration cycle, compressors, evaporators, condensers, cooling equipment, hydrocooling, vacuum cooling, surface contact cooling, tunnel cooling, vacuum cooling freezing-air freezing, cold surface freezing, liquid freezing

Module 5-Food Dehydration Equipment **18 Hrs**

Principles of drying, commercial food drying equipment-sun dryers, solar dryers, bin, silo and tower dryers, tray/cabinet dryers, tunnel dryers, rotary dryers, drum dryers, spray dryers, vacuum and freeze dryers

Text books:

1. Dincer, I. Heat Transfer Food Cooling Applications. Taylor and Francis Publishers, USA. 1997.
2. Heldman, D. R. and Lund, D.B. Handbook of Food Engineering 2nd edition. CRC press, Newyork. 2007.
3. Singh, R.P. Introduction to Food Engineering 3rd edition. Academic Press, London. 2004.

4. Saravacos, G D and Kostaropoulos A E. Handbook of Food Processing Equipment. 2006. Brijbasi Art Press Ltd, New Delhi.

AFP3S02- BAKERY AND CONFECTIONERY TECHNOLOGY

Credit: 4 **72 Hrs**

Objectives

- To highlight the processing methods used in confectionary and culinary industries

Module 1- Manufacture of Sugar **12 Hrs**

Sugarcane, gur, khandasari sugar, raw sugar, refined sugar, white sugar, beet sugar.

Module 2- Classification of confectionery **15 Hrs**

Sugar boiled confectionery- crystalline and amorphous confectionery, rock candy, hard candy, lemon drop, china balls, soft candy, lollypop, marshmallows, fondant, fudge, cream, caramel, toffee, lozenges, gumdrops, honeycomb candy.

Module 3- Cocoa processing **15 Hrs**

Processing of cocoa, manufacture of chocolate- conching, enrobing, milk chocolate, white chocolate, dark chocolate, cocoa butter, wafer coated chocolate, fat bloom, cocoa powder.

Module 4- Bread manufacturing **15 Hrs**

Ingredients, role of ingredients, dough development, molding, proofing, knock-back, baking, packing.

Module 5- Cake & Biscuit **15 Hrs**

Processing of cake and biscuit- Ingredients, role of ingredients, development of batter, baking, packing.

Text books:

1. Manay, N.S, Shadakshara swamy, 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.

AFP3S03- FOOD ANALYSIS AND ADULTERATION TESTING

Credit: 5

90 Hrs

Objectives

To enable the students

- To understand different sampling techniques employed in chemical analysis of foods.
- To learn various chemical methods of food analysis.
- To be familiar with adulteration test used for quality control

Module 1- Introduction to food analysis

10 Hrs

Proximate principles and analysis of food, official methods of analysis.

Module 2- Sampling techniques

15 Hrs

Population and sampling, importance of sampling, types of sampling, preparation of samples.

Module 3- Chemical analysis of moisture, carbohydrates and protein

20 Hrs

Moisture assay – oven drying methods, Karl Fischer titration, Toluene distillation method

Carbohydrate- starch, crude fiber Protein- Kjeldhal method, Biuret method, Lowry's method.

Module 4- Chemical analysis of fat, vitamin C and minerals

15 Hrs

Fat- soxhlet method, gerber method. Analysis of vitamin C. Estimation of minerals by ashing - dry, wet and low temperature plasma ashing.

Module 5- Food adulteration

12 Hrs

Definition, classification – intentional & incidental, health hazards caused by various adulterants and the critical level of metals in various foods, common adulterants in food and their testing.

ACTIVITY ORIENTED CLASS (AOC)

Objectives

18 hrs

- To learn various processing aspects of food products having economic importance

1. .Manufacture of different milk products.

5 Hrs

2. Manufacture of jack fruit products.

5 Hrs

3. Preparation of peanut butter.

1 Hrs

4. Preparation of potato chips and tapioca chips.

2 Hrs

- | | |
|--|--------------|
| 5. Preparation of RTS. | 2 Hrs |
| 6. Preparation of new product development. | 3 Hrs |

Text books:

1. Kalia, M. Food Analysis and Quality Control. Kalyani Publishers, New Delhi. 2002.
2. Winton, A.L and Winton, K.B. Techniques of food analysis. Allied Scientific Publishers, New Delhi. 1999.
3. Nielsen, S.S. Introduction to the chemical analysis of foods. Jones and Bartlett Publishers, Boston, London. 2003.
4. Connell, J.J. Control of fish quality. Blackwell Scientific Publications, Cambridge. 2000.
5. PFA ACT.
6. Manay, N.S, Shadaksharaswamy, M., Foods- Facts and Principles, New Age International Publishers, New Delhi, 2004.
7. Potter, N. N, Hotchkiss, J. H. Food Science. CBS Publishers, New Delhi. 2000.
8. Srilakshmi, B. Food Science (3rd edition), New Age International (P) Limited Publishers, New Delhi, 2003.

GENERAL EDUCATION COURSES

BOCG301 -PRINCIPLES OF MANAGEMENT

Credit:4

72 hrs

MODULE – I

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 – II

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.

MODULE – III

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 – IV

Staffing: Recruitment, selection, induction training, maintenance, and retrenchment. Systems approach to HRM – Performance appraisal and career strategy – HRD - meaning and concept.

MODULE – V

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.

Books for Reference:

1. Moshal.B.S . *Principles of Management*, Ane Books India,New Delhi.
2. Bhatia R.C. *Business Organization and Management*, Ane Books Pvt. Ltd., NewDelhi.
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.

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.

COMPLIMENTRY COURSE

BAT3G03- Protected cultivation of Horticultural crops

Credit: 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 cultivation in India - growing structures - green house - polyhouse - net house - basic considerations in establishment and operation of greenhouses - maintenance .

Module 2 **12 Hrs**

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

Module 3 **12 Hrs**

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

Module 4 **10 Hrs**

Crop regulation – special horticultural practices in protected cultivation for commercially important crops: vegetable crops, seedlings, etc.

Module 5 **8 Hrs**

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

ACTIVITY ORIENTED CLASS (AOC)

Objective	18 Hrs
<ul style="list-style-type: none">To practice with protected cultivation practices of important crops	
1. Study of structures utilized for protected culture.	2 Hrs
2. Design and orientation of poly/green houses.	2 Hrs
3. Type of containers used in protected culture.	2 Hrs
4. Use of substrate and preparation of substrate for protected cultivation	3 Hrs
5. Fertigation system in green houses	3 Hrs
6. Maintenance of cooling and heating system in green houses.	3 Hrs
7. Special horticultural practices in protected cultivation	3 Hrs

Text books:

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

AFP3S04 -WORK EXPERIENCE/INDUSTRY VISIT [AOC]

Credits:4 **72 Hrs**

Industrial visit at Modern Bread Cochin, Jive Frit Products Vazhakulam and Happy Fruits to get acquainted with processing of cereals and value additions in various fruits. They are made aware of modern machineries in processing industry. The students were sent to 7 days internship in the above industries as per their choice. Students must submit a report on scope,

marketing, procedure of processing and various steps in production of different cereals and fruit products.

SEMESTER – 4

AFP4S01- DAIRY TECHNOLOGY

Credit: 5

90 Hrs

Objectives

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

Module 1- Introduction

12 Hrs

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

Module 2- Milk Processing

15 Hrs

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

Module 3- Butter and cream

15 Hrs

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

Module 4- Cheese, Ice cream and condensed milk

15 Hrs

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

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

Module 5- Indigenous Dairy Products**15 Hrs**

Fat rich products- Ghee, Makkan and Malai..Concentrated Products- Khoa .Coagulated Products- Chhana and Paneer.Fermented Products- Dahi , Chakka, Shrikhand , Sweet dairy products - Gulab Jamun and Rasagulla.

ACTIVITY ORIENTED CLASS (AOC)**Objectives****18 Hrs**

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

1. Analysis of milk**8 hrs**

- Estimation of acidity
- Estimation of lactose
- Estimation of protein by Sorenson formaldehyde titration
- Estimation of milk fat
- Adulteration testing- starch, cane sugar, water

2. Manufacture of paneer**4 Hrs****3. Manufacture of Rasagulla****3 Hrs****4. Processing of gulab jamun****3 Hrs****Text books:**

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

13. Kalia, M. Food Analysis and Quality Control. Kalyani Publishers, New Delhi. 2002.
Winton, A.L and Winton, K.B. Techniques of food analysis. Allied Scientific Publishers, New Delhi. 1999.
14. Nielsen, S.S. Introduction to the chemical analysis of foods. Jones and Bartlett Publishers, Boston, London. 2003.
15. Manay, N.S, Shadaksharaswamy, M., Foods- Facts and Principles, New Age International Publishers, New Delhi, 2004.
16. Potter, N. N, Hotchkiss, J. H. Food Science. CBS Publishers, New Delhi. 2000.

AFP4S02- MEAT FISH AND POULTRY PROCESSING TECHNOLOGY

Credit: 5

90 Hrs

Objectives

- To provide an extensive description of meat, fish and poultry processing
- To introduce the latest technologies, manufacturing processes and tools for effective control of safety and quality during processing.

Module 1- Meat Processing

18 Hrs

Basic meat science: Chemical composition & structure of meat, Post-mortem changes in muscle & meat quality Classification, Meat preservation- chilling, freezing, curing, salting, pickling, smoking and canning. Abattoir practices.

Module 2- Fish Processing

18 Hrs

Composition of fish, Preservation of fish by drying, salting and smoking, Chilling and freezing of fish and seafood, application of freezing system in fish processing- IQF method, Canning of fish and fish products, Packaging.

Module 3- Egg Processing

18 Hrs

Egg formation and structure, composition, preservation: Refrigeration, drying and freezing. Egg quality parameters: interior and exterior. By-products and waste utilization.

Module 4- Poultry Processing

18 Hrs

Poultry composition, classification, slaughtering techniques, preservation of poultry meat, Byproducts and waste utilization

Module 5- Quality Control in Meat and Fish**18 Hrs**

Meat: Test for assessment of raw meat-TVN, FFA, PV, Nitrate & nitrite in cured meat, Establishment of HACCP in meat industry. Fish: Quality assurance in sea food processing: GMP, HACCP, ISO 9000.

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. Subalakshmi, G and Udipi, S.A. Food processing and preservation. New Age International Publishers, New Delhi, 2001.
4. Srilakshmi, B. Food Science. New Age International Publishers, New Delhi, 2003
5. Warriss P. D, Meat Science: An Introductory Text, Cambridge university press – 2010

AFP4S03- FOOD SCIENCE AND NUTRITION**Credit: 4****72 Hrs****Objectives**

To enable the students

- To know and understand the functions, importance of all nutrients present in foods.
- To know about the various types of nutrients and their functions in the body.
- To familiarize with the recent advances in field of nutrition.
- To understand the different types of newly developed food products.

Module 1- Introduction to Nutrition**8 Hrs**

Definition of nutrition and health, inter-relationship between nutrition and health.

Malnutrition: Definition and types. Reference man and reference women

Module 2- Food and water**18 Hrs**

Definition of food, classification of foods based on origin, pH, nutritive value. Basic five food groups, food guide pyramid. Functions of foods. New concepts of food: health foods, ethnic foods, organic foods, functional foods, nutraceuticals, fabricated foods, extruded foods, convenience foods, junk foods, GM foods and proprietary foods. Water: functions, sources, requirement, water balance, toxicity and deficiency.

Module 3- Vitamins **16 Hrs**

Classification, structure, function, sources, general causes for loss in foods, bioavailability, enrichment, fortification and restoration. Units of measurement. Deficiency and toxicity disorders.

Module 4- Minerals **18 Hrs**

Classification of minerals. Functions, sources, bioavailability and deficiency of the following minerals- Calcium, Iron, Iodine, Fluorine, Sodium, Potassium

Module 5- Energy **12Hrs**

Units of energy, food as a source of energy, basal metabolic rate, factors affecting BMR, total energy requirement.

Text books:

1. James L Groff and S Gropper (2009) “Advanced Nutrition and Human Metabolism”, Fourth Edition, Wadsworth Publication Company
2. Maurice B Shils, Moshe Shike A, Catherine Ross, Benjamin Cabellero, Robert J Cousins (2006), “Modern Nutrition in Health and Disease”, Lippincott Williams al Wilkins.

Michael J Gibney, Ian A Macdonald and Helen M Roche (2003) “Nutrition and Metabolism “. The Nutrition Textbook Series, Blackwell Publishing, First Edition

GENERAL EDUCATION COURSES

BOCG401-SOFTSKILLS AND PERSONALITY DEVELOPMENT

Credits : 4 **72 Hrs**

Module – I **12 Hrs**

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

Module – II **15Hrs**

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

Module – III **15Hrs**

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

Module – IV **15 Hrs**

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

Module – V **15 Hrs**

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

Books for Reference:

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

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

COMPLIMENTRY COURSES

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 gourd, snake gourd, cucumber, melons, pumpkins, watermelon and ivy gourd. Leguminous crops- vegetable cow pea and winged bean. Other vegetables-okra, 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 (2 Hrs each)

1. Familiarization of different vegetable crops- through field visits and slide show.
2. Main field preparation and planting of transplanted tropical vegetable crops.
3. Main field preparation and planting of direct sown vegetable crops.

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

AFP4S04-INTERNSHIP - INDUSTRY VISIT

Credits 4

72 Hrs

Industrial visit at Meat Products of India (MPI) Parayil Food Products Kottayam and MDS Parathodu to get acquainted with processing of meat and value additions in various packed foods. They are made aware of modern trends in meat industry. The students were sent to 14 days internship in the above industries as per their choice. Students must submit a report on scope, marketing, procedure of processing and various steps in production of different meat fish and food products.

SEMESTER - 5

AFP5S01- FOOD PACKAGING

Credit: 5

90 Hrs

Objectives

- To be familiar with different methods and materials used for packaging.
- To understand the technology behind packaging.

Module 1- Introduction to food packaging

12 Hrs

Definition, functions and requirements for effective packaging, packaging criteria, Classification of packaging- Primary, secondary and tertiary packaging, Flexible, rigid and Semi- rigid packaging.

Module 2- Materials for food packaging

15 Hrs

Paper, Glass, Tin, Aluminium: TFS, Polymer coated tin free steel cans, cellophane, plastics-LDPE, HDPE, LLDPE, HMHDPE, Polypropylene, polystyrene, polyamide, polyester, polyvinyl chloride.

Module 3- Different forms of food containers **15 Hrs**

Boxes, jars, cans, bottle. Interaction of packages with foods-Global migration of plastics, packaging requirements for various products- fish, meat, spices, vegetables & fruits, canned foods, dehydrated foods.

Module 4- Modern concepts of packaging technology **15 Hrs**

Aseptic packaging, Form-Fill-Seal packaging, Edible Films, Retort pouch packaging, Easy-Open-End, Boil-In-Bags, Closures, tetra-pack, vacuum-packaging, MAP & CAP, Hyper baric storage, insect resistant packaging, intelligent packaging.

Module 5- Food packaging Laws & Specifications **15 Hrs**

Quality testing of packaging materials

- Paper & paper boards-thickness, bursting strength, grammage, puncture resistance, Cobbs test, tearing resistance.
- Flexible packaging materials (plastics)-yield, density, tensile strength, elongation, impact resistance, WVTR, GTR, Overall Migration Rate, seal strength.
- Transportation hazards and testing.
- Oxygen interactions, moisture interchanges and aroma permeability.

ACTIVITY ORIENTED CLASS (AOC)

- **Credit: 1**

18 HRS

Visit pack house of various industries and design new generation packing technology.

Text books:

1. Cruess, W.V. Commercial Fruit & Vegetable Products. Allied Scientific Publishers, New Delhi. 2003
2. Davis, E.G. Evaluation of tin & plastic containers for foods. CBS Publishers, New Delhi. 2004
3. Gopal T.K.S. Seafood packaging, CIFT, Matsyapuri Cochin, 2007
4. Potter, N. N, Hotchkiss, J. H. Food Science. CBS Publishers, New Delhi. 2000.
5. Sacharow, S., Griffin, R.C. Food Packaging. AVI Publishing Company, West Port, Connecticut. 2000

AFP5S02- TECHNOLOGY OF BEVERAGES

Credit: 5

90 Hrs

Objectives

- To enable the students to get an up to date knowledge about fermented foods and beverages.

Module 1- Introduction & Classification of Beverages

18 Hrs

Introduction and classification of beverages, Mineral water-water source and deionization of mineral water, Water treatment process: Filtration, Adsorption, ion exchange, Chemical oxidation, Biological process, Remineralisation and microbiological treatments. Microbiology of bottled water.

Module 2- Alcoholic Beverages

18 Hrs

Beer Making and Types of Beer: ale, lager, pilsner, stout and porter beer. Wine making and Types of wine: white wine, red wine, dry wine, sweet wine and sparkling wine. Whisky manufacture and types of whisky: Scotch whisky, malt whisky, Irish whisky and Canadian whisky, Manufacture of rum, vodka, brandy and gin.

Module 3- Carbonated Beverages

12 Hrs

Carbonated soft drinks- Ingredients and preservatives used in carbonation. Syrup room operation and equipments involved.

Module 4 - Tea

10 Hrs

Steps involved in processing of tea. Types of tea: Black tea, Green tea and Oolong tea.

Module 5 - Coffee

14 Hrs

Manufacture of coffee, Types of coffee: Vacuum coffee, drip coffee, percolator coffee, steeped coffee, espresso coffee, iced coffee and Instant coffee. Decaffeination of coffee

ACTIVITY ORIENTED CLASS(AOC)

18hrs

- 1.Preparation of cappuchino
2. Blending of tea
- 3.Preparation of wine
- 4.Commerical wineries designing

Text books:

1. Manay, N.S, Shadaksharaswamy, M., Foods- Facts and Principles, New Age International Publishers, New Delhi, 2004.
2. Nicholas Dege. Technology of Bottled water. Blackwell publishing Ltd, UK.,2011
3. Potter, N. N, Hotchkiss, J. H. Food Science. CBS Publishers, New Delhi. 2000.
4. Srilakshmi, B. Food Science. New Age International Publishers, New Delhi, 2003

AFP5S03- SENSORY EVALUATION

Credit: 4

Hrs: 72

Objectives

- To understand different aspects of sensory science and its application.

Module 1-Introduction

10 Hrs

Sensory evaluation: Definition & Importance of sensory evaluation; Practical requirements for conducting sensory tests, limitations of sensory evaluation.

Module 2- Testing conditions

12 Hrs

General testing conditions - Testing area, testing set up, lighting, testing schedule, Preparation of samples, sample coding, evaluation card preparation.

Module 3- Sensory assessment

10 Hrs

Taste—Taste sensation on the tongue, Recognition test for the four basic tastes. Odour and Smell – Anatomy of nose, Smelling techniques, Vonskramlk, Test. Glossary of textural terms. Texture measurement Colour vision and appearance measurement-Structure of eye, Visual perception and colour of foods. Flavour and aroma - aroma perception, Definition of flavor, Flavour profile methods, Flavour compounds Temperature sensation, pain sensation, touch sensation, kinesthetic sensations, and sound sensations.

Module 4- Sensory Tests

10 Hrs

Threshold test, Difference test, Ranking test, Hedonic test, Acceptance and Preference test, scoring test, Sensitivity test Application of sensory analysis in food industry, trained panel members.

Module 5- Data analysis

12 Hrs

Importance of data analysis, tests of significance, null hypothesis, mean, median, variance, standard deviation, t-test, chi-square test.

ACTIVITY ORIENTED CLASS (AOC)

Objectives

18hrs

- To understand different aspects of various sensory parameters and its application in food quality analysis.

The following tests will be done.

1. Triangle test
2. Single sample test
3. Paired comparison test
4. Duo- trio test
5. Hedonic rating test
6. Numerical scoring test
7. Ranking test
8. Overall acceptability
9. Flavor profile
10. Descriptive test

Text books:

11. Jellinek, G., Sensory Evaluation of Food-Theory and Practice. Elis Horwood Ltd., England, 1985.
12. Lawless H.T, Sensory Evaluation of Food, Food Science Text series, Springer Science, 2010
13. Srilakshmi, B., Food Science., New Age International (P) Limited., New Delhi, 2005

GENERAL EDUCATION COURSES

BOCG501-ENVIRONMENTAL STUDIES

AIM

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

OBJECTIVES

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

Credit: 4

72 hrs

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

(12 hrs)

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 - Erach Bharucha 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)

AFP5G02- SANITATION AND HYGIENE

Credit: 4

72 Hrs

Objectives

- To know the principles and applications of sanitation in food industry

Module 1: Sanitation; Introduction **14 Hrs**

Definition and Application to Food Industry and Food service. Microorganisms and sanitation. Sources of food contamination. Prevention and control of contamination of food. Physical and chemical Disinfectants, Antiseptics, Bactericidal and Bacteriostatic agents used in food industry.

Module 2: Food Sanitizers **14 Hrs**

Sanitizers, Chemical and physical properties of sanitizers. Cleaning compounds, Chemical and physical characteristics of detergents. Sanitizing methods, handling precautions.

Module 3: Sanitation equipments and systems in Food Industry **16 Hrs**

Mechanized sweepers and scrubbers, high pressure cleaners, CIP and COP equipment. Membrane Cleaning. Quality of water used for food processing, Water quality standards. Waste product handling, Suspended solids, Total solids, BOD & COD requirements. Wastewater treatment and disposal.

Module 4: Food handling and personal hygiene **16 Hrs**

Food handling and personal hygiene. Hygienic food handling. Hand washing. Food service control points. Regulatory requirements. Hygiene monitoring tests (HMT). Food contact surfaces. Biofilms. Environmental sanitation- premises, equipment, furniture and fixtures. Safety at work place.

Module 5: Insect & Pest Control **12 Hrs**

Pest control, insect, rodents, other pests. Sanitary Design and Construction for Food Processing., Sanitation programme and Quality assurance. Sanitation Regulation and Standards.

Text books:

1. Frazier, W.C. Food Microbiology. 4th edition. Mc Graw Hill. New York, 2008
2. Pelzar, H.J. and Rober, D. Microbiology 5th edition Mc Graw Hill. New York, 2009
3. Prescott, L.M., Harley, J.P. and Klein, D.A. Microbiology. 4th edition McGraw-Hill, New York. 1999
Holla, J. Hygiene in food processing

AFP5G03- DRYING TECHNOLOGY

Credit: 4 **72 Hrs**

Objectives

- To be familiar with different methods of drying.
- To understand the technology behind drying

Module 1- Introduction	16 Hrs
Food dehydration, dehydration principles, selection of methods based on characteristics of foods to be produced, heat and mass transfer, difference between drying and dehydration	
Module 2- Mechanism of drying	18 Hrs
Drying curve, constant rate period, falling rate period, dry and wet bulb temperature, factors affecting dehydration, Physical and chemical changes during drying, Effect of food properties on dehydration, cell structure, case hardening, control of changes	
Module 3- Driers used in food industry	18 Hrs
Drying methods, equipments, sun drying, air convection driers, kiln drier, cabinet drier, tunnel drier, fluidized bed drier, spray drier, drum drier, vacuum drier, freeze drier, advantages and disadvantages of different methods	
Module 4- Processing of some Dehydrated foods	12 Hrs
Processing of milk powder, raisins, osmotic dehydrated foods, intermediate moisture food, dehydrofreezing	
Module 5- Packing	8 Hrs
Packaging materials for dried foods, storage, transportation	

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. Singh, R.P. Introduction to Food Engineering 3rd edition. Academic Press, London. 2004

AFP5S04 - WORK EXPERIENCE/INDUSTRY VISIT [AOC]

Credits 4

Industrial visit at Central Institute of Fisheries Technology (CIFT) Eranakulam, Devon Food Ltd Kottayam and Synthite Industries Kolencherry to get acquainted with processing of Fish and value additions in various packed foods. They are made aware of modern trends in sea fish industry. The students were sent to 7 days internship in the above industries as per their choice. Students must submit a report on scope, marketing, procedure of processing and various steps in production of different meat fish and food products.

SEMESTER 6

AFP6S01- ANALYTICAL METHODS IN FOOD PROCESSING

Credit: 6

108 Hrs

Objectives

- To know the principles and applications of different techniques used in food and nutrition research.
- To gain knowledge about different instruments used in food analysis.

Module 1- Chromatography

18Hrs

Introduction, principles of chromatography; Techniques and working principle and application in food industries of- Paper chromatography, GC, GLC, HPLC, TLC.

Module 2- Spectroscopy

18 Hrs

Principles of spectroscopy, properties; Techniques and working of-Infrared spectroscopy, UV spectrophotometer, Atomic absorption, Atomic emission, Fluorimetry and NMR.

Module 3- Radiotracer Techniques

18 Hrs

Introduction, Nature of radioactivity, units, radioactive counters, solid, gas and liquid scintillation.

Module 4- Electrophoresis

18 Hrs

Definition, types of electrophoresis methods, free solution electrophoresis, paper or gel electrophoresis, SDS-PAGE.

Module 5- Measurement of enzyme activity

18 Hrs

Enzyme activity, basic principles, chemical reactions, catalytic effects, reaction rates, reaction mixtures.

ACTIVITY ORIENTED CLASS (AOC)

Objectives

- To gain knowledge about different instruments used in food analysis

1. Paper chromatography

8 Hrs

2. Colorimetry

4 Hrs

3. Centrifugation

6 Hrs

Text books:

1. Mahindru, S.N. Food additives. Characteristics, detection and estimation. Tata McGraw-Hill Publishing Company Limited, New Delhi. 2000
2. Nielsen, S.S. Introduction to the chemical analysis of foods. Jones and Bartlett Publishers, Boston, London. 2004.
3. Pearson, D. The Chemical Analysis of Foods, Churchill Livingstone, New York, 2002.
4. Sharma, B.K. Instrumental Methods of Chemical Analysis. Goel Publishing House, New Delhi. 2004.
5. Srilakshmi, B., Food Science., New Age International (P) Limited., New Delhi, 2005
6. Nielsen, S.S. Introduction to the chemical analysis of foods. Jones and Bartlett Publishers, Boston, London. 2004.
7. Mahindru, S.N. Food additives. Characteristics, detection and estimation. Tata McGraw-Hill Publishing Company Limited, New Delhi. 2000
8. Pearson, D. The Chemical Analysis of Foods, Churchill Livingstone, New York, 2002

AFP6S02- FOOD PLANT DESIGN**Credit: 6****108 Hrs****Objectives**

- To understand concepts of plant layout.
- To have knowledge on building, utilities in the plant.
- To know the importance of proper food plant design.

Module 1: Introduction**15 Hrs**

Definition, Basic concepts of plant layout and design with special reference to food process industries. Application of HACCP concept, ISO, FPO & MPO requirements in food plant layout and design.

Module 2: Plant Location**15 Hrs**

Influence of location on plant layout, location factors, location theory and models, Economic plant size, types of manufacturing processes like continuous, repetitive and intermittent processes.

Module 3: Plant Layout**16 Hrs**

Preparation of a Plant Layout, Plant Layout problem, importance, objectives, classical types of layouts. Evaluation of layout. Advantages of good layout.

Module 4: Plant Building

20 Hrs

Consideration in building design, type of factory buildings, choice of building construction, material for floors, foundation, walls, doors, windows, drains etc. ventilation, fly control, mold prevention and illumination in food processing industries.

Module 5: Plant layout & equipment layout

24 Hrs

Plant layout and design of bakery and biscuit industries, fruits and vegetable processing industries including beverages, milk and milk products, meat poultry and fish processing industries

Text books:

- 1 John Holah, H.L.M Lelieveld, (2011), “Hygienic Design of Food Factories”, Elsevier Publications.
- 2 J. Peter Clark, (2008),” practical Design, Construction and operation of Food Facilities “, Academic Publishers.
- 3 Zacharias B.Maroulis, George D. Saravacos, (2007), “ Food Plant Economic”.CRC Press Publishers.
- 4 Antonio Lopez – Gomez, Gustavo V. Barbosa – Canovas, (2005),” food Plant Design”,CRC Press Publishers.

GENERAL EDUCATION COURSES

BOCG601- ENTREPRENEURSHIP DEVELOPMENT

Credits: 4

72 Hrs

Objectives:

To help students to

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

Module 1 Introduction

15 Hrs

Concept of entrepreneurship, essential attributes of an entrepreneur, women entrepreneurs, intrapreneurs, entrepreneurs and economic development. Decision making steps. Types of enterprises – demand based, resource based, import substitution and export promotion. Large,

Medium, SSI, Partnership and sole proprietorship, Problem solving skills and SWOT techniques.

Module 2 Project formulation **15 Hrs**

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

Module 3 Financial management **15 Hrs**

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

Module 4 Resource management **15 Hrs**

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

Module 5 Marketing management **12 Hrs**

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

Text books:

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

AFP6G02- COMPUTER HARDWARE AND NETWORKING

Credit: 4 **72 Hrs**

Objectives

- Understand the hardware components of a system.
- Understand basic issues in installing and using software.
- Understand how a network functions and the issues of network security.

Module 1- Basics of Computer and Hardware **10 Hrs**

Input & Output Devices, their types and specifications, CPU, Memory devices- types primary and secondary, BIOS/ CMOS setting.

Module 2- Mother Board

10 Hrs

Study of Motherboard RAM, ROM, CMOS, POST, BUS, (Address, Data, SYSTEM), Connections of various devices such as Display Adapter, Ports (Serial, Parallel) , Modem on the Mother Board, Importance of CPU cooling, Motherboard troubleshooting.

Module 3- Serial Devices

10 Hrs

Key Board: Switches, Keyboard organization, Key board type, Wireless Keyboard Trouble shooting. Mouse: Mouse type- Scroll & Optical Mouse, Function Connecting Mouse, Trouble shooting Mouse. FILE SYSTEM: Types of file Sequential, index, direct access, creation and updates of file and access method.

Module 4- Storage Devices

13 Hrs

HDD: HDD types, integrated, SCSI, Magnetic recording, Formatting (Track, Sector) Cluster, Bad Sector, Jumper Setting, Common Problem and its trouble Shooting, External Drive (HDD), Optical Drives. FDD: FDD types and working and its related problem, CD and DVD drives- ROM and Writer, USB Devices, Hub, Pen Drives.

Module 5-Parallel Devices

13 Hrs

Printers: Working of DMP, Ink Jet, Laser Printer, line printer, MFP (Multi-Functional Printer and its Trouble shooting, Scanners, BOOT PROCESS, POWER SUPPLY, TYPES OF PC'S : Desktop, Laptop, Palmtop.

Module 6 - Introduction to LAN and WAN networking

16 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.

Text books:

1. The Indispensable PC Hardware Book (4th Edition) by Hans-Peter Messmer.
2. USB Mass Storage by Jan Axelson.
3. Bigelow's PC Hardware Desk Reference – 2002 by Stephen J. Bigelow.
4. PC Architecture. An online book in by Michael Karbo.

AFP6G03- FOOD TOXICOLOGY

Credit: 4

72 Hrs

Objectives

- Provide students with a basic understanding of the principles of toxicology.
- Provide students an in depth understanding of how the science of toxicology is applied to chemical food and feed safety, including food regulation and risk assessment

Module 1

15 Hrs

Introduction to food toxicology. Principles of food toxicology. Classifications and divisions in Toxicology. Classes of toxicants. Indicators of toxicity and their evaluation.

Module 2

15 Hrs

Plant and animal toxins, Natural toxicants present in foods (plants, animal, marine and microbial toxins). Phytoalexins, alkaloids, inhibitors of enzymes and toxic proteins, cyanogenic glycosides, phenols. Antagonists of vitamins. Xenobiotics. Natural carcinogens in animal and plant materials. Types of these dangerous chemical substances and their effects on living organisms

Module 3

15 Hrs

Microbial toxins, Food-borne disease agents among the major microbial groups: fungi, bacteria, algae viruses, protozoa and worms. food toxicants; Bacteriotoxins (botulin and other bacterial exotoxins). Mycotoxins (aflatoxins, trichothecenes, ochratoxins, and fumonisins); their production, properties and Parameters affecting microbial growth in food.

Module 4

15 Hrs

Environmental toxicants, Health Effects of Nitrate, Nitrite and N-Nitroso Compounds. Pesticides. Heavy metals and other toxic elements (lead, arsenic, mercury, cadmium and others).

Module 5

12 Hrs

Toxicants formed in processed foods, Hazardous chemical compounds arising from processing and storing of foods. Heating and Chemical Changes. Radiation and Microwave Energy. Nitrosamines and other biologically active nitro compounds. Polycyclic aromatic hydrocarbons.

Text books:

1. Schlegel H., 1988: General Microbiology. - Cambridge, New York, New Rochelle, Melbourne, Sydney.: Cambridge University Press.

2. Chelkowski J. (ed.), 1991: Cereal grain. Mycotoxins, Fungi and Quality in Drying and Storage. – Elsevier, Amsterdam.
3. Booth C. (ed.), 1981: Methods in Microbiology. – London – New York.

AFP6S03 INTERNSHIP PROJECT WORK/ DISSERTATION [AOC]

Credits 6

Project Work in Selected Industries.

Industrial training will be conducted at the industrial premises engaged in agro food processing 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 processing operations the students will 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
<p>FIRST YEAR</p> <p>Level 5</p>	<p>1. Assistant Lab Technician – Food and Agricultural Commodities: Reference ID: FIC/Q7006</p> <p>An Assistant Lab Technician is responsible for ensuring quality products through sampling of raw materials, packaging material, finished products and shelf life samples for quantitative and qualitative analysis.</p> <p>2. Jam/Jelly/ Ketchup Processing Technician : Reference ID:FIC/Q0103</p> <p>A jam, jelly, ketchup operating technician is responsible for processing fruits and vegetables to make jam/ jelly and ketchup by receiving, checking raw material quality, sorting, pulping, pasteurizing, cooking, juice extracting, clarifying, filtering, sampling for quality analysis, cooling, packing and storing.</p> <p>3. Agri commodity quality analyzer: AGR/Q 7901</p> <p>An agro commodity quality analyzer evaluate the agro food products according to the food laws given by different countries.</p> <p>4. Fruit and vegetable selection in -charge : Reference ID: FIC/Q0108</p> <p>A fruit and vegetable selection in-charge is responsible for sorting and grading produce such as fruits, vegetables, nuts etc. based on their colour, size, appearance, feel and smell.</p> <p>5. Grain Mill Operator : Reference ID: FIC/Q1003</p> <p>A grain mill operator carries out processes such as cleaning, destoning, hulling, polishing and grinding to produce milled grains and flour(s).</p> <p>6. Chief Miller : Reference ID: FIC/Q1001</p> <p>A chief miller manages a milling process for all types of grains overseeing activities such as handling of various milling machineries, maintenance of process parameters, inspection of raw materials and finished goods to achieve the desired quality and quality of products.</p>

<p>SECOND YEAR</p> <p>Level 6</p>	<p>1. Baking Technician / Operative: Reference ID: FIC/Q5005</p> <p>A baking technician/ operative is responsible for baking of products, maintaining their consistency and quality, while meeting defines SOPs and leveraging his/ her skill to operate ovens in synchronization with proof box/ rest of the plant or unit.</p> <p>2. Plant biscuit production specialist : Reference ID: FIC/Q5005</p> <p>A plant biscuit production specialist produces biscuits in industrial units as per defines SOPs in synchronization with rest of the plant/ unit by weighing, mixing, kneading, rolling, sheeting, cutting, moulding, baking, cooling etc. either manually or using machineries following the defines SOPs of the plant/ unit.</p> <p>3. Craft baker: Reference ID: FIC/ Q5002</p> <p>Craft baker produces baked products (breads, puffs, cookies, cakes/ pastries, desserts, speciality baked products etc.) in artisan bakeries and patisseries by measuring raw materials and ingredients, mixing, kneading, fermenting, shaping and baking in order to achieve the desired quality and quantity of products.</p> <p>4. Plant baker: Reference ID: FIC/ Q5001</p> <p>A plant baker produces or supervises the production of baked products (breads, biscuits, cakes etc.) in industrial unit by weighing, mixing, kneading, fermenting, shaping, rolling, sheeting, cutting, moulding, baking, cooling etc. using various industrial equipments.</p> <p>5. Mixing technician: Reference ID: FIC/ Q5004</p> <p>A mixing technician prepares different types of dough used in baking baked products by using various methods such as weighing, mixing, kneading, fermenting following the defined Sops of the plant or unit while maintaining food safety and hygiene in the work environment.</p> <p>6. Pulse Processing Technician: Reference ID: FIC/Q1004</p> <p>A pulse processing Technician is responsible for milling various types of pulses (Red gram, black gram, Bengal gram, green gram, green peas etc.) through processes such as cleaning, destining, conditioning, dehusking, splitting, sorting, polishing, grinding.</p>
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<p>THIRD YEAR</p> <p>Level 7</p>	<p>1. Fish and Sea food Processing Technician : Reference ID: FIC/ Q4001</p> <p>Fish and seafood processing technician is responsible for processing fish and sea foods to achieve quality and quantity of products along with maintain food safety and hygiene in work environment.</p> <p>2. Fruit and vegetable selection in -charge : Reference ID: FIC/Q0108</p> <p>Fruit and vegetable selection in-charge is responsible for sorting and grading produce such as fruits, vegetables, nuts etc. based on their colour, size, appearance, feel and smell.</p> <p>3. Fruit ripening Technician : Reference ID: FIC/Q0104</p> <p>Fruit ripening technician is responsible for ripening of all types of fruits in the ripening chamber and maintaining cleanliness, hygiene and safety of the fruit and ripening chamber.</p> <p>4. Pickle making Technician : Reference ID: FIC/Q0102</p> <p>Pickle making technician is responsible for preparation of all types of pickles from various fruits and vegetables through the process of washing, peeling, cutting, slicing, curing, brining, blending, filling, oil topping, packing and storage.</p> <p>5. Fruit Pulp Processing Technician: Reference ID: FIC/Q0106</p> <p>Fruit Pulp Processing Technician is responsible for pulping/ producing fruit pulp through the process of receiving, ripening, checking raw material quality, sorting, washing, cutting/ slicing, deseeding/ destining, pulping, pre- cooking, sterilizing, aseptic packaging or canning, sampling for quality analysis and sorting.</p>
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**DETAILS OF INDUSTRY SELECTED FOR INTERNSHIP FOR AGRO
FOOD PROCESSING**

Year	Name of Industry	Activity
First Year	<ol style="list-style-type: none"> 1. Malanadu Milks Parathodu 2. Peermedu Development Society Kuttikkanam 3. Devon foods Ltd Chungam Kottayam 4. Brahmins Foods India Ltd Thodupuzha 	<p>Milk value addition products.</p> <p>Bread making and quality and standard assessment of foods</p>
Second Year	<ol style="list-style-type: none"> 1. Parayil Food Products (P) Ltd Kottayam 2. Synthite Industries (P) Ltd Kolenchery 3. Aska Foods & Spices (P) Ltd Edapally Cochin 4. Tropical Bioscience Pala Kottayam 	<p>Value addition in important agricultural produce, Baking packing and marketing</p>
Third Year	<ol style="list-style-type: none"> 1. Central Tuber Crops Research Institute (CTCRI)Sreekaryam Thiruvananthapuram 2. Central Food Technological Research Institute(CFTRI) Kanjihudi, Mysoor Karnataka 	<p>Advanced processing methods of tubers fruits and vegetables</p>

B.VOC. DEGREE EXAMINATION, JANUARY 2019

First Semester

Core Course – BASIC PRINCIPLES OF FOOD PROCESSING

(B. Voc Programme in Agro-Food processing 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 AFP2S02- BASIC PRINCIPLES OF FOOD ENGINEERING

(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 an account on importance of viscosity in separating techniques
- 2 Explain moisture diffusion.
- 3 Write a note on importance of steam utilization in food processing .
- 4 Explain diffusion and its applications in food technology.
- 5 Give an account on indirect contact freezing system.
- 6 Write about any 2 supplementary units.
- 7 Explain bulk density.
- 8 Explain clarification.
- 9 Mention importance of cooling of food products.
- 10 Write about scraped surface heat exchanger.
- 11 What are extensive properties?
- 12 Write about irradiation doses used in food industry.

PART B

Answer Any six questions

5 marks each

- 13 Explain different types of evaporators.
- 14 Write about effect of irradiation in food.
- 15 Give an account on different types of alteration techniques.
- 16 Explain various conservation processes.
- 17 Write about heat exchangers.
- 18 Explain principle and types of centrifuges used in food processing.
- 19 Write about importance of distillation in food industry,
- 20 Give an account of systems used for heating of food.
- 21 Explain advantages and disadvantages of irradiation in food.

PART C

Answer Any two questions

15 marks each

- 22 Explain different types of mixers used in food industry.
- 23 Give an account of engineering units.
- 24 Write about modes of heat transfer in food processing.
- 25 Describe various mechanical separation techniques used in food industry.

(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.

(Pages : 2)

B. Voc. DEGREE MODEL EXAMINATION, 2019

Second Semester

Core Course AFP2S03-BASIC MICROBIOLOGY

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

(2018-2019 Admissions)

Time : 3 Hours

Maximum Mark : 80

PART A

Answer any 10 questions

2 marks each

1. Explain lytic cycle.
2. Write a note on role of microbes in effluent treatment.
3. Write a note on Mac-Conkey agar.
4. Write about production of antibiotics.
5. Explain gram staining.
6. Give an account on importance of bacteria in industrial production of enzymes.
7. Explain anaerobic respiration.
8. Write a note on nutrient media.
9. Give an account on sterilisation of culture media.
10. Write a short note on protozoa.
11. Explain vaccination.
12. Write about pasteurization.

PART B

Answer Any 6 questions

5 marks each

13. Explain importance of fermentation.
14. Explain preparation of culture media.
15. Write about different types of viruses.
16. Explain growth curve and various factors affecting growth of microbes.
17. Write a note on streak plate.
18. Illustrate morphological variation in alga.
19. Write about selective media.
20. Explain SCP and uses of SCP.
21. Give an account on importance of microbiology in daily life.

PART C

Answer Any two questions

15 marks each

22. Give an account on industrially important microorganisms,
23. Write a note on different types of microbial culture media.
24. Give an outline of major microbial food-borne diseases.
25. Explain structure of bacterial cell. Mention different types of bacteria based on structure.

B.VOC. DEGREE EXAMINATION, JANUARY 2019

First Semester

Core Course AFP1S03– FOOD CHEMISTRY

(B. Voc Programme in Agro-Food processing technology)

Time: 3 Hours

Maximum Marks: 80

PART A

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

1. What are Reducing and non –reducing sugar, Give examples of each?
2. What is Starch?
3. Hydrolysis of protein?
4. Water and its structure?
5. Explain Dextrinization?
6. Explain Isoelectric point?
7. What are Polysaccharides and give example?
8. Explain Mutarotation?
9. Water activity and food processing?
10. What are Pentoses, Give examples?
11. Classification of amino acids based on nutritional availability?
12. Functions of carbohydrates?

PART B

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

- 13 What are Disaccharides? Structure and its properties?
- 14 Explain in detail about Water activity?
- 15 Quality and safety attributes of food?
- 16 Functional properties of protein in food?
- 17 Chemical and biochemical reactions of food?

- 18 Denaturation of protein? Agents causing denaturation?
- 19 Steps involved in gelatinization of starch?
- 20 Bonds involved in tertiary structure of protein?
- 21 Monosaccharide? Classification and its structure?

PART C

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

- 22 Confirmation of proteins?
- 23 Browning reactions?
- 24 Application of enzymes in food processing?
- 25 Classification of amino acids based on structure?

B.VOC. DEGREE EXAMINATION, JANUARY 2019

First Semester

Core Course – BASIC PRINCIPLES OF FOOD PRESERVATION

(B. Voc Programme in Agro-Food processing technology)

Time: 3 Hours

Maximum Marks: 80

PART A

(Answer/explain any **10** questions. Each question carries **2** marks.)

1. Flash pasteurization?
2. Flat sour spoilage?
3. Blanching?
4. Dehydration?
5. Different types of preservatives?
6. Gamma rays and Cathode rays?
7. Fermentation?
8. Six different zones of water spray pasteurizer?
9. Factors affecting maillard reaction?
10. Water activity?
11. Oxidative rancidity?
12. Enzymes with their spoilage action?

PART B

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

- 13 Principles of food preservation?
- 14 Different types of pasteurization?
- 15 Advantages and disadvantages of irradiation?
16. Methods of concentration?
- 17 Explain the different common spoilage during freezing?
- 18 Sterilization?
- 19 Different types of drying?

- 20 Packaging of canned foods?
- 21 Use of low temperature?

PART C

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

- 22 Define pasteurization? Explain pasteurization of packaged and unpackaged foods?
- 23 Define food spoilage? Explain different types of food spoilage?
- 24 Define canning? Explain the steps involved in canning with flowchart?
- 25 Explain spoilage on canned foods?

B.VOC. DEGREE EXAMINATION, JANUARY 2019

First Semester

Core Course – BASIC PRINCIPLES OF FOOD PROCESSING

(B. Voc Programme in Agro-Food processing 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?
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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?
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- 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

First Semester

General Course BAT1G03: FUNDAMENTALS OF HORTICULTURE

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

(2018 - 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 ?