

**Regulations for Under Graduate Programme
(B.Sc.Food Science & Quality Control) under Choice
Based Credit System**

2016(U.G CBCS 2016)

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2. ACKNOWLEDGEMENT

The course in Model III –B.Sc. Food Science and Quality Control has been designed keeping in mind the latest technological advances in the food processing industries and the need for complete professionals adept in all areas of the vast science of food. The course aims at training students not just academically but also in the areas that develop communication skills, soft skills and overall ability. The course is also designed to give a further thrust on developing in students a desirable attitude for self employment.

I take this opportunity to thank all the members on the Expert Committee for their untiring efforts and support for the preparation of the syllabus . I gratefully take this opportunity to thank all the members for their valuable contributions in drafting the syllabus of B.Sc. Food Science and Quality Control.

I place on record my gratitude to Miss Asha Yohannan and Miss Anila Joseph, Dept.of Food Science & Quality Control, B.C.M College, Kottayam for the suggestions offered to the formulation of the syllabus.

NEED AND SCOPE OF FOOD SCIENCE & QUALITY CONTROL

With liberalization of Indian economy, all-round industrial growth has been witnessed in all sectors with improvement in social and economic conditions of our people. This has created demand for more and better quality foods. With advancement in production technology, high yield levels will lead to large amount of marketable surplus of food grains and crop residues, demanding appropriate handling, processing, preservation, storage, marketing and utilization.

The development of processing industries to preserve the perishable agricultural produce will not only improve economic and nutritional status of our population but it may help in employment generation in rural as well as urban areas of the country. This can be achieved by linking production, and post harvest technology in synergistic way.

At present the export from agro-sector represents about 16% of total Indian exports. The primary export commodities are cereals, fruits, vegetables and their processed products, and marine products but fast growing specialty products have also penetrated in foreign markets. Considering the contribution of these products in Indian export, it is necessary to have appropriate technology for handling and processing of agricultural produce.

The importance of Food Science and Quality Control lies in the fact that it has capability to provide food to our population through scientific conservations, eliminating avoidable losses and making available more balanced and nutritious food. High value products from low grade material can be produced by innovative and appropriate processing and packaging technologies and also from by-products and residue waste using integrated approach. Thus modernization of post harvest operations and agro-processing industries through innovative and appropriate technology has a vital role to play in national economy in general and rural economy in particular. Considering the above aspects, the role of food technologist does not stop at farm level but it continues till the harvested crops and animal products are processed, preserved and further modified into useful and nutritious products, until it utilized by the consumer. So, the post-harvest handling and processing need to be attended on priority basis at national and international level. Moreover, with development of processing industries, it is quite likely that the demand for food scientists and technologists will increase in the next few decades. Hence, specializations offered at graduate level need to be strengthened considering occupational needs as well as demands of the food industries.

The field of food quality assurance has evolved substantially over the past decade, and certain key developments have become widely accepted. These include Quality Systems (e.g., ISO) and HACCP. Consequently, it has become essential for undergraduate Food Science and Quality Control students preparing for careers in the food industry to have some basic training in these systems as part of the curriculum in their university or college programs. The B.Sc. programme integrates the latest principles, practices, and terminology of food safety systems with those of quality management systems to provide an understanding of a single food quality management system. Modules define industry terminology, review the differences and components of food quality and food safety, explain quality programs and quality systems, and thoroughly examine Good Manufacturing Practices and HACCP. Designed primarily as an undergraduate-level programme, it combines the fundamentals of food science and quality management courses in its curriculum.

Food Science is basically an interdisciplinary programme involving chemistry, microbiology and quality assurance. Hence, basic knowledge of these three disciplines becomes mandatory if student wishes to pursue career in this discipline. In order to develop strong and need based programme, core courses in above disciplines should be there for developing Food Science and Quality Control discipline for effective preservation, processing and utilization of perishable agricultural produce ensuring its quality.

In addition, the programme offers industrial training in the first, second and third year giving students an opportunity to familiarize the food industrial unit operations while learning.

3. Introduction

This practical and informative course provides participants with foundational knowledge related to all aspects of food science presented by world renowned experts.

This course is designed for any one working in food industry or in the field of food science in order to increase their knowledge in food chemistry, food processing, sensory science, food safety, food packaging and functional foods and Nutraceutical.

This course is designed to give a five day overview of the most relevant aspects of food science typically covered over our three year under graduate programme.

Food Science can be defined as the application of basic sciences and engineering to study the basic and fundamental physical, chemical and biochemical nature of foods and the principles of food processing.

As such food science is a broad discipline which contains within it much specialization such as in food microbiology, food engineering and food chemistry.

Food Technology is the science of processing and packaging of food items. Fruits, vegetables, sea foods, meats, cooked foods, snacks, confectionaries, beverages, juices, canned juices and fruits all come under the preview of food technology.

Aim & Objectives

- 1.** To train the students to be competent working professionals in the food industry, in the production of quality food by imparting better nutritional, sanitation & hygiene concepts.
- 2.** To encourage students to the entrepreneurs and develop the capacity for setting up small scale enterprises with respect to food within the country.
- 3.** To organize functions for creating awareness about the importance of safe processed nutritious food.
- 4.** To provide diagnostic analysis of food products.

4. REGULATIONS

1 NAME OF PROGRAMME : B Sc Food Science & Quality Control

2.FACULTY : Faculty of Science

3.DURATION OF COURSE

- i. The curriculum requirement of B. Sc. Food Science and Quality Control shall consist of a period of 3 academic years as prescribed in the curriculum.
- ii. The academic years shall be split into 6 semesters (6 months each). Examinations will be conducted at the end of each semester in subjects prescribed in the respective scheme of examinations.
- iii. The duration of odd semesters shall be from June to October and that of even semesters from November to March. There shall be three days semester break after odd semesters and two months vacation during April and May in every academic year. (The commencement of first semester may be delayed owing to the finalization of the admission processes.)
- iv. A student may be permitted to complete the Programme, on valid reasons within a period of 12 continuous semesters from the date of commencement of the first semester of the programme.

4.DEFINITIONS

- 4.1 Academic week:** is a unit of five working days in which distribution of work is organized from day one to five, with five contact hours of one hour duration on each day. A sequence of 18 such academic weeks constitutes a semester.
- 4.2 College co-ordinator:** is a teacher nominated by the College Council to co-ordinate the continuous evaluation undertaken by various departments within the college. He/she shall be nominated to the college-level monitoring committee.
- 4.3 Course:** means a complete unit of learning which will be taught and evaluated within a programme. It comprises of 'Paper(s)' which will be taught and evaluated within a programme.
- 4.4 Common Course I** means a course that comes under the category of courses for English and Environmental Studies & Human Rights & **Common Course II** means additional language.
- 4.5 Complementary course:** means a course which would enrich the study of core

courses.

- 4.6 Core course:** means a course in the subject of specialization within a degree programme.
- 4.7 Vocational course (Skill Enhancement Course):** means a course that enables the students to enhance their practical skills and ability to pursue a vocation in their subject of specialization.
- 4.8 Choice based course:** means a course that enables the students to familiarize the advanced areas of core course.
- 4.9 Paper:** means a complete unit of learning which will be taught and evaluated within a semester.
- 4.10 Credit (C):** is a numerical value assigned to a paper according to the relative importance of the content of the syllabus of the programme.
- 4.11 Credit point (CP):** is the value obtained by multiplying the grade-point (GP) by the credit (C); $CP = C \times GP$
- 4.12 Cumulative Grade Point Average (CGPA):** is the value obtained by dividing the sum of credit-points in all the courses taken by a student for the entire programme by the total number of credits. This shall be rounded off to two decimal places. CGPA indicates the broad level of academic performance of a student in a programme. An overall letter grade (Cumulative Grade) for the entire programme shall be awarded to a student depending on his/her CGPA.
- 4.13 Department:** means any teaching department in a college.
- 4.14 Department Co-ordinator:** is a teacher nominated by a Department Council to co-ordinate the continuous evaluation under-taken in that department.
- 4.15 Department Council:** means the body of all teachers of a department in a college.
- 4.16 Faculty Advisor:** means a teacher from the parent department nominated by the department council who will advise the student in the choice of his/her courses and other academic matters.
- 4.17 Generic Elective (GE):** means an elective paper chosen from any discipline/subject, in an advanced area.
- 4.18 Grace Marks:** shall be awarded to the candidates as per the University Orders issued from time to time.
- 4.19 Grade:** means a letter symbol (e.g. - A, B, C etc) which indicates the broad level of performance of a student in an answer/course/semester/programme.
- 4.20 Grade point (GP):** is the numerical indicator of the percentage of marks awarded

to a student in a paper.

- 4.21 Grade Point Average (GPA):** is the value obtained by dividing the sum of the total credit points obtained by a student in an examination of a course in a semester by the total number of credits taken in those examinations. The GPA shall be rounded off to two decimal places.
- 4.22 Institutional Average (IA):** means average mark secured (Internal + external) for a paper at the college level.
- 4.23 Parent Department:** means the department which offers core-courses within an undergraduate programme.
- 4.24 Programme:** means a three year programme of study and examination spread over six semesters, the successful completion of which would lead to the award of a degree.
- 4.25 Semester:** means a term consisting of a minimum of 450 contact hours distributed over 90 working days, inclusive of of tutorials, examination days and other academic activities, within 18 five-day academic weeks (a period of six months).
Odd semester: shall be from June to October.
Even semester: shall be from December to April.
- 4.26 Semester Grade Point Average (SGPA):** is the value obtained by dividing the sum of credit points (P) obtained by a student in various courses taken in a semester by the total number of credits taken by him/her in that semester. The grade-points shall be rounded off to two decimal places.
- 4.27 Total Credit Point (TCP):** is the sum of credit points.
- 4.28** Words and expressions used and not defined in this regulation shall have the same meaning assigned to them in the Act and Statutes of the University.

ELIGIBILITY FOR ADMISSION

A pass in Plus-two/equivalent degree accepted by M.G. University in the stream, Science (Physics, Chemistry, Biology/Mathematics) or Home Science with Chemistry, Physics & Biology or Aquaculture with Chemistry and Biology/Mathematics (as auxiliary) can apply for the B Sc Food Science& Quality Control Programme.

The eligibility for admission, norms for admission and reservation of seats to the B. Sc programme shall be according to the regulations framed/orders issued by the University in this regard, from time to time.

MODE OF ADMISSION

- i. Selection of candidates will be based on the marks in the Plus-two examination.
- ii. The candidates shall also satisfy the conditions regarding physical fitness as may be prescribed by the University.
- iii. Weightage of marks for proficiency in NCC/NSS etc and bonus marks for ex-service men applicants and widows and children of Jawans- ex-service men will be given as per the existing rules of admission. Reservation for the candidates with outstanding reports in sports and games shall be allowed as per rules. Reservation of the seat under merit quota for physically challenged candidates shall be given as per the existing rules of admission of University.
- iv. No admission shall be made after 30 working days from the date of commencement of the first semester as per the academic calendar approved by the University
- v. All the above rules will be subjected to change as per the general rules prescribed by Mahatma Gandhi University from time to time

RULES FOR READMISSION

- i. Students who are unable to attend classes on medical grounds after completing the first-two semesters may be re-admitted to the respective semester along with the subsequent batch.
- ii. Such students seeking re-admission shall give a written application to the Principal
- iii. Students who have been removed from the nominal rolls due to default in payment of the semester fees shall be re-admitted, subject to the existing rules of the University

REGISTRATION

- i. The registration of students, selection of number of courses by students shall remain as per existing rules of the University.
- ii. The strength of students for each programme shall remain as per existing regulations, as approved by the University.
- iii. The college shall send a list of students registered for each programme in each semester giving the details of courses registered including repeat courses to the University in the prescribed form within **20** days from the commencement of the Semester.
- iv. Those students who possess the required minimum attendance during an academic year/semester and could not register for the semester examination are permitted to apply for Notional Registration to the examinations concerned enabling them to get promoted to the next class.

SCHEME OF PROGRAMME

- i. The U.G. programme shall include
 - (a) Common courses I and/or II

- (b) Core course(s)
 - (c) Complementary/Vocational Courses
 - (d) Generic Elective Course (GE)
- ii. There shall be one Generic Elective paper in the fifth semester with a choice of one out of three elective papers from any programme or from the Physical Education department.
 - iii. There shall be one Choice Based paper in the sixth semester with a choice of one out of three elective papers.
 - iv. Credit Transfer and Accumulation System can be adopted in the programme. Transfer of credit consists of acknowledging, recognizing and accepting credits by an institution for programmes or courses completed at another institution. The Credit Transfer Scheme shall allow students pursuing a programme in one University to continue their education in another University without break.
 - v. A separate minimum of 30% marks each for internal and external (for both theory and practical) and aggregate minimum of 40% are required for a pass for a paper. For a pass in a programme, a separate minimum of **Grade D** is required for all the individual papers. If a candidate secures **F Grade** for any one of the paper offered in a Semester/Programme, **only F grade** will be awarded for that Semester/Programme until he/she improves this to **D Grade** or above within the permitted period. (See Clause 3. iv)
 - vi. Students who complete the programme with ‘D’ grade in the “Regulations for Under Graduate Programmes under Choice Based Credit System 2016” will have one betterment chance within 12 months, immediately after the publication of the result of the whole programme.
 - vii. Students discontinued from previous regulations, CBCSS 2013, can pursue their studies in “Regulations for Under Graduate Programmes under Choice Based Credit System 2016” after obtaining readmission. These students have to complete the programme as per “Regulations for Under Graduate Programmes under Choice Based Credit System 2016”.
 - viii. Practical examination will be conducted only at the end of even semesters for all Model I/II/III programmes

PROGRAMME STRUCTURE

Model III: B Sc Food Science & Quality Control

a	Programme Duration	6 Semesters
b	Total Credits required for successful completion of the Programme	120

c	Credits required from Common Course I	8
d	Credits required from Core + Complementary + Vocational Courses including Project	109
e	Generic Elective (GE)	3
f	Minimum attendance required	75%

B. Sc. Food Science and Quality Control is a U.G. Model III programme comprising 18 Theory & 6 Practical papers, 2 Industrial Training Reports & 1 Project

Sl No	Type of Course	Credit per course	No of papers per course
1	Common course	8	2 Theory
2	Complementary courses	1	4 Theory + 2 Practical
		2	4 Theory + 2 Practical
3	Core courses along with choice based paper	81	18 Theory + 6 Practical + 2 Industrial Training (OJT) + 1 Project
4	Generic Elective (GE)	3	1 out of 3

4.1 Generic Elective Course

Students can opt for any one of the **Generic Elective Papers** offered by different departments of the college in fifth semester (subject to the availability of vacancy in the concerned discipline). If the number of applications exceeds the number of vacancies for a particular Generic elective paper, priority will be given to the students from the parent department (core subject). Selection of students in the generic elective paper will be done in the college based on merit and interest of the students.

Department of Food Science offers three generic elective papers to the students of parent/other departments:

Generic Elective Course for Fifth Semester

No	Semester	Title of generic elective paper
1	V	FS5GET17-Coconut Technology
2	V	FS5GET18-Basic Food Engineering
3	V	FS5GET19-Introduction To Food Engineering

4.2 Choice Based Core Course

The choice based core papers available for the students of B Sc. Food Science & Quality Control Programme in the sixth semester are given as:

Choice Based Core Papers for Sixth Semester

No	Semester	Title of choice based core elective paper
1	VI	FS6CBT25-Beverage Technology
2	VI	FS6CBT26-Advanced Food Engineering
3	VI	FS6CBT27-Infestation & Pest Management

The detailed scheme of B Sc Food Science & Quality Control course (Table 1) and detailed scheme for the distribution of credits and period of instruction for B Sc Food Technology & Quality Assurance (Table 2), detailed scheme for the distribution of credits and period of instruction of the core courses (Table 3) and list of elective courses with detailed scheme of instruction available for fifth semester (Table 4) and sixth semester (Table 5) are given in the tables below.

Consolidated Scheme for All Semesters in The Format

SEM	Title with Course Code	Course Category	Hours Per Week	Credit	Marks	
					Intl	Extl
	Common- English	Common	5	4	20	80
	Complementary- Chemistry	Complementary	4	2	20	80

I	Complementary- Zoology	Complementary	4	2	20	80
	Complementary- Mathematics	Complementary (optional)	4	3	20	80
	Core- Basic Nutrition-FS1CRT01	Core	4	3	20	80
	Core- Basic Food Chemistry-FS1CRT02	Core	4	4	20	80
	Core- Basic Food Microbiology-FS1CRT03	Core	4	4	20	80
II	Common- English	Common	5	4	20	80
	Complementary- Chemistry	Complementary	4	2	20	80
	Complementary- Zoology	Complementary	4	2	20	80
	Complementary- Mathematics	Complementary (optional)	4	3	20	80
	Core- Food Commodities-FS2CRT04	Core	4	3	20	80
	Core- Food Preservation-FS2CRT05	Core	4	4	20	80
	Core- Sanitation & Hygiene-FS2CRT06	Core	4	3	20	80
	Core- (OJT)Industrial Training-FS2OJP07	Core		2		100
III	Complementary- Chemistry	Complementary	4	3	20	80
	Complementary-Zoology	Complementary	4	3	20	80
	Complementary- Mathematics	Complementary (optional)	4	4	20	80
	Core-Processing Technology of AnimalsFoods-FS3CRT08	Core	5	4	20	80
	Core-Sensory Evaluation-FS3CRT09	Core	4	3	20	80
	Core-Food Packaging Materials & Testing-FS3CRT10	Core	5	3	20	80
	Complementary-	Complementary	4	3	20	80

IV	Chemistry	y				
	Complementary- Zoology	Complementary	4	3	20	80
	Complementary- Mathematics	Complementary (optional)	4	4	20	80
	Core- Processing Technology of Plant foods- FS4CRT11	Core	5	4	20	80
	Core- Analytical Instrumentation- FS4CRT12	Core	5	4	20	80
	Core- Food Safety & Quality Assurance- FS4CRT13	Core	5	3	20	80
	Core (OJT)-Industrial Training-FS4OJP14			2		100
V	Core- Food Analysis (Theory)-FS5CRT15	Core	5	4	20	80
	Core-Food Toxicology- FS5CRT16	Core	5	4	20	80
	Generic Elective I- FS5GET17, FS5GET18, FS5GET19	Core	4	3	20	80
VI	Core- Entrepreneurship Development & Management in food Industry-FS6CRT23	Core	5	4	20	80
	Core- Food Adulteration & Testing-FS6CRT24	Core	5	4	20	80
	Choice Based Elective II- FS6CBT25, FS6CBT26, FS6CBT27	Core	5	4	20	80
	Core- Project/Dissertation- FS6DSP31	Core	5	3		100

Consolidated Scheme for Practicals

SL.No	SEMESTER	COURSE TITLE	HOURS PER WEEK	CREDIT
1.	I & II	Practical - Complementary- Chemistry	2	2
2.	I & II	Practical - Complementary- Zoology	2	2
3.	III & IV	Practical- Complementary- Chemistry	2	2
4.	III & IV	Practical- Complementary- Zoology	2	2
5.	V & VI	Practical-Core- Basic Food Microbiology FS5CRP20 & Advanced Food Microbiology- FS6CRP28	5	2+2=4
6.	V & VI	Practical-Core- Food Analysis & Adulteration testing -Practical I & Food Analysis FS5CRP21 & Adulteration testing -Practical II –FS6CRP29	5	2+2=4
7.	V & VI	Practical-Core- Food Chemistry Practical FS5CRP22 & Advanced Food Chemistry Practical- FS6CRP30	5	2+2=4

List of Generic Elective Course Papers available for Fifth Semester for Other Departments

No	Title of course	Exam duration (hours)	Credit per course	Contact hours per week
1	FS5GET17-Coconut Technology	3	3	4
2	FS5GET18-Basic Food Engineering	3	3	4
3	FS5GET19-Introduction To Food Engineering	3	3	4

List of Choice Based Core Elective Course Papers available for Sixth Semester

No	Title of course	Exam duration (hours)	Credit per course	Contact hours per week
1	FS6CBT25-Beverage Technology	3	4	5
2	FS6CBT26-Advanced Food Engineering	3	4	5
3	FS6CBT27-Infestation & Pest Management	3	4	5

EXAMINATIONS

The evaluation of each course 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. There shall be a maximum of 80 marks for external evaluation and maximum of 20 marks for internal evaluation. Both internal and external marks are to be mathematically rounded to the nearest integer.

For all papers (theory & practical), grades are given on a 10-point scale based on the total percentage of marks. (ISA+ESA) as given below:-

Percentage of Marks	Grade	Grade point
95 and above	S Outstanding	10
85 to below 95	A ⁺ Excellent	9
75 to below 85	A Very Good	8
65 to below 75	B ⁺ Good	7
55 to below 65	B Above Average	6
45 to below 55	C Satisfactory	5
40 to below 45	D Pass	4
Below 40	F Failure	0
	Ab Absent	0

GRADING SYSTEM

Credit Point

Credit Point (CP) of a course is calculated using the formula

$$CP = C \times GP, \text{ where } C = \text{Credit}; GP = \text{Grade point}$$

Semester Grade Point Average

Semester Grade Point Average (SGPA) of a Semester is calculated using the formula

$$SGPA = TCP/TC, \text{ where } TCP = \text{Total Credit Point of that semester ie, } \sum_1^n CP_i \text{ and}$$

$$TC = \text{Total Credit of that semester ie, } \sum_1^n C_i \text{ where } n \text{ is the number of papers in that semester}$$

Cumulative Grade Point Average

Cumulative Grade Point Average (CGPA) of a programme is calculated using the formula

$CGPA = TCP/TC$, where **TCP = Total Credit Point of that programme ie,** $\sum_1^n CPi$ and

TC= Total Credit of that programme ie, $\sum_1^n Ci$ where **n** is the number of papers in that programme.

Grade Point Average

Grade Point Average (GPA) of a Course (Common course I, Complementary Course I, Complementary Course II, Core Course, Vocational Course) is calculated using the formula

GPA = TCP/TC, where TCP = Total Credit Point of that course ie, $\sum_1^n CPi$ and

TC = Total Credit of that course ie, $\sum_1^n Ci$ where **n** is the number of papers in that course.

Grades

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

GPA	Grade
9.5 and above	S Outstanding
8.5 to below 9.5	A ⁺ Excellent
7.5 to below 8.5	A Very Good
6.5 to below 7.5	B ⁺ Good
5.5 to below 6.5	B Above Average
4.5 to below 5.5	C Satisfactory
4.0 to below 4.5	D Pass
Below 4.0	F Failure
	Ab Absent

Note: A separate minimum of 30% marks each for internal and external (for both theory and practical) and aggregate minimum of 40% are required for a pass for a paper. For a pass in a programme, a separate minimum of **Grade D** is required for all the individual papers. If a candidate secures **F Grade** for any one of the paper offered in a Semester/Programme, **only F grade** will be awarded for that Semester/ Programme until he/she improves this to **D Grade** or above within the permitted period. (See Clause 3. iv)

MARKS DISTRIBUTION FOR EXTERNAL EXAMINATION AND INTERNAL EVALUATION

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.

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

Theory Papers (All)

a) Marks of External Examination : 80

b) Marks of Internal Evaluation : 20

Components of Internal Evaluation of Theory Papers

All the three components of the internal assessment are mandatory.

Sl No	Components of Theory Internal Evaluation	Marks
1	Attendance	5
2	Assignment/Seminar/Viva	5
3	Test paper/s (1 or 2) [1×10=10; 2×5=10]	10
	Total	20

Practical Papers (All)

a) Marks of External Examination : 80

b) Marks of Internal Evaluation : 20

Components of Internal Evaluation of Practical Papers

All the four components of the internal assessment are mandatory. Practical examinations are conducted only at the end of even semesters.

Components Internal evaluation of Practical	Marks
Attendance	5
Test paper	5
Record*	5
Lab involvement	5
Total	20

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

Project Evaluation

a) Marks of External Examination : 80

b) Marks of Internal Evaluation : 20

Components of External Evaluation of Project

SI No	Components of External Project Evaluation	Marks
1	Dissertation (External)	50
2	Viva-Voce (External)	30
	Total	80

Components Internal Evaluation of Project

All the four components of the internal assessment are mandatory.

SI No	Components of Internal Project Evaluation	Marks
1	Punctuality	5
2	Experimentation/ Data Collection	5
3	Knowledge	5
4	Report	5
	Total	20

Internal Evaluation of On-the-Job Industrial Training (OJT)

Marks of Internal Evaluation : 100

The students registered for B Sc Food Technology & Quality Assurance Programme are to undergo **two On-the Job Industrial Training (OJT)** in any of the companies

(private or public) of food industry in fields such as food processing, food analysis, evaluation of food quality, food quality assurance and management.

The responsibility for evaluation of industrial training report is vested on **External Evaluators from concerned industry where the OJT is being done** and the evaluation report should reach the University at the **end of third and fifth semester** respectively along with other internal, as per current rules and regulations of University.

ATTENDANCE EVALUATION

Percentage of Attendance (%) For ALL Papers	Grade
90 and above	5
85 -89	4
80-84	3
76-79	2
75	1

Decimals are to be rounded to the next higher whole number.

ASSIGNMENTS

Assignments are to be done from 1st to 4th Semesters. At least one assignment should be done in each semester for all papers.

SEMINAR / VIVA

A student shall present a seminar in the 5th semester and appear for Viva-voce in the 6th semester.

INTERNAL ASSESSMENT TEST PAPERS

At least one internal test-paper is to be attended in each semester for each paper. 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 two years 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 paper.

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:Dept. Level: The department cell chaired by the Head; and Dept. coordinator and teacher in-charge, as members.

Level 2: College level: A committee with the Principal as Chairman, Dept. Coordinator, HOD of concerned Department and a senior teacher nominated by the College council as members.

Level 3: University Level: A Committee constituted by the Vice-Chancellor as Chairman and Pro-Vice-Chancellor, Convener - Syndicate sub-committee on Students Discipline and Welfare, Chairman- Board of Examinations as members and the Controller of Examination as member-secretary.

This coordinator shall make arrangements for giving awareness of the internal evaluation components to students immediately after commencement of I semester.

The internal evaluation report 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 or 50 hours 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 course along with the next batch.

All students are to do a project. This project can be done individually or as a group of 3 students. The projects are to be identified during the II semester of the programme with the help of the supervising teacher. The report of the project in duplicate is to be submitted to the department at the sixth semester and are to be produced before the examiners

appointed by the University.

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

A 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.

All programmes and courses shall have unique alphanumeric code. Each teacher working in affiliated institutions shall have a unique identification number and this number is to be attached with the codes of the courses for which he/she can perform examination duty.

PATTERN OF QUESTIONS

Questions shall be set to assess knowledge acquired, standard 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. He/She shall also submit a detailed scheme of evaluation along with the question paper.

A question paper shall be a judicious mix of very short answer type, short answer type, short essay type /problem solving type and long essay type questions.

Pattern of questions for external examination for theory paper

Pattern	Marks	Choice of questions	Total marks	Length of answers
Very Short Answer	2	9/12	18	50 words
Paragraph answer (Short answer)	4	6/9	24	150 words
Problem/ Short Essay	6	3/5	18	2 pages

Long Essay	10	2/4	20	4 pages
		20/30	80	

Each BOS shall specify the length of the answers in terms of number of words. Pattern of questions for external examination of practical papers will be decided by the concerned Board of Studies/Expert Committees.

MARK CUM GRADE CARD

The University under its seal shall issue to the students a MARK CUM GRADE CARD on completion of each semester, which shall contain the following information:

- a. Name of the University
- b. Name of the College
- c. Title & Model of the Undergraduate Programme
- d. Name of the Semester
- e. Name and Register Number of the student
- f. Date of publication of result
- g. Code, Title, Credits and Maximum Marks (Internal, External & Total) of each paper opted in the semester.
- h. Internal, External and Total Marks awarded, Grade, Grade point and Credit point in each paper opted in the semester
- i. Institutional average (IA) of the marks of all papers and University Average (UA) of the marks of all papers.
- j. The total credits, total marks (Maximum & Awarded) and total credit points in the semester
- k. Semester Grade Point Average (SGPA) and corresponding Grade.
- l. Cumulative Grade Point Average (CGPA), GPA corresponding to Common Courses I and II, Core Course, Complementary Courses, Vocational Courses and Generic Elective paper.
- m. The final Mark cum Grade Card issued at the end of the final semester shall contain the details of all papers taken during the final semester examination and shall include the final Grade/Marks(SGPA) scored by the candidate from 1st to 5th semesters, and the overall Grade/Marks for the total programme.

MONITORING COMMITTEES FOR SCHEME

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, College Council secretary and A.O/Superintendent as members.
- 3. University Level Monitoring Committee (ULMC)**, headed by the Vice-Chancellor, Pro-Vice-Chancellor, Conveners of Syndicate Standing Committee on Examination, Academic Affairs and Registrar as members and the Controller of Examinations as member-secretary.

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, have the power to provide by order that these regulations shall be applied to any programme with such modifications as may be necessary.

The Vice Chancellor is authorized to make necessary criteria for eligibility for higher education in the grading scheme, if necessary, in consultation with other Universities. The Vice Chancellor is also authorized to issue orders for the perfect realization of the Regulations.

6. SYLLABUS – CORE COURSE

SEMESTER I

FS1CRT01- BASIC NUTRITION

Credits-3

72 hrs

OBJECTIVES:-

To enable the students to

1. Understand the relationship between nutrition and human well being
2. Know and understand the functions, importance of all nutrients for different age group and special group.

UNIT- 1

12 hrs

- Introduction to Nutrition – general Introduction, definitions of balanced diet, nutrition, health, malnutrition, Food, Nutrients, Functions of Food , Basic Food Groups.
- Inter Relationship between Nutrition and Health, Malnourishment- definition, types etiological factors and remedial measures.

UNIT- II

14 hrs

- Water and Its Use in the Body- Distribution, Requirements, Sources, Water Balance, Unit of Measurement, Deficiency and Toxicity

UNIT- III

14 hrs

Proximate principles – Carbohydrates, Proteins & fats

- Introduction
- Classification
- Sources
- Functions
- Deficiency & toxicity
- Unit of measurement
- RDA

UNIT- IV

16 hrs

Vitamins & Minerals

- Introduction

- Classification (Fat Soluble and Water Soluble, Minerals (Ca, P, Fe, I, Na, K, Zn, Cu, Ni, Pb)
- Sources
- Functions
- Deficiency & toxicity
- Unit of measurement
- RDA

UNIT –V

16 hrs

Energy- Introduction, Calorific value of foods, determination of calorific value, BMR,SDA, sources, deficiency, PEM, Requirements, RDA, Unit of measurement

REFERENCES

1. Mudambi, S. R., Rajagopal M. V., Fundamentals of food and Nutritions, 2nd edition, Wiley Eastern Ltd, New Delhi 1990.
2. Swaminathan, M., Hand book of Food & Nutrition, Bappco Ltd, Bangalore, 1978.
3. Srilakshmi, B, Nutrition Science, New age international (P) Ltd publishers, New Delhi, 2006.
4. Swaminathan, M. Essential of food and Nutrition, Vol.I. Bangalore Printing and Publishing Co. Ltd Bangalore.
5. Begum, R. A text book of foods, Nutrition and Dietetics. Second revised edition, Sterling Publishers(P) Ltd, New Delhi, 1991.

SEMESTER I

FS1CRT02- BASIC FOOD CHEMISTRY

Credits – 4

72 hrs

OBJECTIVES:

To enable the students to:

- Acquire knowledge on the macro and micro constituents of the food
- Know the structure and chemical characteristics of constituents of food

UNIT I – INTRODUCTION TO FOOD CHEMISTRY

14 hrs

- Introduction to Food Chemistry
- Water (Structure of water and ice, Physical constants of water, Types of water, Water activity)
- Composition of Food- Carbohydrates, Proteins, Lipids, Vitamins & Minerals

UNIT II-CARBOHYDRATES

16hrs

- **CLASSIFICATION, STRUCTURE, PROPERTIES AND REACTIONS OF CARBOHYDRATES**

Monosaccharide

Classification., Optical Activity D-and L-forms. Muta-Rotation. Straight and Ring structure of glucose, fructose and galactose.

Oligosaccharides

Classification.Reducing & Non-reducing sugar. Glycosidic bonds. Structure of sucrose, maltose, iso- maltose & lactose .Inversion of sucrose.

Polysaccharides

Classification. Structure of starch, cellulose, glycogen, pectin, hyaluronic acid. Difference between amylose & amylopectin .Gelatinization of starch. Theories of gel formation .

Chemical Reactions of Carbohydrates

Reactions involving glycosidic-OH group.Reactions involving alcoholic-OH group. Reactions involving both glycosidic & alcoholic-OH group. Oxidation reactions.

Browning reactions - Enzymatic & Non-enzymatic browning.

UNIT III- PROTEINS & ENZYMES

16 hrs

- Classification of amino acid- structure, essential and non essential amino acids, zwitter ion, isoelectric point, amphoteric property, Peptide bond. biological roles of protein.
- Classification of protein according to shape; classification of protein according to composition and solubility Structure of protein, chemical bonds involved in protein structure

- Physical-chemical properties of proteins; colour and taste, shape of size, molecular weight, colloidal nature, amphoteric nature, ion bonding capacity, solubility, optical activity, precipitation with antibodies.
- Denaturation-agents causing denaturation, changes occurring during denaturation
- Chemical reaction-hydrolysis, Reactions involving COOH group, Reactions involving NH₂ group, Reactions involving R groups or side chain.
- **ENZYMES** -Introduction, classification of enzyme,enzyme kinetics, enzyme activity, factors affecting enzyme activity
- Enzyme inhibitors- reversible (Competitive & Noncompetitive), irreversible
- Enzyme activators; regulation of enzyme activity- zymogens inactivation, covalent modification and feedback inhibition
- Enzymes used in food industry

UNIT IV- LIPIDS

14 hrs

- Classification of lipids according to chemical composition, fatty acids; saturated and unsaturated fatty acids. Fatty acids-essential fatty acids structure, chemical reactions of lipids.
- Physical properties - melting point, polymorphism, softening point, slipping point, specific gravity, refractive index, smoke flash and fire points, turbidity points,
- Chemical properties- RM, P,K values Saponification value, iodine value, acid value
- Rancidity: Hydrolytic and oxidative rancidity; mechanism of auto oxidation of fat; reversion
- Antioxidants- natural and synthetic
- Technology of edible fats and oils; hardening of fat hydrogenation and inter esterification
- Emulsion and emulsifiers.

UNIT V- FOOD PIGMENTS

12 hrs

Introduction, classification, types of food pigments- chlorophyll, carotenoids, anthocyanins, flavanoids.

REFERENCES

1. Fundamentals of Biochemistry J L Jain 4th Edition 1990 S.Chand &Company, New Delhi
2. Aurand, L.W. and Woods, A.E. 1973. Food Chemistry. AVI, Westport.
3. Birch, G.G., Cameron, A.G. and Spencer, M. 1986. Food Science,3rd Ed. Pergamon Press, New York
4. Fennema, O.R. Ed. 1976. Principles of Food Science: Part-I Food Chemistry. Marcel Dekker, New York.
5. Meyer, L.H. 1973. Food Chemistry. East-West Press Pvt. Ltd.,New Delhi.

SEMESTER I

FS1CRT03-BASIC FOOD MICROBIOLOGY

Credits – 4

72 hrs

OBJECTIVES

To help the students to:

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

UNIT I-INTRODUCTION TO MICROBIOLOGY

12 hrs

- Characteristics and morphology of bacteria, fungi, virus, algae and protozoa
- Introduction to microscope
- Culture Medias, types and Culture techniques
- Microbial Growth curve
- Factors affecting microbial growth

UNIT II- FOOD BORNE ILLNESS AND DISEASES ASSOCIATED WITH MICROORGANISMS

14 hrs

- Definition, Classification (Food infections and intoxication)
- Food hazard- definition, types
- Food poisoning- types, prevention and control
- Diseases- neurolathyrisms, Botulism, aflatoxin, ergotism, staphylococcal intoxication, salmonellosis etc

UNIT III- SPOILAGE AND CONTAMINATION OF DIFFERENT FOODS

16 hrs

- Cereal and cereal products
- Sugar and sugar products
- Fruits and vegetable products
- Meat and meat products
- Fish and Fish products
- Egg and poultry
- Milk and Milk Products
- Canned Foods

UNIT – IV – ENVIRONMENTAL MICROBIOLOGY

16 hrs

- Water
- Soil
- Air
- Sewage,
- Composition, treatment

UNIT V- BENEFICIAL MICROORGANISM IN FOOD INDUSTRY

14 hrs

- SCP
- Biomass
- Fermentation- definition, types
- Enzymes- types, application in food industry
- Antibiotics
- Vaccines

References:

1. Frazier, W.C. Food Micro biology . 4th edition. Mc Graw Hill. Newyork.
2. Pelzar, H.J. and Rober, D. Microbiology 5th edition Mc Graw Hill. Newyork
3. Banwart, G.T. Basic Food Microbiology. CBS Publishers, New Delhi.
4. Narayanan, L.M., Mani,L., Microbiology.Saras Publications, Nagercoil.
5. Bryan,F.L., Diseases transmitted by foods. Munich Publishers, Atlanda.

SEMESTER-II

SEMESTER II

FS2CRT04- FOOD COMMODITIES

Credits – 3

72 hrs

OBJECTIVES

1. To understand the basic commodities both raw and processed in food industries and various aspects of their production and distribution.
2. To discuss the qualities and standards of available commodities and their suitability for different purposes

UNIT I- PERISHABLE FOOD COMMODITIES

12 hrs

- Milk, Meat, Fish, Egg and Poultry
- Introduction, composition, types, processing, products, uses in Indian Cookery

UNIT –II- SEMI PERISHABLE FOOD COMMODITIES

16 hrs

- Fruits and Vegetable, Fats and Oils
- Introduction, composition, types, processing, products, uses in Indian Cookery

UNIT –III- NON PERISHABLE FOOD COMMODITIES

16 hrs

- Cereals, Pulses, Legumes, Oil seeds and Spices
- Introduction, composition, types, processing, products, uses in Indian Cookery

UNIT IV- TYPES OF FOODS

14 hrs

Nutraceuticals, Probiotics, Prebiotics, GM Foods, Organic Foods, Traditional Foods, Fabricated Foods, Junk Foods, Fast Foods, Convenience Foods, RTS and RTE

UNIT V- SUGAR AND CONFECTIONARY

14 hrs

- Different types of sugar (sugar, Jaggery, honey, syrup),
- Manufacture, selection, storage and use as preservative

REFERENCES

1. Srilakshmi, B.. Food Science (3rd edition), New Age International (P) Limited Publishers, New Delhi, 2003.
2. National Institute of Industrial Research Board, Hand Book on SPICES Asia Pacific Business press Inc. New Delhi.
3. Potter, N.N. Food Science (5th edition), CBS publishers and Distributors, New Delhi, 1995.
4. Manay, N.S, Shadaksharaswamy, M., Foods- Facts and Principles., New Age International Publishers., New Delhi., 2004.

SEMESTER II

FS2CRT05-FOOD PRESERVATION

Credits – 4

72 hrs

Objectives

To enable the students to

- 1) Acquire knowledge on different preservation techniques used to enhance the shelf span of food product.

UNIT-I FOOD PRESERVATION

12 hrs

- Introduction, Importance, principle and Types

UNIT-II HIGH AND LOW TEMPERATURES PRESERVATION

14 hrs

- Pasteurization
- Sterilization
- Canning
- Freezing
- Refrigeration

UNIT – III MOISTURE REMOVAL PRESERVATION TECHNIQUE

16 hrs

- Concentration
- Drying
- Dehydration
- Freeze Drying
- Dehydro freezing

UNIT IV- ELECTRIC CURRENT & PRESERVATIVES

16 hrs

- Ohmic Heating

- Pulsed Electric Field
- High Pressure Processing (HPP)
- Class- Class I and Class II
- Its role
- Permitted Preservatives and Levels
- Preparation of Jam, Jelly, Marmalade, Preserves, candy, glazed crystallized fruit, sauces, chutney, Pickles.

**UNIT V- FERMENTATION, IRRADIATION, COMBINATION AND PICKLING
TECHNIQUES**

14 hrs

- Types of Fermentation
- Fermented Foods
- Properties of irradiation
- Microwave heating

REFERENCES

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, 1984.
6. Cruess, W.V. Commercial Fruits and Vegetable Products, Anees Offset press, New Delhi, 1997

SEMESTER II

FS2CRT06-SANITATION AND HYGIENE

Credits –3

72 hrs

OBJECTIVES:

- Identify the essential principles of food hygiene applicable throughout the food chain (including primary production through to the final consumer),
- To achieve the goal of ensuring that food is safe and suitable for human consumption.

UNIT I- INTRODUCTION TO SANITATION AND HYGIENE

12 hrs

- Food Sanitation
- Principles of Sanitation
- Personnel Hygiene

UNIT II- FOOD HAZARD AND FOOD CONTAMINATION

16 hrs

Definition, types, preventive measures adopted_

WASTE PRODUCT HANDLING

- Introduction
- Importance of waste disposal
- Disposal of solid waste
- Waste water handling

UNIT III – PRE REQUISITE PROGRAMES IN FOOD INDUSTRY

14hrs

- GHP

- GMP

UNIT IV- CLEANING METHODS & TECHNIQUES

16 hrs

- CIP
- COP
- Cleaning equipments & Sanitizers
- Sterilization & Disinfection
- Use of detergents, heat, chemicals
- Cleaning compounds

UNIT V- CONTROL OF INFESTATION

14 hrs

- Rodent Control
- Insect Control
- Pest Control
- Uses of Pesticides

References:

1. Jacob.M, Safe food handling, a training guide for Manager, WHO, Geneva, MARRIOTT.N.G (1989)
2. Principles of Food Sanitation, 2ND edition, AVI Books, Van Nostrand Reinhold, Newyork.

**INDUSTRIAL
TRAINING
(ONE MONTH)-
FS2OJP07**

SEMESTER III

SEMESTER III
FS3CRT08-PROCESSING TECHNOLOGY OF ANIMAL FOODS

Credits – 4

72 hrs

Objectives:

1. To enable the students to understand the importance and methods of post processing Technology of Animal foods.

UNIT I- INTRODUCTION TO POST HARVEST TECHNOLOGY **12 hrs**

- Introduction, Definition, Primary and secondary processing, Importance.
-

UNIT II- PROCESSING TECHNOLOGY OF MILK AND MILK PRODUCTS **16 hrs**

- Milk- Definition, composition, method of manufacture, use
- Butter- Definition, composition, method of manufacture, use
- Butter Oil- Definition, composition, method of manufacture, use
- Ice cream- Definition, composition, method of manufacture, use
- Cheese- Definition, composition, method of manufacture, use
- Condensed milk- Definition, composition, method of manufacture, use
- Dried Milk- Definition, composition, method of manufacture, use
- Yoghurt- Definition, composition, method of manufacture, use
- Indian Dairy Products- Kheer, Khoa, Rabri, Kulfi, Dahi, Shrikdhand, Paneer, Channa, Ghee.

UNIT III- PROCESSING TECHNOLOGY OF EGG **14 hrs**

- Changes during storage, processing , functions of egg in cookery
- Egg Quality ,Egg Grading
- Egg products

UNIT IV- PROCESSING TECHNOLOGY OF MEAT AND POULTRY **16 hrs**

- **Meat**- types methods of slaughter, Antimortem inspection
- Post mortem changes in meat
- Tenderizing of meat
- Grading of Meat,
- Processing of meat
- Sausage, Salami, Bacon, Ham
- **Poultry**
- Classification, processing

UNIT V- PROCESSING TECHNOLOGY OF FISH **14 hrs**

- Types of sea foods

- Fish processing
- Fish products

REFERENCES:

1. Kent, J.A. Riegels Handbook of Industrial Chemistry, 7th edition. Van Nostrand Reinhold Company, New York. 2003.
2. Dubey, R.C. A Textbook of Biotechnology. S.Chand & Company Limited, New Delhi. 2000.
3. Prescott and Proctor B.E. Food Technology. MC Graw Hill Book Co. New York 1997.
4. Potter, N. N., Hotchkiss, J. H. Food Science . CBS Publishers, New Delhi. 2000.

SEMESTER III
FS3CRT09-SENSORY EVALUATION

Credits – 3

72 hrs

OBJECTIVES

To enable the students

- To understand different aspects of sensory science and its application.
- To be able to use sensory evaluation as an analytical tool.

UNIT I –INTRODUCTION TO SENSORY EVALUATION AND QUALITY

ATTRIBUTES

12 hrs

- Definition and importance of sensory evaluation
- Quality attributes –appearance, flavor, texture and additional quality factors

UNIT II- PRACTICAL REQUIREMENTS AND GENERAL TESTING CONDITIONS

14 hrs

- Testing area ,testing set up ,lighting, testing schedule, preparation of samples, sample coding ,evaluation card preparation, Trained & untrained panel members

UNIT III- SENSORY ASSESSMENT OF FOOD QUALITY

16 hrs

1. TASTE (GUSTATION)

- Introduction , importance of gustation,
- Taste sense to mouth, tongue
- Chemical dimensions of basic tastes- sweet, bitter, sour, salt and umami.
- Taste enhancers, perception of taste
- Taste measurement- E-tongue

2. ODOUR AND FLAVOR (OLFACTION)

- Introduction and importance of odour and flavor
- Smelling techniques- Vonskramlk Test
- E- Nose and theories of olfaction.

3. COLOR

- Introduction and importance of color
- Dimensions of color, perception of color

4. TEXTURE

- Introduction, definition and importance
- Texture classification
- Texture measurement

5. OTHER SENSES

- Temperature sensation, pain sensation, touche sensation, kinesthetic sensations, and sound sensations etc.

UNIT –IV SENSORY TESTING OF FOODS

16 hrs

- Threshold tests,
- Descriptive test
- Discriminative tests,
- Ranking tests,
- Hedonic tests,
- Acceptance and preference tests,
- Scoring tests
- Sensitivity tests

UNIT- V DATA ANALYSIS

14 hrs

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

REFERENCE

1. Jellinek, G., Sensory Evaluation of Food-Theory and Practice., Elis Horwood Ltd.,England.,1985.
2. Srilakshmi,B., Food Science., New Age International (P) Limited., New Delhi.,2005.
3. Manay,S., Shadaksharaswamy,M., Food Facts and Principles, New Age International (P) L imited., New Delhi., 2008.

SEMESTER III

ES3CRT10-FOOD PACKAGING MATERIALS AND TESTING

Credits – 3

72 hrs

OBJECTIVES

To enable students

- (i) To be familiar with different methods and materials used for packaging.
- (ii) To understand the technology behind packaging.
- (iii) To understand interaction of food with packaging & to do shelf life testing.

UNIT – I INTRODUCTION TO FOOD PACKAGING

12 hrs

- Definition, functions and requirements for effective packaging.

UNIT II- CLASSIFICATION OF PACKAGING

14 hrs

- Primary, secondary and tertiary packaging.
- Flexible, rigid and Semi- rigid packaging.

UNIT -III MATERIALS FOR FOOD PACKAGING, TYPES, USES, MERITS DRAWBACKS.

16 hrs

- Paper, Glass, Tin, Aluminum, Plastic, Boxes, Jars, Cans, Bottles

Interaction of packages with foods

- Tin can corrosion
- Global migration of plastics

UNIT IV- MODERN CONCEPTS OF PACKAGING TECHNOLOGY.

16 hrs

- Aseptic packaging
- Form Fill Seal packaging
- Edible Films
- **Vacuum, Controlled atmospheric Packaging, Retort Pouches, Active & intelligent packaging systems.**
- Easy - Open End, Boil in- bags, Closures.

UNIT V- QUALITY TESTING OF PACKAGING MATERIALS

14 hrs

- Physical test for tin and plastic
- Testing of glass containers
- Physical and chemical test for plastics

SHELF LIFE TESTING OF DIFFERENT PACKAGED FOODS.

Tin, Plastic, Oxygen interactions, moisture interchanges and aroma permeability

REFERENCES:-

1. Sacharow, S., Griffin, R.C. Food Packaging. AVI Publishing Company, West Port, Connecticut. 2000.
2. Davis, E.G. Evaluation of tin & plastic containers for foods. CBS Publishers, New Delhi. 2004.
3. Cruess, W.V. Commercial Fruit & Vegetable Products. Allied Scientific Publishers, Delhi. 2003.
4. Potter, N. N., Hotchkiss, J. H. Food Science . CBS Publishers, New Delhi. 2000.
5. Raj, G .D. Encyclopaedia of Food Science, Vol 2. Anmol Publications PVT Ltd, New Delhi.

SEMESTER IV

SEMESTER IV

FS4CRT11-PROCESSING TECHNOLOGY OF PLANT FOODS

Credits – 4

72 hrs

OBJECTIVE:

- To enable students to understand the importance and to gain knowledge in the processing of plant foods

UNIT I-PROCESSING TECHNOLOGY OF CEREAL AND CEREAL PRODUCTS

16 hrs

- Wheat- composition, milling process, products- baked food products
- Rice- parboiling, milling, products & by products
- Maize- milling
- Oats- milling

UNIT II- PROCESSING TECHNOLOGY OF PULSES, LEGUMES AND OILSEEDS

12 hrs

- Processing- milling- importance pulses- processed soya
- Oil seeds- extraction

UNIT III- PROCESSING TECHNOLOGY OF FRUITS & VEGETABLES

16 hrs

- Tomato- sauce, ketchup, puree
- Mango- pickles, concentrates, pulp, bar, candies, Jam, essences, canned mango pulp
- Tapioca- Syrup, dextrose, syrup solids, flour
- Jackfruit- value added jackfruit products- canned jackfruit, nectar, chips,
- Apple- apple cider, candy, jam, jelly, Juice, pulp, concentrate
- Pineapple- canned pineapple, natural pineapple pulp, juice, fresh pineapple, frozen pineapple juice concentrate, sulphated pineapple ,RTS- pineapple juice
- Potato- chips, French fries, flour, starch, dried potato slices, dehydrated potato products

UNIT IV- PROCESSING TECHNOLOGY OF SPICES & EXTRACTS

14 hrs

- Introduction – classification- processing- uses- oleoresins & spice oils.

UNIT V- PROCESSING TECHNOLOGY OF MISCELLANEOUS FOOD PRODUCTS

14 hrs

- Tea , coffee, - Introduction, processing
- Alcoholic beverages- Introduction (beer, wine, brandy, whisky, rum, gin, vodka)
- Soft drinks- introduction
- Cocoa- processing, products
- Sugar- manufacture, forms of sugar, by products of sugarcane

- Jaggery
- Honey

REFERENCES:

1. Kent, J.A. Riegels Handbook of Industrial Chemistry, 7th edition. Van Nostrand Reinhold Company, New York. 2003.
2. Dubey, R.C. A Textbook of Biotechnology. S.Chand & Company Limited, New Delhi. 2000.
3. Prescott and Proctor B.E. Food Technology. MC Graw hill Book Co. New York 1997.
4. Potter, N. N, Hotchkiss, J. H. Food Science . CBS Publishers, New Delhi. 2000.

SEMESTER IV
FS4CRT12-ANALYTICAL INSTRUMENTATION

Credits- 4

72 hrs

Objectives:

In order to enable students:

- To be familiar with different methods of investigation used in the analysis of foods and biochemical assay.
- To gain knowledge about different instruments used in food analysis.
- To know the principles and applications of different techniques used in food and nutrition research.

UNIT I - BASIC PRINCIPLES OF CHROMATOGRAPHY

12 hrs

- Adsorption
- Partition
- Affinity
- Size exclusion

UNIT II- TYPES OF CHROMATOGRAPHY

16 hrs

(Introduction, general principles, procedure.)

Paper Chromatography, thin layer chromatography, column chromatography

UNIT III- HPLC & GC

16 hrs

Introduction, principle of separation, procedure, components, types of detectors, column hardware & applications

UNIT IV- SPECTROPHOTOMETRY

14 hrs

- Introduction, basic principles,
- UV –Visible spectroscopy
- Fluorimetry
- Atomic absorption spectroscopy

UNIT V- ELECTROPHORETIC, ENZYMATIC & RADIO TRACER TECHNIQUE

14 hrs

- Introduction, basic principles, types, procedure & applications of the following:
- SDS PAGE
- Agarose gel
- Native gel
- Radio Immuno Assay
- Scintillation counting(Solid, Liquid, gas)
- Elisa
- Application of enzymes in food industry

REFERENCES:

1. Nielsen, S.S. Introduction to the chemical analysis of foods. Jones and Bartlett Publishers, Boston , London.2004.
2. Mahindru,S.N. Food additives. Characteristics, detection and estimation. Tata Mc Graw-Hill Publishing Company Limited, New Delhi.2000.
3. Pearson, D. The Chemical Analysis of Foods. Churchill Livingstone, New York,2002

SEMESTER IV

FS4CRT13-FOOD SAFETY AND QUALITY ASSURANCE

Credits- 3

72 hrs

OBJECTIVES:

- To provide a basic understanding of quality concepts and practice in food companies.
- To provide approaches to the planning and organization of a quality control system.
- To provide a basic acquaintance with standards and specifications

UNIT 1- INTRODUCTION TO FOOD SAFETY

16 hrs

- Definition, types of hazard-physical, chemical and biological, factors affecting Food Safety.
- **Quality Control Concepts as applied to the food industry**
- General Concepts of quality control and quality control
- Major quality control functions

UNIT II- QUALITY ASSURANCE- TOTAL QUALITY CONTROL AND STATISTICAL QUALITY CONTROL

14 hrs

- Definition of Quality Assurance, Difference between QA and QC
- Definition of TQC, its nature, approaches and role of management
- Definition of SQC, determining the need for SQC,
- Definition –control chart, uses process control.

UNIT III- STANDARDS AND SPECIFICATIONS

12 hrs

- Voluntary and Compulsory standards
- Packaging and labeling standards
- ISO and HACCP
- FSSAI

UNIT IV- QUALITY IMPROVEMENT TECHNIQUES

14 hrs

- Quality Improvement Plans(QIP)
- Quality Control Circles(QCC)
- Total quality management (TQM)

UNIT V- EXTERNAL QUALITY CONTROL ACTIVITIES

16 hrs

- Inspection- Preshipment inspection and inspection at the port of destination
- Certification and quality marks
- National Standard Bodies

- Testing Laboratories.

REFERENCES :

- Philip,A.C. Reconceptualizing quality. New Age International Publishers,Banglore. 2001.
- Bhatia,R. and Ichhpujan,R.L. Quality assurance in Microbiology. CBS Publishers and Distributors, New Delhi. 2004.
- Kher, C.P. Quality control for the food industry. ITC Publishers, Geneva. 2000.

**INDUSTRIAL
TRAINING
(ONE MONTH)-
FS4OJP14**

SEMESTER V

SEMESTER V
FS5CRT15-FOOD ANALYSIS (THEORY)

Credit – 4

72 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 do the proximate analysis.

UNIT I- INTRODUCTION TO FOOD ANALYSIS

14 hrs

- Introduction to food analysis
- Sampling, Population, Proximate Principles
- Importance of sampling
- Sampling technique
- Types of sampling
- Sampling Plan
- Preparation of samples
- Problems in sampling

UNIT II- PHYSICAL METHODS OF FOOD ANALYSIS

12 hrs

- Food Rheology
- Viscosity
- Surface Tension
- Refractometry
- Polarimetry
- Freezing point
- Specific gravity

UNIT III- ANALYSIS OF FOODS

16 hrs

- **MOISTURE ANALYSIS**- Oven drying method, Distillation method, Karl-Fischer Titration Method, San Pan Technique
- **ASH ANALYSIS**- Dry, Wet, Low temperature, Plasma Ashing, Soluble and Insoluble Ash in Water, Ash insoluble in acid

- **TOTAL CARBOHYDRATE ANALYSIS**- Lane and Eynon's Metho, Nelson-Somogyi method, Alkaline ferric cyanide method, Phenol-sulphuric acid method, Starch Analysis.
- **FIBRE ANALYSIS**: - Crude Fibre analysis, Dietary Fibre Analysis by AOAC method
- **PROTEIN ANALYSIS**- Kjeldahl Method, Biuret Method, Lowry Method, BCA Method, Barford's Method, Ninhydrin Method, Amino acid Analysis.
- **FAT ANALYSIS**: Continuous solvent extraction method, Semi continuous solvent extraction method, Discontinuous extraction method, Non-solvent wet extraction method, Instrumental methods, Refractive index, melting point, SFI, Cold Test, Cloud point, Smoke point, Flash and Fire point, Iodine Value, Saponification Value, Acid Value, Peroxide Value, TBA Test, Schaal Oven test.

UNIT IV- VITAMINS

16 hrs

- Vitamin A by Carr-Price method, HPLC
- Vitamin C- Ascorbic acid dichloroindophenol method
- Vitamin D- Line test

UNIT V- MINERAL ANALYSIS

14 hrs

- Mineral Analysis- Calcium- Gravimetric, EDTA and redox titration
- Iron – Redox titration
- Phosphorous- colorimetry

REFERENCE

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

SEMESTER V

FS5CRT16-FOOD TOXICOLOGY

Credit – 4

72 hrs

OBJECTIVES:

- to make students aware of the toxicity in foods
- to assess the safety of food
- to familiar with the techniques used in food evaluation.

UNIT I- INTRODUCTION TO TOXICOLOGY

12 hrs

Definition- Toxicology- importance- scope – basic divisions- Goals- Basic concept of Toxicology

UNIT II- NATURALLY OCCURRING TOXICANTS IN VARIOUS FOODS

14 hrs

Toxicants in Plant foods- Seafood toxins- Antivitamins- Radioactive metals in foods- Toxic minerals- other inorganic compounds occur in Food & Water

UNIT – III TOXICANTS OF PUBLIC HEALTH HAZARD

16 hrs

Chemical contaminants- pesticide residues- types of pesticides- automobile emissions(CO, SO₂, NO), Hydrocarbons- photochemical products- heavy metals(Mercury, Arsenic, Lead, Cadmium, Aluminium, Tin), Food additives- types- health hazards- radioactive substances-kinds of radiators- sources of radiations- biological effect of radiations

UNIT IV- XENOBIOTICS & CARCINOGENS

16 hrs

Absorption, Assimilation, utilization and excretion of xenobiotics- Biotransformation- Phase I and Phase II-Types- Mechanism of chemical carcinogens-mutagens and Teratogens

UNIT V- SUBSTANCES INTENTIONALLY ADDED TO FOODS

14 hrs

Antioxidants- colors-stabilizers –GM Foods and their safety

REFERENCES:

- B.Jacob, Chemical analysis of food and food products by Morris, 3rd edtn,
- Nutritional and Toxicological aspects of food processing edt. Walker and E.Quattrucci Tayloss and Francis New York 1980

GENERIC ELECTIVE- I

FS5GET17 -SEMESTER VI
COCONUT PROCESSING TECHNOLOGY

Credit: 3

72 Hrs

Objectives:

- Building an enabling environment for growth for the sector
- To enable the students to enhance knowledge on scientific advancement In Coconut processing

UNIT-I

12 Hrs

Introduction, Harvesting & storage of coconut & coconut water

UNIT-II

16 Hrs

FRESH COCONUT KERNEL

- Characteristics
- Canning
- Honey Roasted Coconut
- Coconut Toffee
- Dehydrated Sweet Coconut
- Coconut Baked Custard
- Coconut Chips

UNIT-III

16 Hrs

COCONUT MILK AND RELATED PRODUCTS

- Preserved Coconut Milk Or Cream
- Bottled Coconut Milk
- Coconut Cream
- Coconut Jam
- Coconut Syrup
- Coconut Honey
- Coconut Cheese
- Spray Dried Coconut Milk Powder
- Dessicated coconut

UNIT-IV

14 Hrs

COCONUT OIL PROCESSING

Copra- Introduction, Grades, Copra Drying, Quality Copra

Coconut oil- Introduction, Properties, Uses, Extraction Methods, Quality Standard methods Of Refining, Virgin Coconut Oil

UNIT V

14 Hrs

Innovative coconut food products- Neera, Neera Honey, Neera Sugar, Vinegar

REFERENCES:

1. Dr.Rethinam.P & Dr.Bosco.S.J.B,Coconut- Harvest, Processing and Products,

- SEMESTER V
FS5GET18- BASIC FOOD ENGINEERING

Credit 3

(72 Hrs)

UNIT I: DIMENSIONS, QUANTITIES AND UNITS

10 Hrs

- a. Dimensions and units
- b. Basic physical quantities: velocity and speed, acceleration, force and momentum, weight, pressure. Work and energy, power.

UNIT II: FLUID FLOW IN FOOD PROCESSING

16 Hrs

- a. Fundamentals of fluid flow
- b. Properties of fluids, density, viscosity, Handling system for Newtonian liquids – Continuity equation, Reynolds number, Entrance region and fully developed flow, Velocity profile.
- c. Measurement of fluid flow, Pitot tube.

UNIT III: HEAT TRANSFER IN FOOD PROCESSING

16 Hrs

- a. Principles of heat transfer, heat exchangers.
- b. Thermal properties of food, specific heat, thermal conductivity, thermal diffusivity
- c. Modes of heat transfer: conduction, convection, and radiation
- d. Conductive heat transfer in rectangular slab

UNIT IV: UNIT OPERATIONS

16Hrs

- a. Separation processes: centrifugation, filtration, solvent extraction.
- b. Mechanical operations: mixing of liquid and solid food materials, size reduction of liquid and solid food materials, Extrusion
- c. Membrane separation: electro dialysis system, reverse osmosis, ultra filtration.

UNIT V: FREEZING AND DRYING

14 Hrs

- a. Refrigeration: selection of refrigerant, components of a refrigeration system, advantages and disadvantages.
- b. Freezing: principles, types of freezing, theories of freezing, Merits and demerits of freezing.
- c. Drying: Theories of drying, types of driers, Merits and demerits of freezing of drying.
- d. Evaporation: Types of evaporators.

REFERENCE

1. Introduction to food engineering, 4 th edition, R. Paulsingh & Dennis .R. Heldman, Elsevier publications.
2. Singh, R.P., 2004, Introduction to Food Engineering 3rd edition. Academic Press, London.

- SEMESTER V
ES5GET19- INTRODUCTION TO FOOD ENGINEERING

Credit – 3

72 hrs

OBJECTIVES:

- To provide an understanding of basics in food engineering

UNIT I- INTRODUCTION

10 hrs

Dimensions – Primary and Secondary

Engineering Units – Base units, Derived units and supplementary units

System – State of a system, extensive and intensive properties

Density – Solid, Particle and Bulk density

Concentration, Temperature, Pressure, Enthalpy, Power and area

Phase diagram of water

UNIT II – THERMODYNAMICS AND EQUILIBRIUM

13 hrs

Conservation of mass- conservation of mass for an open system and a closed system

Thermodynamics – laws of thermodynamics

Equation of state and Perfect Gas Law

Energy – potential and kinetic energy

Energy balance for a closed system and an open system, total energy balance

UNIT III – FLUID FLOW IN FOOD PROCESSING

17 hrs

Liquid Transport Systems – Pipes and Pumps

PUMPS- Definition, classification, positive displacement and centrifugal pumps, factors affecting choice of a pump

Properties of liquids - Density, Pressure, Surface tension and Viscosity.

Newtonian and non Newtonian fluids, laminar and turbulent fluid, The Continuity equation,

Reynold's number

Energy equation for steady flow of fluids – pressure, kinetic energy, potential energy, frictional loss, power requirements of a pump

UNIT IV – ENERGY IN FOOD PROCESSES

17 hrs

Generation of steam – Steam Generation System, Steam Tables, Steam Utilization

Fuel utilization- Systems, Mass And Energy Balance Analysis, Burner Efficiency

Electric Power Utilization – Electric Terms and Units, Ohm's Law, Electric Circuits, Electric Motors, Electric Controls and Lighting

UNIT V – HEAT TRANSFER IN FOOD PROCESSING

15 hrs

Thermal properties of food – Specific Heat, Thermal Conductivity, Thermal Diffusivity

Modes of Heat Transfer – Conductive, Convective, Radiative

Steady state heat transfer, Application of steady state heat transfer

Fourier's law

Role of insulation in reducing heat loss from process equipment

REFERENCES

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

- SEMESTER V
FS5CRP20- BASIC MICROBIOLOGY PRACTICALS

Credit – 2

72hrs

OBJECTIVES:

- To study the different laboratory equipments in the lab
 - To understand the preparation of media
 - To get thorough with various staining techniques, isolation and enumeration of microbes
1. Study of compound microscope
 2. Working and handling of common microbiological laboratory equipments and materials
 3. Preparation of microscopic examination
 4. Monochrome staining
 5. Differential staining
 6. Capsule staining
 7. Spore staining
 8. Microscopic examination of living organisms- hanging drop mount method for the demonstration of bacterial motility
 9. Negative staining of bacteria
 10. Isolation, Enumeration and Characteristics of microorganisms

References:

Dubey, R.C and Maheshwari, D.K. Practical microbiology. S.Chand & Company Ltd, Ram Nagar
200

SEMESTER V
FS5CRP21- FOOD ANALYSIS AND ADULTERATION TESTING
PRACTICALS

Credits-2

72hrs

1. **INTRODUCTION TO LABORATORY EQUIPMENTS AND APPARATUS**

2. **ANALYSIS OF MILK**

- Milk Solids,
- Ash
- Fat
- Protein
- Lactose
- Acidity

Qualitative test

- MBRT Test
- Starch
- Sucrose
- Urea
- Formalin

3. **ANALYSIS OF SQUASH:**

- Total solids
- Ash
- Water insoluble ash, Water soluble ash, Alkalinity water soluble Ash
- Acidity
- Total Sugar
- Soluble solids(Refractive index)
- Qualitative tests- potassium metabisulphite, sodium benzoate

4. **ANALYSIS OF CONDENSED MILK**

- Total Solids
- Fat
- Acidity
- Estimation of lactose and estimation of sucrose
- Qualitative tests- sucrose, starch

5. **ANALYSIS OF VINEGAR**

- Total solids
- Acidity

- Specific gravity
- Qualitative tests

6. **ANALYSIS OF HONEY**

- Moisture
- Estimation of reducing sugar
- Acidity
- Specific gravity
- Qualitative tests- Aniline chloride and Added glucose

7. **ANALYSIS OF WINE**

- Specific gravity
- Suspended solids
- Dissolved solids
- Total solids
- Total acidity

8. **ANALYSIS OF SPICES**

- Moisture
- Alcoholic extract
- Ash
- Acid insoluble ash
- Volatile Oil

9. **ANALYSIS OF TOMATO KETCHUP**

- Moisture
- Ash
- TSS
- Acidity

10. **DETECTION OF ADULTERATION IN VARIOUS FOODS**

- | | |
|------------------|-----------|
| • Milk | • Vinegar |
| • Condensed milk | • Wine |
| • Honey | • Spices |
| • Squash | • Ketchu |

SEMESTER V

ES5CRP22- FOOD CHEMISTRY PRACTICALS

Credit – 2

72 hrs

1. Estimation of Starch
2. Estimation of Crude fibre
3. Estimation of sugar by Phenol Sulphuric acid method
4. Estimation of sugar by Munson & Walker's method
5. Estimation of sugar by Lane & Eynon's method
6. Water Hardness
7. Paper Chromatography
8. Saponification Value of oils/fats
9. Acid value of oils/fats
10. Estimation of ascorbic acid

Semester VI

SEMESTER VI
FS6CRT23-ENTREPRENEURSHIP DEVELOPMENT & MANAGEMENT IN FOOD
INDUSTRY

Credits - 4 **72 hrs**

UNIT I

Entrepreneurship: Definition, characteristics and traits, difference between entrepreneur, intrapreneur and manager, types of entrepreneurs, role of entrepreneurs in economic development 12 hrs

UNIT II

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

14 hrs

UNIT III

Role of Government in promoting Entrepreneurship

- Incentives, subsidies and grants
- Agencies and their role - DIC, SISI, EDII, NIESBUD, NEDB

14 hrs

UNIT IV

Management- Characteristics, Objectives, Principles, Challenges, Importance, Levels of management, Food industry and Management

16 hrs

UNIT V

Product Development - need for new products, stages in product development, factors to be considered for it, Pricing and distribution of new product -kinds of pricing, sales promotion techniques

16 hrs

REFERENCES

- Gupta,C.P. Entrepreneurship Development in India. Sultan Chand & sons, New Delhi
- Abraham, M.M.Entrepreneurship Development & Management, Prakash Publications, Changanacherry, 2000.

SEMESTER VI
FS6CRT24-FOOD ADULTERATION & TESTING

Credit – 4

72 hrs

OBJECTIVES:

- To enable students to familiarize about the testing methods for adulteration.
- To test for adulteration in food samples.

UNIT I- FOOD ADULTERATION

12 hrs

- Definition, Classification,
- Health hazards caused by various adulterants
- Critical levels of metals in various foods.

UNIT II- COMPOSITION AND QUALITY CRITERIA FOR PLANT FOODS 16 hrs

- Oils and Fats
- Spices and condiments
- Food grains
- Fruits & Vegetables
- Beverages- Alcoholic & Non Alcoholic

UNIT III- COMPOSITION AND QUALITY CRITERIA FOR ANIMAL FOODS 14 hrs

- Milk and Milk Products
- Flesh Foods
- Egg

UNIT IV- COMPOSITION & QUALITY CRITERIA FOR SUGAR & PRESERVES & TIN FOODS 14 hrs

- Sugar and Sugar products
- Preserves
- Tin Foods

UNIT V- FOOD ADDITIVES

16 hrs

- Introduction
- Classification- Antioxidants, Preservatives, Emulsifiers, Stabilizers, sweeteners, thickening agents, chelating agents, curing agents, leavening agents, anti caking agents, coloring agents, flavoring agents.

REFERENCES:

- Handbook of Analysis; QC for Fruits & Vegetable Products
- E.M.Master; Standard Methods for examination of Dairy Products
- Jacob; Chemical methods of Food Analysis

CHOICE BASED ELECTIVE- II

SEMESTER VI
FS6CBT 25 - BEVERAGE TECHNOLOGY

Credit: 4

72 Hrs

Objectives

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

UNIT I

12 Hrs

Introduction, Classification and use in food Industry

UNIT II

14 Hrs

Processing Technology of tea, coffee and cocoa

UNIT III

16 Hrs

Processing Technology of Fruit beverages

- FRUIT JUICE
- FRUIT DRINK
- FRUIT SQUASH
- FRUIT CORDIAL
- FRUIT JUICE CONCENTRATE

UNIT IV

14 Hrs

Processing Technology of Carbonated beverages

UNIT V

16 Hrs

Processing Technology of Alcoholic beverages

- WINE
- BEER
- DISTILLED SPIRITS- VODKA, GIN, WHISKY, BRANDY, RUM

References:

1. Srilakshmi, Food Science. New Age International Publishers, New Delhi, 2003
2. Potter, N.N., Hotchmiss, J.H. Food Science, CBS Publishers, New Delhi, 2002

SEMESTER VI
FS6CBT26- ADVANCED FOOD ENGINEERING

Credit – 4

72 hrs

OBJECTIVES:

To enable students to understand the application of engineering principles in the design of equipments

UNIT I- PROCESSING SYSTEMS

10 hrs

Pasteurization and Blanching Systems
Commercial Sterilization Systems
Ultra- High Pressure Systems
Pulsed Electric Field Systems
Alternative Preservation Systems

UNIT II- REFRIGERATION AND FOOD FREEZING

14 hrs

Selection of a refrigerant, Components of a refrigerant system
Freezing Systems- Indirect and Direct- contact systems

UNIT III- HEAT EXCHANGERS

10 hrs

Steam injection and steam infusion.
Tubular, scrapped surface, plate heat, shell and tube heat exchangers

UNIT IV- SIZE REDUCTION

16 hrs

Definition and requirements of size reduction, forces used in size reduction
Equipments for size reduction-crushing rolls, hammer mill, disc attrition mill, tumbling mill- ball and rod mill.
Modes of operation, energy requirements for comminution of solids- Rittenger's law, Kick's law and Bond's law.

UNIT V

12 hrs

EVAPORATION- Single effect and multiple effect evaporator
Different types of evaporators, steam economy, design of evaporator
PSYCHROMETRY- Psychrometric properties of dry air, water vapor and air-vapor mixtures

UNIT VI- DEHYDRATION

10 hrs

Basic Drying Processes- Water Activity, Moisture Diffusion, Drying Rate Curves, Heat and Mass Transfer
Dehydrated Systems- Tray Dryers, Tunnel Dryers, Puff-Drying, Fluidized Bed Drying, Spray Drying, Freeze Drying

REFERENCES

- Singh, R.P and Dennis R. H. Introduction to Food Engineering 4th edition. Academic Press, London. 2008.
- Fundamentals of food engineering by Radha Charan Verma, Sanjay Kumar Jain Himanshu Publications.
- Fundamentals of food processing engineering by Romeo T Taledo, CBS Publications.
- Unit operations of Agriculture Processing by K M Sahay and K K Singh, Vikas Publishers.
- Experimental Methods in food engineering by Rizvi and Mittal, CBS Publishers.

SEMESTER VI
FS6CBT 27 -INFESTATION AND PEST MANAGEMENT

CREDITS – 4

72 hrs

Unit 1 – INFESTATION

14

hrs

Principles of food commodity storage. Common insects which affects food and their food preference. Effects of insects on food commodities. Detection of infestation and monitoring techniques.

Unit 2 – FUNGAL INFESTATION

12hrs

Mould- classification, general characteristics, types, growth requirements, major food commodities which are affected by mould, toxins produced by moulds, prevention of mould

Unit 3 – RODENTS AND VERTEBRATE PESTS

16hrs

Rodents - classification, general characteristics, types, distribution and habitat, behavior, major food commodities which are affected by rodents, detection and prevention of rodents

Other vertebrate pests – Birds and reptiles, types and effects on food commodities, prevention

Unit 4 – PESTICIDES

14hrs

Pesticides- Definition, classification, application. Pesticide appliances- sprayers, fogging, aerosol equipments

Fumigation – fumigants, properties, application technique, fumigation appliances

Unit 5 – PEST MANAGEMENT IN FOOD INDUSTRY

16hrs

Integrated pest management in food commodities. Pesticides and health hazards. Bio-pesticides. Safety devices. Sanitation in food processing and handling units.

REFERENCES:

1. Dennis. S. Hill, Pest and stored food stuff
2. Vijaya Kadar, Food storage and Preservation
3. Central ware House corporation, New Delhi, manual of Storage.
4. Manual of pest management in processed foods and food industry.
5. Manual of storage practices – Central ware House Corporation.
6. Panda H. – The complete technology book on pesticides, Fungicides and herbicid

SEMESTER VI
FS6CRP28-FOOD MICROBIOLOGY PRACTICALS

Credits – 2

72 hrs

Objectives:

- To study the standard plate count method
 - To identify microorganisms based on their enzymatic activity
 - To evaluate micro flora of various food samples
 - To assess sanitary quality of water
1. Composition, preparation and sterilization of media, nutrient agar, PDA agar, McKonkey Agar, EMB Agar
 2. Isolation of Pure Colonies
 - Preparation of media and sterilization,
 - Pour plate and Streak Plate Methods
 3. Microbiology of Milk
 - a) Quantitative analysis of milk by SPC(standard Plate Count Method)
 - b) Enzymatic test of milk by MBRT(Methylene Blue Reductase Test)
 - c) Determination of phosphatase activity of milk
 - d) Detection of mastitis through milk test
 - e) Detection of calcium and phosphorous in milk
 4. Microbiological Analysis of Meat and Fish and Egg
 5. Microbiology of Sauce
 6. Microbiology of Bread (Yeast & mold)
 7. Microbiology of fruits and vegetables
 8. Microbiology of Air, Water and Soil
 9. SWAB test
 10. Biochemical Testing
 - a) Triple sugar iron agar test
 - b) Indole Production Test
 - c) Methyl Red Test
 - d) Vogues Proskauer Test
 - e) Citrate Utilization Test

SEMESTER VI
FS6CRP29-FOOD ANALYSIS AND ADULTERATION TESTING
PRACTICALS

Credit – 2

72hrs

1. ANALYSIS OF JAM

- Determination of Soluble Solids
- Insoluble Solids
- Totals Solids
- Acidity
- Pectin Content
- Total Sugar

2. ANALYSIS OF TEA

- Moisture
- Ash
- Water soluble Ash
- Alkalinity of water Soluble Ash
- Total extractives
- Stalks in Tea
- Tannin

3. ANALYSIS OF COFFEE

- Moisture
- Ash
- Water-soluble ash
- Alkalinity of soluble ash
- Caffeine extractives
- Chicory
- Qualitative tests for chicory

4. ANALYSIS OF WHEAT FLOUR

- Moisture
- Ash
- Gluten
- Crude fibre
- Maltose figure
- Acidity
- Acid insoluble ash

- Sedimentation value

5. ANALYSIS OF BUTTER

- Moisture
- Curd and salt
- Fat analysis
- Total titratable acidity
- Qualitative tests- added color, vanaspathi and added starch

6. ANALYSIS OF COCOA POWDER

- Moisture
- Ash
- Bulk Density
- Fat
- Crude fibre

7. ANALYSIS OF MILK POWDER

- Moisture
- Ash
- Alkalinity of ash
- Acidity
- Fat
- Lactose
- Bulk density

8. ANALYSIS OF JELLY

- Determination of Soluble solids
- Insoluble solids
- Total solids
- Total sugar
- Acidity
- Pectin

9. DETECTION OF ADULTERATION IN VARIOUS FOODS

- Jam
- Tea
- Coffee
- Wheat Flour
- Butter
- Milk powder
- Jelly
- Cocoa powder

10. SENSORY ANALYSIS OF FOODS

- DIFFERENCE TESTS
 - Paired
 - Compared
 - Duo-trio
 - Triangle
- RATING TEST
 - Ranking test
 - Two sample test
 - Multiple sample test
- NUMERICAL SCORING TEST – Composite scoring test

SEMESTER VI

FS6CRP30-ADVANCED FOOD CHEMISTRY PRACTICALS

Credits- 2

72 hrs

1. Estimation of Chlorophyll
2. Estimation of SO₂
3. Estimation of sucrose by Willstatter's method
4. Peroxide value of fats/oils
5. Estimation of protein by Lowry method
6. Estimation of Iodine value
7. Estimation of free fatty acids
8. Estimation of protein by Sorenson's Formol titration
9. Enzyme standardization- Determination of amylase activity
10. Estimation of Protein by Biuret method

PROJECT/DISSERTATION-
FS6DSP31