CHRIST COLLEGE (AUTONOMOUS), IRINJALAKUDA

DEGREE OF B. VOC. F.P.T

BACHELOR OF VOCATION IN FOOD PROCESSING TECHNOLOGY

(CHOICE BASED CREDIT AND SEMESTER SYSTEM FOR UNDERGRADUATE CURRICULUM)

UNDER THE FACULTY OF VOCATIONAL STUDIES

SYLLABUS

(FOR THE STUDENTS ADMITTED FROM THE ACADEMIC YEAR 2018 – '19 ONWARDS)

BOARD OF VOCATIONAL STUDIES IN FOOD PROCESSING TECHNOLOGY (UG)

CHRIST COLLEGE (AUTONOMOUS), IRINJALAKUDA - 680125, KERALA, INDIA

JUNE, 2018

ADMISSION CRITERIA

Candidates who have passed (Eligible for Higher Studies) the HSE/VHSC of the Kerala State Board of Higher Secondary Examination or any other examination recognized as equivalent thereto with Science group are eligible for admission.

COURSE STRUCTURE

Credit Distribution

Semester	*Common course*		*General course*	*Total for Gen. & Comm.*	*Skill Component courses*	*Total for Skill*	***Total***
	English	*Second Language*					
I	4	4	4	12	3+4*+4+5*+2**	18	**30**
II	4	4	4	12	3+4*+4+5*+2**	18	**30**
III	4	-	4+4	12	3+4*+4+5*+2**	18	**30**
IV	4	-	4+4	12	3+5*+3+5*+2**	18	**30**
V			4+4+4	12	4+5*+2+4*+3	18	**30**
VI					30***	30	**30**
Total	**16**	**8**	**36**	**60**		**120**	**180**

***Practical **I.V. ***Project/Internship**

(1 credit = 15h: 30 credit = 450 hours: 1 semester = 90 days: 18 weeks of 5 working days consisting of six hours. For internship/I.V./field-work/self-learning, the credit weightage for equivalent hours shall be 50% of that for lectures/practical)

MARK DISTRIBUTION AND INDIRECT GRADING SYSTEM

Indirect Grading System based on a 7 -point scale is used to evaluate the performance of students. Mark system is followed for the evaluation of answer scripts. After external and internal evaluations, mark lists are submitted to the office of the Controller of Examinations. All other calculations, including grading, will be done by the college using the appropriate software. Indirect Grading System in 7 point scale is followed. Each course is evaluated by assigning marks with a letter grade (A+, A, B, C, D, E or F) to that course by the method of indirect grading.

Mark Distribution

Sl. No.	***Course***	***Marks***
1	English	400
2	Additional Language	200
3	General courses	900

4	Skill Component courses	2400
	Total Marks	**3900**

An aggregate of E grade with 40 % of marks (after external and internal put together) is required in each course for a pass (Except for project*) and also for awarding a degree/diploma. Appearance for Internal Assessment and End Semester Evaluation are compulsory and no grade shall be awarded to a candidate if she/he is absent for Internal Assessment / End Semester Evaluation or both. A student who fails to secure a minimum grade for a pass in a course is permitted to write the examination along with the next batch. After the successful completion of a semester, Semester Grade Point Average (SGPA) of a student in that semester is calculated using the formula given below. For the successful completion of a semester, a student should pass all courses. However, a student is permitted to move to the next semester irrespective of SGPA obtained.

Note: *For project/Internship the minimum for a pass shall be 50% of the total marks assigned to the respective examination.

Seven point Indirect Grading System

% of Marks	***Grade***	***Interpretation***	***Grade Point Average***	***Range of Grade points***	***Class***
90 and above	A+	Outstanding	6	5.5 - 6.0	First Class with distinction
80 to below 90	A	Excellent	5	4.5 - 5.49	
70 to below 80	B	Very good	4	3.5 - 4.49	First Class
60 to below 70	C	Good	3	2.5 - 3.49	
50 to below 60	D	Satisfactory	2	1.5 - 2.49	Second Class
40 to below 50	E	Pass/Adequate	1	0.5 - 1.49	Pass
Below 40	F	Failure	0	0 - 0.49	Fail

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

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

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

SGPA and CGPA shall be rounded off to two decimal places.

CREDIT AND MARK DISTRIBUTION IN EACH SEMESTER

Total Credits: 180; Total Marks: 3900

Semester	*Course*	*Credit*	*Marks*
I	Transactions: Essential English Language Skills - A01	4	100
	Malayalam-Bhashayum Sahithyavum I - MAL1A01(2) or Communication Skills in Hindi - A07	4	100
	Perspectives of food science and technology - FT1B01	4	100
	Food Chemistry, Nutrition and Instrumentation	3	100
	Practical Paper 1- Food Chemistry, Nutrition, Instrumentation	4	100
	Bakery and confectionary	4	100
	Practical Paper 2- Bakery and confectionary	5	100
	Industrial visit/training	2	50
	Total	**30**	**750**
II	Ways with words: Literatures in English - A02	4	100
	Malayalam-Bhashayum Sahithyavum II / Literature in Hindi	4	100
	Food safety, food laws and packaging technology - FTL6B17	4	100
	Principles of food preservation	3	100
	Practical Paper 3- Principles of food preservation	4	100
	Dairy Technology	4	100
	Practical Paper 4- Dairy Technology	5	100
	Industrial visit/training	2	50
	Total	**30**	**750**
III	Writing for Academic and Professional Success - A03	4	100
	Basic numerical skills - BC3A11	4	100
	Computer fundamentals and HTML - BCA1B01	4	100
	Food microbiology	3	100
	Practical Paper 5- Food microbiology	4	100
	Milling Technology (cereals, pulses and oil seeds)	4	100
	Practical Paper 6 - Milling Technology (cereals, pulses and oil seeds)	5	100
	Industrial visit/training	2	50
	Total	**30**	**750**
IV	Zeitgeist: Readings on Contemporary Culture - A04	4	100

	Organizational psychology - PSY6B05-01	4	100
	Marketing management - BC2C02	4	100
	Technology of meat and egg	3	100
	Practical paper 7 - Technology of meat and egg	5	100
	Fish processing and byproduct technology	3	100
	Practical paper 8 - Seafood processing and packaging	5	100
	Industrial visit/training	2	50
	Total	**30**	**750**
V	Food engineering - FTL6B15E	4	100
	Human resource management - BC3C03	4	100
	Entrepreneurship development programme - BC4A13	4	100
	Technology of fruits and vegetables	4	100
	Practical paper 9 - Technology of Fruits and vegetables	5	100
	Sensory evaluation of food	2	100
	Practical paper 10 - Sensory evaluation of food	4	100
	Byproduct utilization and and waste management	3	100
	Total	**30**	**800**
VI	Project, product development, In-plant training	30	100
	Total	**30**	**100**
	Grant Total	**180**	**3900**

CODES AND INSTRUCTIONAL DETAILS

Semesters	*Code*	*Course Title*	*Instructional hours/ week*	*Instructional hours/ Sem*
I	GEC1 EG01	Transactions: Essential English Language Skills - A01	4	60
	GEC1 ML02 or GEC1 HD02	Malayalam-Bhashayum Sahithyavum I - MAL1A01(2) or Communication Skills in Hindi - A07	4	60
	GEC1 PF03	Perspectives of food science and technology - FT1B01	4	60
	SDC1 FF01	Food Chemistry, Nutrition and Instrumentation	3	45
	SDC1 FF02P	Practical Paper 1- Food Chemistry, Nutrition, Instrumentation	4	60

	SDC1 BC 03	Bakery and confectionary	4	60
	SDC1 BC04P	Practical Paper 2- Bakery and Confectionary	5	75
	SDC1 IV 05	Industrial visit/training	2	30
II	GEC2 EG04	Ways with words: Literatures in English - A02	4	60
	GEC2 ML 05 or GEC2 HD05	Malayalam-Bhashayum Sahithyavum II / Literature in Hindi	4	60
	GEC2 FS 06	Food safety, food laws and packaging technology - FTL6B17	4	60
	SDC2 PF06	Principles of food preservation	3	45
	SDC2 PF07P	Practical Paper 3- Principles of food preservation	4	60
	SDC2 DT08	Dairy Technology	4	60
	SDC2 DT09P	Practical Paper 4- Dairy Technology	5	75
	SDC2 IV 10	Industrial visit/training	2	30
III	GEC3 EG07	Writing for Academic and Professional Success - A03	4	60
	GEC3 NS08	Basic Numerical Skills - BC3A11	4	60
	GEC3 CF09	Computer fundamentals and HTML - BCA1B01	4	60
	SDC3 FM11	Food microbiology	3	45
	SDC3 FM12P	Practical Paper 5- Food microbiology	4	60
	SDC3 MT13	Milling Technology (cereals, pulses and oil seeds)	4	60
	SDC3 MT14P	Practical Paper 6 - Milling Technology (cereals, pulses and oil seeds)	5	75
	SDC3 IV15	Industrial visit/training	2	30
IV	GEC4 EG10	Zeitgeist: Readings on Contemporary Culture - A04	4	60
	GEC4 ED11	Organizational psychology - PSY6B05-01	4	60
	GEC4 FA12	Marketing Management - BC2C02	4	60
	SDC4 TM16	Technology of meat and egg	3	45
	SDC4 TM17P	Practical paper 7 - Technology of meat and egg	5	75

	SDC4 FP18	Fish processing and byproduct technology	3	45
	SDC4 FP19P	Practical paper 8 - Seafood processing and packaging	5	75
	SDC4 IV20	Industrial visit/training	2	30
V	GEC5 FE13	Food engineering - FTL6B15E	4	60
	GEC5 HR14	Human resource management - - BC3C03	4	60
	GEC5 OP15	Entrepreneurship development programme - BC4A13	4	60
	SDC5 TF21	Technology of fruits and vegetables	4	60
	SDC5 TF22P	Practical paper 9 - Technology of Fruits and vegetables	5	75
	SDC5 SE23	Sensory evaluation of food	2	30
	SDC5 SE24P	Practical paper 10 - Sensory evaluation of food	4	60
	SDC5 BU25	Byproduct utilization and waste management	3	45
VI	SDC6 PR26Pr	Project, product development, In-plant training	-	900

EVALUATION SCHEME FOR THEORY COURSES

The evaluation scheme for each course contains two parts: *viz.,* internal evaluation and external evaluation.

1. INTERNAL EVALUATION

20% of the total marks in each course are for internal evaluation. The Department shall send only the marks obtained for internal examination to the CoE of the College.

Table 1: Components of Evaluation (Assuming total marks is 100)

Sl. No	*Components*	*Marks*
1	Attendance (Refer Table 1a for the matrix)	5
2	Assignment (Refer Table 1b for the matrix)	5
3	Test paper : I & II (Refer Table 1c for the matrix)	5 + 5
	Total Marks	**20**

Table 1a: Percentage of attendance and eligible internal marks

% of attendance	*Marks*
Above 90	5
85 - 89	4
80 - 84	3

76 - 79	2
75	1

A candidate shall be permitted to appear for the Semester-End examinations only if he/she secure not less than 75% attendance in the total number of working hours in each semester.

Table 1b: Assignment

Assignments can be home work, problem solving, group discussions, quiz, literature survey, seminar, team project, software exercises, etc. As decided by the faculty handling the course, and regularity in the class. Assignments of every semester shall preferably be submitted in Assignment Book, which is a bound book similar to laboratory record.

Table 1c : Pattern of test papers and eligible internal marks

Duration	***Pattern***	***Total number of questions***	***Number of questions to be answered***	***Marks for each question***	***Marks***
1.5 Hours	One word	4	4	1	4
	Short answer	5	4	2	8
	Paragraph	5	3	6	18
	Essay	2	1	10	10
				Total Marks*	**40**

****Eligible internal marks. 90% and above = 5, 80 to below 90% = 4.5, 70 to below 80% = 4, 60 to below 70% = 3.5, 50 to below 60% = 3, 40 to below 50% = 2, 35 to below 40% = 1, below 35% = 0***

2. EXTERNAL EVALUATION

External evaluation carries 80% marks. External examinations will be conducted at the end of each semester.

Table 1: Pattern of question paper

Duration	***Pattern***	***Total number of questions***	***Number of questions to be answered***	***Marks for each question***	***Marks***
3 Hours	One word	10	10	1	10
	Short answer	12	10	2	20
	Paragraph	8	5	6	30
	Essay	4	2	10	20
				Total Marks	**80**

EVALUATION SCHEME FOR PRACTICAL COURSES

Practical evaluation will be conducted at the end of 1st 2nd 3rd 4th and 5th semesters. The evaluation scheme for each course contains two parts: *viz.,* internal evaluation and external evaluation.

Table 1: Internal evaluation for practical

Sl. No	*Criteria*	*Marks*
1	Evaluation in the lab and Rough Record	10
2	Test Paper	4
3	Viva voce	1
4	Regularity (Refer Table 1a for the matrix)	5
	Total Marks	**20**

Note: No candidate will be permitted to attend the end-semester practical examination unless he/she produces certified record of the laboratory.

Table 1a: Percentage of attendance and eligible internal marks

% of attendance	*Marks*
Above 90	5
85 - 89	4
80 - 84	3
76 - 79	2
75	1

Table 2: External evaluation for practical

Sl. No	*Type of question*	*Question number*	*Nature of question*	*Marks*
1	Theory/ Algorithm/Flow diagram			20
2	Implementation			30
3	Result/Output			10
4	Record			10
5	Viva voce			10
			Total Marks	**80**

EVALUATION SCHEME FOR PROJECT/INTERNSHIP

There will be iv/internship evaluation at the end of 1st 2nd 3rd and 4th semesters

Table 1: Mark distribution for IV/in-plant training (Internal - 20% and External - 80%)

Sl. No	*Criteria*	*Marks*

		Sem 1	Sem 2	Sem 3	Sem 4
1	Content and relevance of report	30	30	30	30
2	Viva voce	10	10	10	10
3	Project presentation	10	10	10	10
	Total Marks	**50**	**50**	**50**	**50**

The major project/internship evaluation will be conducted at the end of 6th semester. Internship and the major project should be carried out in the industry, not necessarily with industry partner. The major idea for internship is to implement the things learned and to get a real life experience. **The Evaluation process for this alone, follows 100% external assessment.**

Every student will be assigned an internal guide, allotted from the parent department concerned or an expert available in the college appointed by the principal. The student has to make regular discussions with the guide while choosing the subject/area and throughout the life time of the project. At least three reviews should be conducted to evaluate the progress of work. An evaluation team is constituted for conducting the evaluation. The team consist of external examiner, representative from the industry and a faculty of the concerned department. Students should submit a report of their work. A valid certificate from the organization should be produced as a proof that the work is carried out in the respective organization. Students are required to demonstrate the working model of their work (if possible) to the panel of examiners. A viva will be conducted based on the report and students are supposed to clarify the queries regarding their work.

Table 2: Mark distribution for major internship assessment.

Sl. No	***Criteria***	***Marks***
1	Content and relevance of the project	60
2	Viva voce	20
3	Project presentation	20
	Total Marks	**100**

SEMESTER I

SDC1FF01 – FOOD CHEMISTRY, NUTRITION AND INSTRUMENTATION

Number of Contact Hours: 105 Hrs. (45T, 60L)

Course Outline

Unit I - Carbohydrates (8 Hours)

Classification, properties and reactions of 1) Monosaccharides: Glucose& Fructose 2) Oligosaccharides: Maltose, lactose. Sucrose- properties- crystallization and inversion. 3) Polysaccharides: starch: components of starch, gelatization, retrogradation, modified starch. Cellulose, hemicellulose, pectic substances, gums, dietary fibre.

Unit – II – Proteins (6 Hours)

Introduction to food protein, structure of protein, classification of proteins, amino acids, physicochemical properties, denaturation, reactions, protein determination

Unit – III – Lipids (6 Hours)

Classification, fatty acids, saturated, unsaturated, polyunsaturated fatty acids, chemical properties, reactions, rancidity, auto-oxidation, antioxidants.

Unit – IV -Water (4 Hours)

Introduction, physical & chemical properties of water, moisture in foods, methods of moisture determination, hydrogen bonding, Free & bound water

Unit – V – Pigments (3 Hours)

Properties and Occurrence: Chlorophyll, Carotenoids, Flavanoids, Anthocyanins, Anthoxanthins, Myoglobin

Unit – VI - Enzymes (3 Hours)

Introduction, Definition, Occurrence, Classification. Properties of Enzymes- Specificity, Factors affecting enzyme activity. Enzymes in food Industry.

Unit – V II -Balanced Diet and RDA (3 Hours)

Meal planning, factors affecting meal planning, principles of meal planning. Factors affecting RDA, principles deriving RDA

Unit – VIII - Colloids and Emulsions (4 Hours)

Colloidal chemistry, Properties of solutions, Sols & Suspensions, Food colloids. Emulsion, Types, Emulsifying Agents.

Unit – IX - Spectrophotometry/Colourimetry (2 Hours)

Principle - Beer lamberts law. The technique and instrumentation.

Unit – X – Chromatography (6 Hours)

Classification- Adsorption chromatography, Partition chromatography, Ion exchange, Paper chromatography, Column chromatography, Thin layer chromatography, Gas chromatography, High Pressure Liquid Chromatography.

SDC1FF02P – FOOD CHEMISTRY, NUTRITION AND INSTRUMENTATION (PRACTICAL)

Number of Credits: 4

Course Outline

1. Chemical Analysis of Lipids
    a) Determination of Iodine value
    b) Determination of saponification value
    c) Determination of peroxide value
    d) Determination of Free Fatty Acid

2. Analysis of Protein
    Kjeldahl's methods

3. Analysis of Water
    Total solids, Acidity of water, Alkalinity of water, Determination of Chloride, Hardness of water.

4. Paper chromatography

5. Ash content.

References

1) Ranganna S 2001.Hand book of analysis and quality control of fruits and vegetable products Tata-McGraw- Hill.
2) Sharma B.K. 2004, Instrumental Methods of Chemical Analysis. Goel Publishing House, New Delhi.
3) Belitz, H.D 1999 Food Chemistry Springer Verlag
4) Fennema O R. 1996 Food Chemistry Marcel Dekker

SDC1BC03 – BAKERY AND CONFECTIONERY

Number of Contact Hours: 135 Hrs. (60T, 75L)

Course Outline

Module I. Manufacture of Sugar (10 Hours)

Sugarcane, jaggery, khandasari sugar, raw sugar, refined sugar, white sugar, beet sugar, manufacture of sugar from sugar cane, refining of sugar.

Module II. Classification of confectionery (12 Hours)

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

Module III. Properties of wheat (7 Hours)

Wheat – Properties, Quality – Hardness, Gluten strength, protein content, soundness. Methodology and approaches to evaluate bread and bread – wheat quality – processing factors, product factors.

Module IV. Principles of baking and Bread manufacturing (10 Hours)

Major baking ingredients and their functions, role of baking ingredients in improving the quality of bread. Characteristics of good flour used for making bread, biscuits and cakes. Ingredients used for bread manufacture, methods of mixing the ingredients, dough development methods - straight dough, sponge dough, moulding, proofing, baking, packing, spoilage, bread staling, methods to reduce bread staling and spoilage.

Module V. Cake and Biscuit manufacturing (6 Hours)

Processing of cakes and biscuits- ingredients, development of batter, baking and packing, Spoilage in cakes and biscuits.

Module VI. Wheat based bakery products (4 Hours)

Cookies-Cracker and wafer manufacture, Baking additives, Technology of Indian traditional products from cereals, Technology of Pasta preparation, Extruded products, Premixes for bakery and traditional products.

Module VII. Chocolate Processing (3 Hours)

Chocolate types, Ingredients and Processing

Module VIII. Rice Overview and Byproducts (8 Hours)

Varieties, Chemical composition, Physical properties of rice, Importance in handling processing, Cooking quality of rice, Methods, Properties of parboiled rice, Changes during parboiling. Advantages and dis advantages of parboiling, Byproducts of rice milling and their benefits, Industrial uses of bran, Ageing and curing of rice, Puffed rice and flaked rice.

References

1. Zhou. W, Hui Y, H; (2014), “Bakery Products Science and Technology”, 2nd Edition, Wiley Blackwell Publishers,
2. Pyler, E. J. and Gorton, L.A. (2009), “Baking Science & Technology” Vol.1 Fourth Edition, Sosland Publications.
3. Stanley P. Cauvain, Linda S. Young, (2008), “Baked Products: Science Technology and Practice”. John Wiley & Sons Publishers.

SDC1BC04 – BAKERY AND CONFECTIONERY (PRACTICAL)

Number of Contact Hours: 75 Hrs.

Number of Credits: 5

Course Outline

1. Preparation of ghee biscuits
2. Preparation of melting marvels
3. Preparation of sweet and salt biscuits
4. Preparation of bread
5. Preparation of pizza
6. Preparation of hot cross buns (sweet buns)
7. Preparation of jam nut cookies
8. Preparation of vanilla cake
9. Preparation of cake.
10. Quality test for wheat flour used in baked products- water absorption, sedimentation and alcoholic acidity.
11. Preparation and quality evaluation of chocolate
12. Effect of syrup consistency and temperature on quality characteristics of hard boiled sweets.
13. To determine ash content in sugar products
14. To estimate acidity and TSS in sugar products
15. Shelf life analysis of Biscuits, breads and cookies.
    - Bread

      a) Moisture content, b) Analysis of protein content, c) Peroxide value, d) Iodine value
    - Biscuit

      a) FFA estimation, b) Peroxide value, c) Antioxidant estimation
    - Confectionery

      a) Glucose estimation, b) Glucose – Fructose ratio
16. Visit to production unit of a bakery.

Sl. No	Job Role	Qualification Packs	NSQF Level
1	Plant Biscuit Production Specialist	FIC/Q5003	4
2	Craft Baker	FIC/ Q5002	4
3			

SEMESTER II

SDC2PF06 – PRINCIPLES OF FOOD PRESERVATION

Number of Contact Hours: 105 Hrs. (45T, 60L)

Course Outline

Module I: Food Spoilage (6 Hours)

Definition, types of spoilage - physical, enzymatic, chemical and biological spoilage. Mechanism of spoilage and its end products, shelf life determination.

Module II: Preservation by using Preservatives (6 Hours)

Food preservation: Definition, principles, importance of food preservation, traditional and modern methods of food preservation. Food additives – definition, types, Class I and Class II preservatives.

Module III: Preservation by use of high temperature (10 Hours)

Pasteurization: Definition, types, Sterilization, Canning - history and steps involved, spoilage encountered in canned foods, types of containers used for canning foods. Food irradiation – Principles, merits and demerits, effects of irradiation and photochemical methods.

Module IV: Preservation by use of Low Temperature (8 Hours)

Refrigeration - advantages and disadvantages, freezing: Types of freezing, common spoilages occurring during freezing, difference between refrigeration and freezing.

Module V: Preservation by Removal of Moisture (7 Hours)

Drying and dehydration - merits and demerits, factors affecting, different types of drying, Concentration: principles and types of concentrated foods.

Module VI. Fermentation (2 Hours)

Principles, Significance, Types of fermentation-acetic, lactic and alcoholic

Module VII. Irradiation (2 Hours)

Source of ionisation irradiation, Dose and Dosimetry, Mode of action Scope of irradiation.

Module VIII. Recent trends (4 Hours)

Food preservation application-pulsed electric field, high pressure technology, Ohmic heating, Microwave heating, Ultrasonics, nanotechnology, Hurdle technology.

References

1. Gould, G. W. (2012), "New Methods of food preservation", Springer Science & Business Media.
2. Manay, N.S. Shadaksharaswamy, M. (2004), "Foods- Facts and Principles", New age international publishers, New Delhi.
3. Srilakshmi, B.(2003), "Food Science", New Age International Publishers, New Delhi.

4. Subalakshmi, G and Udipi, S.A. (2001), “Food processing and preservation”. New Age International Publishers, New Delhi.

SDC2PF07P – PRINCIPLES OF FOOD PRESERVATION (PRACTICAL)

Number of Contact Hours: 60 Hrs.

Number of Credits: 4

Course Outline

1) Introduction to preservation equipments
2) Preservation by using chemical preservatives
3) Preparation of product by using salt as preservative
4) Preparation of product by using sugar as preservative
5) Preparation of product by using oil as preservative
6) Preparation of food product by Freeze drying
7) Sensory evaluation
8) Dehydration of fruits in sugar syrup
9) Drying kinetics of vegetables using cabinet dryer
10) Estimation of Sulphur dioxide (Quantitative)
11) Estimation of Benzoic acid (Quantitative)
12) Qualitative estimation of Sulphur dioxide.
13) Qualitative Estimation of benzoic acid.
14) Estimation of residual salt content in pickle.
15) Estimation of Acetic acid.
16) Estimation of Ethyl alcohol content.
17) Visit to a well established Food Processing unit

SDC2DT08 – DAIRY TECHNOLOGY

Number of Contact Hours: 135 Hrs. (60T, 75L)

Course Outline

Module I: Introduction (10 Hours)

Milk - Definition, sources, and composition of milk, factors effecting composition of milk, physiochemical properties of milk, grading of milk-definition and types of grades, collection and transportation of milk.

Module II: Processing of market milk (15 Hours)

Flowchart of milk processing, Reception, Different types of cooling systems. Clarification and filtration process, standardization- Pearson’s square method, pasteurization-LTLT, HTST and UHT process-continuous pasteuriser, Sterilisation and Homogenisation, Cream separation- centrifugal cream separator, bactofugation.

Module III: Special milks (10 Hours)

Skim milk, evaporated milk, condensed milk, standardized milk, toned milk, double toned milk, flavoured milk, reconstituted milk.

Module IV: Indigenous and Fermented milk products (15 Hours)

Product description, methods for manufacture of butter, cheese, ice cream, khoa, channa, paneer, shrikhand, ghee. Spray drying system: dried milk- whole milk and skim milk powder. Instantization of milk.

Module V: In-Plant cleaning system (10 Hours)

Introduction to Cleaning in- place (CIP) system - cleaning procedure, Cleaning efficiency, Methods of cleaning in food industry, cleaning solutions – Detergents, Sanitizers. SIP system of dairy plant, Personal hygiene in dairy plant.

References

1. Joshi V. K., (2015), "Indigenous Fermented Foods of South Asia", CRC Press.
2. Alan H. Varnam, (2012), "Milk and Milk Products: Technology, chemistry and microbiology", Springer Science & Business Media Publishers.
3. Robinson, R. K., (2012), "Modern Dairy Technology: Volume 2 Advances in Milk Products", Springer Science & Business Media Publishers.

SDC2DT09P – DAIRY TECHNOLOGY (PRACTICAL)

Number of Contact Hours: 75 Hrs.

Number of Credits: 5

Course Outline

1. Milk Testing - Platform Tests.
2. Determination of Activity (Titrable Acidity) of Milk.
3. Determination of fat and SNF content in milk.
4. Clot on boiling test for milk.
5. Determination of specific gravity of milk.
6. Detection of adulteration in milk
7. Determination of FFA
8. Determination of quality of milk by mbrt
9. Preparation of Lassi.
10. Preparation of khoa.
11. Preparation of Basundi.
12. Preparation of chakka and shrikand.
13. Preparation of kalakand.
14. Preparation of cooking butter.

15. Preparation of ghee.
16. Preparation of flavoured milk.
17. Preparation of different types of ice creams
18. Visit to milk product development centre.

Sl. No	Job Role	Qualification Packs	NSQF Level
1	Dairy Products Processor	FIC/Q2007	5
2	Supervisor: Dairy Products Processing	FIC/Q2007	5
3			
4			
5			

SEMESTER III

SDC3FM11 –FOOD MICROBIOLOGY

Number of Contact Hours: 105 Hrs. (45T, 60L)

Course Outline

Introduction to microorganisms (6 Hours)

Bacteria, Fungi and Virus, their structure, classification, morphology and requirements for growth.

Culture Media (3 Hours)

Bacteriological Media – Selective, Differential, Enrichment Media.

Methods of isolating Pure culture (3 Hours)

Serial dilution, Pour plate, streak plate, stroke Culture.

Control of Microorganism (6 Hours)

Physical agents – high temperature, low temperature, desiccation, osmotic radiation, filtration. Chemical agents-Characteristics of an ideal antimicrobial chemical agent, Aldehydes, Dyes, Halogens, Phenols, Acids, Alkalis, Gases.

Food spoilage (6 Hours)

Sources of contamination, factors responsible for spoilage, factors affecting kinds and number of microorganisms in food. Chemical changes due to spoilage.

Effect of spoilage (8 Hours)

Contamination and spoilage of Fruits and Vegetables, Meat & Meat products, Milk & Cream, Cereal &

Cereal products, Spoilage of canned food.

Microbial intoxications & Infections (6 Hours)

Definition, Exotoxin, Endotoxin, intoxications and infections – sources, symptoms Methods of Prevention and investigation of food borne disease outbreak.

Microbes in fermented foods (7 Hours)

Fermented vegetable products, Sauer Kraut, pickles, soy sauces, idli Fermented dairy products – Cheese, yoghurt.

References

1. Banwart GJ ,1989. Basic Food Microbiology. AVI publishers
2. Jay JM, Loessner MJ & Golden D A 2005. Modern Food Microbiology. Springer Verlag
3. Ananthanarayanan R Jayaram Paniker CK 2009 Text book of microbiology. University Press Pvt Ltd, Hyderabad
4. Prescott, L.M, Harley, J.P and Klein, D.A Microbiology. McGraw Hill New York
5. Frazier J& Westhoff DC. 1988. Food Microbiology. McGraw Hill, New York.
6. Pelczar JM & Reid RD. Microbiology. Tata McGraw Hill
7. Black, JG. Microbiology. Principles and Explorations John Wiley

SDC3FM12P –FOOD MICROBIOLOGY (PRACTICAL)

Number of Credits: 4

Course Outline

1. Introduction to equipments and glassware used in microbiology
2. Sterilization techniques: Dry heat and moist heat
3. Staining techniques – simple staining, gram staining
4. Isolation of pure culture: Pourplate, Streak plate
5. Microbial analysis of meats – Total plate count – *Staphylococcus*
6. Microbial analysis of Milk- Total plate count, Spices-Yeast and Mold, TPC
7. Microbial analysis of water – Coliforms

SDC3MT13 – MILLING TECHNOLOGY (Cereals, Pulses and Oilseeds)

Number of Contact Hours: 135 Hrs. (60T, 75L)

Course Outline

Module I: Paddy Processing (10 Hours)

Composition and Quality characteristics. Curing of Paddy. Parboiling Processes-soaking, steaming, drying, CFTRI and pressure parboiling process, Paddy Dryer - LSU Dryer. Production of Flattened Rice and Puffed Rice from Paddy.

Module II: Rice Milling (15 Hours)

Paddy Dehusking Processes. Rice Mill Flow Chart. Engelberg Huller Mills. Modern Rice Mills – Their Components - Pre Cleaners, rubber roll Shellers, Paddy Separators – Satake type, Polishers - Cone polishers, glazing, Extraction of rice bran oil and uses of rice bran in food industry.

Module III: Wheat milling (10 Hours)

Wheat - composition and nutritional value, wheat milling process - cleaning-conditioning/hydrothermal treatment, milling-break roll and reduction rolls.

Module IV: Milling of Pulses (8 Hours)

Varieties-chemical composition and structure-dry milling and wet milling process of pulses, processed products of pulses.

Module V: Oil seed processing (10 Hours)

Introduction- methods- hydraulic press- screw press – principle and working, solvent extraction methods, Clarification, degumming, neutralization, bleaching, deodorization techniques/process, blending of oils. Hydrogenation, Fractionation, Winterization.

Module VI: Spice processing (7 Hours)

Definition, classification, chemical composition, uses of spices, spice oils and oleoresins, Major spices and its processing.

References

1. Dendy DAV & Dobraszczyk BJ. (2001), "Cereal and Cereal Products", Aspen Publications.
2. Chakraverty, A. (1995), "Post Harvest Technology of Cereals, Pulses and Oilseeds". Oxford and IBH Publishing Co, Calcutta
3. N. L. Kent and A. D. Evans: (1994) "Technology of Cereals" (4th Edition), Elsevier Science (Pergaman), Oxford, UK,
4. Samuel Matz: (1992), "The Chemistry and Technology of Cereals as Food and Feed, Chapman & Hall

SDC3MT14P – MILLING TECHNOLOGY (PRACTICAL)

Number of Contact Hours: 75 Hrs.

Course Outline

1. Physical characteristics of Wheat.
2. Estimation of Gluten Content of flour.
3. Fermenting power of yeast.
4. Physical Characteristics of Rice and paddy.
5. Cooking characteristics of rice.
6. Determination of sedimentation power of flour.
7. Determination of water absorption power

8. Determination of moisture
9. Adulteration tests in spices
10. Pelshanke value.
11. Estimation of maltose value
12. Estimation of Falling number
13. Estimation of rheological properties
14. Oleoresin estimation in spices
15. Farinograph
16. Alveo graph
17. Solvent extraction method (Soxhlet apparatus)
18. Visit to rice mill station.
19. Visit to oil expelling unit.

Sl. No	Job Role	Qualification Packs	NSQF Level
1	Food Microbiologist	FIC/Q7603	6
2	Milling Technician	FIC/Q1002	5
3	Chief Miller	FIC/Q1001	6
4			
5			

SEMESTER IV

SDC4TM16 – TECHNOLOGY OF MEAT AND EGG

Number of Contact Hours: 120 Hrs. (45T, 75L)

Course Outline

Slaughter and Inspection of Meat (8 Hours)

Humane method, Inspection of meat- Ante mortem and post-mortem inspection. Slaughter of sheep, pigs, poultry. Post mortem changes, ageing. Structure of meat, Factors affecting tenderness of meat, Effect of cooking on texture, colour and flavour.

Cured Meat (8 Hours)

Role of ingredients, Methods of curing, Processing of Ham, Bacon. Sausage - classification, emulsion, ground sausage, processing, casings, Factors affecting quality of cured meat.

Preservation (8 Hours)

Refrigeration, freezing, thermal processing, dehydration, irradiation, chemical, antibiotics.

By products (6 Hours)
Rendering, Feeds, Hides, Skins, Hoofs, Horns.

Egg (15 Hours)

Grading, Changes during storage. Egg quality- Factors affecting egg quality, Measures of egg quality, Effect of cooking, Factors affecting coagulation, Industrial use of egg. Preservation of egg Refrigeration, Freezing, Thermal processing, Dehydration, Coating.

References

1. Gracey JF Collins DS Meat Hygiene ELBS
2. Person AM Gillet T A Processed Meats. CBS publishers
3. Lawrie R A Lawries Meat Science Tata McGrawHhill
4. Mountney T. Carmen G Prakhurst R Poultry Products Technology CBS
5. Stadelman, William J. Egg Science and Technology. CBS.
6. Parkhurst, Carmen R. Poultry Meat and Egg Production.CBS
7. Ockerman H W Hancen C L Animal Byproduct Processing Elis Horwood

SDC4TM17P – TECHNOLOGY OF MEAT AND EGG (PRACTICAL)

Number of Credits: 5

Course Outline

1. Slaughtering and dressing of meat
2. Study of post mortem changes, cutting and handling
3. Evaluation of meat quality
4. Evaluation of quality of eggs
5. Preparation of meat products
6. Value added products of egg
7. Value added products of meat
8. Proximate composition estimation
9. Pre-mortem examination
10. PSE. DFD – Observation
11. By product preparation.
12. Estimation of protein.
13. Estimation of lipids.
14. Visit to a Meat processing unit
15. Visit to a egg processing unit

SDC4FP18 – FISH PROCESSING AND BYPRODUCT TECHNOLOGY

Number of Contact Hours: 120 Hrs. (45T, 75L)

Course Outline

Module I (Hours 2)

Structure, composition and nutritive value

Module 2 (Hours 10)

Principle of fish preservation and processing. Processing of fish by traditional methods – salting, sun drying, smoking, marinading and fermentation. Theory of salting, methods of salting –wet salting and dry salting. Drying and dehydration- theory, importance of water activity in relation to microbial growth. Sun drying and artificial drying- solar dryer.

Module 3 (Hours 10)

Packaging and storage of salted and dried fish. Different types of spoilage in salt cured fish. Quality standard for salted and dry fish. Fish preservation by smoking- chemical composition of wood smoke and their role in preservation. Methods of smoking and equipments used for smoking. Carcinogenic compound in wood and methods to remove them. Hurdle technology in fish preservation and processing.

Module 4 (Hours 10)

Marinaded and fermented fish products – role of acids in marinades, Fish and prawn pickles, fish sauce and Fish paste, traditional Indian fermented products. Principles and methods of preparation of various fish paste products like fish sausage, fish ham, surimi, fish cake, kamaboko etc. Fish muscle structure, myofibriller protein and their role in elasticity formation. Extruded products – theory of extrusion, equipments used, advantages of extruded products, methods of preparation of extruded products.

Module 5 (Hours 10)

Fish protein concentrate. Fish hydrolysate, partially hydrolyzed and deodorized fish meat, functional fish protein concentrate and their incorporation to various products. Fish meal and oil. Dry reduction and wet reduction methods. Fish maws, shark leather, Chitin, chitosan, fish glue, fish gelatin, isinglass, pearl essence, shark fin rays, beach de mer, and biochemical and pharmaceutical products.

Module 6 (Hours 3)

Utilization of seaweeds: agar agar, algin, carrageenan. Diversified fish products: battered and braided products-fish finger, fish cutlet, fish wafer, and fish soup powder etc and imitation products. Value addition, HACCP in safe products production.

References

1. Ockerman H. W, Hancen C. L. Animal Byproduct Processing Elis Horwood
2. Gopakumar K, Tropical Fishery Products Oxford

3. Jhingran V. G Fish & Fisheries of India Hindustan Publishing Company
4. Biswas KP A Text Book of Fish and Fisheries Technology Tata McGraw hill

SDC4FP19P– FISH PROCESSING AND BYPRODUCT TECHNOLOGY (PRACTICAL)

Number of Credits: 5

Course Outline

1. Preparation of salted fish, dried fish and smoked fish by different methods.
2. Quality assessment of salted, dried and smoked fish.
3. Preparation of fish manure, fishmeal, fish body oil, fish liver oil, fish maws, isinglass, fish silage, ensilage, fish glue, fish gelatin, fattice, pearl essence, chitin and chitosan.
4. Quality assessment of individual by-products.
5. Preparation of prawn & fish pickles.
6. Preparation of fermented fish sauce and marinaded products.
7. Preparation of surimi and surimi based products.
8. Preparation of seaweed products, Preparation of diversified and value added fish products.
9. Proximate analysis
10. TMA
11. TVBN
12. Peroxide value
13. K – Value.
14. Estimation of FFA
15. Iodine Value.

Sl. No	Job Role	Qualification Packs	NSQF Level
1	Lab Technician		5
2	Supervisor- Meat & Poultry	FIC/Q3007	5
3			
4			
5			

SEMESTER V

SDC5TF21 – TECHNOLOGY OF FRUITS & VEGETABLES

Number of Contact Hours: 135 Hrs. (60T, 75L)

Course Outline

Post-harvest management (8 Hours)
Maturity indices, Ripening, Changes during ripening-Climacteric & Non-Climacteric, storage-Controlled Atmospheric & Modified Atmospheric Storage

Pectin, Jam, Jelly and Marmalade (8 Hours)

Pectin Definition of pectin, classification, Pectic enzymes, Properties, jelly grade of pectin, Testing of pectin. Jam, Jelly and Marmalade Definition, jam making, jelly making, Defects.

Fruits juices & Fruit preparations (12 Hours)

Fruit Juices Ready to serve beverages, Squashes Cordials, Nectars, Concentrates Fruit juice powder- Freeze drying, Foam mat drying. Fruit preparations Preserves, Candies Crystallized fruits & Glazed fruits. Pickle and chutneys - Action of preservatives Pickling process, defects.

Tomato products (7 Hours)

Tomato juice, puree, paste& Ketchup specification of the above products.

Canning (7 Hours)

Classification of canning of fruits- Pineapple, Oranges, Canning of vegetables - Peas, Carrots, syrups & brines for canning.

Drying & Dehydration (9 Hours)

Enzyme Inactivation, Sulphuring Sun drying - grapes and dates. Dehydration of vegetables and Fruits. Tunnel & cabinet drier.

Browning (9 Hours)

Enzyme activity, enzymatic browning Non enzymatic browning, its prevention.

References

1. Pandey P. H, Principle of Practices of post harvest Technology Kalyani publication
2. Cruess W.V., 1997. Commercial fruit and vegetables Products. Anees offset press, New Delhi.
3. Lal,G, Siddappa S and Tandon G.L. Preservation of fruit and vegetables. ICAR
4. Thompson A.K 1995 Post harvest Technology of Fruits and Vegetables Black well Sci
5. Verma L.R & Joshi V. K ,2000 Post Harvest Technology of Fruits & Vegetables. Indus Publications
6. Potter N. N, Hotchkiss J.H. Food Science. CBS Publishers
7. Manany S, N S. Swamy Food Facts and Principles. New Age International Publishers
8. Srivastava RP & Kumar S .2003 Fruit and Vegetable preservation Principles and Practices. International Book Distributor

SDC5TF22P – TECHNOLOGY OF FRUITS & VEGETABLES (PRACTICAL)

Number of Credits: 5

Course Outline

1. **Handling and operating of food processing equipments and Instruments**
   - Pulper
   - Sealers
   - Juice extracting machines
   - Autoclaves
   - Corking machines
   - Refractometer
   - Salinometer
   - Hydrometers
   - Jelmeter
   - Thermometer
   - Vacuum gauge, pressure gauge, seam checking gauge
   - Electronic weighing balance

2. **Quality analysis**
   - Quality evaluation of fruits and vegetables.
   - Quantitative analysis of cut fruits and vegetable yield.
   - Effects of pretreatment on quality of cut fruits and vegetables.
   - Refrigeration storage of fruits and vegetables
   - Determination of Maturity indices of fruits & vegetables.

3. **Quality Testing**
   - Determination of Degree Brix (TSS), pH and % acidity in fruits and vegetable products.
   - Estimation of benzoic acid, sulphur dioxide and KMS in terms of ppm present in fruits and vegetable products.
   - Estimation of reducing and non reducing sugars in fruit and vegetable products
   - Estimation of chloride content in food products.

4. **Preservation techniques**
   - Extraction of juice by different methods.
   - Preservation of fruits juices with addition of preservative.
   - Preparation of fruit and synthetic beverages.
   - Preparation of carbonated beverages.

5. **Product Preparation**

- Preparation of tomato juices, puree, sauces, ketchups, soup, paste.
- Comparison of juice/pulp extraction methods on quality and yield of tomato pulp.
- Preparation of jam, jelly and marmalades.
- Preparation of preserves, candies, crystallized and glazed fruits and fruit bars.
- Effects of pre- treatment and process variables on quality of preserve and candied fruits.
- Preparation of chutney
- Preparation of sauerkraut, gherkins, cauliflower, lime, mango and mixed pickles.

SDC5SE23 – SENSORY EVALUATION OF FOODS

Number of Contact Hours: 90Hrs (30T, 60L)

Course Outline

Module I: Introduction (5 Hours)

Definition of sensory evaluation; basic tastes; human senses and sensory perception; threshold; psychophysics, Tongue surface

Module II: Arrangements for Sensory Evaluation Test controls (8 Hours)

Environment and test room design; product controls: sample preparation and presentation; panelist controls; factors influencing measurements: psychological and physiological errors

Module III: Statistical Methods for Sensory Evaluation (10 Hours)

Classification of test methods; discrimination tests: paired-comparison, duo-trio and triangle tests; affective tests: qualitative (interview and focus group) and quantitative tests (paired preference and acceptance tests); Two sample test, Ranking test, Two sample difference test, numeric scoring test, hedonic ranking test

Module IV: Subjective and objective methods (7 Hours)

Texture analyser- mechanical characteristics- chewiness, brittleness, and geometric characteristics, Sensory panel-types-criteria for panel selection.

References

1. Herbert Stone, Joel L. Sidel, (2012), “Sensory Evaluation Practices”, Academic Press Publishers.
2. Maynard A. Amerine, Rose Marie Pangborn, Edward B. Roessler, (2013), “Principles of Sensory Evaluation of Food”, Elsevier Publications.
3. Harry T. Lawless, Hildegarde Heymann, (2010), “Sensory Evaluation of Food: Principles and Practices”, Springer Science & Business Media.

SDC5SE24P – SENSORY EVALUATION OF FOODS (PRACTICAL)

Number of Contact Hours: 70Hrs

Course Outline

1. Training of sensory panel.
2. To perform sensitivity tests for four basic tastes
3. To perform analytical and affective tests of sensory evaluation.
4. Recognition tests for various food flavors.
5. Sensory evaluation of milk and milk products
6. Flavor defects in milk
7. Extraction of pigments from various fruits and vegetables and study the effect of temperature and pH
8. Texture evaluation of various food samples- cookies/ biscuits/ snack foods
9. Textural measurement of various food products using Texture Analyzer
10. Measurement of colour by using Tintometer/ Hunter Colour Lab etc.
11. Analytical instrumentation evaluation methods
    a) TLC b) GC c) HPLC d) Spectroscopy e) Electrophoresis

References

1. Rao E. S. (2013). Food Quality Evaluation. Variety Books.
2. Pomeranz Y and Meloan CE (2002). Food Analysis – Theory and Practice, CBS Publishers and Distributors, New Delhi.
3. deMan J. (2007). Principles of Food Chemistry, 3rd ed., Springer.
4. Meilgard (1999). Sensory Evaluation Techniques, 3rd ed. CRC Press LLC, 1999.
5. Amerine, Pangborn & Roessler (1965). Principles of Sensory Evaluation of food, Academic Press, London.

SDC5BU25 – BYPRODUCT UTILIZATION AND WASTE MANAGEMENT

Number of Contact Hours: 45Hrs

Course Outline

Module I: Introduction (8 hours)

Types of waste and magnitude of waste generation in different food processing industries, concept, scope and importance of waste management and effluent treatment.

Module II: Waste characterization (10 Hours)

Temperature, pH, Oxygen demands (BOD, COD, TOD), fat, oil and grease content, metal content, forms of phosphorous and sulphur in waste waters, microbiology of waste, other ingredients like insecticide, pesticides and fungicides residues

Module III: Effluent Treatment (10 Hours)

Pretreatment of waste: sedimentation, coagulation, flocculation and floatation Secondary treatments: Biological oxidation trickling filters, activated sludge process), industrial wastewater treatment: characteristics of industrial wastewater, treatment levels.

Module IV: Waste utilization of agro industries (8 Hours)

Characterization and utilization of byproducts from cereals (breweries), pulses, oilseeds, fruits & vegetables (wineries) and plantation crops (sugar industries).

Module V: Waste utilization of animal and marine product industries (9 Hours)

Characterization and utilization of byproducts from dairy, eggs, meat, fish and poultry.

References

1. Abbas Kazmi, Peter Shuttleworth, (2013), "The Economic Utilisation of Food Co-Products", Royal Society of Chemistry Publishing.
2. A.M. Martin, (2012), "Bioconversion of Waste Materials to Industrial Products", Springer Science & Business Media Publishing.
3. Marcos von Sperling, (2007), "Basic Principles of Wastewater Treatment", IWA Publishing.

Sl. No	Job Role	Qualification Packs	NSQF Level
1	Supervisor: Fruits and Vegetables Processing	FIC/Q0109	5
2	Processed Food Entrepreneur	FIC/Q9001	5
3	Manager/Asst Manager - Procurement	FIC/Q9003	7
4			
5			

SEMESTER VI

SDC6PR26Pr – PROJECT, PRODUCT DEVELOPMENT, IN-PLANT TRAINING

Number of Contact Hours: 900 Hrs.

Course Outline