CHRIST COLLEGE (AUTONOMOUS), IRINJALAKUDA

B VOC FOOD PROCESSING TECHNOLOGY

CHOICE BASED CREDIT AND SEMESTER SYSTEM FOR UNDERGRADUATE CURRICULUM

UNDER THE FACULTY OF SCIENCE

SYLLABUS

(FOR THE STUDENTS ADMITTED FROM THE ACADEMIC YEAR 2021-'22 ONWARDS)

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

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. 25 marks weightage in index mark calculation shall be given to compute ranking of candidates who successfully completed VHSE/HSE with NSQF course at Higher Secondary (Level 4) in the relevant sector.

COURSE STRUCTURE

Semester	**Credit Distribution**						***Total***
	Common course		*General course*	*Total for Gen. & Comm.*	*Skill Component courses*	*Total for Skill*	
	English	*Second Language*					
I	3+3	4		10	3+4+4+4*+5*	20	**30**
II	4+4	4		12	3+3*+3+5*+4**	18	**30**
III		-	4+4	8	3+3+3+4*+4*+5*	22	**30**
IV		-	4+4	8	3+4*+3+4*+4*+4**	22	**30**
V					4+2+3+4*+4+5*+3+5*	30	**30**
VI					28**	30	**30**
Total	**14**	**8**	**16**	**38**		**142**	**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. All aspects pertaining to Common courses and General courses, including syllabus and evaluation pattern, will be based on B.Voc regulation 2021 (CBCSSVUG) of University of Calicut.

MARK DISTRIBUTION AND INDIRECT GRADING SYSTEM

Indirect Grading System based on a 10 -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 CE using the appropriate software.

Mark Distribution

Sl. No.	***Course***	***Marks***
1	English	350
2	Additional Language	200
3	General courses	400
4	Skill Component courses	3100
	Total Marks	**4050**

Ten point Indirect Grading System

% of Marks (IE + ESE)	***Grade***	***Interpretation***	***Grade Point Average***	***Range of Grade points***	***Class***
95 and above	O	Outstanding	10	9.5 - 10.0	First Class with distinction
85 to below 95	A+	Excellent	9	8.5 - 9.49	
75 to below 85	A	Very good	8	7.5 - 8.49	
65 to below 75	B+	Good	7	6.5 - 7.49	First Class
55 to below 65	B	Satisfactory	6	5.5 - 6.49	
45 to below 55	C	Average	5	4.5 - 5.49	Second Class
35 to below 45	P	Pass	4	3.5 - 4.49	Third Class
Below 35	F	Fail	0	0	Fail
Incomplete	I	Incomplete	0	0	Fail
Absent	Ab	Absent	0	0	Fail

An aggregate of P grade with 35 % 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 40% of the total marks assigned to the respective examination.

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

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,

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

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

OUTCOMES AND OUTCOME BASED EDUCATION (OBE)

Outcomes are what the students are expected to be able to do at the end of a unit of learning. The unit of learning is three year formal programme. OBE establish the conditions and opportunities within the system that enable and encourage all students to achieve those essential outcomes. There are three levels of Outcomes that are: 1) Programme Outcomes (POs), 2) Programme Specific Outcomes (PSOs), 3) Course Outcomes (COs)

An Outcome:

Should unambiguously state what the student should be able to do/perform.

What the students do or perform are observable and assessable?

Students should be able to understand what it means (comprehensible).

Should be able to provide guidance to students in planning their learning.

1) Programme Outcomes (POs)

Programme Outcomes (POs) indicate the generic knowledge, skills and attitudes that every student graduating from a UG programme should attain. While every course of the programme can address only a subset of POs, all the core courses together should be able to address all the POs.

PO1. To provide skill training in a specific fields with appropriate content of general education for professional excellence.

PO2. To provide vertical mobility for higher secondary pass outs in vocational education in the university system without any age restriction.

PO3. To integrate NSQF at undergraduate level in order to enhance employability of the graduates who are equipped with industry requirements to become the workforce with local, national and global demand.

PO4. To ensure that the students have adequate knowledge and skills, so that they are work ready at different exit points of the programme and can help them in their entrepreneurship journey.

2) Programme Specific Outcomes (PSOs)

PSOs are specific to a programme and are to be attained at the time of graduation from the programme. They are to be identified by a committee with representation from all stakeholders.

PSO1. To empower the students with professional competence and expertise in food processing technology in ally with industry and market demands.

PSO2. To train the students in the physicochemical, nutritional, microbiological and sensory aspects in food processing and preservation.

PSO3. To make the students aware of food security and to train them with different food processing and preservation techniques for enhanced shelf life.

PSO4. To emphasise the importance of safety, quality, plant sanitation, laws and regulations, engineering and packaging in food industry.

3) Course Outcomes (COs)

Course outcomes are statements that describe significant and essential learning that the learners have achieved and can reliably demonstrate at the end of the course. Course outcomes are what the student should be able to do at the end of the course. They are listed along with the detailed syllabus of each course.

CREDIT AND MARK DISTRIBUTION IN EACH SEMESTER
Total Credits: 180; Total Marks: 4050

Semester	*Course*	*Credit*	*Marks*
I	ENG1A01	3	75
	ENG1A02	3	75
	MAL1A07 (3) or HIN1A07(3)	4	100
	Perspectives of food science and technology	3	75
	Food Chemistry, Nutrition and Instrumentation	4	100
	Bakery and confectionary	4	100
	Practical Paper 1- Food Chemistry, Nutrition, Instrumentation	4	100
	Practical Paper 2- Bakery and confectionary	5	100
	Total	30	725
II	ENG1A03	4	100
	ENG1A04	4	100
	MAL2A08 (3) or HIN2A08(3)	4	100
	Principles of food preservation	3	75
	Practical Paper 3- Principles of food preservation	3	75
	Dairy Technology	3	75
	Practical Paper 4- Dairy Technology	5	100
	Industrial visit/training or mini project/product development	4	100
	Total	30	725
III	Basic Mathematics and General Awareness A11	4	100
	Professional Business Skills A12	4	100
	Food safety, food laws and packaging technology	3	75
	Introduction to Computers and Office Automation	3	75
	Food microbiology and Value addition	3	75
	Practical Paper 5- Food microbiology and Value addition	4	100
	Milling Technology (cereals, pulses and oil seeds)	4	100
	Practical Paper 6 - Milling Technology (cereals, pulses and oil seeds)	5	100
	Total	30	725

IV	Entrepreneurship Development A13	4	100
	Public Health, Sanitation and Safety A14	4	100
	Technology of meat and egg	3	75
	Practical paper 7 - Technology of meat and egg	4	100
	Seafood processing technology	3	75
	Practical paper 8 - Seafood processing technology	4	100
	Food engineering	4	100
	Industrial visit/training or mini project/product development	4	100
	Total	30	750
V	Marketing management	4	100
	Byproduct utilization and waste management	2	75
	Flavour technology and sensory evaluation	3	75
	Practical Paper 9- Flavour technology and sensory evaluation	4	100
	Technology of fruits and vegetables	4	100
	Practical paper 10 - Technology of Fruits and vegetables	5	100
	Technology of beverages	3	75
	Practical paper 11 - Technology of beverages and byproduct utilisation	5	100
	Total	30	725
VI	Major Project	28	200
	Product development/In-plant training/Internship		200
	Total	30	400
	Grant Total	180	4050
	Total Practical credits (Minimum 72)	86	

CODES AND INSTRUCTIONAL DETAILS OF SKILL COURSES

Semesters	***Code***	***Course Title***	***Instructional hours/ week***	***Instructional hours/ Sem***

I	SDC1PF01	Perspectives of food science and technology	3	45
	SDC1FC02	Food Chemistry, Nutrition and Instrumentation	4	60
	SDC1BC03	Bakery and confectionary	4	60
	SDC1FC01P	Practical Paper 1- Food Chemistry, Nutrition, Instrumentation	4	60
	SDC1BC02P	Practical Paper 2- Bakery and confectionary	5	75
II	SDC2PF04	Principles of food preservation	3	45
	SDC2PF03P	Practical Paper 3- Principles of food preservation	3	45
	SDC2DT05	Dairy Technology	3	45
	SDC2DT04P	Practical Paper 4- Dairy Technology	5	75
	SDC2MP01Pr	Industrial visit/training or mini project/ product development	4	60
III	SDC3FS6	Food safety, food laws and packaging technology	3	45
	SDC3OA7	Introduction to Computers and Office Automation	3	45
	SDC3FM8	Food microbiology and Value addition	3	45
	SDC3FM5P	Practical Paper 5- Food microbiology and Value addition	4	60
	SDC3MT9	Milling Technology (cereals, pulses and oil seeds)	4	60
	SDC3MT6P	Practical Paper 6 - Milling Technology (cereals, pulses and oil seeds)	5	75
IV	SDC4TM10	Technology of meat and egg	3	45
	SDC4TM7P	Practical paper 7 - Technology of meat and egg	4	60
	SDC4SP11	Seafood processing technology	3	45
	SDC4SP8P	Practical paper 8 - Seafood processing technology	4	60

	SDC4FE12	Food engineering	4	60
	SDC4MP02Pr	Industrial visit/training or mini project/ product development	4	60
V	SDC5MM13	Marketing management	4	60
	SDC5BU14	Byproduct utilization and waste management	2	30
	SDC5FT15	Flavour technology and sensory evaluation	3	45
	SDC5FT9P	Practical Paper 9- Flavour technology and sensory evaluation	4	60
	SDC5TF16	Technology of fruits and vegetables	4	60
	SDC5TF10P	Practical paper 10 - Technology of Fruits and vegetables	5	75
	SDC5TB17	Technology of beverages	3	45
	SDC5TB11P	Practical paper 11 - Technology of beverages and byproduct utilisation	5	75
VI	SDC6MP03Pr	Project, Product development and/or Industrial training and/or Internship	30	900

AUDIT COURSES/ABILITY ENHANCEMENT COURSES

These are courses which are mandatory for a programme but not counted for the calculation of SGPA or CGPA. There shall be one Audit course each in the first four semesters. These courses are not meant for class room study. The students can attain only pass (Grade P) for these courses. At the end of each semester, there shall be examination conducted by the college from a pool of questions (Question Bank). The Question paper shall be of MCQ type with 100 marks maximum and the examination may be conducted through Learning Management System. The students can also attain these credits through online courses like SWAYAM, MOOC etc (optional). The list of passed students must be sent to the University from the colleges at least before the fifth semester examination. The lists of courses in each semester with credits are given below.

Sl. No	***Course***	***Semester***	***Credit***
1	Environment Studies	I	4
2	Disaster Management	II	4

3	*Human Rights /Intellectual Property Rights /Consumer Protection-	III	4
4	*Gender Studies/Gerontology	IV	4
*Opt any one of the courses.			

EVALUATION SCHEME FOR THEORY COURSES

The evaluation scheme for each course contains two parts: *viz.*, internal evaluation and external evaluation. Mark system is followed instead of direct grading for each question. For each course in the semester letter grade and grade point are introduced in 10-point indirect grading system

1. INTERNAL EVALUATION

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

Table 1 : Components of Evaluation (Theory)

Sl. No	***Components***	***Maximum internal marks 15 (2/3 credit courses – Type 1)***	***Maximum internal marks 15 (4/5 credit courses – Type 2)***
1	Attendance (Refer Table 1a for the matrix)	3	4
2	Assignment (Refer Table 1b for the matrix)	3	4
3	Test paper (Refer Table 1c for the matrix)	6	8
4	Seminar (Refer Table 1d for the matrix)	3	4
	Total Marks	**15**	**20**

Table 1a : Percentage of attendance and eligible internal marks (Classroom Participation - CRP)

% of attendance	***Marks (Type 1)***	***Marks (Type 2)***
85 and above	3	4
75 to below 85	2	2
50 to below 75	1	1
Below 50	0	0
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.		

able 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.			
Sl. No	***Criteria***	***Marks (Type 1) Max-3***	***Marks (Type 2) Max-4***
1	Submission on time	1	1
2	Content	2	3
3	Total	3	4

Table 1c : Pattern of test papers

Type 1 (2/3 credit courses)					
Duration	***Pattern***	***Total number of questions***	***Number of questions to be answered***	***Marks for each question***	***Ceiling of Marks***
1.0 Hours	Short answer	6	6	2	10
	Paragraph	3	3	5	10
	Essay	2	1	10	10
				Total Marks	**30**
Type 2 (4/5 credit courses)					
Duration	***Pattern***	***Total number of questions***	***Number of questions to be answered***	***Marks for each question***	***Ceiling of Marks***
1.5 Hours	Short answer	6	6	2	10
	Paragraph	5	5	5	20
	Essay	2	1	10	10
				Total Marks	**40**

Table 1c : Eligible internal marks from test paper

% of marks in test paper	***Marks (Type 1) Max-6***	***Marks (Type 2) Max-8***
85 and above	6	8
65 to below 85	5	6
55 to below 65	4	4
45 to below 55	3	3

35 to below 45	2	2
Below 35	1	1

Table 1d : Eligible internal marks from Seminar

Sl. No	*Criteria*	*Marks (Type 1) Max-3*	*Marks (Type 2) Max-4*
1	Presentation	1	1
2	Content	1	2
3	Time management	1	1
4	Total	3	4

2. EXTERNAL EVALUATION

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

Question paper type 1 (2 and 3 credit courses)

The external QP with 60 marks and Internal examination is of 15 marks. Duration of each external examination is 2 Hrs. The pattern of External Examination is as given below. The students can answer all the questions in Sections A & B. But there shall be Ceiling in each section.

Section A

Short answer type carries 2 marks each - 12 questions Ceiling - 20

Section B

Paragraph/ Problem type carries 5 marks each - 7 questions Ceiling - 30

Section C

Essay type carries 10 marks (2 out of 4) 1x10 =10

Total =60

Question paper type 2 (4 and 5 credit courses)

The external QP with 80 marks and Internal examination is of 20 marks. Duration of each external examination is 2.5 Hrs. The pattern of External Examination is as given below. The students can answer all the questions in Sections A & B. But there shall be Ceiling in each section.

Section A

Short answer type carries 2 marks each - 15 questions Ceiling - 25

Section B

Paragraph/ Problem type carries 5 marks each - 8 questions Ceiling - 35

Section C

Essay type carries 10 marks (2 out of 4) 2x10 =20

Total =80

EVALUATION SCHEME FOR PRACTICAL COURSES

Practical evaluation will be conducted at the end of 1st 2nd 3rd 4th and 5th semesters including the respective internship/mini projects. 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	8
2	Test Paper	4
3	Viva voce	4
4	Regularity in Class Room Participation (Refer Table 1a for the matrix)	4
	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 works.

Table 1a : Percentage of attendance and eligible internal marks

% of attendance	***Eligible Marks***
85 and above	4
75 to below 85	2
50 to below 75	1
Below 50	0

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

The major project/internship evaluation will be conducted at the end of 6th semester

Table 1 : Mark distribution for internship (Internal - 20% and External - 80%)

Sl. No	*Criteria*	*Marks*	
		External	Internal
1	Content of report	100	30
2	Viva voce	60	10
	Total Marks	**160**	**40**

Table 1 : Mark distribution for Project (Internal - 20% and External - 80%)

Sl. No	*Criteria*	*Marks*	
		External	Internal
1	Theory/Algorithm/Flow Chart	40	10
2	Implementation	80	20
3	Result/Output	20	4
4	Record	10	2
5	Viva voce	10	2
6	Term Paper	-	2
	Total Marks	**160**	**40**

* Internal evaluation only

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. 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 make the presentations of their work before the panel of

examiners. A viva will be conducted based on the report and students are supposed to clarify the queries regarding their work.

Semester I

SDC1PF01: PERSPECTIVES OF FOOD SCIENCE & TECHNOLOGY
(Credits- 3 Total Hours- 45)

COURSE OUTCOME:

- To obtain basic knowledge of food science and technology
- Structure and composition of different types of foods
- Basics of quality assessment, nutritional factors and health foods
- Knowledge in food additives, preservatives, colours, improvers and the like.
- An idea about journals, research centres and leading industries

COURSE OUTLINES:

Module 1 Introduction 5hrs
Scope of food science and Technology, Functions of food. Nutrients, Water, Carbohydrates, Proteins, Lipids, Vitamins and Minerals.

Module 2 Composition and nutritive value 15hrs
Pulses & Legumes, Nuts & Oilseeds, Meat, Fish, Egg and Milk
Structure and composition of wheat and Rice. Classification and Composition of Fruits, Vegetables and Spices.

Module 3 Food Quality assessment 5hrs
Sensory assessment-Appearance of food- visual perception, colour of foods, smell, flavour and taste. Threshold tests, difference tests, ranking test &
hedonic scale

Module 4 Food Additives 5hrs
Preservatives, colouring agents, flavour and flavour enhancer, Anti-oxidants, Artificial sweeteners, stabilizers, thickening agents, anticaking agents, bleaching and maturing agents, flour improvers, leavening agents, surface active agents.

Module 5 Health foods 5hrs
Health foods Functional foods, Prebiotics, Probiotics, Neutraceuticals, organic foods, GM foods

Module 6 Food Research & food technology updates 10hrs
CFTRI,DFRL, NIFTEM, IIFPT & CIFT. Major Food Industries in India. Journals:- Journals of Food Science & Technology, Indian Food Industry, Beverage Food World, Indian Food Packer, AFST (I)

REFERENCE

1. S. Manany, N S. Swamy Food Facts and Principles. New Age International Publishers.
2. Potter NN , Hotchkiss JH. Food Science. CBS publishers and distributers Sumati R Mudambi , Rajagopal M V. Fundamentals of Food and Nutrition. New Age international publishers.
3. Potter NN , Hotchkiss JH. Food Science. CBS publishers and distributers S. Manany, N S. Swamy Food Facts and Principles. New Age International Publishers
4. S. Manany, N S. Swamy Food Facts and Principles. New Age International Publishers .
5. Murano, Peter S. Understanding Food Science and Technology .Thomson
6. Sumati R Mudambi , Rajagopal M V. Fundamentals of Food and Nutrition. New Age International Publishers
7. Shubhangini A Joshi . Nutrition and Dietics. Tata McGraw Hill Education Private limited.
8. Journals: Indian Food Industry Food packer Journal of Food Science and Technology Beverage Food World

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SDC1FC02: FOOD CHEMISTRY, NUTRITION AND INSTRUMENTATION
(Credits- 4 Total hours– 60)

COURSE OUTCOME:

- To understand the chemistry of foods - composition of food, role of each component and their interaction
- To understand how processing conditions are likely to change the reactivity of food components
- To explain the chemistry of the most important food components, including their properties and reactions
- Understand the relationship between nutrition and human wellbeing.
- Apply their knowledge and laboratory skills to measure, control and modify the chemical and physical properties of food
- To understand the principles behind some of the most common analytical techniques used in food analysis and to get skilled in it's usage
- To understand the major chemical reactions that occur during food handling, processing and storage, including those that limit food shelf life

COURSE OUTLINE:

Unit I - Carbohydrates 8hrs

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 8hrs

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

Unit – III - Lipids **6hrs**

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

Unit – IV -Water **5hrs**

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

Unit – V -Pigments **3hrs**

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

Unit – VI -Enzymes **5hrs**

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

Unit – VII –Balanced Diet and RDA **3hrs**

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

Unit – VIII - Colloids and Emulsions **5hrs**

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

Unit – IX - **7hrs**

Spectrophotometry/Colourimetry Principle - Beer lamberts law. The technique and instrumentation.

Unit – X -Chromatography **10hrs**

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

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SDC1BC03: BAKERY AND CONFECTIONERY
(Credits-4 Total Hours: 60)

COURSE OUTCOME:

•To understand the fundamentals of baking and technology behind various bakery products
•Understand the fundamentals of baking and to familiarize various kinds of ingredients used in baking.
•To get skilled in preparation of different bakery items and bread making.
•To develop skill in various baking procedures and to get working knowledge of equipment

needed for baking so as to start independent unit.
•To get trained in the technologies (equipment and process) for confectionary product preparations

COURSE OUTLINE:

Module I. Manufacture of Sugar: 8 Hrs
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: 10 Hrs
Sugar boiled confectionery- crystalline and amorphous confectionery, rock candy, hard candy, lemon drop, soft candy, lollypop, marshmallows, fudge, cream, caramel, toffee, lozenges, gumdrops, honeycomb candy.

Module III. Wheat overview and products: 6Hrs
Wheat – introduction, composition, properties, wheat milling, by-products

Module IV. Principles of baking and Bread manufacturing: 12 Hrs
Major baking ingredients and their functions, role of baking ingredients in improving the quality of bread, bread quality. 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, bread making process moulding, proofing, baking, packing, spoilage, bread staling, methods to reduce bread staling and spoilage.

Module V. Cake, Biscuit & Rusk manufacturing: 6 Hrs
Processing of cakes, biscuits & rusk- ingredients, development of batter, baking and packing, faults and remedies, Spoilage in cakes biscuits & Rusk

Module VI. Wheat based bakery products: 4 Hrs
Cookies-Cracker and wafer manufacture, Technology of Indian traditional products from cereals, Technology of Pasta preparation, Extruded products, Mix and Premixes for bakery and products, Baking additives

Module VII. Chocolate Processing: 4 Hrs
Chocolate types, Ingredients and Processing

Module VIII Rice Overview and rice products: 10 Hrs
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.

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SDC1FC01P: FOOD CHEMISTRY, NUTRITION, INSTRUMENTATION (PRACTICAL)
Total credits– 4 Total Laboratory Hours- 60

COURSE OUTCOME:

- To develop laboratory skills in analysis of food
- Experimental learning, the preparation of reagents and use of basic instrumentation
- Familiarise with lab instruments devices and their handling

EXPERIMENTS:

1. Preparation of primary and secondary solutions
2. Standardisation of NaoH
3. Standardisation of Hcl
4. Determination of acidity and pH
5. Qualitative test for carbohydrates- Molisch's test, Benedict's test, Iodine test, Anthrone test, Seliwanoff's
6. Determination of Iodine value
7. Determination of saponification value
8. Determination of peroxide value
9. Determination of Free Fatty Acid
10. Analysis of Protein - Kjeldahl's methods
11. Analysis of Water:Total solids, Acidity of water, Alkalinity of water, Determination of Chloride, Hardness of water.
12. Determination of refractive index and specific gravity of fats and oils
13. Determination of smoke point and percent fat absorption for different fats and oils
14. Determination of Moisture in food sample
15. Determination of Vitamin C in food sample
16. Determination of 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,OR. 1996 Food Chemistry Marcel Dekke

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SDC1BC02P: BAKERY AND CONFECTIONERY (PRACTICAL)
(Total Credits: 5 Total Laboratory Hours: 75)

COURSE OUTCOME

- To develop skills in various baking procedures in industry
- Have working knowledge of equipment's needed for baking
- To develop different bakery products
- To determine quality test for products

EXPERIMENTS

1. Preparation of biscuits - Sweet& salt
2. Preparation of marsh mellows
3. Preparation of bread
4. Preparation of Gulab jamun
5. Preparation of buns(sweet buns)
6. Preparation of cookies
7. Preparation of peanut chikki
8. Preparation of cake.
9. Preparation of chocolate
10. Preparation of Laddu
11. Preparation of piping biscuits
12. Preparation of dough nuts
13. Quality test for wheat flour used in baked products- water absorption, alcoholic acidity.
14. Effect of syrup consistency and temperature on sugar cooking
15. To determine moisture in flour
16. To determine ash content in flour
17. Determination of moisture in bread, biscuits and cookies
18. Determination of reducing and non-reducing sugars
19. Visit to production unit of a bakery.

Sl. No	Job Role	Qualification Packs	NSQF Level
1	Plant Biscuit Production	FIC/Q5003	4

Sl. No	Job Role	Qualification Packs	NSQF Level
	Specialist		
2	Craft Baker	FIC/ Q5002	4

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Semester II

SDC2PF04 PRINCIPLES OF FOOD PRESERVATION
(Credits-3 Total Hours: 45)

COURSE OUTCOME

- To study the systematic approach towards the basic and applied aspects of different preservation methods.
- To familiarize with various theoretical aspects of recent trends in food preservation
- To understand the method of action of different preservatives.
- To understand the different ways in which food spoilage occurs and the techniques to prevent it
- To get skilled in the appropriate usage of different preservatives that are used commonly in the industry
- . To get skilled in the estimation of different preservatives in food samples that are used commonly in the industry

COURSE OUTLINE

Module I: Food Spoilage 6 Hrs

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 Hrs

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 Hrs

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 Hrs

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 Hrs

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

Module VI. Fermentation: 2 Hrs

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

Module VII. Irradiation: 2 Hrs

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

irradiation.

Module VIII. Recent trends: **4 Hrs**

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.

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SDC2DT05 DAIRY TECHNOLOGY
(Credits-4 Total Hours: 60)

COURSE OUTCOME

•To understand the chemistry of milk and its products, composition, role of each component and their interactions
•To understand processing preservation and production of milk and milk products
•To be able to evaluate the adulteration in milk and milk products
•To get skilled in the quality check of Milk and milk products
•To get trained in the preparation of different value added products of milk
•To understand the working of a diary unit in a real life situation.

COURSE OUTLINE:

Module I: Introduction **10 Hrs**

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 Hrs**

Milk collection, Transportation, processing of market milk, Different types of cooling systems. Clarification and filtration process, standardization, pasteurization LTLT, HTST and UHT process- continuous pasteuriser, Sterilisation and Homogenisation, Cream separation-centrifugal cream separator, bactofugation.

Module III: Special milks **10 Hrs**

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 Hrs
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 Hrs
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.

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SDC2PF03P PRINCIPLES OF FOOD PRESERVATION (PRACTICAL)
(Total credits-4-Total Laboratory Hours: 60)

COURSE OUTCOME

- To Develop skills in basic and applied aspects of different preservation techniques
- Fundamental understanding of preservation
- Understand the application of Class I and II preservatives and their applications
- Learn to estimate different preservatives used in food industry.

EXPERIMENTS

1) Introduction to preservation equipment's
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

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SDC2DT04P DAIRY TECHNOLOGY (PRACTICAL) (Total Credits: 5 Total Laboratory Hours: 75)

COURSE OUTCOME

- To be able to evaluate plat form test
- To understand the processing and production of different milk products
- To determine quality test in milk
- To detect adulteration test in milk

EXPERIMENTS

1. Milk Testing - Platform Tests.
2. Determination of Activity (Titrable Acidity) of Milk.
3. Determination of fat and SNF content in milk.
4. Determination of specific gravity of milk.
5. Detection of adulteration in milk
6. Determination of quality of milk by MBRT
7. Preparation of Rasamalai.
9. Preparation of Lassi.
10. Preparation of khoa.
11. Preparation of whey drink.
12. Preparation of channa and paneer.
13. Preparation of shrinkand.
14. Preparation of peda.
15. Preparation of milk chocolate.
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

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Semester III

SDC3FS6: FOOD SAFETY, FOOD LAWS &PACKAGING TECHNOLOGY
(Credits-3 Total Hours- 45)

COURSE OUTCOME

- To impart knowledge of various areas related to food processing and packaging.
- To enable the students to familiarize with different processing and preservation techniques of variety foods.
- To emphasize the importance of food safety, food laws and regulations
- To enable the students to understand packaging materials and effective packaging processes.

COURSE OUTLINE:

1 Food Safety & Hygiene 4hrs
Importance of Food Safety, Food Hygiene, High risk food, Low risk food, Danger Zone, Personal hygiene

2 Food Safety and Quality Management 8hrs
GHP, GMP, SOP, HACCP (Food contaminants- Physical, Chemical, Biological and Allergens), ISO 22000, ISO 9001, Codex Alimentarius Commission (Codex), FAO

3 Traceability & Recalling & sampling 8hrs
Tracebility-Objectives and Applications, recalling of products, its procedure, Sampling, Sample collection, sampling tools, Sampling procedure, Analysis.

4 Food Plant Sanitation 4hrs
Structural requirements, SSOP, CIP, Chlorination, Detergents, Disinfectants and Sanitizers

5 Food Laws & Regulations 10hrs
Food Safety and Standards Act, FDA, Evolution in Food laws and regulations- PFA,FPO, AGMARK, BIS,

6 Food Adulteration 2hrs
Common Food adulterants and their tests: Milk, Vegetable oil, Spices, Tea, Pulses, Sugar, honey

8. Introduction to Food Packaging 4hrs
Definition, functions & Properties. Classification of packaging – Primary, Secondary, Tertiary Packaging. Flexible, Rigid & semi rigid packaging materials.

9. Types of packages & Technologies 5hrs
Metal, Glass, Paper, Plastic, Retortable Pouches,CAP, MAP, Smart, active, Aseptic, Biodegradable, Edible packages. Packaging symbols, Nutritional labelling.

REFERENCE

• Sunetra Rodey."Food hygiene and sanitation with case studies"
• Richard A sprenger ,"Hygiene for Management" High field
• Puja Dudeja; Amarjeet Singh; "Food safety implementation from farm to fork"
• Guideline for food recall-FSSAI
• Sunetra Rodey."Food hygiene and sanitation with case studies"
• Sukhneet Suri,Anita Malhotra; "Food science Nutrition and safety".FSSAI Manual;www.fssai.gov.in
• B Sreelekshmi; "Food science"
• FSSAI manual on general guidelines on sampling
• Mathlouthi, M Food Packaging and Preservation . Aspen
• Larousse, Jean Food Canning Technology Wiley-VCH
• Mahadeviah M & Gowramma RV 1996 Food Packaging Materials. Tata McGraw Hill
• Painy FA.1992 A Hand Book of Food Packaging. Blackie Academic
• Stanley S & Roger CG 1970 FoodPackaging AVIPubl
• Gupta,Ajay KR Handbook on Modern Packaging Industries Asia Pacific Business Press Inc
• Srinivasa Gopal TK Sea Food Packaging CIFT.Cochin
• Robertson, Gordon L. Food Packaging Marcel Dekker Inc.
• Hand book of Packaging Technology. Engineering India Research Institute.

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SDC3OA7: INTRODUCTION TO COMPUTERS AND OFFICE AUTOMATION
(Credits-3 Total Hours- 45)

COURSE OUTCOME

- To describe the usage of computers and why computers are essential
- Utilize the internet web resources and evaluate on- line e- resources
- Solve common business problems using appropriate information technology applications and systems
- Identify categories of programs, system software and applications, Organize and work with files and folders
- Describe various types of network standards and communication software

COURSE OUTLINE:

UNIT- 1 **10hrs**

Introduction to computers: Types of computers: Desktop, laptop, notebook and netbook, Hardware: CPU, input/output devices, storage devices- system-software-operating systems, programming language, application, software-Networks-LAN, WAN-client- server

UNIT-2 **11hrs**

Documentation using a word processor (open office writer/M.S word)- introduction to office automation, creating and editing document, formatting document, auto text, auto correct, spelling and grammar tool, document dictionary, page formatting, book mark, advance features- mail merge, macros, tables, file management, printing styles, linking and embedding object.

UNIT- 3 **12hrs**

Electronic spreadsheet (open office calc/MS –powerpoint): introduction to spreadsheet, creating and editing, worksheet, formatting and essential operations, formulas and functions, charts and advanced features- pivot table and pivot chart, linking and consolidation

UNIT -4 **12hrs**

Presentation using (open office impress/ MS power point): presentations, creating, manipulating and enhancing slide, organisational charts, charts, word art, layering art objects, animations and sounds, inserting animated pictures or accessing through object, inserting recorded sound effect or in built sound effect

REFERENCE

1. Michael miller, Absolute beginner's guide to computer basics, prentice hall
2. Russel A stulz, Learn Microsoft office, BPB publication
3. H.M Dietal,et.al., Internet and world wide web- How to program, prentice hall

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SDC3FM8: FOOD MICROBIOLOGY AND VALUE ADDITION (Credits- 3 Total Hours-45)

COURSE OUTCOME

- To understand the structure and characteristics of different microorganism.
- To understand the concept of sterilisation and its importance in food processing
- To understand the spoilage in different food commodities by means of microorganisms
- To understand the importance of microbes in fermented food products
- To get skilled in aseptic culture techniques for bacteria

COURSE OUTLINE:

1. **Introduction to micro-organisms:** **6 Hrs**

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

2. Culture Media **3 Hrs**

Bacteriological Media – Selective, Differential, Enrichment Media.

3. Methods of isolating Pure culture - **3 Hours**

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

4. Control of Microorganism - 6 Hrs

Physical agents – high temperature, low temperature, desiccation, o s m o t i c radiation, filtration. Chemical agents- Characteristics of an ideal antimicrobial chemical agent, Aldehydes, Dyes, Halogens, Phenols, Acids, Alkalis, Gases.

5. Food spoilage - 6 Hrs

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

6. Effect of spoilage - 10 Hrs

Contamination and spoilage of Fruits and Vegetables, Meat & Meat products, Milk & Cream, Cereal & Cereal products, Spoilage of canned food.

7. Microbial intoxications & Infections - 6 Hrs

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

8. Microbes in fermented foods - 8 Hrs

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

REFERENCES:

Banwart GJ ,1989. Basic Food Microbiology. AVI publishers

Jay JM, Loessner MJ & Golden D A 2005. Modern Food Microbiology. Springer Verlag

Ananthanarayanan R Jayaram Paniker CK 2009 Text book of microbiology. University Press Pvt Ltd, Hyderabad

Prescott, L.M, Harley, J.P and Klein, D.A Microbiology. McGraw Hill New York Frazier J& Westhoff DC. 1988. Food Microbiology.

Pelczar JM & Reid RD. Microbiology. Tata McGraw Hill Black, JG. Microbiology. Principles and Explorations John Wiley

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SDC3MT9: MILLING TECHNOLOGY
(Credits-4 Total Hours-60)

COURSE OUTCOME

•To understand various technologies in cereal and pulse processing and milling.
•Understand basic composition and structure of food grain
•Understand the basics of milling operations and byproducts utilization.
•To understand the production, distribution & storage of grains and their valued added products
•To understand the processing of pulses, spices and oilseeds

COURSE OUTLINE:

Module I: Paddy Processing 10 hrs

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

Module II: Rice Milling 15 hrs

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

Module III: Wheat milling 10 hrs

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

Module IV: Milling of Pulses 8 hrs

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

Module V: Oil seed processing 10 hrs

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 hrs

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

SDC3FM5P FOOD MICROBIOLOGY AND VALUE ADDITION

(PRACTICAL)
(Total Credits: 4 Total laboratory Hours: 60 Hours)

COURSE OUTCOME

- Demonstrate theory and practical skills in microscopy and their handling techniques and staining procedure
- To know various culture media and their applications
- Formulation of products with the application of microbes

EXPERIMENTS

1. Introduction to equipments and glassware used in microbiology
2. Practical techniques- Aseptic technique, Flaming loops and bottles, pipptes & syringes, Handling and labelling agar plates, Incubation and storage, Disposal and disinfection
3. Sterilization techniques: Dry heat and moist heat
4. Staining techniques – simple staining, gram staining
5. Isolation of pure culture: Pourplate, Streak plate
6. Plate identification
7. Conduct serial dilution
8. Preparation of fermented products

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SDC3MT6P MILLING TECHNOLOGY
(PRACTICAL)
(Total Laboratory Hours: 75)

COURSE OUTCOME:

- To understand the analysis of basic parameter test in milling industry
- Able to understand practical implication of milling of spices
- To determine adulteration test in spices

EXPERIMENTS

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

8. Adulteration tests in spices
9. Solvent extraction method (Soxhlet apparatus)
10. Physicochemical properties of different spices
11. Determination of alcoholic acidity of flour
12. Physical properties of legumes
13. Milling of spices
14. Preparation of soy milk and soy paneer
15. Visit to rice mill station.
17. 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

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Semester IV

SDC4TM10: TECHNOLOGY OF MEAT AND EGG
(Credits-3 Total Hours-45)

COURSE OUTCOME

- To understand the importance of livestock, egg and poultry in food security.
- To understand slaughter processes in meat animals and poultry
- To understand methods of processing and preservation of animal origin foods and by-product utilisation in this sector.
- To understand egg production practices, egg preservation methods, factors affecting egg quality and measures of egg quality
- To get trained in the structure, composition and nutritional quality of animal origin food products
- To understand the methods of processing and preservation of animal origin food materials
- To get skilled in the preparation of different value added products using meat and egg.

COURSE OUTLINE:

Module 1 Meat introduction, Slaughter and Inspection of Meat - 8 hrs
Meat introduction, Red meat, white meat, game meat, 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.

Module 2 Curing of Meat - 8hrs
Curing definition, Role of ingredients, Methods of curing, Factors affecting quality of cured meat. Processing of Ham, Bacon. Sausage - classification, emulsion, ground sausage, processing, casings,

Module 3 Meat Preservation - 8 hrs
Refrigeration, freezing, thermal processing, canning, dehydration, irradiation, chemicals, antibiotics

Module 4 Meat By products - 6 hrs
Importance, classification and uses, restructured meat, manufacturing of natural casings, Rendering, Feeds, Hides, Skins, Hoofs, Horns.

Module 6 Egg - 15 hrs
Egg –Introduction, Structure, composition and nutritive value of egg, 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.

REFERENCES

Gracey JF Collins DS Meat Hygiene ELBS Person AM Gillet T A Processed Meats.

CBS publishers
Lawrie R A Lawries Meat Science Tata McGrawHhill Mountney T.
Carmen G Prakhurst R Poultry Products Technology CBS Stadelman, William J.. .Egg Science and Technology. CBS.
Parkhurst, Carmen R .Poultry Meat and Egg Production CBS
Ockerman H W Hancen C L Animal Byproduct Processing Elis Horwood

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SDC4SP11: SEAFOOD PROCESSING TECHNOLOGY
(4 Credits Total Hours – 45 hrs)

COURSE OUTCOME

- To understand the microbiology of fish
- To get trained in different equipment used in fish processing
- To understand the principles of different fish preservation methods
- To get skilled in different fish preservation techniques
- To get skilled in different the preparation of different value added products using fish

COURSE OUTLINE:

Module I FISH INTRODUCTION 2hrs
Fish introduction, Structure, composition and nutritive value

Module 2 FISH PRESERVATION 10hrs
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 FISH SALTING AND SMOKING 10hrs
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 FISH PRODUCTS 10hrs
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 FISH- BY-PRODUCTS 10hrs
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 VALUE ADDITION AND SAFETY 3hrs

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, Packaging, 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 VG Fish & Fisheries of India Hindustan Publishing Company
4. Biswas KP A Text Book of Fish and Fisheries Technology Tata McGraw hill

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SDC4FE12 FOOD ENGINEERING
(4 Credits- 60 Hours)

COUSE OUTCCOME

- Identify the mechanism by which various unit operations in food processing optimise
- Understand principles of heat and mass transfer phenomena
- Describe the theories of refrigeration and freezing
- Understand rheological characteristics of food
- Understand the working principles of heat exchangers, evaporators, driers and boilers

COURSE OUTLINE:

Module 1 Engineering properties of food materials 10hrs

Physical properties -Shape and size – criteria for describing shape and size,Volume and density , specific gravity , platform scale method , air comparison pycnometer , porosity, angle repose, Thermal properties-specific heat, thermal conductivity - measurement

Module 2 Rheological properties 5 hrs

Basic concepts and definitions – physical states of matter – classical Ideal materials, Rheological characteristics of fluids - Newtonian and non-Newtonian, Properties of solid foods – Hookean and Non - Hookean, viscoelastic foods

Module 3 Refrigeration & Freezing 5hrs

Refrigeration-Principle of refrigeration, Vapour compression refrigeration cycle.
Freezing- Principle of freezing & freezing rate.
Types of freezers- Air blast, Contact, Immersion, Fluidized bed and Cryogenic freezers.

Module 4 Evaporation **10hrs**

Principle, single effect evaporation, multiple effect evaporation.
Types of evaporators - Horizontal tube, Vertical tube, falling film evaporator,
Raising film Evaporator.

Module 5 Driers **10hrs**

Driers Principle, Drying rate curve- constant rate & falling rate of period of drying.
Types of driers -Drum drier, Cabinet drier, Tunnel drier, spray drier, Fluidized bed drier, Freeze drier

Module 6 Heat Transfer **5hrs**

Mode of heat transfer- Conduction, convection and radiation

Module 7 Heat exchanger **10hrs**

Classification- contact type heat exchange and Non-contact type heat exchanger, Plate Heat exchanger, Scraped surface Heat exchanger, Tubular Heat exchanger, Double& Triple tube Heat exchanger, Shell & Tube Heat exchanger.
Pasteurization: Pasteurization; LTLT, HTST, UHT, pasteurizing equipment

Module 8 Boilers **5hrs**

Boiler- Principle, working of water tube & fire tube boiler

REFERENCES

- Mohensenin N N, PHYSICAL PROPERTIES OF PLANTS ANIMAL MATERIALS, GORDON AND BREACH PUBLISHERS, NEW YORK, 1980.
- Rao M A , Rizvi S S H,Azim K Datta and Jasim Ahmed, Engineering properties of foods 4th Ed., CRC Press
- Singhal,O.P. and Samuel,D.V.K, "Engineering Properties of BiologicalMaterials". Saroj Prakasan, Allahabad 2003.

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SDC4TM7P TECHNOLOGY OF MEAT AND EGG (PRACTICAL)
(Credit-5 Total Laboratory Hours- 75)

COURSE OUTCOME:

- To study processing and preservation of animal foods
- To get skilled in the preparation of different meat and egg products
- Able to determine egg quality parameters
- To study processing of different by-products of meat industry

EXPERIMENTS

1. Slaughtering and dressing of meat (poultry)

2. Study of post mortem changes, cutting and handling
3. Evaluation of meat quality
4. Determination of meat PH
5. Preparation of meat products (chicken pickle, nuggets, meat balls, meat samosa, dried products)
6. Pre- mortem examination
7. PSE. DFD – Observation
8 By product preparation.
9. Curing of meat
10. Determination of egg quality by Haugh unit
12. Preparation of salted eggs
13 Visit to a Meat processing unit
14. Visit to egg processing unit

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SDC4SP8P: SEAFOOD PROCESSING TECHNOLOGY (PRACTICAL)
(Credits -4 Total Laboratory Hours- 60)

COURSE OUTCOME

- Students will learn to develop different fish products.
- Learn different estimation and analysis methods in fish industry
- Understand the quality assessment methods and their application.

EXPERIMENTS

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 liver oil, fish silage, fish glue, fish gelatin, chitin and chitosan.
4. Quality assessment of individual by-products.
5. Preparation of fish pickles.
6. Preparation of fermented fish sauce and marinaded products.
7. Preparation of surimi and surimi based products.
8. Preparation of fish cutlets
9. Preparation of fish sausage
10. Preparation of fish balls
11. Preparation of fish wafers
12. Preparation of fish soup powder
13. Estimation of FFA
12. Peroxide value
13. Iodine Value.
14. Visit to fish processing industry

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

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Semester V

SDC5MM13: MARKETING MANAGEMENT (CREDITS- 4 TOTAL HOURS- 60)

COURSE OUTCOME:

- To provide basic knowledge about the concepts, principles, tools and techniques of marketing
- To impart necessary knowledge which help the student to choose a carrier in the field of marketing
- To expose the students to the latest trends in marketing

COURSE OUTLINES:

MODULE -1 **15Hrs**

Marketing meaning and definition- scope and importance – evolution of marketing concepts- modern concept of marketing- marketing mix- marketing environment- consumer behaviour- buying motives- consumer buying process- factors influencing buying decision- market segmentation- basis- target-marketing – product positioning- importance and bases.

MODULE- 2 **10Hrs**

Product- meaning and importance- classification- concept of product mix- packaging- branding- brand loyalty and brand equity- labelling- product life cycle- new product development- pricing- factors influencing product price- pricing policies and strategies

MODULE- 3 **10Hrs**

Physical distribution- meaning and importance- levels of marketing channels- wholesaling and retailing- types of retailing- factors influencing choice of distribution channel

MODULE -4 **10Hrs**

Promotion- meaning and importance- promotion mix, advertising- personal selling- sales promotion- public relation- factors affecting promotion mix decision

MODULE- 5 **5Hrs**

E-marketing- traditional marketing v/s e-marketing-internet marketing- e- advertising- new trends in internet marketing- e – branding, e- payment systems and security features in internet

MODULE- 6 **10Hrs**

DEVELOPMENTS AND ISSUES IN MARKETING: Rural marketing- features of rural markets- social marketing, services marketing- services marketing v/s product marketing- online marketing- direct marketing- green marketing- relationship marketing- viral marketing- De marketing- Re- marketing- synchro marketing- Niche marketing

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SDC5BU14: BYPRODUCT UTILIZATION AND WASTE MANAGEMENT
(Credits: 2 Total Hours: 30)

COURSE OUTCOME:

- To get the deep knowledge about the type of waste, its generation and the importance of waste management
- To obtain knowledge about effluent treatment
- To understand the waste utilization in agro industries
- To understand the concept of waste utilization of animal and marine product industry

COURSE OUTLINE:

Module I: Introduction 4 Hrs
Scope and importance of waste management and effluent treatment.

Module II: Waste characterization 6 Hrs
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

Module III: Effluent Treatment 8Hrs
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 Hrs
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 4 Hrs
Characterization and utilization of byproducts from dairy, eggs, meat, fish and poultry.

REFERENCES:

1. Abbas Kazmi, Peter Shuttleworth, (2013), "The Economic Utilisation of Food CoProducts", 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.

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SDC5FT15 FLAVOUR TECHNOLOGY & SENSORY EVALUATION
(Credits: 3 Total Hours: 45)

COURSE OUTCOME:

- To develop an understanding of flavours and its analysis
- To get trained to select and implement appropriate sensory methodology for a specified objectives
- To gain experience in data collection and interpretation of sensory data
- To develop and apply the skills to critique sensory methodology

COURSE OUTLINE:

Module 1 Introduction to food flavours 10Hrs
Flavours, types, flavours generated during processing- reaction flavours, flavour composites, stability of flavours during food processing, analysis of flavours, extraction techniques of flavours, flavour emulsions, essential oil and oleoresin flavourings

Module 2: Introduction 6Hrs
Definition of sensory evaluation; basic tastes; human senses and sensory perception; threshold; psychophysics, Tongue surface

Module 3: Arrangements for Sensory Evaluation Test controls 6 Hrs
Environment and test room design; product controls: sample preparation and presentation; panelist controls; factors influencing measurements: psychological and physiological errors

Module 4: Statistical Methods for Sensory Evaluation 10Hrs
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 5: Subjective and objective methods 10Hrs
Texture analyser- mechanical characteristics- chewiness, brittleness, and geometric characteristics, Sensory panel-types-criteria for panel selection.

Module 6: Sensory evaluation of flavours- 3Hrs
Sensory evaluation of flavours, selection of flavourist, flavours and legal issues.

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.

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SDC5TF16: TECHNOLOGY OF FRUITS AND VEGETABLES (Credits -4 Total hours 60)

COURSE OUTCOME

- To understand the processing and preservation of fruits and vegetables using various techniques
- To understand the concept of quality in relation to fruit and vegetable based products.
- To understand maturity indices of fruits and vegetables
- To get trained to develop different fruit products.
- To get skilled in the usage of different equipment used in fruit processing and preservation.
- To get skilled in the preparation of different value added products using fruits.

COURSE OUTLINE:

1. Post -harvest management - 8Hrs

Importance of post-harvest technology of fruits and vegetables, Composition and nutritive value of fruits and vegetables, Maturity indices, Ripening, Changes during ripening- Climacteric & Non-Climacteric, Harvesting and washing, pre- cooling, preservation of fruits and vegetables, blanching, canning of fruits and vegetables, cold storage, Controlled Atmospheric & Modified Atmospheric Storage

2. Fruits and vegetable Processing 8hrs

Jam, jelly, marmalade- Definition, role of pectin and theory of gel formation, method of preservation, steps of preparation and evaluation, defects

Preserves – Method of preservation, steps of preparation, evaluation, crystallized and glazed foods

Pickles- Method of preservation and evaluation

Pectin Definition of pectin, classification, Pectic enzymes, Properties, jelly grade of pectin, testing of pectin.

3. Fruits juices & Fruit preparations 12Hrs

Fruit Juices, Ready to serve beverages, Pulp, Squashes, Cordials, Nectars, Concentrates, fruit bars, Fruit juice powder- Freeze drying, Foam mat drying.

4. Tomato products 7Hrs

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

5. Canning - 7Hrs

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

6. Drying & Dehydration- 9Hrs

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

7. Browning 4Hrs

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

8. Post-harvest handling 5Hrs

Post- harvest losses, Post- harvest handling system for fruits and vegetables of regional importance such as mango, banana, tomato, papaya and jack fruit

REFERENCES:

1. Pandey PH Principle of Practices of Post-harvest Technology Kalyani publication
2. Cruess WV., 1997. Commercial fruit and vegetables Products. Anees offset press, New delhi.
3. Lal,G Siddappa S and Tandon GL. Presrvation of fruit and vegetables. ICAR 4. Thompson AK 1995 Post harvest Technology of Fruits and Vegetables Black well Sci
5. Verma LR& Joshi V.K .,2000 Post Harvest Technology of Fruits & Vegetables. Indus Publ
6. Potter NN , Hotchkiss JH. 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. Interntional Book Distributor.

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SDC5TB17 - TECHNOLOGY OF BEVERAGES
(Credits: 3 Total Hours: 45)

COURSE OUTCOME:

- Ability to understand the science and technology for processing different types of beverages
- Ability to explain processing of fruit juice beverages, carbonated beverages, dairy based beverages, tea and coffee
- Understanding the quality evaluation of alcoholic beverages
- To understand the manufacturing process and quality evaluation of packaged drinking water

COURSE OUTLINE:

Module I: Introduction to beverages 10hrs

Types of beverages and their importance, status of beverage industry in India, Manufacturing technology for juice-based beverages, synthetic beverages, carbonated, low-calorie and dry beverages, isotonic and sports drinks; role of various ingredients of soft drinks, carbonation of soft drinks.

Module II: Manufacturing process of beverages 8hrs

Beverages based on tea, coffee, cocoa, spices, Dairy-based beverages.

Module III: Types of coffee and tea **10hrs**

Chemical composition and processing of tea and coffee and their quality assessment. Types of tea: black tea, green tea, oolong tea, grades. Types of coffee: Vaccum coffee, drip coffee, iced coffee. Espresso coffee, instant coffee. Decaffeination of Coffee, types of decaffeination, processing of cocoa, cocoa powder, chocolate, cocoa liquor

Module IV: Alcoholic beverages **12hrs**

Types, manufacture and quality evaluation; the role of yeast in beer and other alcoholic beverages, ale type beer, lager type beer, technology of brewing process, equipments used for brewing and distillation, wine and related beverages, distilled spirits.

Module V: Packaged drinking water **5hrs**

Definition, types, manufacturing processes, quality evaluation and raw and processed water, methods of water treatment, BIS quality standards of bottled water; mineral water, natural spring water, flavoured water, carbonated water.

REFERENCE

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

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SDC5FT9P: FLAVOUR TECHNOLOGY & SENSORY EVALUATION (PRACTICALS) (Credits- 4 Total Laboratory Hours- 60)

COURSE OUTCOME:

- Methods of analysis used in food industry for sensory evaluation.
- Study about different attributes of food and its significance
- Learn the procedures required to conduct sensory evaluation.

EXPERIMENTS

1. Sensory attributes of food and beverages and their perceptions
2. Appearance, flavour, taste, aroma, texture/ mouth feel
3. Sensory evaluation methodology
4. Threshold measurements

5. Scaling procedures
6. Difference test
7. Descriptive analytical test
8. Consumer test
9. Instrumental measurements
10. Sensory analysis of flavoured foods
11. Correlation of subjective and objective methods
12. Study of off flavours in different foods
13. Analysis of different types of flavours such as whole and powdered spices, essential oils, oleoresins, synthetic flavours, plated and dispersed spices general test

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SDC5TF10P TECHNOLOGY OF FRUITS AND VEGETABLES (PRACTICAL)
(Credits-5 Total Hours- 75)

COURSE OUTCOME

- Ability to assess the quality of fruits and vegetables
- Ability to establish the quality specifications for processing of fruits and vegetables
- Ability to develop various fruits and vegetables products with quality assurance and safety
- Understand principles and methods of preservation of fruits and vegetables
- To develop proficiency skill in preserving fruits and vegetables into various products

EXPERIMENTS

1. Handling and operating of food processing equipment and Instruments
2. Quality evaluation of fruits and vegetables.
3. Quantitative analysis of cut fruits and vegetable yield.
4. Determination of Degree Brix (TSS)
5. Determination of pH and % acidity in fruits and vegetable products.
6. Estimation of benzoic acid
7. Determination of sulphur dioxide
8. Estimation of KMS
9. Estimation of reducing and non-reducing sugars in fruit and vegetable products
10. Estimation of chloride content in food products.
11. Preservation of fruits juices with addition of preservative.
12. Preparation of tomato juices, puree, sauces, ketchups, soup, paste.
13. Preparation of jam
14. Preparation of jelly
15. Preparation of marmalades.
16. Preparation of preserves, candies
17. Preparation of crystallized and glazed fruits and fruit bars.
18. Preparation of chutney
19. Preparation of sauerkraut

20. Preparation of grape raisins
21. Preparation of banana fig
22. Preparation of Tweety fruity
23. Preparation of mango and mixed pickles.
24. Visit to fruits and vegetable processing industry

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SDC5TB11P: TECHNOLOGY OF BEVERAGES AND BYPRODUCT UTILISATION (PRACTICALS) (Credits- 5 Total Laboratory Hours- 75)

COURSE OUTCOME:

- Ability to use laboratory techniques to analyse water
- To develop skills in preparation of different beverages
- Able to determine quality test in beverages

EXPERIMENTS

1. Quality analysis of water from different sources and treatments
2. Determination of aqueous extraction of tea/coffee
3. Test for chicory in coffee
4. Detection of sodium benzoate in beverage
5. Measurement of pH and acidity of beverage
6. Preparation of RTS beverage
7. Preparation of carbonated beverage
8. Specifications for different fruit beverages and preparation of fruits squash
9. Determination of sulphur dioxide in beverages
10. Preparation of different types of wine
11. Preparation of beverage using artificial sweetener
12. Visit to mineral water plant

Sl. No	Job Role	Qualification Packs	NSQF Level
1	Supervisor: Fruits and Vegetables Processing	FIC/Q0109	5
2	Processed Food Entrepreneur	FIC/Q9001	5

Sl. No	Job Role	Qualification Packs	NSQF Level
3	Manager/Asst Manager - Procurement	FIC/Q9003	7

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