

**B.Sc. Food Science And Quality Control
SYLLABUS 2017 ONWARDS**

**DEPT. OF FOOD SCIENCE AND QUALITY CONTROL
(MODEL III- VOCATIONAL PROGRAMME)
BCM COLLEGE , KOTTAYAM**

PROGRAMME : B.Sc. Food Science and Quality Control

GPO No.	GRADUATE PROGRAMME OUTCOMES
GPO 1	Effective Communication and Critical Thinking
GPO 2	Lifelong Learning
GPO 3	Skills and Ethical Standards In Industry and Business
GPO 4	Environmental and Legal Consciousness
GPO 5	Social Interaction

PSO No	PROGRAMME SPECIFIC OUTCOMES (PSO)	GPO No.
PSO1	Understand the multidisciplinary sciences involved in Food , Safety and its Management and related subject enrichment	2
PSO2	Develop practical skills in laboratory knowledge and skills in basic food chemistry, microbiology and analysis of foods at basic and advanced levels	2,3
PSO3	Develop Communication skill and critical thinking , Industrial skill , with on the job training and industrial projects in reputed food industries , food certification programmes.	1,2,3
PSO4	Interpretations and explanations of testing methods employed in practical and theory , its levels , accuracy and significance	2,3
PSO5	Generate Skill in handling food related micro organisms , chemicals , personal and consumer safety and implementation of sanitation and hygienic techniques in industry	2,3
PSO6	Differentiate concepts , tools and techniques related to statistical analysis , applied zoology , advanced chemistry and its applications in the science of Foods	1,2,3
PSO7	Creation of Product Formulations As a Basis for Research and Development	1,3
PSO8	Understanding environmental issues, Human Rights, Its Over exploitation and its drastic effect on food chain as well as remedial measures to be adopted	4,5
PSO9	Basic understanding of management and entrepreneurship as options for start ups	1,3,4,5

SEMESTER- 1

BASIC NUTRITION

Course	Details
Code	FS1CRT01
Title	BASIC NUTRITION
Degree	B.Sc.
Branch(s)	Food Science
Semester	I
Type	CORE
Credits	3
Total hours	72
Hours per week	4

Course Outcomes

CO No.	Expected Course Outcomes Upon completion of this course the students will be able to:	Cognitive level	PSO No.
1	Retrieve knowledge from foundational sciences as a basis for understanding the role of food and nutrients in health and disease.	Re	PSO1,6
2	Integrate scientific information, research, and critical thinking into evidence- based practice.	An	PSO4
3	Attribute professionalism and ethical behavior in all areas of practice.	An	PSO8
4	Infer the advocacy on issues that affect public health and nutrition policy.	U	PSO1
5	Interpret the basis for lifelong learning and interprofessional collaboration.	U	PSO8
6	Implement strategies for food access, procurement, preparation, and safety that are relevant for the culture, age, literacy level, and socio-economic status of clients and groups.	Ap	PSO1
7	Identify the food system management and leadership functions that consider sustainability in business, healthcare, community, and institutional arenas.	Re	PSO1,8,9

Course Description

Module	Course Description	Hrs	CO
1	Introduction to Nutrition		
1.1.	General Introduction, Definition of Balanced diet , Nutrition, Health, Malnutrition, Food , Nutrients	4	1

1.2	Functions of Food	2	1
1.3	Basic Food Groups	2	1
1.4	Inter relationship between Nutrition and Health	2	7
1.5	Malnourishment- Definition, Types	2	4
2	Water and Its Use In the Body		
2.1	Distribution, Requirements and Source	7	5
2.2	Water Balance, Unit of Measurement , Deficiency and Toxicity	7	1
3.	Proximate Principles- Carbohydrates, Proteins and Fats		
3.1	Carbohydrates- Introduction, Classification, Sources, Functions, Deficiency and Toxicity, Unit of Measurement, RDA	4	1,3,4,7
3.2	Proteins-Introduction, Classification, Sources, Functions, Deficiency and Toxicity, Unit of Measurement, RDA	5	1,3,4,7
3.3	Fats-Introduction, Classification, Sources, Functions, Deficiency and Toxicity, Unit of Measurement, RDA	5	1,3,4,7
4	Vitamins and Minerals		
4.1	Vitamins-Introduction, Classification (Fat Soluble and Water Soluble), Sources, Functions, Deficiency and Toxicity, Unit of Measurement, RDA	8	1,3,4,7
4.2	Minerals- Calcium, Phosphorous, Iron, Iodine, Sodium, Potassium, Zinc, Copper, Nickel, Lead-Introduction, Classification (Fat Soluble and Water Soluble), Sources, Functions, Deficiency and Toxicity, Unit of Measurement, RDA	8	1,3,4,7
5	Energy		
5.1	Introduction, Calorific Value of Foods	4	1,2,4
5.2	Determination of Calorific Value	4	1
5.3	BMR, SDA, Sources	4	1
5.4	Deficiency, PEM, Requirements , RDA, Unit of measurement	4	4,6,7

REFERENCES

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

FOOD CHEMISTRY

Course	Details
Code	FS1CRT02
Title	FOOD CHEMISTRY
Degree	B.Sc.
Branch(s)	Food Science
Semester	I
Type	CORE
Credits	3
Total hours	72
Hours per week	4

Course Outcomes

CO No.	Expected Course Outcomes Upon completion of this course the students will be able to:	Cognitive level	PSO No.
1	Explain properties and reactions of the proximate principles(Carbohydrates, Proteins and Lipids) during storage and processing of food and how these influence the quality and properties of food.	U	PSO1,4
2	Explain the importance of water for food stability and quality.	U	PSO1
3	Differentiate the main classes of compounds influencing food pigments and antioxidants in food, knowledge on important sources of vitamins and minerals in food and how other quality aspects can be affected	U	PSO1
4	Interpret the role of enzymes and its mechanism of action in food	U	PSO1

Course Description

Module	Course Description	Hrs	CO
1	Introduction to Food Chemistry		
1.1	Water (Structure of water and ice, Physical constants of water, Types of water, Water activity)	7	2
1.2	Composition of Food- Carbohydrates, Proteins, Lipids, Vitamins & Minerals	7	1
2	Carbohydrates		
2.1	Monosaccharide- Classification., Optical Activity D-and L-forms. Muta-Rotation. Straight and Ring structure of glucose, fructose and galactose.	3	1
2.2	Oligosaccharides- Classification.Reducing & Non-reducing sugar. Glycosidic bonds. Structure of sucrose, maltose, iso-maltose & lactose .Inversion of sucrose.	3	1

2.3	Polysaccharides Classification. Structure of starch, cellulose, glycogen, pectin, hyaluronic acid. Difference between amylose & amylopectin .Gelatinization of starch. Theories of gel formation .	3	1
2.4	Chemical Reactions of Carbohydrates Reactions involving glycosidic-OH group.Reactions involving alcoholic-OH group. Reactions involving both glycosidic & alcoholic-OH group. Oxidation reactions.	4	1
2.5	Browning reactions - Enzymatic & Non-enzymatic browning.	3	1,3,4
3.	Proteins and Enzymes		
3.1	Classification of amino acid- structure, essential and non essential amino acids, zwitter ion, isoelectric point, amphoteric property, Peptide bond. biological roles of protein.	2	1,3,
3.2	Classification of protein according to shape; classification of protein according to composition and solubility Structure of protein, chemical bonds involved in protein structure	2	1,3,
3.3	Physical-chemical properties of proteins; colour and taste, shape of size, molecular weight, colloidal nature, amphoteric nature, ion bonding capacity, solubility, optical activity, precipitation with antibodies	2	1,3,
3.4	Denaturation-agents causing denaturation, changes occurring during denaturation	1	1,3,
3.5	Chemical reaction-hydrolysis, Reactions involving COOH group, Reactions involving NH ₂ group, Reactions involving R groups or side chain.	2	1,3,
3.6	EnzymesIntroduction, classification of enzyme,enzyme kinetics, enzyme activity, factors affecting enzyme activity	3	1,3,4
3.7	Enzyme inhibitors- reversible (Competitive & Noncompetitive), irreversible	1	1,3,4
3.8	Enzyme activators; regulation of enzyme activity- zymogens inactivation, covalent modification and feedback inhibition	2	1,3,4
3.9	Enzymes used in food industry	1	1,3,4
4	Lipids		
4.1	Classification of lipids according to chemical composition, fatty acids; saturated and unsaturated fatty acids. Fatty acids-essential fatty acids structure, chemical reactions of lipids.	3	1,3
4.2	Physical properties - melting point, polymorphism, softening point, slipping point, specific gravity, refractive index, smoke flash and fire points, turbidity points,	3	1,3
4.3	Chemical properties- RM, P,K values Saponification value, iodine value, acid value	2	1,3
4.4	Rancidity: Hydrolytic and oxidative rancidity; mechanism of auto oxidation of fat; reversion Antioxidants- natural and synthetic	2	1,3,4
4.5	Technology of edible fats and oils; hardening of fat hydrogenation and inter esterification	2	1,3,4
4.6	Emulsion and emulsifiers.	2	1,3

5	Food Pigments		
5.1	Introduction, classification, types of food pigments- chlorophyll,	3	1,3
5.2	Introduction, classification, types of food pigments-carotenoids	3	1,3
5.3	Introduction, classification, types of food pigments-Anthocyanins	3	1,3
5.4	Introduction, classification, types of food pigments-Flavonoids	3	1,3

REFERENCES

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

METHODOLOGY IN DISCIPLINE OF FOOD SCIENCE

Course	Details
Code	FS1CRT03
Title	Methodology in the Discipline of Food Science
Degree	B.Sc.
Branch(s)	Food Science
Semester	I
Type	CORE
Credits	3
Total hours	72
Hours per week	4

Course Outcomes

CO No.	Expected Course Outcomes Upon completion of this course the students will be able to:	Cognitive level	PSO No.
1	Understand some basic concepts of research and methodology in relation to food science	U	PSO1,4
2	Implement and define appropriate research and its parameters	Ap	PSO1,4,6
3	Plan and design an innovative food product	C	PSO7

Course Description

Module	Course Description	Hrs	CO
1	Introduction to Food Science		
1.1	What is Food science and Quality Control?	3	1
1.2	Early history of food science, its developments	3	1
1.3	Preparation of a career in food science	3	1
1.4	Activities of food scientists	2	1
1.5	Components of a food industry	2	1
1.6	Allied industries	2	1
2	Innovations		
2.1	Importance of new products and product technology	3	3
2.2	New applications of membranes in food processing	3	3
2.3	Cross flow membrane technology	3	3
2.4	Next generation products	3	3
2.5	Competitive behaviour	3	3
3	Types of Research		
3.1	Introduction to research, Research design	3	2

3.2	Sampling	3	2
3.3	Measurement and scaling techniques	2	2
3.4	Importance in the field of Food Science	2	2
4	Experimentation in Science		
4.1	Hypothesis, Formulation of Hypotheses- Deductive model and Inductive model	5	2
4.2	Design of an experiment: experimentation, observation, data collection, interpretation and deduction	5	2
4.3	Making observations: direct, indirect controlled and uncontrolled, human and machine observations	4	2
4.4	Scientific instruments used in food science	4	2
5	Data Handling and Ethics in Science		
5.1	Documentation of experiments, nature and types of data	4	2
5.2	Significance of statistical tools in data presentation	3	2
5.3	Data presentations- graphs, tables, histograms and pi diagrams	3	2
5.4	Statistical testing of hypotheses, null hypotheses, significance tests, Correlation	4	2

References:

Kothari, C.R. (2004). *Research methodology-methods and techniques*. (2nd ed.). New Delhi, India: New Age International (P) Ltd.

Singh, Y.K. (2006). *Fundamental of research methodology and statistics*. New Delhi, India: New Age International (P) Ltd.

SEMESTER II

FOOD COMMODITIES

Course	Details
Code	FS2CRT04
Title	Food Commodities
Degree	B.Sc.
Branch(s)	Food Science
Semester	II
Type	CORE
Credits	3
Total hours	72
Hours per week	4

Course Outcomes

CO No.	Expected Course Outcomes Upon completion of this course the students will be able to:	Cognitive level	PSO No.
1	To understand what are food commodities and the commonly consumed foods that are ingested for their nutrient properties	Re	PSO1,3
2	To understand the composition, nutrient value , processing methods , preservation and storage methods of various commodities	Re	PSO1,3,5
3	Attribute professionalism and ethical behavior in all areas of practice of processing of foods	An	PSO9
4	Infer the advocacy on issues that affect public health and nutrition policy.	U	PSO1,8
5	Apply knowledge of various commodities into product development	U	PSO7
6	Implement strategies for food access, procurement, preparation, and safety that are relevant for the culture, age, literacy level, and socio-economic status of clients and groups.	Ap	PSO1,3,4,8,9

*PSO –Program Specific Outcome; CO- Course Outcome
Cognitive Level: R- Remember, U-Understanding, Ap- Application; An- Analyse; E- Evaluate;
C-Create

Course Description

Module	Course Description	Hrs	CO
1	Perishable Food Commodities- Milk, Meat, Fish, Egg and Poultry-		
1.1	Milk- Introduction, Composition, Types, Processing, Products , Uses in Indian Cookery	3	1,2,3,4,5,6
1.2	Meat- Introduction, Composition, Types, Processing, Products , Uses in Indian Cookery	2	1,2,3,4,5,6
1.3	Fish- Introduction, Composition, Types, Processing, Products , Uses in Indian Cookery	2	1,2,3,4,5,6

1.4	Egg- Introduction, Composition, Types, Processing, Products , Uses in Indian Cookery	3	1,2,3,4,5,6
1.5	Poultry- Introduction, Composition, Types, Processing, Products , Uses in Indian Cookery	2	1,2,3,4,5,6
2	Semi Perishable Food Commodities- Fruits and Vegetables, Fats and Oils		1,2,3,4,5,6
2.1	Fruits -Introduction, Composition, Types, Processing, Products , Uses in Indian Cookery	6	1,2,3,4,5,6
2.2	Vegetables- Introduction, Composition, Types, Processing, Products , Uses in Indian Cookery	6	1,2,3,4,5,6
2.3	Fats and Oils -Introduction, Composition, Types, Processing, Products , Uses in Indian Cookery	4	1,2,3,4,5,6
3	Non Perishable Food Commodities- Cereals , Pulses and Legumes,Oils seeds and Spices		1,2,3,4,5,6
3.1	Cereals- Introduction, Composition, Types, Processing, Products , Uses in Indian Cookery	5	1,2,3,4,5,6
3.2	Pulses and Legumes- Introduction, Composition, Types, Processing, Products , Uses in Indian Cookery	3	1,2,3,4,5,6
3.3	Oils seeds- Introduction, Composition, Types, Processing, Products , Uses in Indian Cookery	3	1,2,3,4,5,6
3.4	Spices- Introduction, Composition, Types, Processing, Products , Uses in Indian Cookery	5	1,2,3,4,5,6
4	Types of Foods		1,2,3,4,5,6
4.1	Neutraceuticals	2	1,2,3,4,5,6
4.2	Probiotics	1	1,2,3,4,5,6
4.3	Prebiotics	1	1,2,3,4,5,6
4.4	GM Foods	1	1,2,3,4,5,6
4.5	Organic Foods	1	1,2,3,4,5,6
4.6	Traditional Foods	1	1,2,3,4,5,6
4.7	Fabricated Foods	2	1,2,3,4,5,6
4.8	Junk Foods	1	1,2,3,4,5,6
4.9	Fast Foods	1	1,2,3,4,5,6
4.10	Convenience foods	1	1,2,3,4,5,6
4.11	Ready To Serve And Ready To Eat (RTS and RTE)	2	1,2,3,4,5,6
5	Sugar and Confectionary- Sugar, Jaggery, Honey, Syrup		1,2,3,4,5,6
5.1	Sugar- Manufacture, Selection, Storage and Use as Preservative	4	1,2,3,4,5,6
5.2	Jaggery -Manufacture, Selection, Storage and Use as Preservative	2	1,2,3,4,5,6
5.3	Honey - Manufacture, Selection, Storage and Use as Preservative	2	1,2,3,4,5,6
5.4	Syrup - Manufacture, Selection, Storage and Use as Preservative	2	1,2,3,4,5,6
5.5	Confectionary- Manufacture, Selection, Storage	4	1,2,3,4,5,6

REFERENCES

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

FOOD PRESERVATION

Course	Details
Code	FS2CRT05
Title	Food Preservation
Degree	B.Sc.
Branch(s)	Food Science
Semester	II
Type	CORE
Credits	3
Total hours	72
Hours per week	4

Course Outcomes

CO No.	Expected Course Outcomes Upon completion of this course the students will be able to:	Cognitive level	PSO No.
1	Understand the basic principles of food preservation processes	Re	PSO1,3
2	Understand the mechanisms of spoilage of foods and raw materials	Re	PSO1,3,4,6
3	Recognize the range of processing operations used in food preservation techniques	Re	PSO1,5
4	Recall the sources and variability of raw food material and the impact on food processing operations	U	PSO1,5
5	Compare food quality (texture, sensory, structure/appearance, etc.) to the chemical composition, processing and storage conditions	U	PSO1,3,5
6	Recognize effects of processing and storage conditions on shelf life of food	Re	PSO1,4,5

*PSO –Program Specific Outcome; CO- Course Outcome
Cognitive Level: R- Remember, U-Understanding, Ap- Application; An- Analyse; E- Evaluate;
C-Create

Course Description

Module	Course Description	Hrs	CO
1	FOOD PRESERVATION		
1.1	Introduction and Importance	4	1
1.2	Principles and Types	8	1
2	HIGH AND LOW TEMPERATURE PRESERVATION		
2.1	Pasteurization	3	1,3,4,5
2.2	Streilization	3	1,3,4,5
2.3	Canning	4	1,3,4,5
2.4	Freezing	2	1,3,4,5

2.5	Refrigeration	2	
3	MOISTURE REMOVAL PRESERVATION TECHNIQUES		
3.1	Concentration	3	1,3,4,5
3.2	Drying	3	1,3,4,5
3.3	Dehydration	4	1,3,4,5
3.4	Freeze Drying	3	1,3,4,5
3.5	Dehydro Freezing	3	1,3,4,5
4	ELECTRIC CURRENT AND PRESERVATIVES		
4.1	Ohmic Heating	2	1,3,4,5
4.2	Pulse Electric Field	2	1,3,4,5
4.3	High Pressure Processing	2	1,3,4,5
4.4	Class I and Class II Preservatives, Its Role, Permitted Preservatives and Levels	2	1,3,4,5
4.5	Preparation of Jam, Jelly, Marmalades, Preserves, Candy, Glaced , Crystallized Fruits, Sauces, Chutney and Pickles	8	1,3,4,5
5	FERMENTATION, IRRADIATION, COMBINATION AND PICKLING TECHNIQUES		
5.1	Types of Fermentation	2	1,3,4,5
5.2	Fermented Foods	4	1,3,4,5
5.3	Properties of Irradiation	4	1,3,4,5
5.4	Microwave Heating	4	1,3,4,5

REFERENCES

1. Subalakshmi, G and Udipi, S.A. Food processing and preservation; New Age International Publishers, New Delhi, 2001.
2. Srilakshmi, B. Food Science. New Age International Publishers, New Delhi, 2003.
3. Potter, N.N. and Hotchkiss J. H. Food Science.CBS publishers and distributors. 1996.
4. Srivastava, R.PO and Kumar, S. Fruit and vegetable preservation, International Book distribution Company, Lucknow, 1994.
5. MC.Williams, M and Paine, H. Modern Food preservation. Surjeet Publications, Delhi, 1984.
6. Cruess, W.V. Commercial Fruits and Vegetable Products, Anees Offset press, New Delhi, 1997

FOOD MICROBIOLOGY ,SANITATION AND HYGIENE

Course	Details
Code	FS2CRT04
Title	Food Microbiology, Sanitation and Hygiene
Degree	B.Sc.
Branch(s)	Food Science
Semester	II
Type	CORE
Credits	3
Total hours	72
Hours per week	4

Course Outcome

CO No.	Expected Course Outcomes Upon completion of this course the students will be able to:	Cognitive level	PSO No.
1	Understand causes of food borne illnesses	Re	PSO1,5
2	Explain the characteristics,growth,morphology and prevention of disease causing micro organisms , food borne illnesses and suspect foods in a commercial kitchen	Re	PSO1,4,5
3	Recognize food poisoning, chemical food poisoning, and food infection	Re	PSO1
4	Illustrate proper techniques for storing supplies and rodent control techniques	U	PSO1,3,5
5	Describe proper handling techniques for potentially hazardous foods	Re	PSO1,3,5
6	Identify proper hygienic requirements for food handlers and premises	Re	PSO1,3,5,8
7.	Identify and understand the nature of micro organisms , its media and equipment beneficial effects	Re	PSO1,3,5

Course Description

Module	Course Description	Hrs	CO
1	INTRODUCTION TO MICROBIOLOGY		
1.1	haracteristics and morphology of bacteria, fungi, virus, algae and protozoa	2	1
1.2	Introduction to microscope	2	7
1.3	Culture Medias, types and Culture techniques	2	7
1.4	Microbial Growth curve	2	2
1.5	Factors affecting microbial growth	2	2
1.6	Beneficial microbes in food industry- SCP, Fermentation,Enzymes	2	7
2	FOOD BORNE ILLNESS AND DISEASES ASSOCIATED WITH MICROORGANISMS		
2.1	Definition, Classification (Food infections and intoxication)	3	1,3
2.2	Food hazard- definition, types	3	1,3,5,6

2.3	Food poisoning- types, prevention and control	4	1,3,5,6
2.4	Diseases- neurolathyrism, Boutilism, aflatoxin, ergotism, staphylococcal intoxication, salmanellosis etc	4	1,3,5,6
3	SPOILAGE AND CONTAMINATION OF DIFFERENT FOODS		
3.1	Cereal and cereal products	2	2,3,5,6,7
3.2	Sugar and sugar products	2	2,3,5,6,7
3.3	Fruits and vegetable products	2	2,3,5,6,7
3.4	Meat and meat products	2	2,3,5,6,7
3.5	Fish and Fish products	2	2,3,5,6,7
3.6	Egg and poultry	2	2,3,5,6,7
3.7	Milk and Milk Products	2	2,3,5,6,7
3.8	Canned Foods	2	2,3,5,6,7
4	CLEANING METHODS & TECHNIQUES		2,3,5,6,7
4.1	CIP	3	2,3,5,6,7
4.2	COP	3	2,3,5,6,7
4.3	Cleaning equipments & Sanitizers	2	2,3,5,6,7
4.4	Sterilization & Disinfection	2	2,3,5,6,7
4.5	Use of detergents, heat, chemicals	3	2,3,5,6,7
4.6	Cleaning compounds	3	2,3,5,6,7
5	CONTROL OF INFESTATION		
5.1	Rodent Control	5	4
5.2	Insect Control	3	4
5.3	Pest Control	3	4
5.4	Uses of Pesticides	3	4

REFERENCES:

1. Frazier, W.C. Food Micro biology . 4th edition. Mc Graw Hill. Newyork.
2. Pelzar, H.J. and Rober, D. Microbiology 5th edition Mc Graw Hill. Newyork
3. Banwart, G.T. Basic Food Microbiology. CBS Publishers, New Delhi.
4. Narayanan, L.M., Mani,L., Microbiology.Saras Publications, Nagercoil.
5. Bryan,F.L., Diseases transmitted by foods. Munich Publishers, Atlanda.
6. Jacob.M, Safe food handling, a training guide for Manager, WHO, Geneva, MARRIOTT.N.G (1989)

III SEMESTER

PROCESSING TECHNOLOGY OF ANIMAL FOODS

Course	Details
Code	FS3CRT08
Title	PROCESSING TECHNOLOGY OF ANIMAL FOODS
Degree	B.Sc.
Branch(s)	Food Science
Semester	III
Type	CORE
Credits	3
Total hours	72
Hours per week	4

Course Outcome

CO No.	Expected Course Outcomes Upon completion of this course the students will be able to:	Cognitive level	PSO No.
1	Understand the types of animal foods , its processing and importance	U	PSO1
2	Describe the process of red and white meat, slaughter, explain meat structure and inspect meat parameters, Process manufactured meat products to produce variety of animal food products.	Re	PSO1
3	Identify the areas of concern in the processing of meat products, in relation to process control and export.	Re	PSO1
4	Exemplify the requirements for meat export and chemical and physiological structure of meat	U	PSO1
5	Distinguish processing techniques used to produce a variety of milk products.	An	PSO1
6	Analyse the process of harvesting, processing and storage of seafood.	An	PSO1,2,3
7	Evaluate variety of egg products produced in the food processing industry including egg structure and egg quality.	Ev	PSO1,2,3

Course Description

Module	Course Description	Hrs	CO
1	INTRODUCTION TO POST HARVEST TECHNOLOGY		

1.1	Introduction, Definition	4	1
1.2	Primary and secondary processing, Importance	8	1
2	PROCESSING TECHNOLOGY OF MILK AND MILK PRODUCTS		
2.1	Milk- Definition, composition, method of manufacture, use	1	1,5
2.2	Butter- Definition, composition, method of manufacture, use	1	1,5
2.3	Butter Oil- Definition, composition, method of manufacture, use	1	1,5
2.4	Ice cream- Definition, composition, method of manufacture, use	2	1,5
2.5	Cheese- Definition, composition, method of manufacture, use	2	1,5
2.6	Condensed milk- Definition, composition, method of manufacture, use	2	1,5
2.7	Dried Milk- Definition, composition, method of manufacture, use	2	1,5
2.8	Yoghurt- Definition, composition, method of manufacture, use	2	1,5
2.9	Indian Dairy Products- Kheer, Khoa, Rabri, Kulfi, Dahi, Shrikdhand, Paneer, Channa, Ghee.	3	1,5
3	PROCESSING TECHNOLOGY OF EGG		
3.1	Changes during storage, processing , functions of egg in cookery	6	1,7
3.2	Egg Quality ,Egg Grading	4	1,7
3.3	Egg products	4	1,7
4	PROCESSING TECHNOLOGY OF MEAT AND POULTRY		
4.1	Meat- types methods of slaughter,	2	1,2
4.2	Antimortem inspection	2	1,2,3
4.3	Post mortem changes in meat	2	1,2,3
4.4	Tenderizing of meat	2	1,2,3
4.5	Grading of Meat,	2	1,2,3
4.6	Processing of meat	2	1,2,3
4.7	Sausage, Salami, Bacon, Ham	2	1,2,3

4.8	Poultry- Classification, processing	2	2
5	PROCESSING TECHNOLOGY OF FISH		
5.1	Types of sea foods	4	1,5
5.2	Fish processing	4	5
5.3	Fish Products	6	5

REFERENCES:

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

SENSORY EVALUATION

Course	Details
Code	FS3CRT09
Title	SENSORY EVALUATION
Degree	B.Sc
Branch(s)	Food science
Semester	III
Type	CORE
Credits	4
Total hours	72
Hours per week	4

Course Outcome

CO No.	Expected Course Outcomes Upon completion of this course the students will be able to:	Cognitive level	PSO No.
1	Understand ability to identify solutions to problems related to the sensory analysis of food and to apply and expand upon the theoretical concepts as presented in lectures	U	PSO1,2
2	Illustrate familiarity and competence with the practical skills and techniques used to analyse the sensory properties of food. This will include experimental planning, the preparation of suitable samples	U	PSO2,4,5,6
3	Recognize terminology, appropriate to the field of sensory analysis, correctly and contextually.	Re	PSO1
4	Explain the benefits and limitations (scientific and ethical) of the sensory evaluation of food	U	PSO1

Course Description

Module	Course Description	Hrs	CO
1	INTRODUCTION TO SENSORY EVALUATION AND QUALITY ATTRIBUTES		
1.1	Definition and importance of sensory evaluation	6	1,3
1.2	Quality attributes –appearance, flavor, texture and additional quality factors	6	1,3
2	PRACTICAL REQUIREMENTS AND GENERAL TESTING CONDITIONS		
2.1	Testing area ,testing set up ,lighting, testing schedule	3	2
2.2	Preparation of samples, sample coding	4	2
2.3	Evaluation card preparation,	3	2

2.4	Trained & untrained panel members	4	2
3	SENSORY ASSESSMENT OF FOOD QUALITY		
3.1	TASTE (GUSTATION) Introduction , importance of gustation, Taste sense to mouth, tongue Chemical dimensions of basic tastes- sweet, bitter, sour, salt and umami.Taste enhancers, perception of taste Taste measurement- E-tongue	4	1,2,3,4
3.2	ODOUR AND FLAVOR (OLFACTION) Introduction and importance of odour and flavor, Smelling techniques- Vonskramlk Test, E- Nose and theories of olfaction.	3	1,2,3,4
3.3	COLOR Introduction and importance of color, Dimensions of color, perception of color	3	1,2,3,4
3.4	TEXTURE Introduction, definition and importance ,Texture classification,Texture measurement	3	1,2,3,4
3.5	OTHER SENSES Temperature sensation, pain sensation, touche sensation, kinesthetic sensations, and sound sensations etc.	3	1,2,3,4
4	SENSORY TESTING OF FOODS		
4.1	Threshold tests	2	1,2,3,4
4.2	Descriptive test	2	1,2,3,4
4.3	Discriminative tests,	2	1,2,3,4
4.4	Ranking tests,	2	1,2,3,4
4.5	Hedonic tests,	2	1,2,3,4
4.6	Acceptance and preference tests,	2	1,2,3,4
4.7	Scoring tests	2	1,2,3,4
4.8	Sensitivity tests	2	1,2,3,4
5	DATA ANALYSIS		
5.1	Importance of data analysis, tests of significance	3	2,3
5.2	Null hypothesis	3	2,3
5.3	Mean, median	1	2,3

5.4	Variance, standard deviation	3	2,3
5.5	t-test ,chi-square test	4	2,3

REFERENCE

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

FOOD PACKAGING MATERIALS AND TESTING

Course	Details
Code	FS3CRT8
Title	FOOD PACKAGING MATERIALS AND TESTING
Degree	B.Sc.
Branch(s)	Food Science
Semester	III
Type	CORE
Credits	3
Total hours	72
Hours per week	4

Course Outcome

CO No.	Expected Course Outcomes Upon completion of this course the students will be able to:	Cognitive level	PSO No.
1	Understand the types and concepts of packaging	U	PSO1
2	Interpret the role and function of packaging materials used for a range of consumer food needs and wants.	U	PSO1,8
3	Illustrate the properties of food packages to conversion technologies, processing and packaging technologies and user requirements including safety, convenience and environmental issues.	U	PSO7,8
4	Measure and evaluate the chemical, physical and mechanical properties of packages and packaging.	Ev	PSO1,3,4
5	Analyse the principles and practices of different types of packaging materials	An	PSO1,8,9

Course Description

Module	Course Description	Hrs	CO
1	INTRODUCTION TO FOOD PACKAGING		
1.1	Definition, functions of packaging	6	1
1.2	Requirements for effective packaging.	6	1
2	CLASSIFICATION OF PACKAGING		
2.1	Primary Secondary and tertiary packaging	7	1,2
2.2	Flexible, rigid and Semi- rigid packaging.	7	1,2

3	MATERIALS FOR FOOD PACKAGING, TYPES, USES, MERITS DRAWBACKS.		
3.1	Paper	2	1,2,3
3.2	Glass	2	1,2,3
3.3	Plastic	2	1,2,3
3.4	Tin, Aluminum	2	1,2,3
3.5	Boxes, Jars, Cans, Bottles	2	1,2,3
3.6	Interaction of packages with foods	2	1,2,3
3.7	Tin can corrosion	2	1,2,3
3.8	Global migration of plastics	2	1,2,3
4	MODERN CONCEPTS OF PACKAGING TECHNOLOGY.		
4.1	Aseptic packaging	2	3,5
4.2	Form Fill Seal packaging, Easy - Open End, Boil in- bags, Closures	2	3,5
4.3	Vacuum Pckaging	2	3,5
4.4	Active & intelligent packaging systems	2	3,5
4.5	Controlled atmospheric Packaging	2	3,5
4.6	Retort Pouches	2	3,5
4.7	Active & intelligent packaging systems.	2	3,5
4.8	Edible Films	2	3,5
5	QUALITY TESTING OF PACKAGING MATERIALS		
5.1	Physical test for tin and plastic	3	4,5
5.2	Testing of glass containers	3	4,5
5.3	Physical and chemical test for plastics	3	4,5
5.4	SHELF LIFE TESTING OF DIFFERENT PACKAGED FOODS. Tin, Plastic	3	4,5

5.5	Oxygen interactions, moisture interchanges and aroma permeability	2	4,5
-----	---	---	-----

REFERENCES:-

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

SEMESTER IV

PROCESSING TECHNOLOGY OF PLANT FOODS

Course	Details
Code	FS4CRT11
Title	Processing Technology of Plant Foods
Degree	B.Sc.
Branch(s)	Food Science
Semester	IV
Type	CORE
Credits	3
Total hours	72
Hours per week	4

Course Outcome

CO No.	Expected Course Outcomes Upon completion of this course the students will be able to:	Cognitive level	PSO No.
1	To understand of modern food processing and profound knowledge of plant food	U	PSO1,3,5,9
2	Understand the ability to apply the knowledge of science, microbiology and technology	U	PSO1,3,5,9
3	Determine the techniques, skills, and modern tools necessary in food processing operations	App	PSO1,3,5,9
4	Apply knowledge for production of safe food and shelf-life extension of food products	App	PSO1,3,5,8
5	Generate individually/in group(s) to the development of scientific/technological knowledge in food science and technology	Cr	PSO1,3,5,8,9

Course Description

Module	Course Description	Hrs	CO
1	Processing technology of cereal and cereal products		
1.1	Wheat- composition, milling process, products- baked food products	4	1,3,4,7,8
1.2	Rice- parboiling, milling, products & by products	4	1,3,4,7,8
1.3	Maize- milling	4	1,3,4,8
1.4	Oats- milling	4	1,3,4,7,8
2	Processing technology of pulses, legumes and oilseeds		
2.1	Processing- milling- importance pulses- processed soya	6	1,3,4,7,8
2.2	Oil seeds- extraction	6	1,3,4,7,8
3	Processing technology of fruits & vegetables		

3.1	Tomato- sauce, ketchup, puree	2	1,3,4,7,8
3.2	Mango- pickles, concentrates, pulp, bar, candies, Jam, essences, canned mango pulp	3	1,3,4,7,8
3.3	Tapioca- Syrup, dextrose, syrup solids, flour	2	1,3,4,7,8
3.4	Jackfruit- value added jackfruit products- canned jackfruit, nectar, chips	2	1,3,4,7,8
3.5	Apple- apple cider, candy, jam, jelly, Juice, pulp, concentrate	2	1,3,4,7,8
3.6	Pineapple- canned pineapple, natural pineapple pulp, juice, fresh pineapple, frozen pineapple juice concentrate, sulphated pineapple ,RTS- pineapple juice	3	1,3,4,7,8
3.7	Potato- chips, French fries, flour, starch, dried potato slices, dehydrated potato products	2	1,3,4,7,8
4	Processing technology of spices & extracts		
4.1	Introduction – classification- processing- uses- of spices	7	1,3,4,7,8
4.2	Introduction – classification- processing- uses of oleoresins and spice oils.	7	1,3,4,7,8
5	Processing technology of miscellaneous food products		1,3,4,7,8
5.1	Tea , coffee, - Introduction, processing	3	1,3,4,7,8
5.2	Alcoholic beverages- Introduction (beer, wine, brandy, whisky, rum, gin, vodka)	4	1,3,4,7,8
5.3	Soft drinks- introduction	1	1,3,4,7,8
5.4	Cocoa- processing, products	2	1,3,4,7,8
5.5	Sugar- manufacture, forms of sugar, by products of sugarcane Jaggery Honey	4	1,3,4,7,8

REFERENCES:

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

ANALYTICAL INSTRUMENTATION

Course	Details
Code	FS4CRT12
Title	Analytical Instrumentation
Degree	B.Sc.
Branch(s)	Food Science
Semester	IV
Type	CORE
Credits	3
Total hours	72
Hours per week	4

Course Outcome

CO No.	Expected Course Outcomes Upon completion of this course the students will be able to:	Cognitive level	PSO No.
1	To impart an understanding the basic and modern techniques in the instrumentation equipments used for analysis	Re	PSO1,3
2	An ability to apply the knowledge of science, and technology and the use of instruments in detection for presence or absence of contaminants	Re	PSO1,2,3,5
3	Understand the techniques, skills, and modern tools necessary in analytical detection during food processing operations of food samples	U	PSO1,3,5,7
4	Apply knowledge for detection of adulterants in food and shelf-life extension of food products	Ap	PSO1,3,5

Course Description

Module	Course Description	Hrs	CO
1	Basic principles of chromatography		
1.1	Adsorption	3	1,2,3,4
1.2	Partition	3	1,2,3,4
1.3	Affinity	3	1,2,3,4
1.4	Size exclusion	3	1,2,3,4
2	Types of chromatography		
2.1	Introduction, general principles, procedure-Paper Chromatography	6	1,2,3,4
2.2	Introduction, general principles, procedure-thin layer chromatography,	5	1,2,3,4
2.3	Introduction, general principles, procedure-column chromatography	5	1,2,3,4
3	HPLC & GC		

3.1	Introduction, principle of separation, procedure, components, types of detectors, column hardware & applications- HPLC	7	1,2,3,4
3.2	Introduction, principle of separation, procedure, components, types of detectors, column hardware & applications - GC	7	1,2,3,4
4	SPECROPHOTOMETRY		
4.1	Introduction, basic principles, UV –Visible spectroscopy	5	1,2,3,4
4.2	Introduction, basic principles, Fluorimetry	4	1,2,3,4
4.3	Introduction, basic principles, Atomic absorption spectroscopy	5	1,2,3,4
5	Electrophoretic, enzymatic & radio tracer technique		
5.1	Introduction, basic principles, types, procedure & applications of- SDS PAGE	2	1,2,3,4
5.2	Introduction, basic principles, types, procedure & applications of- Agaros gel	2	1,2,3,4
5.3	Introduction, basic principles, types, procedure & applications of- Native gel	2	1,2,3,4
5.4	Introduction, basic principles, types, procedure & applications of- Radio Immuno Assay	2	1,2,3,4
5.5	Introduction, basic principles, types, procedure & applications of- Scintillation counting(Solid, Liquid, gas)	2	1,2,3,4
5.6	Introduction, basic principles, types, procedure & applications of- Elisa	2	1,2,3,4
5.7	Application of enzymes in food industry	2	1,2,3,4
			1,2,3,4

REFERENCES:

1. Nielsen, S.S. Introduction to the chemical analysis of foods. Jones and Bartlett Publishers, Boston , London.2004.
2. Mahindru, S.N. Food additives. Characteristics, detection and estimation. Tata Mc Graw-Hill Publishing Company Limited, New Delhi.2000.

___3. Pearson, D. The Chemical Analysis of Foods. Churchill Livingstone, New York,2002

FOOD SAFETY AND QUALITY ASSURANCE

Course	Details
Code	FS4CRT13
Title	Food Safety And Quality Assurance
Degree	B.Sc.
Branch(s)	Food Science
Semester	IV
Type	CORE
Credits	3
Total hours	72
Hours per week	4

Course Outcome

CO No.	Expected Course Outcomes Upon completion of this course the students will be able to:	Cognitive level	PSO No.
1	Understand the scientific concepts of chemistry and microbiology to the development, monitoring and maintenance of food safety and quality assurance systems specific to the food processing industry.	U	PSO1,5
2	Differentiate effectiveness of practical applications of food safety and quality assurance system elements in a food manufacturing environment, across the logistics chain from the farm to the consumer.	An	PSO1,5
3	Understand the law and regulations applicable to food processing from the perspective of food safety and quality assurance and their effects on operational activities in a food manufacturing facility.	U	PSO1,5
4	Understand Food safety and quality system audit tools (i.e. GFSI, ISO) that inform compliance of food processing operations to laws and regulations.	U	PSO1,5

Course Description

Module	Course Description	Hrs	CO
1	Introduction to food safety		
1.1	Definition, types of hazard-physical, chemical and biological, factors affecting Food Safety.	4	1
1.2	Quality Control Concepts as applied to the food industry	4	1,4
1.3	General Concepts of quality control and quality control	4	1,4
1.4	Major quality control functions	4	1,4
2	Quality assurance- total quality control and statistical quality control		
2.1	Definition of Quality Assurance, Difference between QA and QC	4	1,4
2.2	Definition of TQC, its nature, approaches and role of management	4	1,4
2.3	Definition of SQC, determining the need for SQC,	3	1,4
2.4	Definition –control chart, uses process control.	3	1,4

3	Standards and specifications		
3.1	Voluntary and Compulsory standards	3	1,3,4
3.2	Packaging and labeling standards	3	1,3,4
3.3	ISO and HACCP	3	1,3,4
3.4	FSSAI	3	1,3,4
4	Quality improvement techniques		
4.1	Quality Improvement Plans(QIP)	4	2,3,4
4.2	Quality Control Circles(QCC)	5	2,3,4
4.3	Total quality management (TQM)	5	2,3,4
5	External quality control activities		
5.1	Inspection- Preshipment inspection and inspection at the port of destination	4	2,3,4
5.2	Certification and quality marks	4	2,3,4
5.3	National Standard Bodies	4	2,3,4
5.4	Testing Laboratories.	4	2,3,4

REFERENCES :

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

SEMESTER V

FOOD ANALYSIS

Course	Details
Code	FS35CRT15
Title	FOOD ANALYSIS
Degree	B.Sc.
Branch(s)	Food Science
Semester	V
Type	CORE
Credits	3
Total hours	72
Hours per week	4

Course Outcome

CO No.	Expected Course Outcomes Upon completion of this course the students will be able to:	Cognitive level	PSO No.
1	Understand the use of standard techniques of food analysis and the treatment of its calculation	U	PSO1,3,4
2	Interpret modern instrumental methods to analyse chemical and physical properties of foods	U	PSO1,3,4
3	Understand principles and methods for the proximate analyses of foods. Evaluation of test methods	U	PSO1,2,3,4
4	Estimate the use of Official Methods of Analysis of AOAC International	Ap	PSO1,2,3,4
5	Analyse the chemical and physical properties of food using Instrumental methods	A	PSO1,2,3,4
6	Applications of food analysis in research, government, trade and the food industry.	Ap	PSO1,6

Course Description

Module	Course Description	Hrs	CO
1	INTRODUCTION TO FOOD ANALYSIS		
1.1	Introduction to food analysis	1	1
1.2	Sampling, Population, Proximate Principles	1	1
1.3	Importance of sampling	2	1

1.4	Sampling technique	2	1
1.5	Types of sampling	2	1
1.6	Sampling Plan	2	1
1.7	Preparation of samples	2	1
1.8	Problems in sampling	2	1
2	PHYSICAL METHODS OF FOOD ANALYSIS		
2.1	Food Rheology	2	2,3
2.2	Viscosity, Surface Tension	2	2,3,4
2.3	Refractometry	2	2,3,4
2.4	Polarimetry	2	2,3,4
2.5	Freezing point	2	2,3,4
2.6	Specific gravity	2	2,3,4
3	ANALYSIS OF FOODS		
3.1	MOISTURE ANALYSIS- Oven drying method, Distillation method, Karl-Fischer Titration Method, San Pan Technique	3	2,3,4,5
3.2	ASH ANALYSIS- Dry, Wet, Low temperature, Plasma Ashing, Soluble and Insoluble Ash in Water, Ash insoluble in acid	2	2,3,4,5
3.3	TOTAL CARBOHYDRATE ANALYSIS- Lane and Eynon's Metho, Nelson-Somogyi method, Alkaline ferric cyanide method, Phenol-sulphuric acid method, Starch Analysis.	3	2,3,4,5
3.4	FIBRE ANALYSIS: - Crude Fibre analysis, Dietary Fibre Analysis by AOAC method	2	2,3,4,5
3.5	PROTEIN ANALYSIS- Kjeldahl Method, Biuret Method, Lowry Method, BCA Method, Barford's Method, Ninhydrin Method, Amino	3	2,3,4,5

	acid Analysis.		
3.6	FAT ANALYSIS: Continuous solvent extraction method, Semi continuous solvent extraction method, Discontinuous extraction method, Non-solvent wet extraction method, Instrumental methods, Refractive index, melting point, SFI, Cold Test, Cloud point, Smoke point, Flash and Fire point, Iodine Value, Saponification Value, Acid Value, Peroxide Value, TBA Test, Schaal Oven test.	3	2,3,4,5
4	VITAMINS		
4.1	Vitamin A by Carr-Price method, HPLC	6	2,3,4,5
4.2	Vitamin C- Ascorbic acid dichloroindophenol method	5	2,3,4,5
4.3	Vitamin D- Line test	5	2,3,4,5
5	MINERAL ANALYSIS		2,3,4,5
5.1	Mineral Analysis- Calcium- Gravimetric, EDTA and redox titration	8	2,3,4,5
5.2	Iron – Redox titration	4	2,3,4,5
5.3	Phosphorous- colorimetry	2	2,3,4,5

REFERENCE

1. Kalia, M. Food Analysis and Quality Control. Kalyani Publishers, New Delhi. 2002.
2. Winton, A.L and Winton, K.B. Techniques of food analysis. Allied Scientific Publishers, New Delhi. 1999.
3. Nielsen, S.S. Introduction to the chemical analysis of foods. Jones and Bartlett Publishers, Boston, London. 2003.
4. Connell, J.J. Control of fish quality. Blackwell Scientific Publications, Cambridge

FOOD TOXICOLOGY

Course	Details
Code	FS5 CRT 16
Title	FOOD TOXICOLOGY
Degree	B.Sc.
Branch(s)	Food Science
Semester	V
Type	CORE
Credits	3
Total hours	72
Hours per week	4

Course Outcome

CO No.	Expected Course Outcomes Upon completion of this course the students will be able to:	Cognitive level	PSO No.
1	Understand the definitions of toxicology and toxicity	U	PSO1
2	Recognize different types of toxic responses	Re	PSO1
3	Classify Toxicants	U	PSO1
4	Determine toxic effects of specific food toxicants	Ap	PSO1,2,4,5
5	Infer action of specific food toxicants	U	PSO1,2,4,5
6	Estimate the issues related to presence and management of food toxicity and potentially toxic compounds in our food supply	Ap	PSO1,2,4,5

Course Description

Module	Course Description	Hrs	CO
1	INTRODUCTION TO TOXICOLOGY		
1.1	Definition- Toxicology- importance- scope	6	1
1.2	Basic divisions- Goals- Basic concept of Toxicology	6	1
2	NATURALLY OCCURRING TOXICANTS IN VARIOUS FOODS		
2.1	Toxicants in Plant foods-	4	1,2,3,5,6
2.2	Seafood toxins	4	12,,3,56
2.3	Antivitamins	3	1,2,3,5,6
2.4	Radioactive metals in foods- Toxic minerals- other inorganic compounds occur in Food & Water	3	1,2,3,56
3	TOXICANTS OF PUBLIC HEALTH HAZARD		
3.1	Chemical contaminants	2	1,2,3,5,6
3.2	Pesticide residues- types of pesticides	3	12,,3,56
3.3	Automobile emissions(CO, SO ₂ , NO), Hydrocarbons- photochemical products-	3	1,2,3,5,6
3.4	Heavy metals(Mercury, Arsenic, Lead, Cadmium, Aluminium, Tin)	2	1,2,3,56
3.5	Food additives- types- health hazards	3	1,2,3,5,6

3.6	Radioactive substances-kinds of radiators- sources of radiations- biological effect of radiations	3	1,2,3,5,6
4	XENOBIOTICS & CARCINOGENS		
4.1	Absorption, Assimilation,	4	1,4,5,6
4.2	Utilization and excretion of xenobiotics	4	1,4,5,6
4.3	Biotransformation- Phase I and Phase II	4	1,4,5,6
4.4	Types- Mechanism of chemical carcinogens-mutagens and Teratogens	4	1,4,5,6
5	SUBSTANCES INTENTIONALLY ADDED TO FOODS		
5.1	Antioxidants	4	1,4,5,6
5.2	Colors and Stabilizers	5	1,4,5,6
5.3	GM Foods and their safety	5	1,4,5,6

REFERENCES:

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

ENVIRONMENTAL STUDIES AND HUMAN RIGHTS

Course	Details
Code	FS5 CRT 17
Title	ENVIRONMENTAL STUDIES AND HUMAN RIGHTS
Degree	B.Sc.
Branch(s)	Food Science
Semester	V
Type	CORE
Credits	3
Total hours	72
Hours per week	4

Course Outcome

CO No.	Expected Course Outcomes Upon completion of this course the students will be able to:	Cognitive level	PSO No.
1	Understand Core concepts and methods from ecological and physical sciences and their application in environmental problem solving.	U	PSO1,8,9
2	Understand the basic concepts of natural resources, waste management and ecosystem	U	PSO1,8,9
3	Summarize systems concepts and methodologies to analyze and understand interactions between social and environmental processes.	An	PSO 9
4	Understand Rights for humans, laws for protection under various categories	U	PSO8
5	Understand the basic concepts of Human Rights and United Nations	U	PSO8

Course Description

Module	Course Description	Hrs	CO
1.1	Multidisciplinary nature of environmental studies		
1.1.1	Definition, scope and importance	1	2
1.1.2	Need for public awareness.	1	1,2
1.2.	Natural Resources		
1.2.1	Renewable and non-renewable resources : Natural resources and associated problems.	2	1,2
1.2.2	Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.	2	1,2
1.2.3	Water resources : Use and over-utilization of surface and ground water,	2	1,2

	floods, drought, conflicts over water, dams-benefits and problems. Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies		
1.2.4	Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, Case studies.	2	1,2
1.2.5	Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification, Role of individual in conservation of natural resources, Equitable use of resources for sustainable life styles.	2	1,2
1.3	Ecosystems		
1.3.1	Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers	2	2
1.3.2	Energy flow in the ecosystem and Ecological succession	2	2
1.3.3	Food chains, food webs and ecological pyramids, Introduction, types, characteristic features, structure and function of the given ecosystem, Forest ecosystem	2	2
2.1	Biodiversity and its conservation		
2.1.1	Introduction and Biogeographical classification of India	2	1,2
2.1.2	Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.	2	1,2
2.1.3	India as a mega-diversity nation and Hot-spots of biodiversity	2	1,2
2.1.4	Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India	2	1,2
2.2	Environmental Pollution		
2.2.1	Air and Water pollution- Causes, effects and control measures	1	1,2,3
2.2.2	Soil and Marine pollution - Causes, effects and control measures	1	1,2,3
2.2.3	Noise, Thermal Pollution and Nuclear hazards- Causes, effects and control measures, Role of an individual in prevention of pollution	2	1,2,3
2.2.4	Solid waste Management: Causes, effects and control measures of urban and industrial wastes.	1	1,2,3
2.2.5	Pollution case studies	2	1,2,3

2.2.6	Disaster management: floods, earthquake, cyclone and landslides.	1	1,2,3
2.3	Social Issues and the Environment		
2.3.1	Urban problems related to energy	1	1,2,3
2.3.2	Water conservation, rain water harvesting, watershed management	1	1,2,3
2.3.3	Resettlement and rehabilitation of people: its problems and concerns, Case studies, Environmental ethics: Issues and possible solutions	1	1,2,3,4
2.3.4	Climate change, global warming, acid rain, ozone layer depletion , nuclear accidents and holocaust, Case studies, Consumersim and waste products	1	1,2,3
2.3..5	Environmental Protection Act – Air , Water (Prevention and Control of Pollution) Act	1	1,2
2.3.6	Public Awareness and Issues involved in Enforcement of Environmental Legislation	1	4
3.1	Waste Management in Food Industries		
3.1.1	Classification and characterization of food industrial wastes from fruit and vegetable processing industry, beverage industry,	2	1,2,3
3.1.2	Classification and characterization of food industrial wastes from fish, meat and poultry industry	2	1,2,3
3.1.3	Classification and characterization of food industrial waste from sugar industry	2	1,2,3
3.1.4	Classification and characterization of food industrial wastes from - Dairy industry	1	1,2,3
3.1.5	Waste disposal methods –physical, chemical and biological	1	1,2,3
4.1	Treatment Methods of Liquid & Solid Wastes		
4.1.1	Treatment methods for liquid wastes from food process industries	1	2
4.1.2	Design of activated sludge process, Rotating biological contactors, Trickling filters	2	2
4.1.3	Treatment methods of solid wastes: Biological composting, drying and incineration	2	2
4.1.4	Design of solid waste management system: Landfill digester,	1	2
5.1	Human Rights		
5.1.1	An Introduction to Human Rights, Meaning, concept and development,	3	4
5.1.2	History of human rights- different generations of human rigts, universality of human rigts, basic international human rights documents- UDHR,ICCPR,ICESCR- Value dimension of human rights	3	4
5.2	Human rights and United Nations		
5.2.1	Human Rights co-ordination within UN system- Role of UN secretariat- The Economic and Social Council- The Commission Human Rights-The Security Council and Human rights- The Committee on the Elimination of Racial Discrimination-	3	4,5

5.2.2	The Committee on the Elimination of Discrimination Against Women- the Committee on Economic, Social and Cultural Rights- The Human Rights Committee- Critical Appraisal of UN Human Rights Regime.	3	4,5
5.3	Human Rights National Perspective		
5.3.1	Human Rights in Indian Constitution – Fundamental Rights- The Constitutional Context of Human Rights-directive Principles of State Policy and Human Rights	3	4,5
5.3.2	Human Rights of Women-children –minorities- Prisoners- Science Technology and Human Rights- National Human Rights Commission- State Human Rights Commission- Human Rights Awareness in Education.	3	4,5

REFERENCES

1. Bharucha Erach, Text Book of Environmental Studies for undergraduate Courses. University Press, IInd Edition 2013 (TB)
2. Clark.R.S., Marine Pollution, Clanderson Press Oxford (Ref)
3. Cunningham, W.P.Cooper, T.H.Gorhani, E & Hepworth, M.T.2001 Environmental Encyclopedia, Jaico Publ. House. Mumbai. 1196p .(Ref)
4. Dc A.K.Environmental Chemistry, Wiley Eastern Ltd.(Ref)
5. Down to Earth, Centre for Science and Environment (Ref)
6. Heywood, V.H & Watson, R.T. 1995. Global Biodiversity Assessment, Cambridge University Press 1140pb (Ref)
7. Jadhav.H & Bhosale.V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284p (Ref)
8. Mekinney, M.L & Schock.R.M. 1996 Environmental Science Systems & Solutions. Web enhanced edition 639p (Ref)
9. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co. (TB)
10. Odum.E.P 1971. Fundamentals of Ecology. W.B. Saunders Co. USA 574p (Ref)
11. Rao.M.N & Datta.A.K. 1987 Waste Water treatment Oxford & IBII Publication Co.Pvt.Ltd.345p (Ref)
12. Rajagopalan. R, Environmental Studies from crisis and cure, Oxford University Press, Published: 2016 (TB)
13. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut (Ref)
14. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (Ref)
15. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Stadards, Vol I and II, Enviro Media (Ref)
16. Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication (Ref)
17. Wanger K.D., 1998 Environmental Management. W.B. Saunders Co. Philadelphia, USA 499p (Ref)
18. (M) Magazine (R) Reference (TB) Textbook

Human Rights

1. Amartya Sen, The Idea Justice, New Delhi: Penguin Books, 2009.
2. Chatrath, K. J.S., (ed.), Education for Human Rights and Democracy (Shimla: Indian Institute of Advanced Studies, 1998)
3. Law Relating to Human Rights, Asia Law House,2001.
4. Shireesh Pal Singh, Human Rights Education in 21st Century, Discovery Publishing House Pvt.Ltd, New Delhi,
5. S.K.Khanna, Children And The Human Rights, Common Wealth Publishers,1998. 2011.
6. Sudhir Kapoor, Human Rights in 21st Century,Mangal Deep Publications, Jaipur,2001.
7. United Nations Development Programme, Human Development Report 2004: Cultural Liberty in Today's Diverse World, New Delhi: Oxford University Press, 2004.

OPEN COURSE- FOOD FACTS AND PRINCIPLES

Course	Details
Code	FS5 CRT 18
Title	FOOD FACTS AND PRINCIPLES
Degree	B.Sc.
Branch(s)	Food Science
Semester	V
Type	CORE
Credits	3
Total hours	72
Hours per week	4

Course Outcome

CO No.	Expected Course Outcomes Upon completion of this course the students will be able to:	Cognitive level	PSO No.
1	Understand the various nutrients and their nutritional functions	U	PSO 1
2	Integrate the knowledge of nutritional principles and their application in disease prevention and treatment	An	PSO1,7
3	Understand the concepts and practice of hygiene and safety in food preparation and service	U	PSO 1,5
4	Design and innovate novel food products	Cr	PSO 1,7

Course Description

Module	Course Description	Hrs	CO
1	INTRODUCTION AND CLASSIFICATION OF FOODS		
1.1	Definitions and Functions	1	1
1.2	Food groups, Food guide	1	1
1.3	Classification- Natural	1	1,2
1.4	Organic Foods	1	1,2
1.5	Functional Foods	2	1,2
1.6	Probiotic and Prebiotic Foods	2	1,2
1.7	Fabricated Foods	2	1,2
1.8	Functional Foods	1	1,2
1.9	Space Foods	2	1,2
1.10	Health Foods	1	1,2
1.11	Nutritional Foods	1	1,2
1.12	Convenience and fast foods	1	1,2

2	METHODS OF PRESERVATION		
2.1	Low temperature	2	3
2.2	High temperature	3	3
2.3	Use of preservatives	3	3
2.4	Dehydration	3	3
2.5	Irradiation	3	3
3	FOOD ADULTERATION		
3.1	Definition and types	2	3
3.2	Intentional	4	3
3.3	Incidental	4	3
3.4	Methods of detection	4	3
4	PREPARATION OF VARIETY OF FOODS		
4.1	Jam	2	3,4
4.2	Jellies	2	3,4
4.3	Marmalades	2	3,4
4.4	Purees	2	3,4
4.5	Sauces	3	3,4
4.6	Pickles	3	3,4
5	FOOD PACKAGING		
5.1	Definition ,Functions and requirements for Effective Packaging	3	3
5.2	Classification of packaging	3	3
5.3	Materials for food packaging	3	3
5.4	Modern concepts of food packaging technology	5	3

References:

1. Giridhar Lal, G.S, Siddappa and G.L Tandon, Preservation of fruits and vegetables, Indian council of agricultural Research, New Delhi
2. N.Shakunthala manay and M.Shadhakaraswamy, Food Facts and Principles, New Age international Publishers

FOOD ANALYSIS AND ADULTERATION TESTING PRACTICALS-I

Course	Details
Code	FS5 CRP22
Title	Food analysis and adulteration testing practicals-I
Degree	B.Sc.
Branch(s)	Food Science
Semester	V
Type	CORE
Credits	2
Total hours	72
Hours per week	2.5

Course Outcome

CO No.	Expected Course Outcomes Upon completion of this course the students will be able to:	Cognitive level	PSO No.
1.	Understand the applications of various equipments, apparatus and analysis by chemical techniques in food	U	PSO1,2,3,4,5
2	Understand the mechanism and principles , procedures and calculations of various techniques employed for detection of adulterants in food and general analysis	U	PSO1,2,3,4,5
3	Identify the various chemical techniques in the analysis of foods and adulterants present if any	Re	PSO1,2,3,4,5
4	Understand the quality assessment of food products by estimation of all quality parameters	U	PSO1,2,3,4,5

Course Description

Module	Course Description	Hrs	CO
1	Introduction to laboratory equipments and apparatus	7	1
2	ANALYSIS OF MILK <ul style="list-style-type: none">• Milk Solids,• Ash• Fat• Protein• Lactose• Acidity Qualitative test <ul style="list-style-type: none">• MBRT Test• Starch• Sucrose• Urea• Formalin	9	1,2,3,4

3	ANALYSIS OF SQUASH: <ul style="list-style-type: none"> • Total solids • Ash • Water insoluble ash, Water soluble ash, Alkalinity water soluble Ash • Acidity • Total Sugar • Soluble solids(Refractive index) • Qualitative tests- potassium metabisulphite, sodium benzoate 	7	1,2,3,4
4	ANALYSIS OF CONDENSED MILK <ul style="list-style-type: none"> • Total Solids • Fat • Acidity • Estimation of lactose and estimation of sucrose • Qualitative tests- sucrose, starch 	7	1,2,3,4
5	ANALYSIS OF VINEGAR <ul style="list-style-type: none"> • Total solids • Acidity • Specific gravity • Qualitative tests 	7	1,2,3,4
6	ANALYSIS OF HONEY <ul style="list-style-type: none"> • Moisture understand the functioning and principle of various analytical instruments • • Estimation of reducing sugar • Acidity • Specific gravity • Qualitative tests- Aniline chloride and Added glucose 	7	1,2,3,4
7	ANALYSIS OF WINE <ul style="list-style-type: none"> • Specific gravity • Suspended solids • Dissolved solids • Total solids • Total acidity 	7	1,2,3,4
8	ANALYSIS OF SPICES <ul style="list-style-type: none"> • Moisture • Alcoholic extract • Ash • Acid insoluble ash • Volatile Oil 	7	1,2,3,4
9	ANALYSIS OF TOMATO KETCHUP <ul style="list-style-type: none"> • Moisture • Ash • TSS • Acidity 	7	1,2,3,4
10	DETECTION OF ADULTERATION IN VARIOUS FOODS <ul style="list-style-type: none"> • Milk • Condensed milk • Honey • Squash • Vinegar • Wine 	7	1,2,3,4

	<ul style="list-style-type: none">• Spices• Ketchup		
--	--	--	--

FOOD CHEMISTRY PRACTICALS

Course	Details
Code	FS5 CRP23
Title	Food Chemistry Practicals
Degree	B.Sc.
Branch(s)	Food Science
Semester	V
Type	CORE
Credits	2
Total hours	72
Hours per week	2.5

Course Outcome

CO No.	Expected Course Outcomes Upon completion of this course the students will be able to:	Cognitive level	PSO No.
1	Understand the applications of various equipments, apparatus and analysis by chemical techniques in food	U	PSO1,2,4,5
2	Understand the mechanism and principles, procedures and calculations of various techniques employed for detection of adulterants in food and general analysis	U	PSO1,2,4,5
3	Understand basic preparation of solutions and buffers.	U	PSO1,2,4,5
4	Understand the functioning and principle of various instruments	U	PSO1,2,4,5
5	Identify the various chemical techniques in the analysis of foods and adulterants present if any	Re	PSO1,2,4,5
6	Understand the quality assessment of food products by estimation of all quality parameters	U	PSO1,2,4,5

Course Description

Module	Course Description	Hrs	CO
1	Estimation of Starch	7	1,2,3,5,6
2	Estimation of Crude fibre	9	1,2,3,5,6
3	Estimation of sugar by Phenol Sulphuric acid method	7	1,2,3,4,5,6
4	Estimation of sugar by Munson & Walker's method	7	1,2,3,4,5,6
5	Estimation of sugar by Lane & Eynon's method	7	1,2,3,5,6

6	Water Hardness	7	1,2,3,5,6
7	Paper Chromatography	7	1,2,3,5,6
8	Saponification Value of oils/fats	7	1,2,3,5,6
9	Acid value of oils/fats	7	1,2,3,5,6
10	Estimation of ascorbic acid	7	1,2,3,5,6

BASIC MICROBIOLOGY PRACTICALS

Course	Details
Code	FS5 CRP21
Title	Basic microbiology practicals
Degree	B.Sc.
Branch(s)	Food Science
Semester	V
Type	CORE
Credits	2
Total hours	72
Hours per week	7

Course Outcome

CO No.	Expected Course Outcomes Upon completion of this course the students will be able to:	Cognitive level	PSO No.
1	Understand and know parts of microscope, type and its principle	U	PSO1,2,3,4,5
2	Understand the theoretical concepts of related stain	U	PSO1,2,3,4,5
3	Understand different methods of staining technique	U	PSO1,2,3,4,5
4	Understand various accessories for microbiology practicals	U	PSO1,2,3,4,5
5	Illustrate various staining technique	U	PSO1,2,3,4,5
6	Understand various sterilization techniques	U	PSO1,2,3,4,5

Course Description

Module	Course Description	Hrs	CO
1	Study of compound microscope	7	1,4
2	Working and handling of common microbiological laboratory equipments and materials	9	1,2,4
3	Preparation of microscopic examination	7	1,2
4	Monochrome staining	7	1,2,3
5	Differential staining	7	1,2,3
6	Capsule staining	7	1,2,3
7	Spore staining	7	1,2,3
8	Microscopic examination of living organisms- hanging drop mount method for the demonstration of bacterial motility	7	1,2,3,5
9	Negative staining of bacteria	7	1,2,3,4,5
10	Isolation, Enumeration and Characteristics of microorganisms	7	1,2,3,4,5

SEMESTER VI

ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT IN FOOD INDUSTRY

Course	Details
Code	FS6CRT24
Title	Entrepreneurship Development and Management in Food Industry
Degree	B.Sc.
Branch(s)	Food Science
Semester	VI
Type	CORE
Credits	3
Total hours	72
Hours per week	4

Course Outcome

CO No.	Expected Course Outcomes Upon completion of this course the students will be able to:	Cognitive level	PSO No.
1	Understand Entrepreneurship and help Innovation minors to be able to sell themselves and their ideas . Students master oral and visual presentation skills and establish a foundation of confidence in the skills necessary to cause others to act.	U	PSO1
2	Focus on Entrepreneurship and Innovation minorsto be able to find problems worth solving . Students advance their skills in customer development, customer validation, competitive analysis, and iteration while utilizing design thinking and process tools to evaluate in real-world problems and projects in management	An	PSO3,8,9
3	Classification and mobilization of people and resources . Students identify and secure customers, stakeholders, and team members through networks, primary customer research, and competitive and industry analyses in order to prioritize and pursue an initial target market in real-world projects.	U	PSO 3,8,9
4	Understand different methods to assess the attractiveness of business opportunities	U	PSO9
5	Understand what characterizes an attractive business opportunity and common pitfalls during the entrepreneurial process	U	PSO9
6	Understand the dynamics of how teams develop and function as well as the various types of conflicts that can arise during teamwork	U	PSO9
7	Plan, organize, and execute a project or new venture with the goal of bringing new products and service to the market	Cr	PSO9

Course Description

Module	Course Description	Hrs	CO
1	Entrepreneurship		
1.1	Definition, characteristics and traits, difference between entrepreneur, intrapreneur and manager	6	1
1.2	Types of entrepreneurs, role of entrepreneurs in economic development	6	1
2	Project Formulation		
2.1	Various approaches in principles of product selection	7	1,2,3,4,5
2.2	Techno-economic feasibility of the project,	7	5,6
2.3	Structure of project report		7
3	Role of Government in Promoting Entrepreneurship		
3.1	Incentives, subsidies and grants	6	5
3.2	Agencies and their role - DIC, SISI, EDII, NIESBUD, NEDB	8	5
4	Management		
4.1	Characteristics, Objectives, Principles	5	1,3,9
4.2	Challenges, Importance, Levels of management	5	1,3,9
4.3	Food industry and Management	6	1,3,9
5	Product Development		
5.1	Need for new products, stages in product development,	4	6,7
5.2	Pricing and distribution of new product -kinds of pricing	4	6,7
5.3	Pricing and distribution of new product -kinds of pricing	4	6,7
5.4	Sales promotion techniques	4	6,7

REFERENCES

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

FOOD ADULTERATION AND TESTING

Course	Details
Code	FS6CRT24
Title	Food Adulteration and Testing
Degree	B.Sc.
Branch(s)	Food Science
Semester	VI
Type	CORE
Credits	3
Total hours	72
Hours per week	4

Course Outcomes

CO No.	Expected Course Outcomes Upon completion of this course the students will be able to:	Cognitive level	PSO No.
1	Understand and identify food hazards, adulteration and traceability	Re	PSO1,2,3,5
2	Understand how to validate a method to monitor chemical contaminants	Re	PSO1,2,3,5
3	Understand how to perform advanced analysis methods for food hazards, adulteration and traceability	U	PSO1,2,3,5

Course Description

Module	Course Description	Hrs	CO
1	Food adulteration		
1.1	Definition, Classification	4	1
1.2	Health hazards caused by various adulterants	4	1
1.3	Critical levels of metals in various foods.	4	1,2
2	Composition and quality criteria for plant foods		
2.1	Oils and Fats	3	1,2,3
2.2	Spices and condiments	3	1,2,3
2.3	Food grains	3	1,2,3
2.4	Fruits & Vegetables	3	1,2,3
2.5	Beverages- Alcoholic & Non Alcoholic	4	1,2,3
3	Composition and quality criteria for animal foods		
3.1	Milk and Milk Products	5	1,2,3
3.2	Flesh Foods	5	1,2,3
3.3	Egg	4	1,2,3
4	Composition & quality criteria for sugar & preserves & tin foods		

4.1	Sugar and Sugar products	5	1,2,3
4.2	Preserves	5	1,2,3
4.3	Tin Foods	4	1,2,3
5	Food additives		
5.1	Introduction	2	1
5.2	Classification- Antioxidants, Preservatives, Emulsifiers, Stabilizers, sweeteners, thickening agents, chelating agents, curing agents, leavening agents, anti caking agents, coloring agents, flavoring agents.	14	1,2,3

REFERENCES:

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

CHOICE BASED COURSE

COCONUT & BEVERAGE TECHNOLOGY

Course	Details
Code	FS6CBT 26
Title	Coconut & beverage technology
Degree	B.Sc.
Branch(s)	Food Science
Semester	VI
Type	Choice Based
Credits	4
Total hours	72
Hours per week	4

Course Outcomes

CO No.	Expected Course Outcomes Upon completion of this course the students will be able to:	Cognitive level	PSO No.
1	Understand convergence and synergy among numerous ongoing governmental programmes in the field of coconut and beverage development in order to bring in horizontal and vertical integration of these programmes	U	PSO 1,3,7
2	Understand adequate, appropriate, timely and concurrent attention to all the links in the production, post harvest and consumption chain of coconut, its products and beverages as well as modern and traditional technology	U	PSO 1,3,7
3.	Understand economically desirable diversification and value addition to generate skilled employment	U	PSO1,3,7
4	Generate knowledge on the origins and development of Beverage and Coconut as well as its products, its role, types, Processing, Benefits, Value addition and Harmful effects in excess	Cr	PSO 1, 7,9
5	Understand and help prepare students to meet the challenges associated with the Beverage and Coconut Industry	U	PSO1,7,9

Course Description

Module	Course Description	Hrs	CO
1	Introduction to Coconut Technology		
1.1	Harvesting & storage of coconut & coconut water	4	2,3,4,5
1.2	Copra- Introduction, Grades, Copra Drying, Quality Copra	4	2,3,4,5
1.3	Coconut oil- Introduction, Properties, Uses, Extraction Methods, Quality Standard methods Of Refining, Virgin Coconut Oil	4	2,3,4,5
2	Coconut products and its processing		
2.1	Coconut Toffee Dehydrated Sweet Coconut	2	2,3,4,5

2.2	Coconut Baked Custard Coconut Chips	2	2,3,4,5
2.3	Preserved Coconut Milk Coconut Cream	2	2,3,4,5
2.4	Coconut Jam	2	2,3,4,5
2.5	Coconut Honey Coconut Cheese	2	2,3,4,5
2.6	Spray Dried Coconut Milk Powder	2	2,3,4,5
2.7	Dessicated coconut	2	2,3,4,5
3	Processing Technology of Fruit beverages		
3.1	Fruit juice	3	2,3,4,5
3.2	Fruit cordial	3	2,3,4,5
3.3	Fruit juice concentrate	3	2,3,4,5
3.4	Fruit squash	4	2,3,4,5
3.5	Fruit drink	3	2,3,4,5
4	Processing Technology of Carbonated beverages	14	
5	Processing Technology of Alcoholic beverages		
5.1	Wine	3	2,3,4,5
5.2	Beer	3	2,3,4,5
5.3	Distilled spirits- vodka, gin, whisky, brandy, rum	10	2,3,4,5

REFERENCE:

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

ADVANCED FOOD MICROBIOLOGY PRACTICALS

Course	Details
Code	FS5 CRP29
Title	Advanced Food Microbiology Practicals
Degree	B.Sc.
Branch(s)	Food Science
Semester	VI
Type	CORE
Credits	2
Total hours	72
Hours per week	7

Course Outcome

CO No.	Expected Course Outcomes Upon completion of this course the students will be able to:	Cognitive level	PSO No.
1	Understand the advanced concepts of related media and cultures	U	PSO1,2,4,5
2	Understand different methods of advance staining technique	U	PSO1,2,4,5
3	Understand advanced accessories for food microbiology practicals	U	PSO1,2,4,5
4	Illustrate biochemical methods of testing	U	PSO1,2,4,5
5	Analyze Food Samples	An	PSO1,2,4,5

Course Description

Module	Course Description	Hrs	CO
1	Composition, preparation and sterilization of media, nutrient agar, PDA agar, McConkey Agar, EMB Agar	9	1,3,5
2	Isolation of Pure Colonies Preparation of media and sterilization, Pour plate and Streak Plate Methods	7	1,3,5
3	Microbiology of Milk a) Quantitative analysis of milk by SPC(standard Plate Count Method) b) Enzymatic test of milk by MBRT(Methylene Blue Reductase Test) c) Determination of phosphatase activity of milk d) Detection of mastitis through milk test e) Detection of calcium and phosphorous in milk	7	1,3,5
4	Microbiological Analysis of Meat and Fish and Egg	7	1,3,5
5	Microbiology of Sauce	7	1,3,5
6	Microbiology of Bread (Yeast & mold)	7	1,3,5
7	Microbiology of fruits and vegetables	7	1,3,5
8	Microbiology of Air, Water and Soil	7	1,3,5
9	SWAB test	7	1,3,5
10	Biochemical Testing a) Triple sugar iron agar test b) Indole Production Test	7	1,3,4,5

	c) Methyl Red Test d) Vogues Proskauer Test e) Citrate Utilization Test		
--	---	--	--

FOOD ANALYSIS AND ADULTERATION TESTING PRACTICALS- II

Course	Details
Code	FS5 CRP22
Title	Food Analysis and Adulteration Testing Practicals-II
Degree	B.Sc.
Branch(s)	Food Science
Semester	VI
Type	CORE
Credits	2
Total hours	72
Hours per week	2.5

Course Outcome

CO No.	Expected Course Outcomes Upon completion of this course the students will be able to:	Cognitive level	PSO No.
1	Understand the applications of various equipments, apparatus and analysis by chemical techniques in food	U	PSO1,2,3,4,5
2	Understand the mechanism and principles , procedures and calculations of various techniques employed for detection of adulterants in food and general analysis	U	PSO1,2,3,4,5
3	Identify the various chemical techniques in the analysis of foods and adulterants present if any	Re	PSO1,2,3,4,5
4	Understand the quality assessment of food products by estimation of all quality parameters	U	PSO1,2,3,4,5

Course Description

Module	Course Description	Hrs	CO
1	ANALYSIS OF JAM <ul style="list-style-type: none"> • Determination of Soluble Solids • Insoluble Solids • Totals Solids • Acidity • Pectin Content • Total Sugar 	7	1,2,3,4
2	ANALYSIS OF TEA <ul style="list-style-type: none"> • Moisture • Ash • Water soluble Ash • Alkalinity of water Soluble Ash • Total extractives • Stalks in Tea • Tannin 	7	1,2,3,4
3	ANALYSIS OF COFFEE <ul style="list-style-type: none"> • Moisture • Ash • Water-soluble ash • Alkalinity of soluble ash • Caffeine extractives 	7	1,2,3,4

	<ul style="list-style-type: none"> • Chicory • Qualitative tests for chicory 		
4	ANALYSIS OF WHEAT FLOUR <ul style="list-style-type: none"> • Moisture • Ash • Gluten • Crude fibre • Maltose figure • Acidity • Acid insoluble ash • Sedimentation value 	7	1,2,3,4
5	ANALYSIS OF BUTTER <ul style="list-style-type: none"> • Moisture • Curd and salt • Fat analysis • Total titratable acidity • Qualitative tests- added color, vanaspathi and added starch 	7	1,2,3,4
6	ANALYSIS OF COCOA POWDER <ul style="list-style-type: none"> • Moisture • Ash • Bulk Density • Fat • Crude fibre 	7	1,2,3,4
7	ANALYSIS OF MILK POWDER <ul style="list-style-type: none"> • Moisture • Ash • Alkalinity of ash • Acidity • Fat • Lactose • Bulk density 	7	1,2,3,4
8	ANALYSIS OF JELLY <ul style="list-style-type: none"> • Determination of Soluble solids • Insoluble solids • Total solids • Total sugar • Acidity • Pectin 	7	1,2,3,4
9	DETECTION OF ADULTERATION IN VARIOUS FOODS <ul style="list-style-type: none"> • Jam • Tea • Coffee • Wheat Flour • Butter • Milk powder • Jelly • Cocoa powder 	7	1,2,3,4
10	SENSORY ANALYSIS OF FOODS <ul style="list-style-type: none"> • DIFFERENCE TESTS <ul style="list-style-type: none"> - Paired 	9	1,2,3,4

	<ul style="list-style-type: none">◦ Compared◦ Duo-trio◦ Triangle• RATING TEST<ul style="list-style-type: none">◦ Ranking test◦ Two sample test◦ Multiple sample test• NUMERICAL SCORING TEST – Composite scoring test		
--	---	--	--

ADVANCED FOOD CHEMISTRY PRACTICALS

Course	Details
Code	FS5 CRP23
Title	Advanced food chemistry practicals
Degree	B.Sc.
Branch(s)	Food Science
Semester	VI
Type	CORE
Credits	2
Total hours	72
Hours per week	2.5

Course Outcome

CO No.	Expected Course Outcomes Upon completion of this course the students will be able to:	Cognitive level	PSO No.
1	Understand the applications of various equipments, apparatus and analysis by chemical techniques in food	U	PSO1,2,4,5
2	Understand basic preparation of solutions and buffers.	U	PSO1,2,4,5
3	Understand the mechanism and principles, procedures and calculations of various techniques employed for detection of adulterants in food and general analysis	U	PSO1,2,4,5
4	Identify the various chemical techniques in the analysis of foods and adulterants present if any	Re	PSO1,2,4,5
5	Understand the quality assessment of food products by estimation of all quality parameters	U	PSO1,2,4,5

Course Description

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