KURUKSHETRA
UNIVERSITY KURUKSHETRA

Scheme of Examinations and Syllabus

for

Under-Graduate Programme

Bachelor of Vocation in Food Science and Quality Control

Interdisciplinary Scheme-D

Under Multiple Entry-Exit, Internship and CBCS-LOCF in accordance to NEP-2020

w.e.f. 2023-24 (in phased manner)

Department of Home Science

KURUKSHETRA UNIVERSITY, KURUKSHETRA
Scheme of Examination for Under-Graduate Programme
Under multiple Entry-Exit, Internship & CBCS-LOCF-CCF in accordance to NEP 2020
w.e.f. 2023-24 (in phased manner),
Bachelor of Vocation in Food Science and Quality Control

SEMESTER-1

Course	Paper(s)	Nomenclature of Paper	Credits	Hours/ Week	Internal marks	External Marks	Total Marks	Exam Duration
CC-A1 4 credit	B23-FTQ-101	Introduction to Food Science	3	3	20	50	70	3 hrs.
		Introduction to Food Science (Practical)	1	2	10	20	30	4 hrs.
CC-B1 4 credit	B23-FTQ-102	Basics of Biochemistry	3	3	20	50	70	3 hrs.
		Basics of Biochemistry (Practical)	1	2	10	20	30	4 hrs.
CC-C1 4 credit	B23-FTQ-103	General Microbiology	3	3	20	50	70	3 hrs.
		General Microbiology (Practical)	1	2	10	20	30	4 hrs.
CC-M1 2 credit	B23-FTQ-104	Hygiene and Sanitation	1	1	10	20	30	3 hrs.
		Hygiene and Sanitation (Practical)	1	2	5	15	20	4 hr.
MDC-1 3 credit	From the courses offered by D/C/1							
AEC-1 2 credit	From Available AEC-1 pool list of two credits as per NEP							
SEC-1 3 credit	From Available SEC-1 pool list of three credits as per NEP							
VAC-1 2 credit	From Available VAC-1 pool list of two credits as per NEP							

SEMESTER-2

Course	Paper(s)	Nomenclature of Paper	Credits	Hours/ Week	Internal marks	External Marks	Total Marks	Exam Duration
CC-A2 4 credit	B23-FTQ-201	Basic Principles of Food Processing & Preservation	3	3	20	50	70	3 hrs.
		Basic Principles of Food Processing & Preservation (Practical)	1	2	10	20	30	4 hrs.
CC-B2 4 credit	B23-FTQ-202	Food Chemistry	3	3	20	50	70	3 hrs.
		Food Chemistry (Practical)	1	2	10	20	30	4 hrs.
CC-C2 4 credit	B23-FTQ-203	Dairy Technology and Quality Control	3	3	20	50	70	3 hrs.
		Dairy Technology and Quality Control (Practical)	1	2	10	20	30	4 hrs.
CC-M2 2 credit	B23-FTQ-204	Microbiology -II	1	1	10	20	30	3 hrs.
		Microbiology – II (Practical)	1	2	5	15	20	4 hr.
MDC-2 3 credit	From the courses offered by D/C/1							
AEC-2 2 credit	From Available AEC-2 pool list of two credits as per NEP							
SEC-2 3 credit	From Available SEC-2 pool list of three credits as per NEP							
VAC-2 2 credit	From Available SEC-2 pool list of two credits as per NEP							

Internship of 4 credits of 4-6 weeks duration after 2nd semester

SEMESTER-3

Course	Paper(s)	Nomenclature of Paper	Credits	Hours/ Week	Internal marks	External Marks	Total Marks	Exam Duration
CC-A3 4 credit	B23-FTQ-301	Cereal And Bakery Technology and Quality Control	3	3	20	50	70	3 hrs.
		Cereal And Bakery Technology and Quality Control (Practical)	1	2	10	20	30	4 hrs.
CC-B3 4 credit	B23-FTQ-302	Fruit & Vegetable Technology and Quality Control	3	3	20	50	70	3 hrs.
		Fruit & Vegetable Technology and Quality Control (Practical)	1	2	10	20	30	4 hrs.
CC-C3 4 credit	B23-FTQ-303	Food Safety and Quality Assurance-I	3	3	20	50	70	3 hrs.
		Food Safety and Quality Assurance-I (Practical)	1	2	10	20	30	4 hrs.
CC-M3 4 credit	B23-FTQ-304	Techniques in Bio Chemistry	3	3	20	50	70	3 hrs.
		Techniques in Bio Chemistry (Practical)	1	2	10	20	30	4 hrs.
MDC-3 3 credits	From the courses offered by D/C/1							
AEC-3 2 credit	From Available AEC-3 pool list of two credits as per NEP							
SEC-3 3 credit	From Available SEC-3 pool list of three credits as per NEP							

SEMESTER-4

Course	Paper(s)	Nomenclature of Paper	Credits	Hours/ Week	Internal marks	External Marks	Total Marks	Exam Duration
CC-A4 4 credit	B23-FTQ-401	Meat Technology and Quality Control	3	3	20	50	70	3 hrs.
		Meat Technology and Quality Control (Practical)	1	2	10	20	30	4 hrs.
CC-B4 4 credit	B23-FTQ-402	Technology of Pulses, Legumes and Oil seeds and Quality Control	3	3	20	50	70	3 hrs.
		Technology of Pulses, Legumes and Oilseeds and Quality Control (Practical)	1	2	10	20	30	4 hrs.
CC-C4 4 credit	B23-FTQ-403	Food Safety and Quality Assurance-II	3	3	20	50	70	3 hrs.
		Food Safety and Quality Assurance-II (Practical)	1	2	10	20	30	4 hrs.
CC-M4(v) 4 credit (2+2)	From Available CC-M4(V) pool list of four credit as per NEP							
AEC-4 2 credit	From Available AEC-4 pool list of two credits as per NEP							
VAC-3 2 credit	From Available VAC-3 pool list of two credits as per NEP							

Internship of 4 credits of 4-6 weeks duration after 4th semester (If not done after 2nd semester)

SEMESTER-5

Course	Paper(s)	Nomenclature of Paper	Credits	Hours/ Week	Internal marks	External Marks	Total Marks	Exam Duration
CC-A5 4 credit	B23-FTQ-501	Advances in Food Processing & Preservation	3	3	20	50	70	3 hrs.
		Advances in Food Processing & Preservation (Practical)	1	2	10	20	30	4 hrs.
CC-B5 4 credit	B23-FTQ -502	Principles of Food Engineering	3	3	20	50	70	3 hrs.
		Principles of Food Engineering (Practical)	1	2	10	20	30	4 hrs.
CC-C5 4 credit	B23-FTQ-503	Microbial Technology and Therapeutic Foods	3	3	20	50	70	3 hrs.
		Microbial Technology and Therapeutic Foods (Practical)	1	2	10	20	30	4 hrs.
CC-M5 (V) 4 credit (2+2)	From available CC M-5(V) pool list of four credit as per NEP							
Skill Enhancement course	**Internship #4 credit**							

 # Four Credits of Internship, earned by a student during summer internship after 2nd semester or 4th semester, will be taken into account in 5th semester of students who pursue 3rd year UG Programme without taking exit option.

SEMESTER-6

Course	Paper(s)	Nomenclature of Paper	Credits	Hours/ Week	Internal marks	External Marks	Total Marks	Exam Duration
CC-A6 4 credit	B23-FTQ-601	Food Industry Waste & By-Product Management	3	3	20	50	70	3 hrs.
		Food Industry Waste & By-Product Management (Practical)	1	2	10	20	30	4 hrs.
CC-B6 4 credit	B23-FTQ-602	Nutrition and Health	3	3	20	50	70	3 hrs.
		Nutrition and Health (Practical)	1	2	10	20	30	4 hrs.
CC-C6 4 credit	B23-FTQ-603	Food Logistics and Supply Chain Management	3	3	20	50	70	3 hrs.
		Food Logistics and Supply Chain Management (Practical)	1	2	10	20	30	4 hrs.
CC-M 6 4 credit	B23-FTQ-604	Entrepreneurship Development and Management	3	3	20	50	70	3 hrs.
		Entrepreneurship Development and Management (Practical)	1	2	10	20	30	4 hrs.
CC-M-7(V) 4 Credits	From available CC M-7(V) pool list of four credit as per NEP							

Session: 2023-24			
Part A - Introduction			
Subject	Bachelor of Vocation in Food Science and Quality Control		
Semester	I		
Name of the Course	Introduction to Food Science		
Course Code	**B23-FTQ-101**		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC- A1		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	Senior Secondary(10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1 To understand the basic concept of food science 2. To understand the objectives of cooking, processing and preservation 3. The students will be able to know the storage and processing of cereals, millets, pulses, milk, vegetables, fruits etc. 4. To understand the objectives of processed and convenience foods_____ 5*.To impart practical knowledge about the cooking, processing and preservation.		
Credits	**Theory**	**Practical**	**Total**
	3	**1**	**4**
Contact Hours	**3**	**2**	**5**

Max. Marks:100 **Internal Assessment Marks:20(T)+10(P)=30** **End Term Exam Marks:50(T)+20(P)=70**	**Time:3hrs (T)** **4hrs(P)**

Part B- Contents of the Course

Instructions for Paper- Setter : The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.
Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.

Unit	Topics	Contact Hours
I	• Objectives of cooking, processing, preservation, methods of cooking with their merits and demerits. • Effect of cooking and heat on nutritive value of foods. • **Cereals, millets and pulses**: Composition and nutritive value, types, storage, processing.	12
II	• **Cereal cookery:** Gluten and factors affecting the gluten formation, cereal starch, gelatinization, dextrinisation. • **Pulse and legumes cookery**: Composition, Effect of heat, acid and alkali on cooking of pulses, factors affecting cooking quality, toxic constituents in pulses, processing of pulses.	12
III	• **Nuts and oil seeds**: Composition, types, storage, oil extraction, processing, toxic constituents and role in cookery. • **Milk and milk products:** Composition, properties, processing and packaging, effect of heat, acid, enzymes, microbes, processed and indigenous milk products and their quality and role in cookery.	10
IV	• **Vegetables and fruits**: Composition, types, storage, selection, post-harvest changes, effect of processing, preservation and cooking on different pigments of both fruits and vegetables. • **Processed and convenience foods**: Ready to eat foods, frozen foods, dehydrated foods, instant food mixes.	11

V*	• Laboratory conduct and responsibilities; knowledge of different food stuffs. • Terms used in cookery, weights and measures; identification and use of different kitchen items and equipments. • Identification and listing of various food groups; market survey of processed and preserved foods • Cereal cookery: Preparation of plain rice (open and pressure cook), pulao, paratha, chapatti etc. • Pulse cookery: Preparation of plain dal, pakoras, etc. Preparation of cereal and pulse combined recipes-Idli. • Nuts and oil seeds: Preparation of chikki, til ladoos, thandai, etc. • Milk cookery: Preparation of curd and paneer. • Fruits and vegetables cookery: Preparation of sauces, pickles, squash, Sabjis and salad. • Visit of food industries.	30

Suggested Evaluation Methods

Internal Assessment: ➢ **Theory** ● Class Participation: **05** ● Seminar/presentation/assignment/quiz/class test etc.:**05** ● Mid-Term Exam: **10** ➢ **Practicum** ● Class Participation: **00** ● Seminar/Demonstration/Viva-voce/Lab records etc.:**10** ● Mid-Term Exam: **NA**	**End Term Examination:** **50** **20**

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Potter,N.N.(1996).Food Science.The AVI Publishing Company, Inc., Westport, Connecticut.
2. Sehgal,S., Grewal,R.B.,Kawatra,A. and Kaur, Y.(1997). Practical Aspects of Food Preservation. Directorate of Publications. Haryana Agricultural University, Hisar.
3. KhadderV.,(1999),TextbookofFood,StorageandPreservation.KalyaniPublishers,NewDehi.
4. Kalia, M. and Sood, S.(2010). Food Preservation and Processing. Revised Edition, Kalyani Publishers, NewDelhi.
5. Jood,S .and Khetarpaul, N.(2002). Food Preservation. Geeta Somani A grotech Publishing

Academy, Udaipur.

6. Sivasankar,B.(2002).Food Processing and Preservation.PHI Learning Pvt.Ltd.Delhi.

Session: 2023-24			
Part A - Introduction			
Subject	Bachelor of Vocation in Food Science and Quality Control		
Semester	I		
Name of the Course	Basics of Biochemistry		
Course Code	**B23-FTQ-102**		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC –B1		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	Senior Secondary(10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. To understand the basic concept bio-molecules 2. To gain knowledge about Biological properties of water, pH, ionization, biological buffers. 3. To have knowledge of carbohydrates, protein, lipids, vitamins, enzymes etc. 4. To gain knowledge about Nucleotides and Nucleic acids 5*.To impart practical knowledge about the bio-molecules and their methods of determination		
Credits	**Theory**	**Practical**	**Total**
	3	**1**	**4**
Contact Hours	**3**	**2**	**5**
Max. Marks:100 **Internal Assessment Marks:20(T)+10(P)=30** **End Term Exam Marks:50(T)+20(P)=70**		**Time:3hrs (T)** **4hrs(P)**	

Part B- Contents of the Course		
Instructions for Paper- Setter : The examiner will set nine questions in all, selecting two questions from each unit and one compulsory. **Instructions for the Candidate:** The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.		
Unit	**Topics**	**Contact Hours**
I	• **Introduction to Bio-molecules**: Biological properties of water, pH, ionization, biological buffers. • **Classification and structure:** Amino acids, essential amino acids, rare and non-protein amino acids. • **Proteins**: Classification and structure of amino acids, essential amino acids and non essential amino acids. • **Classification and Structural organization of proteins**: Primary structure; Secondary structure-α-Helix, β- pleats and β – turn Tertiary structure myoglobin and lysozyme etc. Quaternary structure-hemoglobin. Forces stabilizing different structural levels.	12
II	• **Structure and function of carbohydrates**: Monosaccharides; families of monosaccharides; simple aldoses and ketoses, pyranose and furanose ring forms, reducing and non-reducing sugars, sugar derivatives viz. sugar alcohols, amino sugars, deoxy sugars, acidic sugars, Glycosidic bond. • **Disaccharides and Oligosaccharides:** Definition, structure and function of important disaccharides and oligosaccharides viz. lactose, sucrose, maltose, raffinose, stachyose, verbascose etc. • **Polysaccharides:** Homo and Hetero polysaccharides, storage. • polysaccharides: Starch and Glycogen.	12

	• **Structural polysaccharides:** Cellulose and Chitin.	
III	• **Lipids**: Introduction and Classification – simple and complex lipids. • **Fatty acids**: Structure and nomenclature, soap value, acid value, iodine number, rancidity. • **Essential fatty acids**: A general account of structure and function of triacylglycerols, phospholipids, glycolipids, sphingolipids, steroids, bile acids, bile salts and terpenes. • **Vitamins**: Water soluble and fat soluble, their structure and functions.	11
IV	• **Enzyme:** General properties of enzymes and coenzymes, their nature, classification and nomenclature of enzymes, fundamentals of steady state kinetics, enzyme inhibition, isozymes. • **Nucleotides and Nucleic acids**: Building blocks: bases, sugar sand phosphates. • Structure and nomenclature of nucleosides and nucleotides. • Polynucleotides, DNA (A, B, ZDNA) and RNA (rRNA, mRNA, tRNA).	10
V*	• Qualitative tests for Carbohydrates. • Estimation of reducing and non-reducing sugars. • Separation of sugars by Paper Chromatography. • Qualitative tests for Protein sand Amino acids. • Protein estimation by Lowry method. • Determination of starch content from wheat flour. • Determination of acid value of a fat/oil. • Determination of saponification and iodine value of Lipids. • Starch hydrolysis by salivary amylase. • Estimation of Vitamin C. • Estimation of DNA and RNA.	30
Suggested Evaluation Methods		

Internal Assessment:	End Term Examination:
➢ **Theory** ● Class Participation: **05** ● Seminar/presentation/assignment/quiz/class test etc.:**05** ● Mid-Term Exam: **10**	**50**
➢ **Practicum** ● Class Participation: **00** ● Seminar/Demonstration/Viva-voce/Lab records etc.:**10** ● Mid-Term Exam: **NA**	**20**

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Lehninger:PrinciplesofBiochemistry,4thedition,byDavidL.NelsonandM.M.Cox(2005)Maxmillan/Worthpublishers/W.H. Freeman & Company
2. Biochemistry(2004)byJ.DavidRawn,PanimaPublishingCorporation,NewDelhi
3. Biochemistry, 2nd edition, by R.H. Garrettand C.M. Grisham (1999). Saunders College Publishing, N.Y. Sons, NY.
4. Biochemistry, 4th edition, by L. Stryer (1995). W.H. Freeman & Co. ,N.Y.
5. Fundamentals of Biochemistry, 2nd ed.,by Donald Voet, Judith G.Voet.

Session: 2023-24			
Part A - Introduction			
Subject	Bachelor of Vocation in Food Science and Quality Control		
Semester	I		
Name of the Course	General Microbiology		
Course Code	**B23-FTQ-103**		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC –C1		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	Senior Secondary(10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. The students will be able to understand the basic concept of microbiology 2. To enable the students to have knowledge of microscope 3. To understand the methods for Control of microorganisms 4. To gain knowledge about microbial nutrition and growth _____ 5*.To impart practical knowledge about the microscope, staining techniques, media preparation etc.		
Credits	**Theory**	**Practical**	**Total**
	3	**1**	**4**
Contact Hours	**3**	**2**	**5**
Max. Marks:100 **Internal Assessment Marks:20(T)+10(P)=30** **End Term Exam Marks:50(T)+20(P)=70**		**Time:3hrs (T)** **4hrs(P)**	
Part B- Contents of the Course			

Instructions for Paper- Setter : The examiner will set nine questions in all, selecting two questions from each unit and one compulsory. **Instructions for the Candidate:** The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.		
Unit	**Topics**	**Contact Hours**
I	• **Introduction and Scope of Microbiology**: Definition and history of microbiology, contributions of Antony van Leeuwenhoek, Louis Pasteur, Robert Koch, Importance and scope of Microbiology as a modern Science Branches of microbiology. • **Microscope:** Construction and working principles of different types of microscopes– compound, dark field , Phase contrast, Fluorescence and Electron (Scanning and transmission).	12
II	• **Control of microorganisms**: Principles and Applications of Physical Methods. Autoclave, Hot air oven, laminar airflow, Seitz filter, Sintered glass filter, and membrane filter chemical Methods: Alcohol, Aldehydes, Phenols, Halogen sand Gaseous agents. Radiation Methods: UV rays and Gamma stains. • **Staining techniques**: Principles of staining, types of stains – simple stains, structural stains and Differential stains.	12
III	• **Microbial Taxonomy**: Concept of microbial species and strains, classification of bacteria based on – morphology (shape and flagella), staining reaction, nutrition and extreme environment. • **General Account of Viruses and Bacteria**: Bacteria–Ultra structure of bacteria cell (both Gram positive and Gram negative) including, endospore and capsule, Viruses–Structure and classification.	11
IV	• **Principles of Microbial Nutrition**: the requirements for carbon, nitrogen, sulfur, growth factors etc., role of oxygen in nutrition,	10

	nutritional categories among micro-organisms. • **Microbial growth**: Kinetics of microbial growth, growth curve, synchronous growth, factors affecting bacterial growth.	
V*	• Safety measures in microbiology laboratory. • Cleaning and sterilization of glass ware. • Study of instruments: Compound microscope, Auto clave, Hot air oven, pH meter, Laminar air flow and centrifuge. • Staining techniques in Microbiology-simple, negative and differential staining. • Media preparation: Nutrients agar, MRBA and Nutrient broth Isolation of bacteria and fungi from soil, air, and water– dilution and pour plate methods. • Isolation, Purification, maintenance and preservation techniques of aerobic and anaerobic cultures. • Isolation of Microorganisms by pour plate and streak plate methods. • Presumptive and confirmation test for the determination of coli form bacteria. • Determination of viability of micro organisms.	30
Suggested Evaluation Methods		
Internal Assessment: ➢ **Theory** ● Class Participation: **05** ● Seminar/presentation/assignment/quiz/class test etc.:**05** ● Mid-Term Exam: **10** ● **Practicum** ● Class Participation**: 00** ● Seminar/Demonstration/Viva-voce/Lab records etc.:**10** ● Mid-Term Exam: **NA**		**End Term Examination:** **50** **20**
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

1. Atlas, R.M. (1998) Microbiology: Fundamental and applications. 2nd edition, Macmillan Publishing Company, New York.
2. Pelezar ,M.J. ,Chan, E.G.S. and Krieg, N.R.(1998)Microbiology.
3. Heritage,J.,Evance,E.G.V.andKillington,R.A.(1999)Microbiologyinaction.Cambridg eUniversity Press.

Session: 2023-24			
Part A - Introduction			
Subject	Bachelor of Vocation in Food Science and Quality Control		
Semester	I		
Name of the Course	Hygiene and Sanitation		
Course Code	**B23-FTQ-104**		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M1		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	Senior Secondary(10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. To acquire basic knowledge about hygiene and sanitation in food plant 2. To understand the food grade standards for different processed products 3. To gain knowledge about food storage and food handling 4. To have knowledge of food poisoning and their causes 5*.To impart practical knowledge about the hygiene and sanitation in relation to food industry.		
Credits	**Theory**	**Practical**	**Total**
	1	**1**	**2**
Contact Hours	**1**	**2**	**3**
Max. Marks:50 **Internal Assessment Marks:10(T)+5(P)=15** **End Term Exam Marks:**20**(T)+15(P)=35**		**Time:3hrs (T)** **4hrs(P)**	
Part B- Contents of the Course			

Instructions for Paper- Setter : The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.

Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.

Unit	Topics	Contact Hours
I	• **Meaning, Principle, Concept and significance** of hygiene and sanitation in relation of food industry. • **Water Requirement and use**: sources of water supply, water pollution, purification of water, portable water and its quality-Criteria and standards, hardness of water and its treatment, defluoridation of water, Domestic and Industrial. Food and water borne infections. Prevention and control.	4
II	• **Food grade standards** for different processed products. • **Food storage**: general guide lines and storage of specific foods. Principles of hygiene and sanitation-sanitary procedures while preparation, cooking, and holding food, serving and displaying food, specific food operations.	3
III	• **Food hygiene**: Contamination of foods from various sources- Green plants and fruits, animals, sewage, soil, air and water and their health hazards. • **Food spoilage**: Causes of spoilage of Perishable, semi perishable and nonperishable foods. • Personal hygieneand food handling habits of personnel sanitary procedures for preparation, handling and storage of foods.	4
IV	• **Food poisoning caused by bacteria**: *Salmonella, Staphylococcalpoisoning ,Botulinum, Clostridiumperfringens and Bcerus*, Sources, incubation period, mechanism of action. • **Food Poisoning**: Prevention and control, Food Poisoning caused by agents other than microorganism, Poisonous plants, animals, chemicals, metals and pesticides etc.	4

V*	• Drawing and labeling of structures of common microorganism in food for identification • Demonstration on preparation of slides, preparation of media. • Collection of water samples. Demonstration on testing of water for: (i) Physical quality (ii) Bacteriological quality. • Survey of hygienic and sanitary condition in food shops/food vendors. • Visit to Food Industries. • Report writing.	30
Suggested Evaluation Methods		
Internal Assessment: ➢ **Theory** ● Class Participation: **04** ● Seminar/presentation/assignment/quiz/class test etc.:**00** ● Mid-Term Exam: **06** ➢ **Practicum** ● Class Participation: **00** ● Seminar/Demonstration/Viva-voce/Lab records etc.:**05** ● Mid-Term Exam: **NA**		**End Term Examination:** **20** **15**
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Adams M.K. and Moss M.O.(2000).Food Microbiology, New Delhi: Panima Corp. • Longree K.L. and Blaker G.C.(1982).Sanitary Techniques in Food Service. New York: John Wiley and Sons. • Park,K.(1997).TextbookofPreventiveandSocialMedicine.1st Ed.Jabalpur:BanarsidasBhanot		

Session: 2023-24			
Part A - Introduction			
Subject	Bachelor of Vocation in Food Science and Quality Control		
Semester	II		
Name of the Course	Basic Principles of Food Processing & Preservation		
Course Code	**B23-FTQ-201**		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC –A2		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	Senior Secondary(10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. The students will gain basic knowledge of food processing 2. To understand the methods of food preservation 3. To acquire the knowledge of different food additives 4. To have knowledge of new and unconventional methods of preservation 5*.To impart practical knowledge about the food processing and preservation		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10(P)=30 End Term Exam Marks:50(T)+20(P)=70		Time:3hrs (T) 4hrs(P)	
Part B- Contents of the Course			

Instructions for Paper- Setter : The examiner will set nine questions in all, selecting two questions from each unit and one compulsory. Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.		
Unit	Topics	Contact Hours
I	• Food Processing: Scope and importance of food processing; historical developments in food processing, • Classification of food on basis of shelf life, pH and origin • Food spoilage: Microbial, physical, chemical & miscellaneous.	10
II	• Thermal processing methods and preservation: Heat resistance of microorganisms, thermal death curve. Blanching, pasteurization, sterilization, Canning of foods, heat penetration • Preservation by low temperature Refrigeration, refrigeration load, refrigeration systems. • Freezing and frozen storage: Freezing curves, slow and quick freezing, factors determining freezing rate, freezing methods, advantages and disadvantages, changes in food during freezing, freeze drying in food processing.	11
III	• Moisture removal: Evaporation, drying, dehydration and concentration. • Principle, Methods, equipment and effect on quality: Drying curve, drying methods and type of dryers; physical and chemical changes in food during drying. Need and principle of concentration, methods of concentration (thermal concentration, freeze concentration, memberane concentration) changes in food quality by concentration	12
IV	• Preservation by salt and sugar: Pickling, fermentation, intermediate moisture foods.	12

	• Food Additives: Different types of food additives (preservatives, acidulants, emulsifiers, antioxidant, leavening agents etc.) and its application in food industry • New and unconventional methods of preservation: pulse electric field processing, high pressure processing, ohmic and infrared, microwave heating.	
V*	• Orientation to the laboratory • Quality evaluation of various raw materials for food processing. • Roasting of food items. • Effects of low temperature storage on various foods. • Preservation by using sugar and salt. • Preservation of food by drying, chemical and radiation. • Shelf life evaluation of various food products. • Production of a fermented food • Demonstration and prevention of Browning reactions.	30
Suggested Evaluation Methods		
Internal Assessment: ➢ Theory ● Class Participation: 05 ● Seminar/presentation/assignment/quiz/class test etc.:05 ● Mid-Term Exam: 10 ➢ Practicum ● Class Participation: 10 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10 ● Mid-Term Exam: NA		End Term Examination: 50 20
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

1. Norman, N.P and Joseph, H.H.(1997). Food Science, Fifth edition, CBS Publication, New Delhi

2. Kalia M. and Sangita, S. (1996). Food Preservation and Processing, First edition, Kalyani Publishers, New Delhi.

3. Sivasankar, B. (2002): Food Processing and Preservation, Prentice Hall of India Pvt.Ltd., New Delhi.

4. Fellows, Food process technology: Principles and Technology, CRC publications.

5. Khetarpaul N. (2005). Food Processing and Preservation, Dya Publishing House , New Delhi

Session: 2023-24			
Part A - Introduction			
Subject	Bachelor of Vocation in Food Science and Quality Control		
Semester	II		
Name of the Course	Food Chemistry		
Course Code	**B23-FTQ -202**		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC –B2		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	Senior Secondary(10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. To understand the basic concept of chemistry in food 2. To acquire the knowledge of carbohydrates, proteins, lipids and other nutrients of food 3. To gain knowledge about the browning reaction and food enzymes 4. The students will gain knowledge of plant pigments and flavor and aroma of foods _____ 5*.To impart practical knowledge about the determination of moisture, acidity, pH in food sample		
Credits	**Theory**	**Practical**	**Total**
	3	**1**	**4**
Contact Hours	**3**	**2**	**5**
Max. Marks:100 **Internal Assessment Marks:20(T)+10(P)=30** **End Term Exam Marks:50(T)+20(P)=70**		**Time:3hrs (T)** **4hrs(P)**	

Part B- Contents of the Course		
Instructions for Paper- Setter : The examiner will set nine questions in all, selecting two questions from each unit and one compulsory. **Instructions for the Candidate:** The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.		
Unit	**Topics**	**Contact Hours**
I	**Food chemistry**: Definition, scope and importance; water in food, water activity and shelf life of food; chemistry and stability of water and fat soluble vitamins; chemical properties of minerals and their bio availability, enrichment and fortification. **Carbohydrates:** Classification, physical and chemical properties of sugars, functional properties and uses of pectic substances, gums and dietary fiber in food; browning reaction in food: enzymatic and non-enzymatic browning, their occurrence and applications in food; starches: functionality of starch in foods, gelatinization and retro-gradation of starches, modified starches, resistant starches.	10
II	**Proteins:** Structures and sources of proteins; chemical and physical properties of protein, changes during processing protein penetration mechanism (folding and unfolding) and application. **Browning reaction**: Enzymatic and non enzymatic browning, advantages and disadvantages, factors affecting their reaction and control.	11
III	**Lipid: S**tructure, physical and chemical property, utilization of fats and oil, margarines, shortening, Hydrogenation and its importance, Lipid per oxidation: mechanism, development of rancidity, antioxidants in foods; types and function etc. **Food enzymes**: Enzymatic modification, criteria for purity enzyme and application of enzymes in food technology.	12

IV	**Plant pigments**: Structure and properties of chlorophyll, anthocyanins, carotenoids, chemical changes during processing. **Flavour and aroma of foods**: Importance and method of retention of flavor and technology, flavor enhancer MSG, recent development in flavor technology.	12
V*	• Estimation of proteins from various food samples. • Determination of moisture in food sample • Determination of Acidity and pH in food sample/beverages. • Precipitation of proteins by acid, alkali and metals. • Estimation of nitrogen content in various food samples. • Estimation of rancidity of fats. • Estimation of crude fibre in food sample • Determination of total ,non-reducing and reducing sugars • Calculate activity of enzymes from various food samples. • Extraction of flavors from various fruits and vegetables.	30
Suggested Evaluation Methods		
Internal Assessment: ➢ **Theory** ● Class Participation: **05** ● Seminar/presentation/assignment/quiz/class test etc.:**05** ● Mid-Term Exam: **10** ➢ **Practicum** ● Class Participation: **00** ● Seminar/Demonstration/Viva-voce/Lab records etc.:**10** ● Mid-Term Exam: **NA**		**End Term Examination:** **50** **20**
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

1. Enzymesin Food Processing, Ind. Edition Ed., by G.A. Tucker & L.F.J. Woods Blackie Academic, 1995.
2. Food Chemistry b. H.D. Belitz & W. Grosch Springer-Verlag, Berlin, 1997.
3. Food Chemistry: A Laboratory Manual by Miller, D.D., John-Wiley, USA, 1998.
4. Food Science by N.N. Potter & J.H. Hotchkiss Chapman & Hall, 1995.
5. Food Enzymes: Structure & Mechanism by Dominic W.S. Wong, Chapman & Hall, & Hall, 1995.

Session: 2023-24			
Part A - Introduction			
Subject	Bachelor of Vocation in Food Science and Quality Control		
Semester	II		
Name of the Course	Dairy Technology and Quality Control		
Course Code	**B23-FTQ-203**		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC –C2		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	Senior Secondary(10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. To understand the concept of dairy and scope and importance now a days 2. To acquire the knowledge of basic unit operation and equipments involved in processing of milk and milk products 3. To understand the methods of drying and dehydration of milk 4. The students will gain knowledge of dairy products manufacturing and quality control 5*.To impart practical knowledge about the sampling of milk, platform test for dairy products		
Credits	**Theory**	**Practical**	**Total**
	3	**1**	**4**
Contact Hours	**3**	**2**	**5**
Max. Marks:100 **Internal Assessment Marks:20(T)+10(P)=30**		**Time:3hrs (T)** **4hrs(P)**	

End Term Exam Marks:50(T)+20(P)=70	

Part B- Contents of the Course

Instructions for Paper- Setter : The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.

Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.

Unit	Topics	Contact Hours
I	• **Dairy industry in India**: scope, strengths and opportunities for dairy industry. • **Milk:** definition, composition and nutritive value. • Factors affecting composition of milk Physico-chemical properties of milk.	10
II	• **Introduction of basic unit operation and equipments involved in processing of milk and milk products:** transportation, milk procurement, handling, receiving, chilling, filtration/clarification, standardization, pasteurization & pasteurizer, sterilization, homogenization & homogenizer, UHT processing. • **Drying and dehydration of milk**: Drying theories, drying equipments (spray and drum drier) manufacture of WMP, SMP. • **Technology of indigenous milk products**: Production of khoa, srikhand, rabri, dahi, kulfi ghee, paneer, channa.	11

III	• **Dairy products manufacturing**: Special milk, Yoghurt, Cheese making, Ice cream manufacturing, cream and butter (process and defects, their causes and prevention). • Utilization of milk industry by-products. • **Newer concepts in dairy product**s: cream powder, sterilized cream, butter powder, cheese spread, whey protein concentrates. Types of membranes, applications of reverse osmosis, ultra-filtration and microfiltration.	12
IV	• **Quality Control**: Grading of milk and milk products, criterion of grading, milk adulteration problem, synthetic milk, PFA standards for market milk and milk products. • **Dairy plant sanitation**: Hygiene in dairy Industry, different types of cleansing and sanitizing agents, their applications, cleaning systems.	12
V*	• Sampling of milk. • To conduct the plat form tests of milk sampling of dairy products. • Determination of physico-chemical properties of milk. • Estimation of fat % by Gerber method. • Detection of common adulterants in milk and milk products. • To perform SPC of milk. • To ascertain microbiological quality of milk by MBRT. • To prepare ice cream from a commercially available ice cream mix and to study defects in ice cream. • Preparation of traditional Indian dairy products. • Quality testing of dairy products likes khoa, paneer, ghee etc.	30
Suggested Evaluation Methods		

Internal Assessment:	End Term Examination:
➢ **Theory** ● Class Participation: **05** ● Seminar/presentation/assignment/quiz/class test etc.:**05** ● Mid-Term Exam: **10**	**50**
➢ **Practicum** ● Class Participation:**00** ● Seminar/Demonstration/Viva-voce/Lab records etc.:**10** ● Mid-Term Exam: **NA**	**20**

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Sukumar, De (1994). Outlines of Dairy Technology. Oxford University Press.

2. Smith G. (2003). Dairy processing improving quality. Wood head Publishers.

3. Aneja RP, Mathur BN, Chandan RC & Banerjee AK. 2002. Technology of Indian Milk Products. Dairy India Publ.

4. Rathore NS et al. 2008. Fundamentals of Dairy Technology - Theory & Practices. Himanshu Publ.

Session: 2023-24			
Part A - Introduction			
Subject	Bachelor of Vocation in Food Science and Quality Control		
Semester	II		
Name of the Course	Microbiology-II		
Course Code	**B23-FTQ-204**		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M2		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	Senior Secondary(10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. To understand the basic aspects and scope of food microbiology 2. The students will gain knowledge of food fermentations 3. To understand the methods of chemical preservatives and natural antimicrobial compounds 4. To acquire the knowledge of microbiology of fruits and vegetables 5*.To impart practical knowledge about the aseptic, sterilization, morphological methods etc.		
Credits	**Theory**	**Practical**	**Total**
	1	**1**	**2**
Contact Hours	**1**	**2**	**3**
Max. Marks:50 **Internal Assessment Marks:10(T)+5(P)=15**		**Time:3hrs (T)** **4hrs(P)**	

End Term Exam Marks:20**(T)+15(P)=35**	

Part B- Contents of the Course

Instructions for Paper- Setter : The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.

Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.

Unit	Topics	Contact Hours
I	• Basic aspects and scope of food microbiology; Intrinsic and extrinsic factors that affect microbial growth in foods. • Microbial spoilage of Milk, fruits, fruit juices, vegetables, cereals, meat, poultry, sea foods, carbonated soft drinks, canned foods, chemical changes caused by microorganisms, control of spoilage.	3
II	• Food Fermentations, traditional fermented foods of India and other Asian countries Probiotics, prebiotics and synbiotics. • Food preservation-Physical methods • Chemical preservatives and natural antimicrobial compounds, biology based preservation system. • Control of microorganisms by use of low and high temperature, asepsis, water activity, drying, preservatives, radiation and pressure for control of micro organisms.	4
III	• Microbiology of milk and milk products; Sources of contamination, spoilage and prevention. • Microbiology of fruits and vegetables. • Cereal and cereal products. • Meat and meat products. • Fish and other sea foods. • Poultry and eggs.	4

IV	• Sugar and sugar products, salts and spices. • Food poisoning caused by bacteria: Salmonella. Staphylococcal poisoning Botulinum Clostridium per fringen sand B.cerus. Sources, incubation period, mechanism of action.	4
V*	• General laboratory practices in micro biology. laboratory • Equipment used in food microbiology laboratory. • Aseptic methods. • Sterilization methods. • Morphological studies. • Preparation of media. • Isolation and enrichment of micro organisms. • Microbial analysis of food products and water. • Isolation of molds from foods. • **Microbial examination of :** ➢ cereal and cereal products ➢ vegetable and fruits ➢ meat and meat products ➢ fish and other sea foods ➢ Eggs and poultry ➢ milk and milk products	30
Suggested Evaluation Methods		
Internal Assessment: ➢ **Theory** ● Class Participation**: 04** ● Seminar/presentation/assignment/quiz/class test etc.:**00** ● Mid-Term Exam: **06** ➢ **Practicum** ● Class Participation: **00** ● Seminar/Demonstration/Viva-voce/Lab records etc.:**05** ● Mid-Term Exam: **NA**		**End Term Examination:** **20** **15**
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

- Stanier Ingraham and Wheels and Painter.1992.General Microbiology.5thed.
- Kapoor,T.and Yadav.1991.AnIntroduction to Microbiology.
- Pelczar, *etal.1996*. Microbiology, 5thedn.

Session: 2023-24			
Part A - Introduction			
Subject	Bachelor of Vocation in Food Science and Quality Control		
Semester	III		
Name of the Course	Cereal and Bakery Technology and Quality Control		
Course Code	**B23- FTQ- 301**		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A3		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	Senior Secondary(10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. To gain basic knowledge about the cereal technology 2. To acquire the knowledge of milling of rice and corn 3. To understand the methods of Barley malting process 4. To have knowledge of preparation of bakery products and noodles & pasta products 5*.To impart practical knowledge about the physico-chemical properties of & quality assessment of wheat and wheat based products		
Credits	**Theory**	**Practical**	**Total**
	3	**1**	**4**
Contact Hours	**3**	**2**	**5**
Max. Marks:100 **Internal Assessment Marks:20(T)+10(P)=30** **End Term Exam Marks:50(T)+20(P)=70**		**Time:3hrs (T)** **4hrs(P)**	
Part B- Contents of the Course			

Instructions for Paper- Setter : The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.

Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.

Unit	Topics	Contact Hours
I	**Cereal Technology**: Structure and chemical composition of prominent cereals(wheat, rice, corn, barley); criteria of wheat quality – physical and chemical factors; Wheat milling – general principles and operations, cleaning, conditioning and roller milling systems; flour extraction rates and various flour grades and types; criteria of flour quality, dough rheology and its measurement. **Milling of rice:** Types of rice mill; huller mill, sheller-cum-cone polisher mill; modern rice milling unit operation-dehusking, paddy separation, polishing and grading; factors affecting rice yield during milling; rice branas rice milling by products. Rice parboiling technology, different parboiling methods, changes during parboiling, advantages and disadvantages of parboiling. Cooking characteristics of rice and factors affecting cooking of rice, rice convenience foods: precooked rice, canned.	10
II	**Corn milling**: Wet and dry milling of corn, products of wet and dry milling of corn. **Barley malting process**: Steeping, germination and drying; significance of malting; different types of malts and their food applications.	11
III	**Introduction**: Status and scope of bakery industry in India, Raw material for bakery products, their role and PFA specification of these raw material. **Bread making processes**,: Different types of bread and preparation of bread using different methods , quality evaluation of bread, staling of bread.	12

IV	**Technology of biscuit, cookies, crackers and cakes manufacturing**: Different types of biscuits and preparation of biscuits using different methods, quality evaluation of biscuits. Preparation of cakes using different methods, types of cakes quality evaluation of cakes. Technology of noodles and pasta products, hygienic condition required in bakery plant, operation and maintenance of bakery equipment.	12
V*	• Physico chemical properties of wheat and wheat based products. • Quality assessment: Flour, yeast, water, leavening agents. • Manufacturing and comparative Sensory evaluation of bread. • Manufacturing of and Sensory evaluation of cookies. • Manufacturing and comparative sensory evaluation of cakes. • Manufacturing and sensory evaluation of cracker. • Manufacturing and sensory valuation of pizza and noodles. • Cooking quality of rice. • Malt preparation. • Visit to bakery plants.	30
Suggested Evaluation Methods		
Internal Assessment: ➢ **Theory** ● Class Participation: 05 ● Seminar/presentation/assignment/quiz/class test etc.:**05** ● Mid-Term Exam: **10** ➢ **Practicum** ● Class Participation: **00** ● Seminar/Demonstration/Viva-voce/Lab records etc.:**10** ● Mid-Term Exam: **NA**		**End Term Examination:** **50** **20**
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

1. Amuel, A.M. (1996) "The Chemistry and Technology of Cereals as Food and Feed ", CBS Publisher & Distribution, New Delhi.
2. Honeney, R.C. (1986) "Principles of Cereal Science and Technology", Am. Assoc Cereal Chemists, St. Paul, MN, USA.
3. Pomeranz, Y. (1976) "Advances in Cereal Science and Technology", Am. Assoc. Cereal Chemists St. Paul, MN, USA.
4. Chakraverty, A. 1988. Postharvest Technology of Cereals, Pulses and oilseeds. Oxford and IBH, New Delhi.
5. Durbey, S.C. 1979. Basic Baking: Science and Craft. Gujarat Agricultural University, Anand (Gujrat).
6. Kent,N.L.1983. Technology of Cereals.3rdEdn.PergamonPress,Oxford,UK.

Session: 2023-24			
Part A - Introduction			
Subject	Bachelor of Vocation in Food Science and Quality Control		
Semester	III		
Name of the Course	Fruit and vegetable Technology and Quality Control		
Course Code	**B23-FTQ-302**		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC –B3		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	Senior Secondary(10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. To understand the status and scope of fruit and vegetable industry in India 2. To understand the general principles and methods of preservation and processing. 3. To acquire the knowledge of canning of fruits and vegetables 4. To have knowledge of preparation of preparation of jam, jellies, marmalades etc. 5*.To impart practical knowledge about the preparation and comparative sensory valuation of tomato products, jam, jellies, fruit juices etc.		
Credits	**Theory**	**Practical**	**Total**
	3	**1**	**4**
Contact Hours	**3**	**2**	**5**
Max. Marks:100 **Internal Assessment Marks:20(T)+10(P)=30**		**Time:3hrs (T)** **4hrs(P)**	

End Term Exam Marks:50(T)+20(P)=70	

Part B- Contents of the Course

Instructions for Paper- Setter : The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.

Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.

Unit	Topics	Contact Hours
I	• **Introduction:** Status and scope of fruit and vegetable industry in India, General principles and methods of preservation and processing. • **Classification and composition** of fruits and vegetables and their nutritional significance, factors influencing maturity and ripening, pre harvest factors influencing post-harvest physiology, bio- chemical changes during maturation, ripening. • **Post harvest handling procedures and treatments**: Pre cooling methods, washing, blanching, peeling, sorting and grading of fruits and vegetables, edible coatings.	12
II	• **Storage systems**: CA&MA storage structures, refrigerated-refrigerants, definition and classification, natural cooling by evaporation. • **Canning of fruits and vegetables**: method, tin and glass containers, spoilage of canned foods.	12
III	• **Vegetable Processing**: Tomato Products, pectic substances, fermented fruits, pickling & preparation of chutneys, vinegar production. • **Technology for Fruit juice**-Preparation of syrups, squash, RTS, cordials & nectars, clarification and debittering of juices, concentration of juices.	11

	• **Fruit Technology** preparation of jam, jellies, marmalades, Fruit preserves and candied fruits, dehydrated fruits & vegetables, Utilization of waste.	
IV	• **Processing and Preservation for a small scale industry**: Products for small scale manufacture, equipments, medium and large sized multi commodity processing. • **Quality Control: S**torage disorders, quality & safety factors & export standards, Standards for processed Fruit and vegetable products & regulations.	10
V*	• To determine the TSS of the given sample using refractometer. • To determine the titrable acidity and acid brixratio of the given sample. • Determination of ascorbic acid content ingiven sample. • To study the preservative action of sugar in fruit juice. • Testing of adequacy of blanching. • Preparation and quality evaluation of pickles, chutneys. • Preparation and comparative sensory valuation of tomato products. • Preparation and comparative sensory valuation of jam, jellies, and preserve. • Preparation and quality evaluation fruit juices. • Drying and shelf life evaluation of fruit and vegetables. • Waste utilization: Extraction of pectin from apple peels and lemon rind. • Visit to fruits and vegetable processing industries	30
Suggested Evaluation Methods		

Internal Assessment:	End Term Examination:
➢ **Theory** ● Class Participation: **05** ● Seminar/presentation/assignment/quiz/class test etc.:**05** ● Mid-Term Exam: **10** ➢ **Practicum** ● Class Participation: **00** ● Seminar/Demonstration/Viva-voce/Lab records etc.:**10** ● Mid-Term Exam: **NA**	**50** **20**

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. R.P. Srivastava and Sanjeev Kumar (2001) : Fruit and Vegetable Preservation – Principles and Practices, Thirdedition, International Book distributing Co. Lucknow (India)
2. A.K. Thompson (2003): Fruit and Vegetables – Harvesting, handling and storage. 2nd edition Black well Publishing.
3. Er. B. Pantastico: Postharvest Physiology, handling and utilization of tropical and subtropical fruits and vegetables. AVI Publishing Company, Inc.
4. W.V Cruess (1997): Commerical Fruit and Vegetable Products .Allied ScientificPublishers.Bikaner(India)Girdharilal(1996)PreservationofFruits and Vegetables. ICAR, New Delhi
5. Dauthy, M.E.1997. Fruitand Vegetable Processing. International Book Distributin Co. Lucknow, India.

Session: 2023-24			
Part A - Introduction			
Subject	Bachelor of Vocation in Food Science and Quality Control		
Semester	III		
Name of the Course	Food Safety and Quality Assurance-I		
Course Code	**B23-FTQ-303**		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC –C3		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	Senior Secondary(10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. To understand the objectives of general concept of quality and quality control 2. To have knowledge of GAP, GMP, GHP, good lab practices 3. To acquire the knowledge of quality improvement techniques 4. To gain knowledge about the Food adulteration and food safety 5*.To impart practical knowledge about the detection of indicator microbes in various food products		
Credits	**Theory**	**Practical**	**Total**
	3	**1**	**4**
Contact Hours	**3**	**2**	**5**
Max. Marks:100 **Internal Assessment Marks:20(T)+10(P)=30** **End Term Exam Marks:50(T)+20(P)=70**		**Time:3hrs (T)** **4hrs(P)**	

Part B- Contents of the Course		
Instructions for Paper- Setter : The examiner will set nine questions in all, selecting two questions from each unit and one compulsory. **Instructions for the Candidate:** The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.		
Unit	**Topics**	**Contact Hours**
I	• **Concepts of food quality applied to food industry**: General concept of quality and quality control, objectives. • **Importance and functions** of quality control. • **Quality assurance and total quality control**: Principles of food quality assurance, nature of total quality control, approaches to TQC. • General awareness and role of management practices in quality control, GAP, GMP, GHP, good lab practices.	10
II	**Quality improvement techniques:** • Quality improvement plans (QIP) • Quality control circles(QCC) • Statistical quality control (Definition, need and importance).	12
III	**Quality control in food industry:** • Methods of evaluation and control of the various aspects of quality of raw materials. • Manufacturing process and testing of finished products.	12

IV	• **Food adulteration and food safety:** Nature of adulterants, methods of evaluation of food adulterants and toxic constituents. • Food safety, Current challenges to food safety.	11
V*	• To study the essential elements of Good lab practices. • Estimation of adulterants in various food products. • Detection of Indicator microbes in various food products. • To study the essential elements of Good Hygiene Practices. • To study the essential elements of Good Manufacturing Practices. • Application of Statistical quality control. • Study of QA department responsibility. • Study of QC department responsibility.	30

Suggested Evaluation Methods

Internal Assessment:	**End Term Examination:**
➢ **Theory** ● Class Participation: **05** ● Seminar/presentation/assignment/quiz/class test etc.:**05** ● Mid-Term Exam: **10**	**50**
➢ **Practicum** ● Class Participation: **00** ● Seminar/Demonstration/Viva-voce/Lab records etc.:**10** ● Mid-Term Exam: **NA**	**20**

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Early.R.(1995):GuidetoQualityManagementSystemsfortheFoodIndustry,Blackie,Academicand professional, London.
2. Gould, W.A and Gould, R.W. (1998).Total Quality Assurance for the Food Industries, CTI Publications Inc. Baltimore.
3. Bryan, F.L. (1992): Hazard Analysis Critical Control Point Evaluations A Guide to Identifying Hazards and Assessing Risks Associated with Food Preparation and Storage.World Health Organization, Geneva

4. Krammer, A. and Twigg, B.A. (1970). Quality Control for the Food Industry.3rdEdn.AVI, Westport.
5. Rekha S. Singhal, Pushpa R. Kulkarni, DananeshV. Rege,(1997).Hand Book of Indices of food Quality and Authenticity, wood head Publishing Ltd.

Session: 2023-24			
Part A - Introduction			
Subject	Bachelor of Vocation in Food Science and Quality Control		
Semester	III		
Name of the Course	Techniques In Biochemistry		
Course Code	**B23-FTQ-304**		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M3		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	Senior Secondary(10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. To understand the methods of sampling and sampling techniques 2. To acquire the knowledge of proximate analysis of food samples 3. To gain knowledge about the HPLC, GLC, spectro photometry, electrophoresis etc. 4. The students will gain knowledge of kjelplus, fibreplus, sox-plus etc. _____ 5*.To impart practical knowledge about the proximate analysis of food samples		
Credits	**Theory**	**Practical**	**Total**
	3	**1**	**4**
Contact Hours	**3**	**2**	**5**
Max. Marks:100 **Internal Assessment Marks:20(T)+10(P)=30**		**Time:3hrs (T)** **4hrs(P)**	

End Term Exam Marks:50(T)+20(P)=70	

Part B- Contents of the Course

Instructions for Paper- Setter : The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.

Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.

Unit	Topics	Contact Hours
I	• Sampling and sampling techniques. • Proximate analysis- Moisture, ash, crude fat, crude fibre, crude protein and carbohydrates by difference method. • Principles and methods of food analysis.	4
II	• Basic principles: Refractometry, polarimetry, densitometry, HPLC, GLC, spectrophotometry, electrophoresis, automatic amino acid analyzer. • Determination of starch • Test for unsaturation of fats, rancidity of fats.	4
III	• Quantitative analysis of protein by Biuret method, Ninhydrin method, Lowry's method and Dye-binding method. • Bio assays for protein quality of grains.	3
IV	• Chemical, microbiological, fluro metric and colorimetric methods of analysis of fat soluble and water soluble vitamins.	4
V*	• Proximate analysis: Moisture, ash and carbohydrate by difference. • Demonstration of kjelplus, fibreplus, sox-plus. • Estimation of sugar content of fruit and reducing and non-reducing sugars in cereals. • Estimation of starch content of cereals Determination of iodine value and saponification number of fats.	30

	• Estimation of minerals, iron, calcium and phosphorus. • Estimation of vitamins: Ascorbic acid, thiamine, beta-carotene. • Protein quality analysis, in-vitro method. • Physical test for grain quality and rheological properties of foods	
Suggested Evaluation Methods		
Internal Assessment: ➢ **Theory** ● Class Participation: **05** ● Seminar/presentation/assignment/quiz/class test etc.:**05** ● Mid-Term Exam: **10** ➢ **Practicum** ● Class Participation: **00** ● Seminar/Demonstration/Viva-voce/Lab records etc.:**10** ● Mid-Term Exam**: NA**		**End Term Examination:** **50** **20**
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • **AOAC. (2000). Association of Official Analytical Chemists. Washington, DC.** • **Pearson, D. (1973. Laboratory Techniques in Food Analysis. Butterworths and Co., London** • **Pomeranz and Yeshajahu. (1987). Food Analysis Theory and Practice. 2nd ed. AVI Publ.Company, Westport.** • **Joslyn, M.A. (1970). Methods in Food Analysis: Physical, Chemical and Instrumental Methods of Analysis. Academic Press. New York** • **NIN. (2003). A Manual of Laboratory Techniques.**		

Session: 2023-24			
Part A - Introduction			
Subject	Bachelor of Vocation in Food Science and Quality Control		
Semester	IV		
Name of the Course	Meat Technology and Quality Control		
Course Code	**B23-FTQ-401**		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A4		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	Senior Secondary(10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. To understand the status and scope of meat industry in India 2. To gain knowledge about the restructured meat products 3. To acquire the knowledge of quality evaluation of eggs 4. The students will gain knowledge of fish processing 5*.To impart practical knowledge about the preservation and quality evaluation of various value added meat products		
Credits	**Theory**	**Practical**	**Total**
	3	**1**	**4**
Contact Hours	**3**	**2**	**5**
Max. Marks:100 **Internal Assessment Marks:20(T)+10(P)=30** **End Term Exam Marks:50(T)+20(P)=70**		**Time:3hrs (T)** **4hrs(P)**	
Part B- Contents of the Course			
Instructions for Paper- Setter : The examiner will set nine questions in all, selecting two questions from			

each unit and one compulsory.

Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.

Unit	Topics	Contact Hours
I	• **Introduction**: Status and scope of meat industry in India; Structure and physico-chemical properties of muscle meat: composition and nutritive value, conversion of muscle into meat, postmortem changes in meat, rigor mortis, cold shortening, pre-rigor processing. • Stunning and slaughtering methods, aging of meat, meat tenderization-natural and artificial methods, cooking methods for meat: roasting, frying and braising.	10
II	• **Storage and preservation of meat**: chilling, freezing, curing, smoking, dehydration, freeze-drying, irradiation, canning. Cooking, palatability and eating quality of meat, microbial spoilage of meat. • Restructured meat products (sausages), meat analogs; meat industry by products: importance and applications; intermediate moisture and dried meat products; meat plant hygiene and good manufacturing practices; packaging of meat products.	11
III	• **Egg:** Structure, composition and nutritive value of eggs, Storage and shelf life problems. • **Quality evaluation of eggs**: International and external quality evaluation, candling, albumen index, Haugh unit, yolk index etc.	12

	• **Egg preservation:** Grading of eggs, whole egg preservation, and pasteurization, dehydration, freezing, and egg products: egg powder, value added egg products (e.g., Meringues and Foams etc.), packaging of egg and egg products. • **Poultry products**: Types, chemical and nutritive value of poultry meat, slaughtering and evaluation of poultry carcasses; poultry cut-up parts and meat/bone ratio; preservation, grading and packaging of poultry meat.	
IV	• **Fish processing**: Factors affecting quality of fresh fish, fish dressing, chilling, freezing, glazing, salting and canning of fish. • Manufacturing of fish paste, fish oil, fish protein concentrate and fish meal. • By-products of fish industry and their utilization.	12
V*	• Physico-chemical and micro-biological quality of raw egg and their products. • Preservation of shell eggs by various methods. • Determination of egg density. • Determination of egg components. • Studies on hygiene and sanitation in meat, poultry and egg processing plants. • Preservation of meat by curing, freezing, smoking, drying and determination of shelf-life. • Preparation quality evaluation of various value added meat products.	30
Suggested Evaluation Methods		

Internal Assessment:	End Term Examination:
➢ **Theory** ● Class Participation: **05** ● Seminar/presentation/assignment/quiz/class test etc.:**0**5 ● Mid-Term Exam: **10** ➢ **Practicum** ● Class Participation: **00** ● Seminar/Demonstration/Viva-voce/Lab records etc.:**10** ● Mid-Term Exam: **NA**	**50** **20**

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Joshi,B.P.(1994). Meat Hygiene for Developing Country, Shree Almora Book Depot,
2. India.
3. William J.& Owen J.,(1977).Egg Science & Technology, AVI Publishing Company,
4. INC.Westport, Connecticut.
5. Lawrie,R.A.(1998).Meat Science. Wood head Publishers.
6. Mead,G.(2004).Poultry Meat Processing and Quality. Wood head Publishers.
7. Panda,P.C.(1992).Text Book onEgg and Poultry Technology, Vikas Publishers

Session: 2023-24			
Part A - Introduction			
Subject	Bachelor of Vocation in Food Science and Quality Control		
Semester	IV		
Name of the Course	Technology of Pulses, Legumes and Oil seeds and Quality Control		
Course Code	**B23-FTQ-402**		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC –B4		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	Senior Secondary(10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. To understand the status, production and major growing areas of pulses 2. The students will gain knowledge of milling techniques 3. To acquire the knowledge of processing of legumes 4. To gain knowledge about the innovative products from pulses and oilseeds 5*.To impart practical knowledge about the milling of different legumes and rancidity in edible oils		
Credits	**Theory**	**Practical**	**Total**
	3	**1**	**4**
Contact Hours	**3**	**2**	**5**
Max. Marks:100 **Internal Assessment Marks:20(T)+10(P)=30** **End Term Exam Marks:50(T)+20(P)=70**		**Time:3hrs (T)** **4hrs(P)**	

Part B- Contents of the Course		
Instructions for Paper- Setter : The examiner will set nine questions in all, selecting two questions from each unit and one compulsory. **Instructions for the Candidate:** The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.		
Unit	**Topics**	**Contact Hours**
I	• **Introduction**: Status, production and major growing areas of pulses, legumes and oilseeds in India and world. • Structure and chemical composition of pulses and oilseeds; nutritional and anti nutritional factors. • **Milling:** Milling techniques: dry milling and wet milling.	10
II	• **Processing of legumes**: Soaking, germination, decortication, cooking, fermentation; puffing, roasting and parching; utilization of pulses. • Protein isolates and concentrates; role of legumes in human nutrition. • **Processing and utilization of soybean for value added products**; soy based fermented products.	11
III	• **Innovative products from pulses and oilseeds**; future developments in products and processes; • Products from legume sand uses: starch, flour, protein concentrates and isolates.	12
IV	• **Oilseeds**: Sources of edible oils (groundnut, mustard, soya bean, sunflower, safflower, coconut, sesame and oil from other sources); physio-chemical properties. • **Processing of oilseeds**: rendering, pressing, solvent extraction, refining, hydrogenation; factors affecting extraction. • **Packing and storage** of fats and oils, changes during storage. Oil specialty products: margarine, mayonnaise, salad dressing, fat substitutes etc; chemical adjuncts: lecithin sand GMS.	12

	• **Nutritional food mixes from oil seeds**: processing of oil seeds for food use, protein rich foods, protein enriched cereal food.	
V*	• Extraction of oil from seeds. • Identification and description of common pulses. • Estimation of rancidity in edible oils. • Milling of different legumes. • Preparation of Soybean based edible cheese. • Estimation of protein in gram flour. • Extraction of starch/protein from flour.	30

Suggested Evaluation Methods

Internal Assessment:	**End Term Examination:**
➢ **Theory** ● Class Participation: **05** ● Seminar/presentation/assignment/quiz/class test etc.:**05** ● Mid-Term Exam: **10**	**50**
➢ **Practicum** ● Class Participation**: 00** ● Seminar/Demonstration/Viva-voce/Lab records etc.:**10** ● Mid-Term Exam**: NA**	**20**

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Hamilton, R.J. and Bharti, A. Ed. 1980. Fats and Oils: Chemistry and Technology. Applied Science, London.
2. Salunkhe, O.K. Chavan, J.K, Adsule, R.N. and Kadam, S.S. 1992. World Oilseeds: chemistry, Technology and Utilization. VNR, New York.
3. Wolf, I.A. Ed. 1983. Handbook of Processing and Utilization in Agriculture.(2 vol. set). CRC Press, Florida.
4. Mathews, R.H. Ed. 1989. Legumes: Chemistry, Technology and Human Nutrition. Marcel Dekker, New York.
5. Salunkhe, D.K., Kadam, S.S. Ed. 1989. Handbook of World Food Legumes: Chemistry, Processing and Utilization, (3vol.set). CRC Press, Florida.

Session: 2023-24			
Part A - Introduction			
Subject	Bachelor of Vocation in Food Science and Quality Control		
Semester	IV		
Name of the Course	Food Safety and Quality Assurance-II		
Course Code	**B23-FTQ-403**		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC –C4		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	Senior Secondary(10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. To understand the objectives of food safety management System 2. To have knowledge of ISO 9000series for food safety and quality 3. To acquire the knowledge of food law and regulations 4. To gain knowledge about the WTO agreements _____ 5*.To impart practical knowledge about the implementation of FSSAI regulations for foods in food industry		
Credits	**Theory**	**Practical**	**Total**
	3	**1**	**4**
Contact Hours	**3**	**2**	**5**
Max. Marks:100 **Internal Assessment Marks:20(T)+10(P)=30** **End Term Exam Marks:50(T)+20(P)=70**		**Time:3hrs (T)** **4hrs(P)**	

Part B- Contents of the Course		
Instructions for Paper- Setter : The examiner will set nine questions in all, selecting two questions from each unit and one compulsory. **Instructions for the Candidate:** The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.		
Unit	**Topics**	**Contact Hours**
I	• **Food safety management System**: HACCP and its application in food industry • TQM (importance and application)	11
II	• Food safety and Standards Act 2006: salient provision and Prospects	12
III	• **ISO9000 series for food safety and quality**:ISO22000, ISO-19011, ISO 15161,ISO14000.	10
IV	• **Food Law and Regulations**: - Development of food standards, objectives and requirements of consumers protection Act. (1986), PFA-1954, BIS, AGMARK, Vanaspati control Order (1978), Export quality control and inspection Act. (1963), Meat products order (1974) Codex alimentarous Act, Food Safety and Standards Authority of India (FSSAI) • Introduction to WTO agreements: SPS and TBT agreements.	10
V*	• Proximate analysis: Moisture, as hand carbohydrate by difference • Demonstration of kjel plus, fibre plus, sox-plus. • Estimation of sugar content of fruit and reducing and non-reducing sugars in cereals. • Estimation of starch content of cereals Determination of iodine value and saponification number of fats. • Estimation of minerals, iron, calcium and phosphorus • Estimation of vitamins: Ascorbic acid, thiamine, beta-carotene. • Protein quality analysis, in-vitro method. • Physical test for grain quality and rheological properties of foods	30
Suggested Evaluation Methods		

Internal Assessment:	End Term Examination:
➢ **Theory** ● Class Participation: **05** ● Seminar/presentation/assignment/quiz/class test etc.:**0**5 ● Mid-Term Exam: **10** ➢ **Practicum** ● Class Participation: **00** ● Seminar/Demonstration/Viva-voce/Lab records etc.:**10** ● Mid-Term Exam: **NA**	**50** **20**

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. H Early. R. (1995): Guide to Quality Management Systems for the Food Industry, Blackie, Academic and professional, London.
2. Gould, W.A and Gould, R.W. (1998). Total Quality Assurance for the Food Industries, CTI Publications Inc. Baltimore.
3. Bryan, F.L. (1992): Hazard Analysis Critical Control Point Evaluations A Guide to Identifying Hazards and Assessing Risks Associated with Food Preparation and Storage. World Health Organization, Geneva