



# MUGBERIA GANGADHAR MAHAVIDYALAYA

P.O.—BHUPATINAGAR, Dist.—PURBA MEDINIPUR, PIN.—721425, WEST BENGAL, INDIA

NAAC 4th Cycle Re-Accredited 'A' Level Govt. Aided College

CPE (Under UGC XII Plan) & NCTE Approved Institutions

DBT Star College Scheme Award Recipient

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## **PROGRAMME OUTCOME (PO), COURSE OUTCOME (CO) AND PROGRAMME SPECIFIC OUTCOME (PSO) FOR END SEMESTER STUDENTS UNDERGRADUATE COURSE: 2023-2024**

### Programme Name: B.VOC in FOOD PROCESSING

#### **PROGRAMME OUTCOMES:**

**PO1: Disciplinary Knowledge** To acquire comprehensive and sufficient knowledge of transformation of agricultural products into prepared food.

**PO2: Skill Development & Flexibility:** To provide flexibility to the students by means of pre-defined entry and multiple exit points.

To provide vertical mobility to students coming out of 10+2 with vocational subjects.

**PO3: Develop Interdisciplinary Knowledge:** To enable students in developing an effective approach to Interdisciplinary study and enable them to build their own interdisciplinary pathway by choosing courses which makes sense to them.

**PO4: Communication skill and attitudes:** Excellent communication of food processing in bakery, dairy, beverages make effective presentation to develop other branches of Food sciences,

**PO5: Self- Directed Learning:** Ability to work independently, study the subjects in its depth and apply thoughts for solving the problems in various field .

**PO6: Industrial learning and Employability options:** To integrate NSQF within the undergraduate level of higher education in order to enhance employability of the graduates and meet industry requirements. Such graduates apart from meeting the needs of local and national industry are also expected to be equipped to become part of the global workforce.

**PO7: Develop Research Related Skill:** Capability of thinking the various field of food processing advances in those fields and clear concept about them so that appropriate questions are formed on related fields.

#### **PROGRAMME SPECIFIC OUTCOME:**

**PSO1:** To provide information about different food industry in food sector

**PSO2:** Students can solve any problem arise in food sector

**PSO3:** To design a food plant layout for any food business and other fields.

**PSO4:** To ensure that the students have adequate knowledge and skills, so that they are ready to work at each exit point of the programme.

**PSO5:** Acquire clear concept and knowledge to understand every problem in bakery, dairy, beverages ,fruits and vegetable processing, fish meat processing, cereal processing, packaging, preservation by the students through the course.

**PSO6:** Aware about the responsibility to become a citizen of the society and promise to scatter the scope of acquire knowledge.

## **COURSE OUTCOMES (CO) FOR END SEMESTER STUDENTS: 2022-2023**

### **CO1-(BVFPS101T&P) BASIC PRINCIPLES OF FOOD PROCESSING & PRESERVATION**

- Students will get knowledge of the properties of raw food. Recognize the origin, variety, and effects of raw food ingredients on food processing procedures. The fundamentals of food preservation, such as sun drying, low and high temperatures, CA storage, radiation, etc., will be taught to the students.
- This course will give the information needed to comprehend how additives are used in food processing and preservation, how foods rot and deteriorate and how to control these processes. The course will also cover the guidelines that ensure a food product is healthy and of a high standard for consumption.

### **CO2-(BVFPS102T&P) CEREAL AND PULSE PROCESSING TECHNOLOGY**

- Students will learn about various methods of processing of rice, corn, wheat, barley, various millets and oats and also processing of pulses.
- Students will get information about toxic substance of cereals and pulses and how to remove this substances, machinery used in cereal and pulse processing, storage handling, breakfast cereals and ready to eat cereals.

### **CO3-(BVFPS103T&P) LIQUID MILK PROCESSING TECHNOLOGY**

- After completion of this course the learner will be able to know about processing, packaging, storage and distribution and cleaning and sanitization of market milk and cleaning and sanitization procedure of dairy machinery and utensils.

### **CO4-(BVFPS104T&P) FOOD ADDITIVES AND INGREDIENTS**

After the completion of this course the learner will be able to know about various food additives and their definitions, classification and functions etc. They will understand how Preservatives, antioxidants, colours and flavours (synthetic and natural), emulsifiers, sequesterants, humectants, hydrocolloids, sweeteners, acidulants, buffering salts, anticaking agents, etc works in food to maintain the quality and shelf life. An overview will be developed regarding spice processing food flavours and functional agents.

### **CO5-(BVFPS105T&P) FOOD CHEMISTRY**

- After the completion of this course the learner will be able to know basic biochemical knowledge of the entire nutrient (carbohydrate, protein, fat, vitamin and minerals, water) present in foods, its properties, structure and the major chemical and biochemical (enzymatic) reactions that influence food quality with emphasis on food industry applications.
- The learner will be able to develop hands on training on the estimation of moisture, reducing sugars, non-reducing sugar, crude fibre content, protein, fat etc in food items.

#### **CO6-(BVFPS201T&P )DAIRY PRODUCTS PROCESSING TECHNOLOGY**

- After completion of this course the learner will be able to know about production, packaging, storage and distribution of different milk products like- cream, butter, ghee, ice-cream, condensed milk, dried milk, cheese, *Dahi*, yoghurt, different traditional dairy products and byproducts.

#### **CO7-(BVFPS202T&P) PRINCIPLES OF FOOD ENGINEERING**

- After finishing this course, students should be able to design food processes and equipment using their understanding of the biological, chemical, and physical-chemical concepts underlying food processing and storage. They will be informed about the essential nutritional, sensory, and functional aspects of food ingredients, as well as how processing affects these aspects. Will be able to develop and operate essential unit operations used in food processing using chemical engineering principles.
- Students are expected to identify and resolve general engineering design and optimization issues in the food processing industry. They can also demonstrate practical expertise in the execution of laboratory-scale experiments pertaining to the production of fermented beverages and dairy products.

#### **CO8-(BVFPS203T&P) FOOD MICROBIOLOGY AND SAFETY**

- After the completion of this course the learner will be able to know about characteristics of different types of microbes, growth of microorganism, fermentation types, sources of microorganisms in food, food spoilage bacteria, Enlist the types of microorganisms, classification and nomenclature of microorganisms, structure & functions.
- They will understand why microbial quality control are necessary in food production. They will practically learn about microscopes, microbial test etc. which helps to enhance their knowledge and they will be able to use these educational things in practice later.

#### **CO9-(BVFPS204T&P) INTRODUCTION TO COMPUTER APPLICATION AND STATISTICS**

- Students will get knowledge about overview of computer and other components of computer. Demonstrate basic of computer hardware and software.
- Generate text documents with formatting features of MS Word. Demonstrate working knowledge of internet and multimedia. Point up the basic concepts of Windows Operating System.
- Work on Spreadsheets and make presentation on MS Power Point. Learn about basic statistics.

#### **CO10-(BVFPS301T )SANITATION AND HYGIENE**

- This course will provide students with information on basic microbiology, safety, personal hygiene, general handling of food, Environmental Sanitation, Hygiene Practices in food industry; the course will provide students with the opportunity to obtain Sanitation regulations and Standards.

### **CO11(BVFPS302T&P) MEAT, POULTRY & FISH PROCESSING TECHNOLOGY**

- To learn about fish meat poultry 's composition, muscle structure, spoilage, preservation technique
- Development of value added products and by products of fish meat and poultry processing
- Students will get information about structure and composition of muscle, connective tissue, factors determining fish and meat and poultry quality, quality of egg, fish and meat processing ,various fish meat products, processing of egg, by products of fish meat poultry processing. They will learn different meat processing and preservation methods.

### **CO12-(BVFPS303T&P) FRUITS AND VEGETABLE PROCESSING TECHNOLOGY**

- After the completion of this course the learner will be able to identify the spoilage in fruits and vegetables and state the reason for the spoilage following safety precautions. Identify and select fresh fruits and vegetables with the help of checklist. Identify spices and food additives by visual inspection.
- Prepare and pack perishables for storage and then store under refrigerated conditions with safety precautions.
- Prepare fruit juices with juice extracting machines with safety precautions and preserve fruit juices with addition of preservatives and determine the acidity and TSS content. Prepare, dry and storage fruits and vegetables with appropriate methods such as drying, cabinet drying and solar drying with safety precautions and determine the moisture
- Prepare fruits/ vegetables pickles with oil/ salt/ vinegar/ spices, determine acidity content. Prepare, preserve and store jam, jelly and marmalades by using appropriate machines such as pulper, autoclave & sealer with safety precautions, determine acidity and TSS content, pectin test.

### **CO13-(BVFPS304T&P) FATS AND OILS PROCESSING TECHNOLOGY**

- The following ideas will be fully understood by students who have successfully finished this course. The different characteristics of fat and oil will be analyzed by the students. Will be informed regarding manufacturing and refinement.
- Informed of changes that occur during the accumulation of fat and oil, as well as preventative techniques.
- Can put presumptive knowledge to the test, practice degumming, neutralization, and dewaxing techniques in a lab setting.

#### **CO14-(BVFPS305T&P) INSTRUMENTATION AND PROCESS CONTROL IN FOOD INDUSTRY**

- On successfully completing the module, students will be able to demonstrate a knowledge and understanding of characteristics of various instruments, temperature and temperature scales, liquid level measurement, weight measurement, process control, controllers and indicators, computer-based monitoring and controls etc.
- They will practically learn about thermocouple, temperature-controlled alarm system, pressure transducer etc. Which provides accurate and adequate information about the process parameters of the system for safe, continuous, reliable, and economical operation of the plant, and to avoid guesswork or imagination of operators during plant operation.

#### **CO15-(BVFPS401T&P) FOOD LAWS, STANDARD & REGULATIONS**

- After the completion of this course the learner will be able to know about different food laws and regulations like FSSAI, Codex, ISO etc.
- They will understand about several good practices like GHP, GMP and GAP.
- They will come to know about the concepts of traceability, recall, six sigma kaizen etc.
- The learner will be able to develop hands on training on Shelf life study, Visit the websites of FSSAI, BIS, AGMARK, ISO, Codex Alimentarius Commission , USFDA, crude fibre content, Adulteration test of food sample and other quality related manual production and tests.

#### **CO16-(BVFPS402T&P) BAKERY, CONFECTIONERY AND SUGAR PROCESSING TECHNOLOGY**

- After completion of this course the learner will be able to know about basic food technology including all bakery, confectionery, sugar processing. Identify reducing and non-reducing sugars in sugar products.
- Prepare chocolate, candy. Calculate acidity and TSS of sugar products. Study equipments related to bakery and sugar products.
- Estimate moisture content of sugar product and others. Bakery plant layout techniques, setting up of units and hygienic condition. Learns about the concepts, categories, and specifications, as well as the equipment needs of the bakery and confectionery processing sector.

#### **CO17-(BVFPS403T&P) FOOD BEVERAGE TECHNOLOGY**

- Students will get learn about processing and storage of carbonated beverages ,soft drinks, fruit juice, tea, coffee, cocoa, chocolate alcoholic beverages, packaged drinking water .
- They also knowledge about beverage industry and machinery used in beverages.

### **CO18-(BVFPS404T&P) FOOD PLANT UTILITIES & SERVICES**

- On successfully completing the module, students will be able to demonstrate a knowledge and understanding about various utilities and services in food plant/industry, electrical system, electrical motors, compressed air system, HV AC and refrigeration system, fans and blowers, pumps and pumping system, DG set system, fuels and combustion, boilers, steam system etc.
- They will practically learn about fuel combustion, plant lighting system and their components, CIP' system components, ETP (Effluent Treatment Plant) etc. These are helps to enhance their knowledge, maintain proper process conditions like pressure, temperature etc., without which it will be impossible to carry out the process in industries.

### **CO19-(BVFPS501T&P) ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT**

- After the completion of this course the learners will pick up about Foundation of Entrepreneurship Development and its theories. Learners will explore entrepreneurial skills and management function of a company with special reference to SME sector.
- They will identify the type of entrepreneur and the steps involved in an entrepreneurial venture. Learners will understand various steps involved in starting a venture and to explore marketing methods & new trends in entrepreneurship.

### **CO20-(BVFPS502T&P) DOCUMENTATION IN FOOD PROCESSING**

- After completion of this course the learner will be able to define and describe major terminologies related to documentation in food industry. Write well-structured reports, proposals to facilitate the different industrial activities.
- Classify and explain programs needed to inspect raw materials in different food industries. Explain various types of packaging materials used in food industry.
- Analyze and evaluate the hazards in food industry to improve the efficiency of industry.
- Describe different requirements essential for the labeling of packaged food products. Analyze and evaluate the problems in food industries using spreadsheets and word. Compare and contrast the data in food industry using statistical package.
- Explain and demonstrate the use of ERP to organize data from various departments of a food industry.
- Accumulate the information about different production processes and machineries used in food industry by industrial visit. Develop skills to produce reports related to food industry.
- Identify and practise the labelling requirements for packaged food materials.

### **CO21-(BVFPS503T&P) FOOD INDUSTRY WASTE AND BYPRODUCT MANAGEMENT**

- After the completion of this course the learner will be able to know about waste and pollutants, utilization of fruits and vegetable wastes, BOD, COD, fish, meat, poultry and tuber crops waste utilization, by-product utilization, biodegradability etc.
- They will understand treatment of wastes.
- They will practically learn about alcohol production from molasses, water treatment using microbes, extraction of banana fiber etc. Which helps to enhance knowledge and reducing waste will not only protect the environment but will also save on costs or reduce expenses for disposal.

### **CO22-(BVFPS504T) INDUSTRIAL SAFETY AND HAZARDS(SS)**

- By the end of this course, a student should be able to evaluate workplace to determine the existence of occupational safety and health hazards and Identify relevant regulatory and national consensus standards along with best practices that are applicable and select appropriate control methodologies .

### **CO23-(BVFPS601T )FOOD BUSINESS MANAGEMENT**

- Food Business Management is a unique blend of chemistry, economics, engineering, marketing, and biology. The classes students take will give them experience in creating and analyzing foods, as well as in the economics and business operations of food processing.
- Students have opportunities to learn about and work with experts in sales, fruits and vegetables, meats and dairy products, economics marketing of food products, and food safety.
- As a student in food business management, students will study food from a scientific perspective and the food industry from a business point of view. Students will have opportunities to create new food products and develop new ways to manufacture, preserve, and package food products. Students will take courses in food production, development, and commercialization

### **CO24-(BVFPS602T&P )FOOD PLANT LAYOUT & DESIGN**

- Students will receive instruction in setting up agriculture and food processing equipment in accordance with process flow. Will be knowledgeable with the varieties and key characteristics of various plant architectures, including those for rice, maize, horticulture pulses, oil seeds, milk and milk products, poultry, meat, and fish. Will comprehend project design principles and factors, layout techniques, and site selection.
- Learns about the concepts, categories, and specifications, as well as the equipment needs of the food processing sectors.

- Gain knowledge of environmental protection from food plant sanitation and economic aspects, as well as how to record and report on plant maintenance.

### **CO25-(BVFPS603T&P) FOOD PACKAGING TECHNOLOGY**

- After successful completion of this course, students should be able to explain the roles of packaging in the food industry and describe the making process, suitability, and functionality of each type of packaging materials for a specific product and explain the principles of innovative packaging technologies for use with food products and come out with a critical evaluation of current issues related to quality and safety aspects of food packaging, Packaging laws.

### **CO26-INDUSTRIAL EXCURSION AND TRAINING**

- Through industrial excursion and training students will get expose to industry to correlate with the knowledge of classroom teaching and will be interested in their study. From industry visit they will learn about raw material collection, processing, packaging, distribution out let, quality control laboratory etc.

## **DETAILED SYLLABUS OF B.VOC (FOOD PROCESSING)**

### **BVFPS101T&P: BASIC PRINCIPLES OF FOOD PROCESSING & PRESERVATION THEORY**

#### **Unit 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

#### **Unit II**

Food spoilage: microbial, physical, chemical & miscellaneous.

#### **Unit III**

Thermal processing methods and preservation: heat resistance of microorganisms, thermal death curve. Blanching, pasteurization, sterilization, Canning of foods, heat penetration

#### **Unit IV**

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

#### **Unit V**

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, membrane concentration) changes in food quality by concentration

#### **Unit VI**

Preservation by salt and sugar: Pickling, fermentation, intermediate moisture foods



## Unit VII

Food Additives: Different types of food additives (preservatives, acidulants, emulsifiers, antioxidant, leavening agents etc.) and its application in food industry

## Unit VIII

New and unconventional methods of preservation: pulse electric field processing, high pressure processing, ohmic and infrared, microwave heating.

### PRACTICALS

1. Demonstration of various machineries used in food processing.
  2. To study the effect of enzymatic browning in fruits and vegetables and its prevention.
  3. To study different types of blanching of fruits and vegetables.
  4. Preservation of food by canning.
  5. To perform cut out analysis of caned product.
  6. Preservation of food by high concentration of sugar i.e. jam.
  7. Preservation of food by high concentration of salt/acid i.e. pickle.
  8. Preservation of food by addition of chemicals i.e. tomato ketchup.
  9. Preservation of food by drying in a cabinet drier.
  10. Preservation of fruits & vegetables by freezing.
  11. Preservation of milk by pasteurization and sterilization.
  12. Preservation of food by using acidulants i.e. pickling by acid, vinegar or acetic acid
  13. Demonstration on drying of green leafy vegetables
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1. Osmotic dehydration of foods e.g. candy
  2. Drying of foods using freeze-drying & spray drying process.
  3. Preservation of milk by condensation/concentration.
  4. Preservation of food by fermentation (Sauerkraut, idli, tempeh, curd, dhokla etc.)
  14. Roasting of food items.
  15. Visit to any food processing industry/unit.

## BVFPS102T&P: CEREAL AND PULSE PROCESSING TECHNOLOGY THEORY

### UNIT I

Present status and future prospects of cereals and millets; Morphology: physico-chemical properties; Chemical composition and nutritive value

Rice: Paddy processing and rice milling: conventional milling, modern milling, milling operations, milling machines, milling efficiency, byproducts of rice milling. Quality characteristics influencing final milled products. Parboiling: rice bran stabilization and its methods; Aging of rice; Enrichment – need, methods; processed foods from rice – breakfast cereals, flakes, puffing, canning and instant rice.

Wheat: break system, purification system and reduction system; extraction rate and its effect on flour composition; Quality characteristics of flour and their suitability for baking.

Corn: Corn milling – dry and wet milling, starch and gluten separation, milling fractions and modified starches. Barley: Malting and milling Sorghum: milling, Malting, Pearling and industrial utilization

Millets: Importance of Millet, composition, processing of millets for food uses, major and minor millets

Products and Byproduct of cereal and millets: infant foods from cereals and millets, breakfast cereal foods – flaked, puffed, expanded, extruded and shredded products, etc.

## UNIT II

Present status and future prospects of legumes; Morphology of legumes; Classification and types of legumes, Anti-nutritional compounds in legumes; Methods of removal of anti-nutritional compounds, Milling of legumes: home scale, cottage scale and modern milling methods, milling quality, efficiency and factors affecting milling; problems in dhal milling industry, Soaking and germination of pulses, Cooking quality of legumes – factors affecting cooking quality, Byproduct of pulses and their value addition.

### PRACTICALS

1. Determination of physical properties of cereal grains
2. Determination of chemical properties of cereal grains
3. Germination of grains
4. Studies on cooking quality of cereals (cooking time, grain elongation, etc)
5. Functional properties of different cereal flour
6. Determination of starch content of cereal
7. Study on gelatinization of starch
8. Determination of amylase content of rice
9. Determination of fat acidity of cereals
10. Phenol test for cereals
  
11. Determination of sedimentation value
12. Milling of cereal grains
13. Visit to milling industry
14. Determination of physical properties of legumes
15. Determination of antinutritional factors in legumes
16. Cooking quality of dhal
17. Puffing of legumes
18. Milling of legumes
19. Preparation of composite legume flour
20. Preparation of soy milk and soy paneer
21. Preparation of protein isolate
22. Preparation of quick cooking dhal
23. Visit to dhal mill

## BVFPS103T&P: LIQUID MILK PROCESSING TECHNOLOGY THEORY

### UNIT I

Milk Production Management - Distinguishing characteristics of Indian and exotic breeds of dairy animals and their performance; feed resources for milk production and their nutritive values; structure and function of mammary system; milk secretion and milk let-down; milking procedure and practices for quality milk production (clean milk production)

### UNIT II

History and status of dairy in India, Annual milk production and per capita availability, Five year plans and dairy development, public sector milk supply schemes, co-operative dairy organizations, Anand pattern and perspectives, milk products manufacture in private sector,

National Dairy Development Board - aim and objectives, Operation Flood, Dairy problems and policies. Contribution of Verghese Kurien in Indian dairy.

#### UNIT III

Milk - Definition, Composition, factors affecting composition of milk, nutritive value, Physico-chemical properties of milk constituents, Physico-chemical properties of milk, microbiology of milk.

#### UNIT IV

Importance of market milk, Collection and transportation of milk-Organization of milk collection routes, Practices for collection of milk, preservation at farm, refrigeration, natural microbial inhibitors, lactoperoxidase system., Adulterations in milk and its detection, processing, packaging and storage. UHT sterilization, Aseptic packaging, Judging and grading of milk, Flavour defects in milk, their causes and prevention, Effect of thermal treatment on milk constituents.

#### Unit V

Special milk: manufacture, packaging, storage of sterilized milk, homogenized milk, soft-curd milk, flavoured milk, vitaminized milk, frozen concentrated milk, fermented milk (natural butter milk, cultured butter milk, acidophilus milk, bulgarian butter milk, Kumiss, Kefir, yoghurt), standardized milk, reconstituted milk,

recombined milk, toned milk, double toned milk, humanized milk, filled milk, imitation milk, vegetable toned milk, soya milk

#### Unit VI

Liquid milk collection, processing, packaging and storage systems and equipment - bulk milk coolers, milk chilling units, milk reception equipment, milk tanks/silos, centrifuges, clarifiers, filtration units, cream separator, homogenizers, pasteurizers, sterilizers, packaging and filling machines

#### Unit VII

Cleaning and sanitization of dairy equipments, CIP units, etc.; Hygienic design concepts, sanitary pipes and fittings, corrosion process and their control.

#### PRACTICALS

1. Method for milking of dairy animals
2. Cleaning and sanitation of milking equipments
3. Method for sampling of milk
4. Microbiological tests for grading raw milk - MBRT
5. Chemical tests for grading raw milk- Platform tests of raw milk.
6. Detection of adulterants in milk
7. Determination of physical properties of milk - pH, titratable acidity of milk.
8. Determination of Moisture, fat, SNF, casein, whey proteins, total milk proteins, lactose, ash
9. Determination of phosphorus and calcium, chloride in milk.
10. Estimation of alkaline phosphatase and lipase in milk.
11. Identification and demonstration of liquid milk processing equipment, pipes and fittings
12. Preparing standardized milk as per requirement
13. Separation of fat from milk
14. Pasteurization and homogenization of milk
15. Packaging of liquid milk

16. Preparation of sterilized flavored milk, reconstituted milk/rehydrated milk, buttermilk, yogurt, Lassi
17. Campaign on clean milk production in rural area
18. Visit to chilling center and dairy plant

## BVFPS104T&P: FOOD ADDITIVES AND INGREDIENTS THEORY

### UNIT I

Food additives- definitions, classification and functions, Preservatives, antioxidants, colours and flavours (synthetic and natural), emulsifiers, sequesterants, humectants, hydrocolloids, sweeteners, acidulants, buffering

salts, anticaking agents, etc. - chemistry, food uses and functions in formulations; indirect food additives; toxicological evaluation of food additives. Food additives as toxicants - Artificial colours, preservatives, sweeteners; toxicants formed during food processing such as nitrosamines, maillard reaction products acrylamide, benzene, heterocyclic amines and aromatic hydrocarbons; risk of genetically modified food, food supplements, persistent organic pollutants, toxicity implications of nanotechnology in food.

### UNIT II

Scope of spice processing industry in India. Spices -definition. Chemical composition, uses and processing of different spices-pepper, cinnamon, turmeric, fennel, chilli, cardmom (small and big), cumin, mint, ginger cloves and fenugreek. Condiments- definition. Spice oleoresins, spice essential oils, encapsulated spices (Brief). Packaging of spices and spice products. Microbial contamination and insect infestation in spices and its control.

### UNIT III

Food flavours- natural and synthetic flavourings. Flavour enhancers their properties and toxicity. Flavours from vegetables, cocoa, chocolate, coffee, vanilla beans. Evaluation tests for flavours. stability of flavours during food processing, analysis of flavours, extraction techniques of flavours, flavour emulsions; essential oils and oleoresins; authentication of flavours etc.

### UNIT IV

Proteins, starches and lipids as functional ingredient; isolation, modification, specifications, functional properties and applications in foods and as nutraceuticals

### PRACTICAL

1. Determination of moisture in whole and ground spices.
2. Determination of total ash in spices.
3. Sampling and determination of extraneous matter in spices.
4. Determination of pungency rating (Scoville method) in red pepper.
5. Adulteration tests for different spices.
6. Organoleptic evaluation of flavours.
7. Identification of saffron by sulphuric – diphenylamine test.
8. Determination of cold water extract.
9. Determination of alcohol soluble extract.
10. Determination of calcium oxide.
11. Determination of volatile oil.
12. Microscopic examination of spices.
13. Detection of Argemone seeds in mustard.
14. Detection of oil soluble color.

15. Extraction of oleoresins from spices.
16. Analysis of different types of flavours such as essential oils, oleoresins, synthetic flavours, plated and dispersed spices-general tests.
17. Sensory analysis of flavours; monitoring flavours during food processing
18. Preparation of flavour emulsions and their stability
19. Study of off-flavours in different foods.
20. Extraction of flavors from various fruits and vegetables

#### BVFPS105 T&P: FOOD CHEMISTRY THEORY

##### UNIT I:

Water- Introduction to food chemistry- Definition, scope and importance, structure of water molecule, hydrogen bonding, effect of hydrogen bonding on the properties of water, moisture in foods, free water, bound water, water activity, estimation of moisture in foods, determination of moisture and water activity.

##### UNIT II

Carbohydrates Nomenclature, composition, sources, structure, reactions, functions, classification - monosaccharide, disaccharides, oligosaccharides and polysaccharides. Properties of Starch – gelatinisation, gel formation, syneresis, starch degradation, dextrinisation, retrogradation, Qualitative and quantitative tests of carbohydrates.

##### UNIT III

Proteins Nomenclature, sources, structure, functions, classification - essential and non-essential amino acids, Physical and chemical properties of proteins and amino acids, functional properties - denaturation, hydrolysis, changes in proteins during processing. Enzymes - criteria for purity of enzyme, Specificity, mechanism of enzyme action, factors influencing enzymatic activity, controlling enzyme action, enzymes added to food during processing, Browning reaction- Enzymatic and non enzymatic browning, advantages and disadvantages, factors affecting their reaction and control.

##### UNIT IV

Fats and oils Nomenclature, composition, sources, structure, functions, classification, essential fatty acids. Physical and chemical properties - hydrolysis, hydrogenation, rancidity and flavour reversion, emulsion and emulsifiers, saponification value, acid value and iodine value, Reichert-Meissl number, Polenske value, smoke point. Lipids of biological importance like cholesterol and phospholipids

##### UNIT V

Minerals and Vitamins Minerals and Vitamins: Sources and structures of minerals & vitamins; Effect of processing and storage of vitamins, Pro vitamins A & D; Vitamins as antioxidants.

##### PRACTICALS

1. Determination of water activity of different food materials
2. Determination of moisture in food sample
3. Determination of Protein in food sample
4. Determination of Fat in food sample
5. Determination of Carbohydrate in food sample
6. Determination of Acidity and pH in food sample/beverages
7. Determination of total, non-reducing and reducing sugars
8. Determination of Vitamin C in food sample
9. Estimation of crude fibre in food sample

10. Analysis of lysine content in animal /vegetable sources
11. Estimation of mineral in food products
12. Estimation of Carotenoids
13. Precipitation of proteins by acid, alkali and metals.
14. Estimation of rancidity of fats.
15. Estimation of crude fibre in food sample
16. Determination of total, non-reducing and reducing sugars
17. Calculate activity of enzymes from various food samples.

## BVFP201 T&P: DAIRY PRODUCTS PROCESSING TECHNOLOGY THEORY

### UNIT I

Cream: Definition, classification, composition, nutritive value, Physico-chemical properties, manufacture of different types of cream, processing of cream; defects in cream and their prevention

Butter: Definition, composition; nutritive value, processing and production steps, overrun, butter making machines, quality testing of table butter, butter- defects, causes and their prevention, packaging and storage

Butter oil and ghee: Definition, composition, nutritive value, processing, equipment, quality tests;

### UNIT II

Ice cream and frozen desserts: Definition, composition, nutritive value, role of the constituents in ice cream, types, Processing steps, equipment, quality testing, defects causes and prevention, packaging and storage.

### UNIT III

Condensed and Dried milk: Definition, composition, role of milk constituents in condensed milk, manufacture of condensed milk, Heat stability and its control , uses, defects, causes and prevention of condensed milk.

Types of standards for dried milk, Role of milk constituents, Manufacture of SMP and WMP using roller and spray drying, cyclone separation, instantization, quality testing, defects, causes and prevention, packaging and storage. malted milk powder, infant milk food

### UNIT IV

Cheese: Definition, composition, standards, origin and history of cheese, status and scope in India and abroad, types, manufacture of different varieties of cheese: Cheddar, Swiss, Mozzarella, Cottage, processed cheese, cheese spread and processed cheese foods; equipment, Microbiological changes during preparation ripening in cheese. Role of milk constituents and changes during manufacture and ripening in cheese. Accelerated ripening of cheese. quality defects, causes and prevention, packaging and storage.

### UNIT V

Traditional Indian Dairy Products: Definitions, compositions, processing, packaging, storage, equipment and quality testing – Desiccated milk-based products-Khoa and Khoa based sweets, Heat-acid coagulated products- Channa and Channa based sweets, Paneer, Fermented products-Srikhand, dahi, Milk-based puddings/Dessert- Kheer

### UNIT-VI

By-products-manufacturing and uses of Casein, sodium and calcium caseinates, casein hydrolysates, Cooprecipitates, Whey, Whey protein concentrates, Lactose, Butter milk, Ghee residue

## PRACTICALS

1. Process of sampling of milk products
2. Cream: Different parts of cream separators, cream separation from milk, standardization, neutralization, pasteurization of cream, chemical and microbiological examination of cream
3. Butter: Study of construction and cooperation of the power operated butter churn and butter packaging machine, manufacture of butter, examination of the quality of sodium chloride for butter making, chemical and microbiological examination of butter
4. Ghee: Study and operation of continuous ghee plant. Preparation of ghee from cream and butter. Determination of melting/slip point, moisture, B.R. Index and Baudouin Test, Acidity, R.M. value and Polenske value, Saponification value, Iodine value, Peroxide value. Detection of animal body fats and vegetable oils, Helphen Test for the presence of cotton-seed oil.
5. Preparation of ice-cream and selected frozen desserts- kulfi, sherbets/ices, Compositional analysis of ice-cream. Microbiological examination of ice-cream and other frozen desserts; SPC, coliform.
6. Preparation of condensed milk, evaporated milk, spray dried milk powder, instant milk powder, tea and coffee whitener, malted milk powder, infant milk food, Chemical and microbiological analysis of condensed and dried milk. Evaluation of bulk density and solubility index of dried milk.
7. Cheese Technology: Familiarization with equipments, accessories and standardization numericals. Study of factors affecting rennet action. Manufacture of Cheddar cheese, Mozzarella cheese, Swiss cheese, Cottage cheese, processed cheese, processed cheese spread, processed cheese food. Analysis of cheese; proximate composition. Determination of ripening index,
8. Preparation of selected Indian dairy products – Chhana, chhana based sweets, .paneer, khoa, khoa based products, misti dahi, Shrikhand, kheer etc, their chemical and microbiological analysis
9. Dairy byproduct; Manufacture casein, sodium caseinate, calcium caseinate. co-preceinate, whey drinks, dried whey, whey protein concentrate, lactose, buttermilk, ghee residue, products of ghee residue,. Whey concentration by ultra filtration process. Chemical and microbiological analysis of casein , whey, dried whey, whey protein concentrates, co-precipitates and lactose, buttermilk.
10. Visit to milk product plant

## BVFPS202T&P: PRINCIPLES OF FOOD ENGINEERING THEORY

### UNIT I

Process time calculations; Sterilizers and accessories used in canning industries; Engineering aspects of pasteurizer; homogenizer, evaporators (basic principle and single-effect evaporator) and concentrators used in food industries; Seaming machine.

### UNIT II

Construction of cold storage; Different types of freezers including plate contact freezer, air blast freezer, cryogenic freezing and refrigerated vans.

### UNIT III

Various types of driers (basic principle and drying time) – Tray drier, roller drier, spray drier, fluidized bed drier, freeze drier and solar drier.

### UNIT IV

Heat exchangers (including paraflow HEs); Extruders – Basic principles and types, Difference between single-and twin-screw extruders; Kneader; Oil expeller

### UNIT V

Liquid transport system- pipelines and pumps for food processing plants-positive displacement pumps, air-lift pumps, propeller pumps, centrifugal pumps and jet pumps.

### UNIT VI

Advanced separation processes: Dialysis, ultrafiltration, reverse osmosis, electro dialysis and membraneseperation.

### PRACTICALS:

1. Determination of conductivity, calorific value and filtration properties of food& water.
2. Calculation of freezing time for some typical foods
3. Determination of Textural characteristics TPA of food product
4. Study of single effect evaporator and estimation of heat/mass balance during concentration of liquid foods
5. Study of sterilizer / pasteurizers/ homogenizers
6. Study of dryers, and its efficiency
7. Visit to food processing plants.

### BVFPS203T&P: FOOD MICROBIOLOGY AND SAFETY UNIT-I

Microorganisms important in food industry: Types of microorganisms, their importance in foods, classification of food borne bacteria, their morphology and distinguishing features with examples.

### UNIT-II

Growth of microorganisms in foods: Intrinsic (pH, moisture content, redox potential, nutrient content, antimicrobial constituents and biological structures) and extrinsic factors (temp., RH, presence and concentration of gases) governing growth of microorganisms in food.

### UNIT-III

Food spoilage: Chemical changes caused by microorganisms in foods (breakdown of proteins, carbohydrates, fats and other constituents during spoilage), specific microorganisms causing spoilage of milk and milk products, meat, fish, egg, cereals, fruits, vegetables and their processed products, quality defects in canned foods, sugar and confectionary products, Antimicrobial substances in milk: immunoglobulin, lactoferin, lysozymes, LP systems etc.

### UNIT-IV

Food fermentations: General description of fermenters, parts and their functions, different types of fermentations (static, submerged, agitated, batch, continuous). Microbial culture selection by screening methods and strain improvement. Starter cultures - definition, types, Fermentation - definition, types (acid, alcohol). Fermented foods



- types, methods of manufacture for vinegar, ethyl alcohol, cheese, yoghurt, baker's yeast and traditional Indian foods.

## PRACTICAL

1. Study and experiments with different microscopes.
2. Measurement of microorganisms.
3. Simple staining and Gram staining.
4. Sterilization techniques and equipments.
5. Preparation of culture media.
6. Isolation of microorganisms and Enumeration.
7. Growth of bacteria - Colorimetric method - Plating method.
8. Purification of bacteria.
9. Purification of fungi.
10. Detection of sources of contamination: air, water, utensils, equipment and personnel line testing
11. Enumeration of coliforms, yeasts and molds and total viable bacteria in fruits and vegetables, Dairy products
12. Enumeration of aerobic spore forming bacteria in food sample.
13. Estimation of alcohol content in fermented product
14. Isolation and identification scheme for detection of Salmonella in foods
15. Casein hydrolysis by microorganism on SMA
16. Starch hydrolysis by microorganism using starch agar
17. Evaluation of Starter Culture by Starter Activity Test
18. Assessment of surface sanitation by swab /rinse method and assessment of personnel hygiene by hand wash
19. To study the given sample (milk) using Methylene blue reduction test (MBRT)
20. To find total viable bacteria and coliforms in water by membrane filtration technique
21. Evaluation of canned products for anaerobic spore formers
22. Spoilage of milk caused by microorganisms souring, sweet curdling, gassiness, lipolysis, ropiness, proteolysis and discoloration.
23. Detection of mastitis milks, pH, SLST, somatic cell count, chloride content, Hotis test, CAMP test. Detection and estimation of coliforms; presumptive test, rapid coliform count, IMVIC test. Estimation of microbial load in milk by SPC and Dye reduction tests-(MBRT, RRT).
24. Detection of antibiotic residues using qualitative test

## BVFPS204T&P: INTRODUCTION TO COMPUTER APPLICATION AND STATISTICS THEORY

### UNIT I

Components of Computers – Hardware: Hardware elements – input devices, storage devices, processing & output devices. Block diagram of computer; Software concept

### UNIT II

Microsoft Word and its applications ( in relation with Food Industry) - Font formatting, Paragraph formatting, Inserting images, auto shapes symbols, diagrams, header & footer, References, watermarks and Hyperlinks, Style

& Formatting, Mail Merge through word, Access database, Page setup, Printing a document. Concept of files and folders.

### UNIT III

MS Excel and its applications (in relation with Food Industry) - Making column chart & pie chart and chart formatting, Use of general functions & formula (autosum, using basic arithmetic operators: +, -, \*, /), Use of filter & sorting, Cell references, header & footer, age setup, use of page break preview, printing worksheets.

### UNIT IV

MS PowerPoint and its applications ( in relation with Food Industry) - Creating own design, formatting objects on a slide, Use of Slide Master to control the design & formatting of a presentation, Use of Image, audio, video in the presentation, Slide show setup, slide transition, use of animation, Use of narration in presentation, Print setup & Printing handouts of a presentation.

### UNIT V

Internet & Web Applications (in relation with Food Industry)

### UNIT VI

Websites, Internet applications, Google Applications (G mail, Google search, G Drive, Google Docs) and other Email Services, Industry customer approach.

### UNIT VII

Statistics: Data and Data Types: Primary data and Secondary Data; Measures of Central Tendency: Mean, Median, Mode: Dispersion: Range, Standard Deviation, Standard error; Kurtosis, Skeness. Hypothesis Testing: Chi-square Test, Student‘t’ test, One Way Analysis of Variance (ANOVA).

### PRACTICAL

1. Typing practice (ability of typing without watching keyboard).
2. Use of Microsoft word and Excel with specific problem.
3. Tabular form of data presentation in computer.
4. Graphical presentation of data.
5. PowerPoint presentation
6. Opening e-mail account and its different uses
7. Problem of Mean, Median, Mode Chi-square Test, Student‘t’ test, One Way ANOVA

## BVFPS205P: EDUCATIONAL EXCURSION

### BVFPS301T: SANITATION AND HYGIENE

#### Unit I

Sanitation and Health: Definition, importance of sanitation, application of sanitation to food industry and

food service establishments. Microorganisms and their characteristics, control of microbial growth in food. Food contamination and spoilage, food borne diseases- Introduction, types of microbial foodborne diseases

(foodborne intoxications and foodborne infections), symptoms and prevention of some commonly occurring food borne diseases.

#### Unit II

Hygiene and food handling: Purchasing and receiving safe food, food storage, sanitary procedures in food preparation, serving and displaying of food, special food operations.

#### Unit III

Environmental Sanitation: Location and layout of premises, constructional details, sanitary requirements for equipments, guidelines for cleaning equipments, cleaning procedures, pest control, water supply, storage and waste disposal, environmental pollution.

#### Unit IV

Hygiene Practices in food industry: Introduction, necessity, personnel hygiene, sanitary practices, management and sanitation, safety at work place.

#### Unit V

Sanitation regulations and Standards: Introduction, regulatory agencies, control of food quality, local health authority. Food sanitation check lists.

## BVFPS302T&P: MEAT, POULTRY & FISH PROCESSING TECHNOLOGY THEORY

### UNIT-I

Introduction to meat and poultry industries; Pre-mortem selection of animals; Modern Abattoir Practices: slaughtering techniques of animal and slaughtering practices; Meat cuts and portions of meat; Inspection and grading of meat; Physico-chemical composition of muscle; Post-mortem changes in muscle; Conversion of muscle to meat.

### UNIT-II

Chemical and nutritional composition of meat ; The eating quality of meat - color, water holding capacity (WHC) and juiciness, texture and tenderness, odour and taste; Meat microbiology and safety; Spoilage characteristics of meat; Endogenous and exogenous infections; Preventive (prophylaxis) measures for avoiding meat spoilage.

### UNIT-III

Meat processing- comminution, emulsification, curing, smoking, cooking, ageing and tenderization; Meat products - meat emulsion, fermented meats, sausages, ham, bacon and comminuted meat products; Meat analogs; Meat storage and preservation- by temperature control (refrigeration, freezing, thermal processing), by moisture control (dehydration, freeze

drying, curing, IMF meat), by microbial inhibition (chemical preservation, ionizing radiation); Packaging of meat products. Meat production, processing and consumption trends; Meat plant sanitation and waste disposal; By-products from meat industries and their utilization.

#### UNIT-IV

Inspection of birds, poultry slaughter and dressing, Factors affecting quality of poultry; Classification of poultry meat; Composition and nutritional value of poultry meat; Processing of poultry meat, spoilage and control; By- product utilization.

Egg and egg products- Structure, composition and functions of eggs; Abnormalities in eggs; Functions of eggs in food products; Inspection and grading for egg quality; Preservation and safe handling of eggs; Coagulation of eggs, egg foams, egg powder and egg based products.

#### UNIT-V

Fish as raw material for processing and its biochemical composition. Factors affecting the quality of product and post harvest losses. Chilling and freezing of fish and other aquatic products. Physical, chemical, microbiological and sensory changes during storage. Principles of thermal processing. decimal reduction time, thermal death time, "Z" and "F" values, 12D concept, determination of process time. Canning process for fish. Value added fish products. Hurdle technology and its application. Composition and role of muscle proteins, Factors influencing denaturation of muscle proteins. Fisheries Byproducts Technology.

#### PRACTICALS

5. Physico-chemical and microbiological quality of different types of meat.
6. Canning of meat products and determination of thermal process time.
7. Preservation of meat by curing, freezing, smoking, drying and determination of shelf-life
8. Preparation of Various value added meat products
9. Estimation of nitrites/nitrates in processed meat products.
10. Estimation of Water Holding Capacity and emulsification capacity of various types of meat.
11. Physico-chemical and micro-biological quality of raw egg and their products.
12. Preservation of shell eggs by various methods
13. Studies on hygiene and sanitation in meat, poultry and egg processing plants.
14. Evaluation of meat quality
15. Evaluation of quality of eggs
16. Preparation of meat products
17. Visit to meat/poultry/egg processing plant for hands on training.

#### BVFPS303T&P: FRUITS AND VEGETABLE PROCESSING TECHNOLOGY THEORY

##### UNIT-I

Fruits and vegetables as living products: Current status of production and processing of fruits and vegetables, Composition and nutritive value of fruits and vegetables; spoilage of fruits and vegetables. Pre-packaging of fresh fruits and vegetables. Storage techniques for fresh fruits and vegetables. Primary processing: grading, sorting,

cleaning, washing, peeling, slicing and blanching, Maturity standards for storage and desirable characteristics of fruits and vegetables for processing, Supply chain management of Fruits and vegetables. Pre-cooling, Concept of evaporating cooling, conditions for transportation and storage.

#### UNIT-II

Introduction to dehydration techniques of Fruits and Vegetables: Tray drying, vacuum drying, foam mat drying, fluidized bed drying, spray drying, freeze drying, microwave drying, heat pump drying, osmotic dehydration. Technology of dry nuts. Physical and chemical changes in food during drying and dehydration. Quality of dried products.

#### UNIT-III

Principles of Thermal processing- review. Process of blanching, Canning and bottling, Effect of canning and bottling on nutritive value, spoilage of canned foods, detection and control. UHT processing: Aseptic processing and packaging.

#### UNIT-IV

Juice extraction and clarification, preparation of syrups, and chemical preservation Products processing: squashes, cordials, nectars. Principle of jel formation - Jam, jelly, marmalade and defects in manufacturing, fortified fruit drinks, Candies; chutneys; fruit juice concentrates and powders; Tomato product: sauce and ketchup, Cut fruits and vegetable, fruit toffee,

#### UNIT-V

Preservation by fermentation- Definition, Advantages, disadvantages, Types of fermentation, equipments. Pickles making and Vinegar; Fruit wine. Irradiation applications for fruits and Vegetable. Minimally processed fruits and vegetables, Emerging technologies for fruits and vegetables processing technologies: Hurdle technology, Ozone application and ultrasound.

#### PRACTICALS

1. Estimation of sugar-acid ratio of fruits
2. Evaluation of washer and grader
3. Testing of adequacy of blanching
4. Pectin determination in fruits and vegetable products.
5. Preparation fruit juices and concentrates
6. Canning of fruits and vegetables
7. Preparation of jams and jellies, marmalade, preserves and candies
8. Preparation of pickles, chutneys
9. Preparation of tomato products
10. Drying of fruit and vegetables
11. Processing of mushrooms.
12. Visit to fruits and vegetable processing industries

### BVFPS304T&P: FATS AND OILS PROCESSING TECHNOLOGY THEORY

#### UNIT-1

What is fat - Importance - chemical composition of fats. Triglycerides - their structure and composition - mono and diglycerides - free fatty acids - phosphatides- sterols, fatty acid alcohols - tocopherols.

#### UNIT-2

Factors affecting physical characteristics of fats and oils - chemical reactions of fats and fatty acids, stability of oils and fats. Important characteristics of oils from coconut, cotton seeds, palm, sunflower, sesame, safflower, rice bran, rape seed, mustard, linseed, soybean, castor and lard.

#### UNIT-3

Processing techniques - Degumming, refining, bleaching, deodorizing, fractionation, hydrogenation, inter- esterification and esterification. Alternative methods for extraction and processing of oils.

#### UNIT-4

Common products preparation - Salad and cooking oils, shortenings (baking and frying fats), hard butters, margarine and spreads, dressings for food (Mayonnaise and Salad dressings, pourable - type dressings, reduced calorie dressing), toppings, coffee whiteners, confectionaries coatings, low - fat spreads for traditional breakfast foods etc.

#### UNIT-5

Value added products from vegetable oil refining industry like lecithin, wax, Vitamin-E, oryzanol. Value added products from non-traditional oils and fat. By-products from bran oil and oil refining industry, utilization of lingo cellulosic waste from oil industry, bakery fats with zero trans fatty acids.

#### PRACTICALS

Common Test methods for Fats -

1. Cold Test
2. Colour, (Lovibond)
3. Dropping point
4. Flavour
5. FFA
6. Melting Point
7. Oil stability index
8. Peroxide Value
9. Solid fat index
10. Solid fat content
11. Total lipids and thiobarbituric and reactive substances (TBARS)
12. Karl-Fischer' titration- application.

#### Oilseeds

13. Experimental expeller processing
14. Experimental solvent extraction
15. Production of protein concentrates and isolates.
16. Lab model hydrogenator (for hydrogenation of vegetable oils).
17. Visit to oil mills

## UNIT I

Introduction, definitions, characteristics of instruments, static and dynamic characteristics

## UNIT II

Temperature and temperature scales; Various types of thermometers; thermocouples, resistance thermometers and pyrometers

## UNIT III

Pressure and pressure scales, manometers, pressure elements differential pressure

## UNIT IV

Liquid level measurement, different methods of liquid level measurement, flow measurement, differential pressure meters, variable area meters

## UNIT V

Weight measurement: Mechanical scale, electronic tank scale, conveyor scale

## UNIT VI

Transmission: Pneumatic and electrical, Control elements: control actions, pneumatic and electrical control systems

## UNIT VII

Process control: Definition, simple system analysis, dynamic behavior of simple process, Laplace transform, process control hardware

## UNIT VIII

Frequency response analysis, characteristics, Bode diagram and Nyquist plots and stability analysis

## UNIT IX

Controllers and indicators: Temperature control, electronic controllers, timers and indicators, discrete controllers, adaptive and intelligent controllers

## UNIT X

Computer-based monitoring and control: Importance, hardware features of data acquisition and control computer, signal interfacing, examples in food processing

## UNIT XI

Introduction of 8051/8085 based system and applications in processing

### PRACTICALS:

1. Study on instrumentation symbols;
2. Study of P&I diagram and flow sheet diagrams in instrumentation.
3. Study of characteristics of Pressure transducers
4. Real-time study of Pressure transducers characteristics with PC
5. Study of Pressure Control by s On/Off Controller
6. Study of characteristics of IC temperature sensor
7. Study of characteristics of Thermocouple.
8. Study of characteristics of Platinum RTD
9. Study of Temperature controlled alarm system
10. Study of Data logger
11. Study of 8051 based programming examples.
12. Study of Programmable Logic Controllers (PLC) Hardware
13. Study of Programmable Logic Controllers (PLC) Ladder programming,
14. To study PLC based control of Multiprocess system
15. Study of various transducers for measurement of pressure ,temperature, flow, combinely

16. Visit to food processing plant and dairy industry.

## BVFPS401T&P: FOOD LAWS, STANDARD & REGULATIONS THEORY

### UNIT-I

Introduction, concept of total quality control and quality assurance, concept of food safety and standards (FSSAI), food safety strategies. Food hazards and contaminations - biological (bacteria, viruses and parasites), chemical (toxic constituents / hazardous materials) pesticides residues / environmental pollution / chemicals) and physical factors. Preventive food safety systems - monitoring of safety, wholesomeness and nutritional quality of food. Prevention and control of microbiological and chemical hazards. Food safety aspects of novel methods of food processing such as PEF, high pressure processing, thermal and non thermal processing, irradiation of foods.

### UNIT-II

Indian and Food Regulatory Regime (Existing and old), PFA Act and Rules, Food Safety and Quality Requirements, Additives, Contaminants and Pesticide Residue. Food Safety and Standards Act, 2006, Essential Commodities Act, 1955, Global Scenario, Codex Alimentarius, WHO/FAO Expert Bodies (JECFA/JEMRA/JMPR) WHO/FAO Expert Bodies (JECFA/JEMRA/JMPR). Food safety inspection services (FSIS) and their utilization. Legal Metrology act, Weight and Measurement act, Introduction to Factory Act.

### UNIT-III

Introduction to OIE and IPPC, Other International Food Standards (e.g. European Commission, USFDA etc). WTO: Introduction to WTO Agreements: SPS and TBT Agreement, Export and Import Laws and Regulations, Export (Quality Control and Inspection) Act, 1963.

Customs Act and Import Control Regulations, Other Voluntary and mandatory product specific regulations, Other

Voluntary National Food Standards: BIS Other product specific standards; AGMARK. Nutritional Labeling, Health claims.

### UNIT-IV

Risk assessment studies: Risk management, risk characterization and communication.

### UNIT-V

Voluntary Quality Standards and Certification GMP, GHP, HACCP, GAP, Good Animal Husbandry Practices, Good Aquaculture Practices ISO 9000, ISO 22000, ISO 14000, ISO 17025, PAS 22000, FSSC 22000, BRC, BRCIOP, IFS, SQF 1000, SQF 2000. Role of NABL, CFLS. Halal & Kosher Standard.

### UNIT-VI



Food Adulteration: Laws governing food standards, significance – PFA, FPO, ISI, Agmark, Meat Products order, Codex Alimentations. Common adulterants in food and their effects on health, common adulterants in food and their effects on health, common household methods to detect adulterants in food.

#### PRACTICAL

1. Licensing and registration process
2. Examination of Cereals as per specifications
3. Examination of milk and milk products as per specifications
4. Examination of Oil and Oil products as per specifications
5. Examination of fruits and vegetable products as per regulations
6. Visit to FDA department

#### BVFPS402T&P: BAKERY, CONFECTIONERY AND SUGAR PROCESSING TECHNOLOGY THEORY

##### UNIT-1

Global Status of bakery and confectionery industry. Review of raw materials and quality parameters of wheat flour, flour standards; dough development; methods of dough mixing; dough chemistry, rheological testing of dough-Farinograph, mixograph. Extensograph, Amylograph/ Rapid- visco analyzer, Falling number, Hosney's dough stickiness tester and interpretation of data.

##### UNIT-2

Bread: various methods of production and effect of various formulations and process parameters on quality. Staling of bread, losses during manufacture and methods to control them; machinery used in bakery industry, multigrain bread, gluten free products, traditional bakery products, shelf life.

Biscuits and Cookies: Ingredients and flour specification; types of biscuits, doughs -developed doughs, short doughs, semi-sweet, enzyme modified doughs and batters importance of the consistency of the dough.

##### UNIT-3

Cakes: Flour specifications-, ingredients, manufacturing process and quality evaluation. Preparation of other bakery products - rusks, crackers, buns, muffins, pizza; raw materials, methods of production, quality parameters.

Confectionery manufacture: Raw materials used in the confectionery manufacturing and processing industry - including quality control methods. Cocoa, Sugar, Dried milk products, Special fats, Emulsifiers, Nut kernels. Production of cocoa liqueur from the cocoa bean, Dark, milk and white chocolate, manufacturing processes.

##### UNIT-4

Chocolate Processing Technology : Compound coatings and candy bars; tempering technology, chocolate hollow figures, chocolate shells, enrobing technology, manufacture of candy bars, Presentation and application of vegetable fats; production of chocolate mass.

#### UNIT-5

Sugar Confectionery manufacture: General technical aspects of industrial sugar confectionery manufacture, Manufacture of high boiled sweets-Ingredients, Methods of manufacture- Types- Center-filled, lollipops, coextruded products. Manufacture of gums and jellies-Quality aspects  
Manufacture of Miscellaneous Products: Caramel, Toffee and fudge-Liquorice paste and aerated confectionery, Lozenges, sugar panning and Chewing gum, Countlines-Quality aspects

#### UNIT 6

Equipment used in bakery and confectionary industry: Construction and working of various equipments like Mixers, proofing chambers, dough dividers, moulder and sheeter, baking ovens, cooling chamber, sealing and packaging machines, Rolling and cutting machines.

#### UNIT 7

Bakery Plant - Layout, setting up of units and hygienic conditions, operation and maintenance.

#### UNIT 8

Sugarcane and sugarbeet as sugar raw materials. Flow charts for manufacture of Granulated sugar and Liquid sugars. Properties of Granulated sucrose and Liquid Sugars. Invert sugar and their characteristics. Speciality products of Sugar Industry. Back strap Molasses and its uses. Applications in animal feed

#### UNIT 9

Sugar production processes: Extraction of juice, extraction yields, drying and uses of Bagasse, Purification of juices-Juice filtration and chemical purification, Clarification stages, Lime addition, pH control, Treatment of clarified juice, evaporation –multiple effect evaporators, Vacuum pans, Crystallization, Washing of sugar crystals and centrifugal separation/dewatering of sugar and other related processes. Sugar Refining, Sugar analysis, Sugar recovery – improvement, Sugar balance, energy conservation, Sugar plant sanitation.

#### PRACTICAL

1. Quality assessment: Flour (Maltose Number, Water Absorption, Sedimentation value, Alcohol Acidity), yeast, water, leavening agents.
2. Dough characteristics - determination of gluten.
3. Manufacturing of bread (sandwich bread, milk bread) and its sensory evaluation.
4. Preparation and quality evaluation of nan khatai
5. Manufacturing of Cookies and its sensory evaluation.
6. Manufacturing and sensory evaluation of Rusk.
7. Manufacturing and sensory evaluation of cakes and pastries.
8. Preparation of melting marvels
9. Preparation of sweet and salt biscuits
10. Preparation of pizza
11. Manufacturing of milk and dark chocolate and its sensory evaluation.
12. Preparation of different varieties of candies and its sensory evaluation.
13. Preparation of Fudge, Caramel, Fondant Jellies and its sensory evaluation.

14. Farinographic and Extensographic studies
15. Identification of types of confectioneries, sugar cookery.
16. Effect of syrup consistency and temperature on the quality characteristics of hardboiled sweets
17. Manufacture of chocolate, toffee, fruit drops, fruit toffees, candies and preservers.
18. Visit to bakery and confectionery plants.
19. Determination of sugar content in juice.
20. Determination of reducing and non reducing sugars in sugar product.
21. To study the equipments related to sugar manufacturing.
22. To determine ash content of sugar product.
23. To determine moisture content of sugar product.
24. To estimate acidity and TSS of sugar product

## BVFPS403T&P: FOOD BEVERAGE TECHNOLOGY THEORY

### UNIT I

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

### UNIT II

Manufacturing process of beverages: Beverages based on tea, coffee, cocoa, spices, plant extracts, herbs, nuts, Dairy-based beverages.

### UNIT III

Types of coffee and tea: Chemical composition and processing of tea and coffee and their quality assessment. Types of tea: black tea, green tea, oolong tea. Types of coffee: Vacuum coffee, drip coffee, iced coffee. Espresso coffee, instant coffee. Decaffeination of Coffee types of decaffeination: Roselius method, swiss water process, direct and indirect method, triglyceride method, carbon dioxide method.

### UNIT IV

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

### UNIT V

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

### PRACTICAL

1. Chemical and microbiological analysis of raw water quality;
2. Preparation of regional fruit juices;
3. Preparation of whey-based beverages;
4. Preparation of crush, nectar, blended juice
5. Preparation of soy milk, fruit milkshakes, herbal beverages;
6. Visit to relevant processing units.

## BVFPS404T&P: FOOD PLANT UTILITIES & SERVICES THEORY

### UNIT I

Introduction: Classification of Various Utilities and Services in food Plant/ industry. Commercial energy Pricing

### UNIT II

Electrical System: Introduction to electric power supply systems, electrical billing, electrical load management & maximum demand control, power factor improvement & benefits, transformers, system distribution losses, harmonics, trouble shooting of electrical power system

### UNIT III

Electrical Motors: Types, losses in Introduction motor, motor efficiency, factors affecting motor performers, performance, rewinding and motor replacement issues, energy saving opportunities with energy efficient motors

### UNIT IV

Compressed air system: Requirement, types, compressor efficiency, efficient compressor operation, compressed air system components, capacity assessment, leakage test, factors affecting the performance & efficiency

### UNIT V

HV AC & Refrigeration system: Requirement, vapor compression refrigeration cycle, refrigerants, coefficient of performance, capacity, factors affecting refrigeration & air conditioning system performance & saving opportunities.

Vapor absorption refrigeration system: Working principle, types & comparison with VCR system, saving potential

### UNIT VI

Fans and blowers: Requirement, types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities

### UNIT VII

Pumps and pumping systems: Requirement, types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities

### UNIT VIII

DG set system: Requirement, introduction, factors affecting selection

### UNIT IX

Fuels and combustion: Introduction to fuels; properties of fuel oil, coal & gas; storage; handling & preparation of fuels; principles of combustion, combustion of oil, coal & gas; draft system

### UNIT X

Boilers: Boiler specification, Indian boiler regulation, system components, types, combustion in boilers, performance terms, analysis of losses, feed water treatment, blow down, energy conservation opportunities

### UNIT XI

Steam system: Properties of steam, assessment of steam distribution losses, steam leakage, steam trapping, condensate and flash steam recovery system, opportunities for energy savings

### UNIT XII

Waste heat recovery: Classification, advantages and application, commercially viable waste heat recovery: devices, saving potential

### UNIT XIII

Other utilities & services: Lighting, CIP system, waste water/drainage, water treatment, dust removal, fire protection and maintenance system

#### PRACTICAL

1. Study on energy basic, types, forms, terms and measuring instruments used in food plant utilities.
2. Study on plant's electrical power supply system, billing and load estimation.
3. Motors and variable speed drives specification, selection, performance terms & definitions.
4. Study on compressed air system components and performance terms & definitions.
5. Study of refrigeration & HVAC system components, performance terms & definitions and load estimation of a plant.
6. Study of fans and blowers, types, specification, performance terms & definitions.
7. Pumps types, specification, selection, performance terms & definitions.
8. Study on plant lighting system and their components.
9. Study on DG system their specification and selection.
10. Study on combustion of oil, gas & coal.
11. Study on fuel substitution.
12. Study on boiler performance terms and assessment.
13. Study on cost of steam
14. Study on waste heat recovery devices

[Recuperates, Regenerators, Heat wheel, Heat pipes, Economizers, Heat exchanger (Shell and tube, PHE, run around coil exchanger, direct contact HX), Waste heat recovery boilers, Heat pumps and Thermocompressor].

15. Study on CIP' system components.
16. Study on fire control operations and use of fire extinguisher.
17. Study of water treatment plant.
18. Study of effluent treatment plant.

#### BVFPS405P: EDUCATIONAL EXCURSION

#### BVFPS501T&P: ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT UNIT-I

Instructions for the examiner: The examiner will set nine questions in all. All questions will carry equal marks.

Q. No. 1 which will be objective/short answer type covering the entire syllabus, will be compulsory. The remaining questions will be set section wise with questions 4 from each section. Each question should be divided into parts & the distribution of marks be indicated part wise

#### UNIT-II

Instructions for the candidates: The candidates will be required to attempt Q. No. 1 & four others selecting 2 questions from each section. As far as possible the question will be of short answer type.

#### UNIT-III

Entrepreneurship: Definition of Entrepreneur, Internal and External Factors, Functions of an Entrepreneur, Entrepreneurial motivation and Barriers, Classification of Entrepreneurship, Theory of Entrepreneurship, Concept of Entrepreneurship, Development of entrepreneurship; Culture, stages in entrepreneurial process

#### UNIT-IV

Creativity and Entrepreneurial Plan: Idea Generation, Screening and Project Identification, Creative Performance, Feasibility Analysis: Economic, Marketing, Financial and Technical; Project Planning: Evaluation, Monitoring and Control segmentation. Creative Problem Solving: Brainstorming, Synectics, Value Analysis, Innovation.

#### UNIT-V

Institutional support for new food ventures: Supporting Organizations; Incentives and facilities; Financial Institutions and Small scale Industries, Govt. Policies for SSIs.

#### UNIT-VI

Managerial aspects of small Business: Principles of Management (Definition, Function of management viz planning, Organisms, coordination, and control Operational Aspects of Production. Basic principal of financial management. Marketing techniques. Personnel and Inventory Management. Importance of communication in business

#### UNIT-VII

Production management: plant location and layout, production planning and control. marketing challenges and approaches for new products and services.. Agricultural sector and food processing industry problems and opportunities, Standard related to food industry

#### UNIT-VIII

Legal Aspects of small Business: Elementary Knowledge income tax, sales tax, excise rules, factory act and payment of wages act.

#### PRACTICALS

1. Overview of present status of food industries in India
2. Overview of management databases
3. Market Survey, Consumer survey to identify new products
4. Layout for different types of food industries.
5. Methods for economic analysis and profitability analysis of food plant
6. Data collection of materials and processes.
7. To study the essential elements of TQM.

#### BVFPS502T&P: DOCUMENTATION IN FOOD PROCESSING THEORY

##### UNIT-I

Introduction to documentation in food industry, documentation and inspection of raw material in food industry. Methods of documentation for raw material to finished product.

##### UNIT-II

Familiarization with the application of computer in some common food industries : milk plant & fruits vegetable plants, starting from the receiving of raw material up to the storage & dispatch of finished product. Statistical analysis in food industry- application of mean, median and standard deviation in food industry.

##### UNIT-III

Introduction and implementation of ERP, application of ERP in food industry, Essential guidelines of ERP in food processing industries.

##### UNIT-IV

Documentation of finished product detail - name of the product, batch number, time of packing, date of manufacture, date of expiry, other label detail, primary ,secondary and tertiary packing material for finished product, storage conditions.

#### PRACTICALS

1. Problem solving using spread sheet and word.
2. Use of statistical package for analysis of data
3. Application of ERP demonstrated with suitable food product.
4. Familiarization with software related to food industry.
5. Visit to industries and Knowledge of computer application in food industry.
6. Actual presentation of report in seminar.
7. Documentation of any food product along with relevant labeling.

#### BVFPS503T&P: FOOD INDUSTRY WASTE AND BYPRODUCT MANAGEMENT THEORY

##### UNIT-I

Introduction : Sources of waste and pollutants, Classification and characterization of Solid, Liquid and Gaseous wastes, such as wastes from fruit and vegetable and treatment of solid wastes from agro wastes. India -nature of different waste - Waste utilization from rice mill- Thermal and biotechnological use rice husk-cement preparation and different thermal application - utilization of rice bran-stabilization-defatted bran utilization.

##### UNIT-II

Utilization of Fruit and Vegetable Wastes: Types Of Waste And Waste Generation in Different Food Processing Industries: Concept, scope and importance of waste management and effluent treatment Temperature, pH, Oxygen Demands (BOD, COD), Measurement of levels of Pollution such as COD, BOD, TOD, fat, oil and grease content, metal content, forms of phosphorus and sulphur in waste waters, microbiology of waste, other ingredients like insecticide, pesticides and fungicides residues. Processes for waste utilization from fruit and vegetable industries - Distillation for production of alcohol - oil extraction from waste - waste management in sugar mills - citric acid production from fruit waste, extraction of active ingredients from fruit waste.

##### UNIT-III

Fish, Meat and Poultry And Tuber Crops Waste Utilization: Fish Industry by products and Waste utilization-meat and poultry waste recycling. Waste from tuber crops - effluent safe disposal-effluent treatment plant - waste recycling plant - feasibility report for food industries using food waste and by products.

##### UNIT-IV

By-Products Utilization of Wheat and Pulse Mill: By products of wheat milling- germs and bran - by products of pulses milling - husk, germs and broken. Coconut processing - by-product utilization - fuel briquette.

##### UNIT-V

Biodegradability : Concept of biodegradability, Criteria of Pollution, Physical Chemical and Biological properties, Soluble, suspended and volatile solids. Ammonia Nitrogen and Biological indicator. BOD Dilution test and mathematical model for BOD curve. Typical Case Studies: Characterization and treatment of liquid wastes from Dairy, Slaughter house etc. Process of

anaerobic bio-methanation, Conventional aerobic process, Aerated lagoon, Strategies for utilization of Biomass residues after fruit/food processing. Animal and community waste. Landfill and composting. Environmental protection act and specifications for effluent of different food industries, waste Utilization, Effluent treatment, Pre-treatment of waste : sedimentation, coagulation, flocculation and floatation, Secondary treatments: Biological oxidation-trickling filters, oxidation ditches, activated sludge process, rotating biological contractors, lagoons, Tertiary treatments: Advanced waste water treatment process- sand, coal and activated carbon filters, phosphorus, sulphur, nitrogen and heavy metals removal.

#### PRACTICAL

1. Waste characterization : Temperature, pH, thermal conductivity, solids content, turbidity, BOD, COD, estimation of break point chlorination, ammonia removal from waste, effect of lime treatment on waste water in respects of BOD, COD, solids content, phosphate content, demonstration of waste utilization in various industries.
2. Identification of useful products from food and agricultural waste
3. Extraction of leaf proteins
4. Alcohol production from molasses
5. Extraction of banana fiber
6. Use of crop residues for the production of cellulose
7. Use of mango kernels for starch manufacture
8. Pectin from organic waste
9. Rice bran utilization for edible grade oil extraction
10. Extraction of volatile oils from organic waste
11. By-Products utilization of poultry, fish, meat milk, cereals, pulses and seed wastes from agro processing industries.
12. Estimation of Water portability and acceptable parameters
13. Characterization of industrial effluents for pH, TS, TDS, TSS, alkalinity and hardness parameters.
14. Evaluation of population potential of waste materials as Biochemical Oxygen Demand (BOD).
15. Determination of chemical oxygen demand (COD) in various effluents.
16. Water treatment using microbes

#### BVFPS504T: INDUSTRIAL SAFETY AND HAZARDS

##### UNIT-I

Origin of process hazards, Laws Codes, Standards, Case Histories, Properties of Chemicals, and Health hazards of industrial substances.

##### UNIT-II

Toxicology :Toxic materials and their properties, effect of dose and exposure time, relationship and predictive models for response, Threshold value and its definitions, material safety data sheets, industrial hygiene evaluation.

##### UNIT-III

Fire & explosion: Fire and explosion hazards, causes of fire and preventive methods. Flammability characteristics of chemical, fire and explosion hazard, ration of process plant.

##### UNIT-IV



Propagation of fire and effect of environmental factors, ventilation, dispersion, purifying and sprinkling, safety and relief valves.

#### UNIT-V

Other Energy Hazards: Electrical hazards, noise hazard, radiation hazard in process operations, hazards communication to employees, plant management and maintenance to reduce energy hazards.

### BVFPS505P: IN-PLANT TRAINING IN PRODUCT PLANT

### BVFPS601T: FOOD BUSINESS MANAGEMENT

#### UNIT I

Business Management: introduction, theories and functions, food industry management, marketing management and human resource development, personal management. Sectors in food industry and scale of operations in India.

#### UNIT II

Human Resource Management: Study the basics about HR and related policies and capacity mapping approaches for better management.

#### UNIT III

Consumer behavior towards food consumption, Consumer Surveys by various Institutes and Agencies, various journals on consumer behavior and market research, internet based data search.

#### UNIT IV

International trade: basics, classical theory, theory of absolute advantage, theory of comparative modern theory, free trade- protection, methods of protection, quotas, bounties, exchange control, devaluation, commercial treaties, terms of trade, balance of payments, Exim policy, foreign exchange, mechanics of foreign exchange, GATT, WTO, role of WTO. International trade in agriculture. World trade agreements related with food business, export trends and prospects of food products in India.

#### UNIT V

World consumption of Food: patterns and types of food consumption across the globe. Ethnic food habits of different regions. Govt. Institutions related to international ad trade; APEDA, Tea board, spice board, wine board, MoFPI etc. management of export import organization, registration, documentation, export import logistics, case studies. Export and import policies relevant to horticultural sector.

### BVFPS602T&P: FOOD PLANT LAYOUT & DESIGN THEORY

#### UNIT I

Introduction: Definition, Basic concepts of plant layout and design with special reference to food process industries. Application of HACCP concept, ISO, FPO & MPO requirements in food plant layout and design.

#### UNIT II

Plant Location: Influence of location on plant layout, location factors, location theory and models, Economic plant size, types of manufacturing processes like continuous, repetitive and intermittent processes.

#### UNIT III

Plant Layout: Preparation of a Plant Layout, Plant Layout problem, importance, objectives, classical types of layouts. Evaluation of layout. Advantages of good layout

#### UNIT IV

Plant Building: Considerations in building design, type of factory buildings, choice of building construction, material for floors, foundation, walls, doors, windows, drains etc, ventilation, fly control, mold prevention and illumination in food processing industries.

#### UNIT V

Plant layout & Equipment Layout: Plant layout and design of bakery and biscuit industries; fruits and vegetables processing industries including beverages; milk and milk products; meat, poultry and fish processing industries.

#### PRACTICAL

1. Preparation of project report
2. Preparation of feasibility report Layout of food storage wares and godowns
3. Visit to food storage wares and godowns
4. Layout and design of cold storage
5. Visit to cold storage plant
6. Layout of preprocessing house
7. Layout of milk and milk product plant
8. Visit of milk processing plant Layout and design of bakery and related product plant
9. Visit to bakery unit
10. Layout and design of fruit processing plant
11. Layout and design of vegetable processing plant
12. Visit to fruit and vegetable processing plant Design and layout of multiproduct and composite food plant
13. Waste treatment and management of food plant

#### BVFPS603T&P: FOOD PACKAGING TECHNOLOGY THEORY

##### UNIT-I

Packaging Machineries, Systems and Regulations, Introduction to Food Packaging: History, Definitions, Importance and scope functions of packaging, package components.

##### UNIT-II

Packaging Materials and Properties: Manufacturing process, types, properties, advantages and disadvantages. Primary Packaging Materials. Paper and paper based packaging materials, Plastic as packaging materials: Brief history, processing, classification, mechanical, optical and barrier properties like WVTR, GTR, additives in plastics.

##### UNIT-III

Aluminium foil. Metal packaging materials. Manufacture of tin plate, TFS, fabrication, corrosion and remedial measures. Glass packaging materials: Composition, structure, properties, manufacture, design and closure. Plastic collapsible tube. Composite container. Secondary Packaging Material: Folding carton. Transport packaging materials- corrugated fiber board boxes, wooden boxes. Ancillary Packaging Materials: Printing inks, varnishes, lacquers and adhesives. Factors responsible for the selection of Packaging materials for fresh and processed food products.

##### UNIT-IV

Packaging requirements of different types of foods : fruits and vegetables, meat, fish, poultry, dairy products, edible oils and spice products, bakery products, confectioneries, Instant foods, extruded foods, snack foods, alcoholic and non alcoholic carbonated beverages, compatibility and estimation of shelf life.

#### UNIT-V

Packaging Machineries, Systems and Regulations: Packaging Machineries: Bottling, canning, capping, labeling, form- fill sealing, strapping, cartonning machineries. Packaging Systems: Vacuum and gas packaging, aseptic packaging, retort packaging, CAP and MAP, Intelligent/Smart/Active packaging systems and their food applications, active packaging, shrink packaging, lined cartonning system. Packaging Standards and Regulations: Laws, regulations, specifications and quality control, recycling of plastic packaging materials: Collection, separation and disposal.

#### UNIT-VI

Labelling requirements, methods of coding and regulation and standards of labelling of food packages

#### PRACTICALS

1. Familiarization of different types of packaging materials.
2. Paper: Thickness, Grammage, weight, and water absorption capacity, Determination of wax weight, Determination of continuity of wax coating weight, grease resistance.
3. Plastics: Identification of different types of plastic packaging materials, thickness, density, Tensile strength and elongation, dart impact, WVTR,GTR, Migration tests on plastics,
4. Metals: Determination of tin coating weight, headspace analysis of trace elements (Pb, Cr, Fe), lacquer coating, Can seaming.
5. Glass ; Study on various defects in glass containers, To perform non-destructive tests for glass containers,
6. Transport package: Corrugated fibre board boxes: Determination of bursting/strength properties, compression strength, cobb value, edge crush test, transport worthiness tests.
7. Estimation of shelf life of packaged food.
8. To perform vacuum packaging of food sample and carry out its storage study.
9. To perform modified atmospheric packaging of food sample and carry out its storage study.
10. To determine grease resistance of packaging materials.
11. Determination of water vapour transmission rate of various packaging materials.
12. To find out the porosity of tin plate.
13. To see the chemical resistance of packaging material.
14. Puncture resistance of corrugated boxes.
15. Visit to various industries, dealing with food packaging materials like / paper, board and metal cans.
16. Visit to packaging institute
17. Tetra packing
18. Labeling of packing

## BVFPS604P: PROJECT

Students have to prepare a business plan/entrepreneurship for production of any food product on the basis of their choice/interest. The submitted report will cover specialized processing from procurement of raw material to processing, including packaging and storage, organizing resources and utilities, selling of the product, maintaining accounts and documents.

Evaluation criteria:

1. Preparation of Business Plan: i. Selection of product to be manufactured, ii. Innovativeness, iii. Creativity, iv. Realistic plan, v. Overall project report and project presentation
2. Organizing the Production: i Organization of resources, ii Organizing Utility, iii Time management
3. Production and Sales: i. Regularity in production, ii. Product quality, iii. Positioning of product in market, iv. Adhering to rules and regulations,
4. Sales: i. Sales performance, ii. Sales volumes, iii. Profit generated including C/B ratio, and pay back period, etc.
5. Documentation and Reports: i. Book keeping, ii. People Management, iii. Preparation of manual, iv. Preparation of final report
6. Oral Examination: i. Presentation, ii. Oral performance

## BVFPS605P: SEMINAR

Students have to give any presentation of any topic related to Food Processing

## BVFPS606P: COMPREHENSIVE VIVA-VOCE

## MAPPING OF CO, PO, PSO

	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO 5	PSO6
	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO 5	PSO6
CO-1	✓	✓				✓		✓			✓	✓	✓
CO-2	✓	✓		✓	✓	✓		✓	✓	✓	✓	✓	✓
CO-3	✓	✓		✓	✓	✓		✓	✓	✓	✓	✓	✓
CO-4	✓	✓	✓			✓		✓				✓	✓
CO-5	✓	✓	✓		✓	✓		✓					
CO-6	✓	✓	✓	✓		✓		✓				✓	
CO-7	✓	✓	✓			✓		✓		✓			
CO-8	✓	✓				✓		✓					
CO-9	✓	✓	✓	✓	✓		✓			✓			✓
CO-10	✓	✓		✓			✓	✓				✓	
CO-11	✓	✓				✓		✓				✓	
CO-12	✓	✓				✓		✓				✓	
CO-13	✓	✓	✓			✓		✓				✓	
CO-14	✓	✓				✓		✓		✓			
CO-15	✓	✓						✓					
CO-16	✓	✓				✓		✓					
CO-17	✓	✓		✓		✓		✓					
CO-18	✓	✓				✓		✓					✓
CO-19	✓	✓						✓		✓			✓
CO-20	✓	✓	✓					✓		✓			✓
CO-21	✓	✓						✓		✓			
CO-22	✓	✓						✓		✓			
CO-23	✓	✓		✓				✓					
CO-24	✓	✓						✓					✓
CO-25	✓	✓						✓					
CO-26				✓		✓		✓		✓		✓	

## JUSTIFICATION MATRIX OF CO WITH PO & PSO (High: 3, Medium: 2, Low: 1)

	Mapping	Correlation	Justification
<b>CO -1</b>	PO1	HIGH	Acquire knowledge about food science, technology ,processing
	PO2	HIGH	Industrial skill development in food presevation
	PO6	MODERATE	Students able to find their scope of job real life problem learning application of this course
	PO7	HIGH	It should be included in research sector to formulate new food products
	PSO1	HIGH	Information in various food sector
	PSO5	HIGH	<b>Basic food preservation concept in different sector</b>
<b>CO-2</b>	PO1	HIGH	Obtain clear concept of science in cereals and pulses
	PO2	HIGH	Students make questioning by different intradicipilinary subjects
	PO5	MODERATE	Students apply the knowledge of industries in cereal processing
	PO7	LOW	Student able to think in advance topics related this subject and improve research skill.
	PSO2	HIGH	Student learn to identify the problems and analyze to find information correctly in this course.
	PSO4	HIGH	Student will able to identify the method of processing of cereals in food industry
<b>CO-3</b>	PO1	HIGH	Students acquired sound and sufficient knowledge about basics of dairy technology
	PO2	HIGH	To understand how to relate other subject with the study of milik and milk processing
	PO4	HIGH	Student learn to communicate with other using concept of different aspect of this course
	PO7	HIGH	Student able to think in advance topics related this subject and improve research skill
	PSO2	HIGH	Students able to know working specification in different dairy sector
	PSO4	MODERATE	Student will able to identify and formulate the problems of convergence of series and limit point of different sequence in a unique way.
<b>CO-4</b>	PO1	HIGH	Students learn the concept additives used in different food products
	PO2	HIGH	Acquire knowledge industrials uses of food additives
	PO3	HIGH	To understand accurate knowledge about additives
	PSO1	MODERATE	Students will able to think critical problems related to this course.
	PSO2	HIGH	Student learn to identify the problems and analyze to find information correctly in this course.
	PSO4	HIGH	Student will able to identify and formulate the problems arise in food industry
<b>CO-5</b>	PO1	HIGH	Proper knowledge on food science
	PO2	HIGH	It also give appropriate knowledge to formulate new product development
	PO4	MODERATE	Student learn to communicate with other using concept of different aspect of this course
	PO7	HIGH	Student able to think in advance topics related this subject and improve research skill
	PSO2	HIGH	Student learn to identify the problems and analyze to find information correctly in this Course
	PSO4	LOW	Student will able to identify and formulate the problems in food reserch
<b>CO-6</b>	PO1	HIGH	learner will be able to know about production, packaging, storage and distribution of different milk products
	PO2	HIGH	Knowledge about various milk products in milk industries
	PO4	HIGH	Student learn to communicate with other using concept of different aspect of this course
	PO7	HIGH	Student able to think in advance topics related this subject and improve research skill
	PSO2	HIGH	Students able to solve problems in different problems in group theory.

	PSO4	MODERATE	Student will able to identify and formulate the problems a unique way.
<b>CO-7</b>	PO1	HIGH	Able to design various machineries used in food industries
	PO2	HIGH	Proper knowledge in food engineering
	PO6	MODERATE	Students able to find their scope of job real life problem learning application of this course
	PO7	HIGH	Students will be able to use research methods for this specified courses.
	PSO1	HIGH	Students will able to think critical problems related to unit operation.
	PSO5	HIGH	Student realize to evaluate the problem .
<b>CO-8</b>	PO1	HIGH	The learner will be able to know about characteristics of different types of microbes, growth of microorganism, fermentation types, sources of microorganisms in food, food spoilage bacteria, Enlist the types of microorganisms, classification and nomenclature of microorganisms, structure & functions.
	PO2	HIGH	They will understand why microbial quality control are necessary in food production.
	PO3	HIGH	Student think about different preservation method to prevent microbial spoilage
	PSO1	MODERATE	Students will able to think critical problems related to food preservation
	PSO2	HIGH	Solving problem in food sector
	PSO4	HIGH	Student will able to identify and formulate the skill in food sector
<b>CO-9</b>	PO1	HIGH	Students will able to obtain vast knowledge computer knowledge
	PO2	HIGH	Student learn about skill in word file,xl etc
	PO5	HIGH	Students apply the knowledge of various field in computer application.
	PSO1	LOW	Students will think the topics about food sector
	PSO3	LOW	Student realize how to evaluate the plant layout of food company

<b>CO-10</b>	PO1	HIGH	Students will proper knowledge in sanitization and hygiene.
	PO4	HIGH	Develop the proper sanitation skill
	PO6	HIGH	It gives the proper industrial hygiene knowledge
	PSO1	MODERATE	Students will learn industrial safety
	PSO2	HIGH	Student learn to solve hazard analysis
	PSO6	HIGH	Student will able to solve new problem
<b>CO-11</b>			
	PO2	HIGH	Students learn about fish meat poultry 's composition, muscle structure, spoilage, preservation technique.
	PO5	MODERATE	Students apply the knowledge about fish , meat and poultry industry
	PO7	LOW	Student able to think in advance topics related fish processing
	PSO2	HIGH	Student learn to identify the problems in fish meat processing and analyze to find information correctly in this course.
PSO4	HIGH	Student will able to develop of value added products and by products of fish meat and poultry processing	
<b>CO-12</b>	PO1	HIGH	Students acquired sound and sufficient knowledge about identify the spoilage in fruits and vegetables
	PO2	HIGH	To understand how to relate and Identify and select fresh fruits and vegetables
	PO4	HIGH	Student learn to knowledge about fruits and vegetable industry
	PO6	HIGH	Student able knowledge in enhancing employability in industry.
	PSO2	HIGH	Students able to solve problems in fruits and vegetable industry

	PSO4	MODERATE	Student will able to identify and preserve and store jam, jelly and marmalades
<b>CO-13</b>	PO1	HIGH	Students will able learn about sufficient knowledge in agricultural products
	PO2	HIGH	To understand how to relate other subject in different techniques of fats and oil processing.
	PO4	HIGH	Characteristics of fat and oil will be analyzed by the students
	PO6	HIGH	Student able to think in industrial problems related in fats and oil processing.
	PSO3	HIGH	Students able to know design of fats and oil industry.
	PSO5	HIGH	Student will able to know clear concept on fats and oil processing.
<b>CO-14</b>	PO1	HIGH	Students will able to think critical problems related to this course
	PO2	HIGH	Students will learn skill on various instruments used in food industry.
	PO4	LOW	Student learn communication skill through this course.
	PSO1	HIGH	Students will able to think critical problems related to this course
	PSO3	HIGH	Student realize how to evaluate the problem in food sector
	PSO4	HIGH	Student will able to identify problems on instrument used in food industry.
<b>CO-15</b>	PO1	HIGH	Students make knowledge in food laws
	PO2	HIGH	Students make knowledge in various regulation on food,
	PO5	MODERATE	Students apply the knowledge of problem solving.
	PSO1	MODERATE	Students will able to think different information in different food industry.
	PSO2	HIGH	Student learn to identify the problems in food sector.
	PSO6	HIGH	Student will able to acquire knowledge of responsible citizen.
<b>CO-16</b>	PO1	HIGH	Acquire knowledge on transformation of agricultural products.
	PO2	HIGH	Students make scope of job real life problem learning application of this course
	PO6	MODERATE	Students able to find industrial learning.
	PO7	HIGH	Students will be able to use research methods for this specified courses
	PSO1	HIGH	Students will able to think critical problems related to bakery and confectionary industry.
	PSO5	HIGH	Student realize to evaluate the problem in the bakery industry.

	Mapping	Correlation	Justification
<b>CO-17</b>	PO1	HIGH	Students acquired knowledge various beverage processing
	PO2	HIGH	To understand how to relate machinery used in beverages.
	PO4	HIGH	Student learn to excellent communication bakery industry.
	PO6	HIGH	Student able to knowledge in bakery industry.
	PSO2	HIGH	Students able to solve problem in food industry
	PSO5	MODERATE	Student will able to identify problem in food sector
<b>CO-18</b>	PO1	HIGH	Students will able to demonstrate a knowledge and understanding about various utilities and services in food plant
	PO2	HIGH	Student learn about the various instruments mechanism .
	PO5	HIGH	Students apply the knowledge of various thoughts of any instruments.
	PSO1	MODERATE	Students will think the topics of food industrial problem.
	PSO3	LOW	Student realize how to evaluate the problem in food sector.
	PSO5	HIGH	Student will able know problems in bakery sector.
<b>CO-19</b>	PO1	HIGH	Students obtain a vivid knowledge in entrepreneurship



	PO2	HIGH	Acquire knowledge of new industry development
	PO3	MODERATE	Students will able to know how to build new business.
	PO6	HIGH	Students will able to know how to build new business.
	PSO1	HIGH	Students will able to knowledge in various food sector industries.
	PSO3	MODERATE	Student realize how to establish new business set up.
CO-20	PO1	HIGH	Students able to define and describe major terminologies related to documentation in food industry.
	PO2	HIGH	Acquire knowledge of analyze and evaluate the hazards in food industry
	PO3	HIGH	Identify and practice the labeling requirements for packaged food materials.
	PSO1	MODERATE	Students will able to compare and contrast the data in food industry using statistical Package
	PSO2	HIGH	Student learn to identify the the information about different production processes and machineries used in food industry
	PSO4	HIGH	Student will able to identify and explain programs needed to inspect raw materials in different food industries
	PSO2	HIGH	Student learn to identify the problems in documentation in various food sector.
CO-21	PO1	HIGH	The learner will be able to know about waste and pollutants, utilization of fruits and vegetable wastes
	PO2	HIGH	Students will understand treatment of wastes.
	PO3	HIGH	enhance knowledge and reducing waste will not only protect the environment but will also save on costs or reduce expenses for disposal
	PSO1	MODERATE	They will practically learn about alcohol production from molasses, water treatment using microbes, extraction of banana fiber etc
	PSO2	HIGH	Students will learn industrial waste management
	PSO4	HIGH	Student learn to identify the problems in industrial waste in various food sector.
CO-22	PO1	HIGH	To learn about various toxic materials and hazard in food industry.
	PO2	HIGH	evaluate workplace to determine the existence of occupational safety and health hazards
	PO5	HIGH	Identify relevant regulatory and national consensus standards
	PSO1	MODERATE	Understand different types pollution
	PSO3	LOW	Students will learn about different occupational safety
	PSO5	HIGH	Students get proper knowledge of methodology.
CO-23	PO1	HIGH	Learners will explore entrepreneurial skills and management function
	PO2	HIGH	Identify the type of entrepreneur and the steps involved in an entrepreneurial venture.
	PO3	MODERATE	Learners will understand various steps involved in starting a venture
	PO6	HIGH	Explore marketing methods & new trends in entrepreneurship.
CO-24	PO1	HIGH	Students will receive instruction in setting up agriculture and food processing equipment in accordance with process flow
	PO2	HIGH	Learns about the concepts, categories, and specifications, as well as the equipment needs of the food processing sectors
	PO4	HIGH	Will gain knowledge of environmental protection from food plant sanitation and economic aspects
	PO7	HIGH	How to record and report on plant maintenance.
	PSO2	HIGH	Comprehend project design principles and factors, layout techniques, and site selection
	PSO4	MODERATE	Will be knowledgeable with the varieties and key characteristics of various plant architectures
CO-25	PO1	HIGH	Get proper information about fundamental in food packaging
	PO2	HIGH	Able to explain the roles of packaging in the food industry and describe the making process
	PO3	MODERATE	Describe the making process, suitability, and functionality of each type of packaging materials
	PO6	HIGH	Evaluation of current issues related to quality and safety aspects of food packaging
	PSO1	HIGH	Know about packaging laws
	PSO3	MODERATE	The principles of innovative packaging technologies for use with food products

CO-26	PO1	HIGH	Through industrial excursion and training students will get expose to industry
	PO2	HIGH	to correlate with the knowledge of classroom teaching and will be interested in their study.
	PO3	MODERATE	From industry visit they will learn about raw material collection, processing, packaging, distribution out let, quality control laboratory etc.

**ARTICULATION MATRIX OF CO WITH PO & PSO**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO -1	3	3				3	3	3				3	
CO -2	3	3			2	1			3		3		
CO-3	3	3			2	1			3		3		3
CO-4	3	3	3					2	3		3		
CO-5	3	3					3		3		1		
CO-6	3	3		3			3		3				
CO=7	3	3					3	3				3	
CO-8	3	3	3						3		3		
CO-9	3	3			3					1		3	
CO-10	3	3			3				3				3
CO-11	3	3		3			3		3		2		
CO-12	3	3			3			2		1		3	
CO-13	3	3	2			3		3		2			
CO-14	3	3	3					2	3		3		
CO-15	3		3	2				3		1	3		
CO-16	3	3		2			3		3		3		
CO-17	3	3			3			2	3				3
CO-18	3	3				3	3	3				3	3
Co 19	3		3	2				3		1	3		3
CO-20	3	3			2	1	3		3		3		
CO-21	3								3	1		3	3
CO-22	3	3					3	3	3		3		
CO-23	3		3		3		3			1		3	
CO-24	3	3				3			3				

CO-25	3						3	2		2		3	3
Co-26	3	3					3		3				
Target	3	3	2.8	2.5	2.6	2	3	2.5	3	1.3	2.7	3	3

**THE FOLLOWING LIST OF STUDENTS FROM 2023-2024 BATCH HAVE TAKEN ADMISSION INTO HEIS FOR HIGHER STUDIES:**

Name of student enrolling into higher education	Program graduated from	Name of institution joined	Name of programme admitted to
Alik Maiti	M.G.M/Department of Nutrition,B.Voc in FOOD PROCESSING	Mugberia Gangadhar Mahavidyalaya	M.Voc. in Food Techonology ,Nutrition,& Management
Amrita Bhattacharya	M.G.M/Department of Nutrition,B.Voc in FOOD PROCESSING	Mugberia Gangadhar Mahavidyalaya	M.Voc. in Food Techonology ,Nutrition,& Management
Bipasa Maity	M.G.M/Department of Nutrition,B.Voc in FOOD PROCESSING	Mugberia Gangadhar Mahavidyalaya	M.Voc. in Food Techonology ,Nutrition,& Management
Manisha Barik	M.G.M/Department of Nutrition,B.Voc in FOOD PROCESSING	Mugberia Gangadhar Mahavidyalaya	M.Voc. in Food Techonology ,Nutrition,& Management
Milan Pal	M.G.M/Department of Nutrition,B.Voc in FOOD PROCESSING	Mugberia Gangadhar Mahavidyalaya	M.Voc. in Food Techonology ,Nutrition,& Management
Naboday Giri	M.G.M/Department of Nutrition,B.Voc in FOOD PROCESSING	Mugberia Gangadhar Mahavidyalaya	M.Voc. in Food Techonology ,Nutrition,& Management
Narugopal Bar	M.G.M/Department of Nutrition,B.Voc in FOOD PROCESSING	Mugberia Gangadhar Mahavidyalaya	M.Voc. in Food Techonology ,Nutrition,& Management
Rakhi Majhi	M.G.M/Department of Nutrition,B.Voc in FOOD	Mugberia Gangadhar	M.Voc. in Food Techonology

	PROCESSING	Mahavidyalaya	,Nutrition,& Management
Saheli Guchhait	M.G.M/Department of Nutrition,B.Voc in FOOD PROCESSING	Mugberia Gangadhar Mahavidyalaya	M.Voc. in Food Techonology ,Nutrition,& Management
Sandipta Bera	M.G.M/Department of Nutrition,B.Voc in FOOD PROCESSING	Mugberia Gangadhar Mahavidyalaya	M.Voc. in Food Techonology ,Nutrition,& Management
Sanjit Patra	M.G.M/Department of Nutrition,B.Voc in FOOD PROCESSING	Mugberia Gangadhar Mahavidyalaya	M.Voc. in Food Techonology ,Nutrition,& Management
Santu Kumar Pal	M.G.M/Department of Nutrition,B.Voc in FOOD PROCESSING	Mugberia Gangadhar Mahavidyalaya	M.Voc. in Food Techonology ,Nutrition,& Management
Shibasis Dhowarh	M.G.M/Department of Nutrition,B.Voc in FOOD PROCESSING	Mugberia Gangadhar Mahavidyalaya	M.Voc. in Food Techonology ,Nutrition,& Management
Somasree Majhi	M.G.M/Department of Nutrition,B.Voc in FOOD PROCESSING	Mugberia Gangadhar Mahavidyalaya	M.Voc. in Food Techonology ,Nutrition,& Management
Somnath Shee	M.G.M/Department of Nutrition,B.Voc in FOOD PROCESSING	Mugberia Gangadhar Mahavidyalaya	M.Voc. in Food Techonology ,Nutrition,& Management
Sovik Bera	M.G.M/Department of Nutrition,B.Voc in FOOD PROCESSING	Mugberia Gangadhar Mahavidyalaya	M.Voc. in Food Techonology ,Nutrition,& Management
Subhajit Das	M.G.M/Department of Nutrition,B.Voc in FOOD PROCESSING	Mugberia Gangadhar Mahavidyalaya	M.Voc. in Food Techonology ,Nutrition,& Management
Sushovan Kar	M.G.M/Department of Nutrition,B.Voc in FOOD PROCESSING	Mugberia Gangadhar Mahavidyalaya	M.Voc. in Food Techonology ,Nutrition,& Management
Susmita Jana	M.G.M/Department of Nutrition,B.Voc in FOOD PROCESSING	Mugberia Gangadhar Mahavidyalaya	M.Voc. in Food Techonology ,Nutrition,& Management
Tanushree Jana	M.G.M/Department of Nutrition,B.Voc in FOOD PROCESSING	Mugberia Gangadhar Mahavidyalaya	M.Voc. in Food Techonology ,Nutrition,& Management

**THE FOLLOWING LIST OF STUDENTS FROM 2023-2024 BATCH HAVE GOT JOB  
IN FOOD INDUSTRY:**

<b>Name of student</b>	<b>Program graduated from</b>	<b>Name of Industry</b>
Souvik Bera	M.G.M/Department of Nutrition,B.Voc in FOOD PROCESSING	Bengal Nestor's Industries Limited
Subhajit Das	M.G.M/Department of Nutrition,B.Voc in FOOD PROCESSING	Bengal Nestor's Industries Limited
Alik Maity	M.G.M/Department of Nutrition,B.Voc in FOOD PROCESSING	Geo Nutri Foods Private Limited
Somnat Shee	M.G.M/Department of Nutrition,B.Voc in FOOD PROCESSING	Geo Nutri Foods Private Limited
Naboday Giri	M.G.M/Department of Nutrition,B.Voc in FOOD PROCESSING	Geo Nutri Foods Private Limited

## Attainment of Course & Programme Outcomes

### For the academic year 2023-24.

In the Outcome Based Education (OBE), assessment is done through one or more than one processes, carried out by the department, that identify, collect, and prepare data to evaluate the achievement of course outcomes (CO's).

The process for finding the attainment of Course outcomes uses various tools/methods. These methods are classified into two types: **Direct methods and indirect methods.**

Direct methods display the student's knowledge and skills from their performance in the class/assignment test, internal assessment tests, assignments, semester examinations, seminars, laboratory assignments/practical's, mini projects etc. These methods provide a sampling of what students know and/or can do and provide strong evidence of student learning.

Indirect methods such as course exit survey and examiner feedback to reflect on student's learning. They are used to assess opinions or thoughts about the graduate's knowledge or skills.

Following tables show the various methods used in assessment process that periodically documents and demonstrates the degree to which the Course Outcomes are attained. They include information on:

- a) Listing and description of the assessment processes used to gather the data, and
- b) The frequency with which these assessment processes are carried out.

Sr. No.	Direct Assessment Method	Assessment frequency	Description
1.	Internal Assessment Test	Twice in a Semester	The Internal Assessment marks in a theory paper shall be based on two tests generally conducted at the end of 6 <sup>th</sup> and 11 <sup>th</sup> weeks of each semester. It is a metric used to continuously assess the attainment of course outcomes w.r.t course objectives. Average marks of two tests shall be the Internal Assessment Marks for the relevant course.
2.	Lab Assignments / experiments	Once in a week	Lab Assignment/Experiment is a qualitative performance assessment tool designed to assess students' practical knowledge and problem solving skills. Minimum ten experiments need to be conducted for every lab course.
3.	End Semester Examination	Once in a Semester	End Semester examination (theory or practical) are the metric to assess

4.	Practical Examination	Semester	whether all the course outcomes are attained or not framed by the course incharge. End Semester Examination is more focused on attainment of all course outcomes and uses a descriptive questions.
5.	Home Assignments	Twice in a Semester	Assignment is a metric used to assess student's analytical and problem solving abilities. Every student is assigned with course related tasks & assessment will be done based on their performance. Grades are assigned depending on their innovation in solving/deriving the problems.
6.	Class / Assignment Test	Twice in a Semester	It is a metric used to continuously assess the student's understanding capabilities.
7.	Preliminary Examination	Once in a semester	Preliminary examination is the metric to assess whether all the course outcomes are attained or not by asking descriptive questions.
8.	Presentations	As per the requirement	Presentation is the metric used to assess student's communication and presentation skills along with depth of the subject knowledge. Seminars topics are given to the students that cover topics of current interest or provide in-depth coverage of selected topics from the core courses.
9.	Class Attendance	As Per Vidyasagar University Guideline.	Total 5 Marks allotted for every Course / SEC/ DSE/AECC or others. The marks obtained of every course from Class Attendance by the students is following manner. <ol style="list-style-type: none"> <li>1. 05 Marks if he/ she attained greater than or equal to 95%.</li> <li>2. 04 Marks if he/ she attained greater than or equal to 90%.</li> <li>3. 03 Marks if he/ she attained greater than or equal to 85%.</li> <li>4. 02 Marks if he/ she attained greater than or equal to 80%.</li> <li>5. 01 Marks if he/ she attained greater than or equal to 75%.</li> </ol>

<b>Table 2: Indirect Assessment tool used for CO attainment</b>			
<b>Sr. No.</b>	<b>Indirect Assessment Method</b>	<b>Assessment frequency</b>	<b>Method Description</b>
1	Course Exit Survey / Students Feedback Survey	End of Semester	Collect variety of information about course outcomes from the students after learning entire course.

**The weightages given for various assessment tools used for the attainment of Course Outcomes are shown in table 3.**

**Table 3: List of Course Assessment tools**

			<b>Tools</b>	<b>Frequency</b>	<b>Weightage</b>
			<b>Assessment Tools</b>	<b>Direct</b>	<b>Internal Tools</b>
Internal Assessment	Twice in a semester				
Home Assignments	Selected Topic				
MOCK Practicals	Once in a semester				
MCQ					
Seminar/Presentations					
Mini Projects					
Preliminary Examination					
End Semester Practical		<b>30/100(Practical Paper Only)</b>			
End Semester Field Visit	<b>100 industry method</b>				
Projects	<b>100( Project Report Only)</b>				
<b>External Tools</b>	End Semester Examination	Once in a semester			<b>30/100(Theory paper), 60/100(Theory paper), 30/75(Practical Paper)</b>
<b>Class Attendance</b>	Counted after completion the End Semester classes.	Once in a semester			Total 5 Marks allotted for every Course The



					<p>marks obtained of every course from Class Attendance by the students is following manner.</p> <ol style="list-style-type: none"> <li>1. 05 Marks if he/she attained greater than or equal to 95%.</li> <li>2. 04 Marks if he/she attained greater than or equal to 90%.</li> <li>3. 03 Marks if he/she attained greater than or equal to 85%.</li> <li>4. 02 Marks if he/she attained greater than or equal to 80%.</li> <li>5. 01 Marks if he/she attained greater than or equal to 75%.</li> </ol>
	<b>Indirect</b>	--	Course Exit Survey/ Examiners feedback	Once in a Semester	<b>On Marks Allotted but As Per NAAC / IQAC Guideline</b>

**DIRECT METHOD**

Academic Session: 2023-2024

**Semester VI**

**Programme Name: B.VOC in FOOD PROCESSING**

**ATTAINMENT LEVELS FOR**

<b>Result of UG SEM 6 of the academic year 2023-24</b>			
<b>Name</b>	<b>Roll</b>	<b>No</b>	<b>SGPA</b>
Alik Maiti	81322129	0415	74.73
Amrita Bhattacharya	81322129	0416	79.97
Bipasa Maity	81322129	0418	83.50
Manisha Barik	81322129	0422	90.60
Milan Pal	81322129	0423	71.83
Naboday Giri	81322129	0426	67.60
Narugopal Bar	81322129	0429	70.97
Rakhi Majhi	81322129	0431	84.23
Saheli Guchhait	81322129	0433	78.10
Sandipta Bera	81322129	0435	69.17
Sanjit Patra	81322129	0436	85.50
Santu Kumar Pal	81322129	0437	72.10
Shibasis Dhowarh	81322129	0439	79.13
Somasree Majhi	81322129	0443	77.80
Somnath Shee	81322129	0444	86.73
Sovik Bera	81322129	0446	83.43
Subhajit Das	81322129	0447	79.60
Sushovan Kar	81322129	0449	80.57
Sushovan Kar	81322129	0450	81.20
Susmita Jana	81322129	0452	80.53
Tanushree Jana	81322129	0456	86.70

**PO & PSO ATTAINMENT  
METHOD**

**2022-2023**

**Programme Name: B. VOC (FOOD PROCESSING)**

**INDIRECT**

**Academic Session:**

**Semester VI**

**EXIT FORM SURVEY IS CONDUCTED THROUGH QUESTIONNAIRE METHODS. OUT OF 10 QUESTIONS, FIRST 7 OF THEM RELATE DIRECTLY TO THE POs & THE LAST 3 QUESTIONS RELATE TO THE PSOs. A SAMPLE FORM IS GIVEN BELOW:**





**MUGBERIA GANGADHAR MAHAVIDYALAYA, MUGBERIA 721425**

**RATING AND RELATION OF POs AND PSOs WITH QUESTIONNARIE**

**Average Rating (Excellent- 4, Good-3, Average-2, Poor-1) Target level: 3**

<b>Questions</b>	<b>Average Rating (of 22 students)</b>
1. Did you acquire sound & sufficient knowledge of the courses taught?	<b>3.8</b>
2. Rate your skill development in terms of critical thinking & reasoning offered in the courses?	<b>3.5</b>
3. How much are the courses offered to you suggesting an interdisciplinary approach?	<b>3.8</b>
4. Rate the courses as per their communication skill and attitude	<b>3.8</b>
5. Did the courses help in developing self directed learning?	<b>3.9</b>
6. Rate the courses in terms of their updation with recent developments.	<b>3.5</b>
7. Rate the courses in terms of their experimental learning and employability option?	<b>3.3</b>
8. Rate the courses in terms of their environmental awareness and relevance to sustainable measures?	<b>3.7</b>
9. Rate the courses in terms of developing research oriented skill	<b>3.8</b>
10. How far the courses are relevant in terms of job opportunities and research/further studies?	<b>3.6</b>

