प्राविधिक शिक्षा तथा व्यावसायिक तालीम परिषद्
पदपूर्ति समिति
सानोठिमी, भक्तपुरको

फुण्ड एण्ड डेरी टेक्नोलोजी प्रशिक्षक
अधिकृत स्तर तृतीय श्रेणी प्राविधिक पदको
खुला र आन्तरिक प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम

द्वितीय पत्र : सेवा सम्बन्धी प्राविधिक विषय

पूर्णाङ्क - १००

1. **Food Engineering**
   - 1.1. Units, dimensions and their conversion.
   - 1.2. Unit operation, heat and material balance, heat transfer (conduction, convection and radiation) and heat exchangers. Laws of thermodynamics and it's applications
   - 1.3. Flow of fluids, laminar and turbulent flow, Newtonian and non-Newtonian fluids, selection of pumps. Application of various types of pumps used on food and dairy industries. Flow measuring devices (rotameter, venturimeter and rotameters). Equation of continuity, Bernoulli's equation, its assumption, limitation and uses. Newton's law of viscosity
   - 1.4. psychrometric properties and application of psychrometric chart
   - 1.5. Steam generation principle, the equipment's involved and it's application in food industries
   - 1.6. Principle, application and equipment for refrigeration & freezing, drying & dehydration, evaporation, centrifugation, size separation (filtration, sedimentation), Crystallization
   - 1.7. Principle and application of different types of distillation
   - 1.8. General introduction to belt drive, chain drive, gear drive and their importance in food industries. Structure and function of Bearings, coupling, shaft, cranks.
   - 1.9. Working principle of refrigeration system. Desirable properties of refrigerants. Merits and demerits of various types of refrigerants. Application of refrigeration system in food industries.
2. **Food Chemistry**
   - 2.1. Introduction of Food Chemistry. Composition of foods and their importance
   - 2.2. Introduction and importance of moisture in foods, moisture determination methods and their application in different foods.
   - 2.3. Structure, classification and functions of carbohydrates. Reducing and non –reducing sugars. Definition, sources and uses of different polysaccharides (starch, pectin, cellulose, hemicellulose). Introduction, sources, structure, pectin grade, extraction, and uses of pectin.
   - 2.4. Introduction, types and function of crude fibre and dietary fibre, the effects of excessive dietary fibre in diet, determination of crude fibre.
   - 2.5. Structure, classification and functions of proteins. Classification and properties of amino acids, essential and non-essential amino acids, denaturation of proteins, Methods of protein determination.
   - 2.6. Composition, classification, properties and importance of fats and oil. Saturated and unsaturated fatty acids, rancidity, autoxidation, flavor reversion, identification of natural fats and oils.
   - 2.7. Classification and properties of vitamins. Functions, sources and deficiency diseases associated to fat soluble and water soluble vitamin.Occurrence of minerals in food.

Biochemical functions of minerals, major and trace (microelements). Method of determination of Ca and Fe.

2.8. General properties and classification of enzymes, enzymes in food industry, desirable and undesirable aspect of browning, enzymatic browning (Occurrence. mechanism and prevention), non-enzymatic reactions, caramelization, Maillard reaction, Ascorbic acid oxidation

2.9. Natural pigments in food (chlorophyll, carotenoids, anthocyanins), artificial food colors, synthetic coal tar dyes and their assessment of safe limit

2.10. Principal flavoring compound in food, threshold value, flavor enhancers

2.11. Food additives used in food industries: antioxidants, emulsifiers, preservatives, stabilizers, artificial sweeteners (saccharine)

3. **Cereal Technology**

3.1. Introduction and distribution of important cereal grains: Rice, wheat and maize.

3.2. Structure, Chemical composition and Post-harvest handling of wheat rice and maize.

3.3. Physical properties of cereal grains: Bulk density, specific gravity, 1000 kernels weight, l/b ratio

3.4. Rice and wheat milling, Parboiling of rice and its benefits.

3.5. Production of bread, biscuits and noodles: raw materials, processing methods, quality and packaging.

3.6. Production of breakfast cereal: corn flakes, beaten rice, puffed rice.

3.7. Qualitative and quantitative assessment of post-harvest losses and management system for loss reduction.

4. **Basic &Food Microbiology**

4.1. Scope and importance of microbiology. Classification of microorganisms

4.2. Principle and application of the polarizing microscope, ultraviolet microscope, phase contrast microscope, electron microscope

4.3. Morphology and cytology of bacteria, yeasts, molds, viruses and protozoa

4.4. Nutrition and culture of microorganisms. Classification of microorganisms. Food borne infection and intoxication.

4.5. Factors affection growth of microorganisms. Hurdle concept of food safety

4.6. General morphological and physiological characteristics of yeasts. Identification characteristics of Saccharomyces and Endomyces

4.7. Identification characteristics of food spoilage microorganisms (Salmonella species, E. coli, Staphylococcus species, Pseudomonas species), identification of Aspergillus, Penicillum, Rhizopus species

4.8. Microbiology of meat, fish, poultry and their products, milk and milk products, fruit and vegetable products, fast foods, cereals and cereal products, spices, tea and coffee

5. **Technology of Fruits and Vegetables**

5.1. Post-harvest operation of fruits and vegetables

5.2. Drying and Dehydration of fruits and vegetables

5.3. Fruits and vegetables canning

5.4. Fruit Beverages (squashes, RTS, juices, cordials and concentrate)

5.5. Pickles, Chutney and tomato products

5.6. Jams, jellies and marmalades

5.7. Preserves, candied and Crystallized fruits

6. **Human Nutrition**

6.1. Introduction of human nutrition, food, food products and nutrients. Food habits and food taboos

6.2. Nutritive value of foods, macro and micro nutrients and their functions.

6.3. Nutritional classification of food. Food groups, balance diet and application of food composition table
6.4. Digestion, absorption, metabolism and functions of carbohydrates, proteins and lipids
6.5. General properties of enzymes, coenzymes and factors, enzyme kinetics and mechanism of action, inhibitors and activators
6.6. Supplementation, fortification and enrichment of foods. Baby foods, infant foods, weaning foods, supplementary foods. Importance of breast feeding in child nutrition.
6.7. Concept of food and nutrition security, food safety and food quality. Four pillars of food security. Role of Food technology in assuring food security in Nepal
6.8. Principles of nutritional labeling and claim and its significance.
6.9. Nutritional requirements in different stages of human life.
6.10. Underline causes and consequences of malnutrition and improvements of nutritional status of infants, pregnant and lactating mother. Double burden of malnutrition.
6.11. Effect of processing on nutrients
6.12. Assessment of nutritional status and their indicators
6.13. Major nutritional deficiency diseases
6.14. Food and nutrition surveys to assess the nutritional problems and develop practical measures to mitigate identified nutritional deficiency by food based approach.
6.15. Natural occurrence of antinutritional factors in food, food toxicity and allergenicity. Methods of their removal.
6.16. National and International agencies in nutritional activities.

7. **Storage and Packaging**

7.1. Storage system of major grain. Food losses and deterioration during Storage.Grain samplingand inspection of storehouse, mills& premises.
7.2. Scope & importance of packaging. Use of various packaging materials in food processing. Quality control of packaging materials. Hazards of packaging

8. **Tea, Coffee and Spices**

8.1 Introduction of Tea and Coffee (production, cultivation, variety)
8.2 Processing of Tea: plucking, withering rolling, fermentation, drying, grading and packaging of tea.
8.3 Different processing methods of Coffee (pulping technique, fermentation, drying, hulling, grading, packaging and storage of coffee beans.)
8.4 Quality parameters and composition of tea and coffee, adulteration in tea and coffee
8.5 Commercial production, chemical composition, processing, drying, storage and quality evaluation of: ginger, Turmeric, Chilies, Cardamom and Pepper.

9. **Principles of Food Preservation**

9.1 Introduction and historical development of food preservation
9.2 Food spoilage and its types and factors responsible
9.3 Food preservation by Dehydration and Drying
9.4 Food preservation by low temperature: Principle of cellar storage and chilling storage, CAS, MAS, chilling effects on microbial growth, food preservation by freezing, Classification of freezing equipment, Definition of thawing, Methods of thawing
9.5 Food preservation by Thermal processing: different forms of heat treatment, factors affecting extent of heat treatment, factors affecting heat resistance, canning, containers and fillers used in canning, Measurement of sterility and determination of process time, aseptic canning, spoilage of canned foods
9.6 Food preservation by Irradiation: generation of ionizing radiation, scope of irradiation in food processing, irradiation effects, quality of irradiated foods
9.7 Food preservation by preservatives: Natural and chemical preservatives used in food.

10. **Technology of Meat, Poultry and Fish**

10.1. Definition, Composition and Nutritive values of meat
10.2. Pre-slaughter handling, slaughtering and dressing of meat animals
10.3. Basic requirements in meat cutting, techniques of meat cutting and meat packaging
10.4. Slaughterhouse, its importance and hygiene practices in the slaughterhouse
10.5. Quality of meat and meat preservation. Manufacturing process and technology of different kinds of meat products
10.6. Process of egg formation, composition and nutritive value
10.7. Egg grading system, defects, spoilage of eggs and the methods of egg preservation
10.8. Freshness evaluation and methods of fish preservation

11. **Dairy Technology**

11.1 Gross composition of different milks (cow, buffalo, yak, human) and Milk quality.
11.2 Mechanisms of milk secretion and ejection. Milk microbiology.
11.3 Unit operations in milk processing and Stabilization of milk
11.4 Transformation of fluid milk into a variety of solid, Semi-solid and frozen products.
11.5 Concept of manufacturing process of cream, butter, milk powder, Ghee, Cheese, Ice cream, Churpi, Yogurt, Sterilized Milk and Flavored milk. (Definition/ purpose, composition, packaging & storage and Uses)
11.6 Indigenous dairy Products of Nepal (Dahi/Lassi, Churpi, Kurauni (Khoa), Chhena – Sikarni)
11.7 Packaging requirements of milk and derived products, along with the process and equipment
11.8 General principles and importance of sanitation and hygiene

12. **Fermentation Technology**

12.1 Scope and importance of fermentation technology.
12.2 Industrial application of micro organisms
12.3 Principle, types, component and application of fermenter. Biochemical reaction and fermentation process.
12.4 Definition, classification, general composition and major steps of beer production.
12.5 Production of distilled spirits**:** major steps of whiskey, rum, brandy, vodka and gin production.
12.6 Overview of the processes used for ethanol production from molasses
12.7 Production methods of different wine types (red wine, white wine, champagne)
12.8 Traditional Fermented foods and beverages
12.9 Effluent treatment in food industry.

13. Food Safety and Quality Control

13.1 Fundamentals of food safety, Quality control and Quality assurance. Quality Attributes of food and sensory evaluation.
13.2 Food adulteration and detection. Food laws and regulation. Food Control system in Nepal
13.3 Food Sampling and Inspection techniques
13.4 Food adulteration and its control mechanism. Food safety and monitoring of contaminants in foods.
13.5 Good Laboratory Practices (GLP), Laboratory Accreditations
13.6 Food plant sanitation and management
13.7 Food standards and Codex Alimentarius Commission

13.8 General concept of Sanitory and PhytoSanitory (SPS) and Technical Barrier to Trade (TBT) in context of WTO

13.9 General principle and application of Food safety tools (HACCP, GMP, GHP), ISO Series (ISO-9001 ISO-22000, ISO 17025), Total Quality Management (TQM) and Good Agricultural Practice (GAP)

13.10 General concept of statistical quality control (SQC)**,** SQC in food processing, Tools of SQC.

13.11 Food and Agriculture related Acts, Rules and Regulations.