MOHAN LAL SUKHADIYA UNIVERSITY
UDAIPUR, RAJASTHAN

CURRICULUM
FOR

MASTER'S
IN
FOOD SCIENCE
&
NUTRITIONAL TECHNOLOGY
2023

Proposed Course Curriculum for M.Sc. Food Science and Nutritional Technology(NEP-2023)

Paper Code	Papers	Credits	Marks		
			Internal	External	Total
Semester 1					
FSNT-DCC-01	**Human Physiology**	**4**	**20**	**80**	**100**
FSNT-DCC-02	**Basics of Human Nutrition**	**4**	**20**	**80**	**100**
FSNT-DCC-03	**Principles of Food Science**	**4**	**20**	**80**	**100**
FSNT-DCC-04	**Biochemistry of Nutrition**	**4**	**20**	**80**	**100**
FSNT-DCC-Lab -1	**Practical 1 (based on Paper 1 & 2)**	**4**	**20**	**80**	**100**
FSNT-DCC-Lab -2	**Practical 2 (based on Paper 3 & 4)**	**4**	**20**	**80**	**100**
	Total	**24**	**120**	**480**	**600**
Semester 2					
FSNT-DCC-05	**Advanced Nutritional Biochemistry**	**4**	**20**	**80**	**100**
FSNT-DCC-06	**Instrumentation in Nutrition**	**4**	**20**	**80**	**100**
FSNT-DCC-07	**Food Microbiology & Food Safety**	**4**	**20**	**80**	**100**
FSNT-DCC-Lab -3	**Practical 1 (based on Paper 5 & 6)**	**4**	**20**	**80**	**100**
FSNT-DCC-Lab -4	**Practical 2 (based on Paper 7)**	**4**	**20**	**80**	**100**
FSNT-GEC-Th A	**Basics of Statistics and Research Methodology-**	**4**	**20**	**80**	**100**
	Total	**24**	**120**	**480**	**600**
Semester 3					
FSNT-DCC-08	**Food Chemistry and Food Analysis**	**4**	**20**	**80**	**100**
FSNT-DCC-09	**Food Toxicology**	**4**	**20**	**80**	**100**
FSNT-DSE-1A	**Public Health and Nutrition-1 (Paper-1-Therapeutic Nutrition)**	**4**	**20**	**80**	**100**
FSNT-DSE-2A	**Public Health and Nutrition-2 (Paper-2-Community Nutrition)**	**4**	**20**	**80**	**100**
FSNT-DSE-1B	**Food Processing and Management 1 (Paper-1-Institutional Food Management)**	**4**	**20**	**80**	**100**
FSNT-DSE-2B	**Food Processing and Management 2 (Paper-2- Food Ingredients and Processing)**	**4**	**20**	**80**	**100**

FSNT-DSE-Lab-1-A	**Practical 1 (based on DSE-1A & 1B**	**4**	**20**	**80**	**100**
FSNT-DSE-Lab-1-B	**Practical 2 (based on DSE-2A & 2B)**	**4**	**20**	**80**	**100**
FSNT-GEC LAB-1	**Baking and Confectionary technology**				
	Total	**24**	**120**	**480**	**600**
Semester 4					
FSNT-DCC-10	**Food Biotechnology and Nanotechnology**	**4**	**20**	**80**	**100**
FSNT-DSE-3A	**Public Health and Nutrition-3 (Paper-3 Child Maternal and Nutrition)**	**4**	**20**	**80**	**100**
FSNT-DSE-4A	**Public Health and Nutrition-4 (Paper-4Geriatric Nutrition)**	**4**	**20**	**80**	**100**
FSNT-DSE-3B	**Food Processing and Management 3 (Paper-3 Food Product Development and Quality Evaluation)**	**4**	**20**	**80**	**100**
FSNT-DSE-4B	**Food Processing and Management 4 (paper-4 Food Processing, Packaging and Food Law)**	**4**	**20**	**80**	**100**
FSNT-DSE-5	**Dissertation (Theory + Practical)**	**4**	**20**	**80**	**100**
FSNT-DSE-Lab-2-A	**Practical (Based on paper 3A & 4A**	**4**	**20**	**80**	**100**
FSNT-DSE-Lab-2-B	**Practical (Based on paper 3B & 4B**	**4**	**20**	**80**	**100**
	Total	**24**	**120**	**480**	**600**

DCC: Discipline centric compulsory course
DSE Discipline specific elective course
GEC: General elective course

Semester-1

Code of the Course: FSNT-DCC01

Title of Course: Human Physiology

Level of the Course: NHEQF level 7.0

Credit of the course: 4

Type of the course: DCC

Pre-requisites: Four Years Bachelor's degree in Home Science (B.Sc.) with 5.50/10.00 or equivalent OGPA for General and 5 % relaxation for SC/ST/ OBC/SBC candidates.

Objective of the Course

- Understand the structure and physiology of various organs in the human body.
- Gain knowledge on the principles of nutrition and dietetics through the study of physiology.
- Comprehend the functions of the system in the body.

Learning outcome

- Advance their understanding of some of the relevant issues and topics of human physiology.
- Enable the students to understand the integrated function of the system and the grounding of nutritional science in physiology.
- Understand alterations of structure and function in various organs and systems in disease conditions**.**
- Comprehend and distinguish in the various functions of cell and tissues in the body.

Unit-I (Credit Hours: 12)

Cell Structure and Function: Cell membrane, Transport across cell membrane, Homeostasis.

Digestive System: Secretary, digestive and absorptive functions of GIT, Function of liver, pancreas and gall bladder, Motility and hormones of GIT.

Unit-II (Credit Hours: 12)

Circulatory System: Regulation of cardiac output and blood pressure, Blood formation, composition, Blood clotting and plasma protein.

Respiratory System: Transport and exchange of oxygen and CO_2, Role of haemoglobin and buffer systems.

Unit-III (Credit Hours: 12)

Excretory System: Structure and function of Nephron, Urine formation, Role of kidney inmaintaining pH of blood, Electrolyte and acid base balance.

Unit-IV (Credit Hours: 12)

Endocrine System: Role and regulation of hormonal secretion.

Nervous System: Blood Brain Barrier, Conduction of nerve impulse, Synapses, Role of neurotransmitters.

Unit-V (Credit Hours: 12)

Immune System: Cell mediated and humeral immunity, Inflammation, Immunization.

Reproduction: Sex hormone, Contraception, Breast milk production, Physiological changes in pregnancy.

Reference Books

- Subrahmanyam S. and Kutty K (1985). Textbook of Human Physiology. Revised by H.D.Singh. S. Chand Publishing
- Chaudhury, K.C (2004). Concise Medical Physiology. New Central Book Publishing,Calcutta.
- Ganong, W.F. (2001). Review of Medical Physiology. Tata McGraw-Hill publishingcompany. New Delhi.
- Raj, T., Kurpad, A., Vaz, M. (2016). *Guyton & Hall Textbook of Medical Physiology - E-Book: A South Asian Edition*. India: Elsevier Health Sciences.
- Waugh, A., Grant, A. (2014). *Ross & Wilson Anatomy and Physiology in Health and Illness E-Book*. United Kingdom: Elsevier Health Sciences.
- Subrahmanyam, S. (1987). *Textbook of Human Physiology*. India: S. Chand Limited.
- Strang, K. T., Widmaier, E. P., Raff, H. (2011). *Vander's Human Physiology: The Mechanisms of Body Function*. United Kingdom: McGraw-Hill.
- Murugesh, N. (2018). *Anatomy physiology and health education.* (6th ed.). India: Sathya publishers.

Code of the Course: FSNT-DCC02
Title of Course: Basic of Human Nutrition

Level of the Course: NHEQF level 7.0

Credit of the course: 4

Type of the course: DCC

Pre-requisites: Four Years Bachelor's degree in Home Science (B.Sc.) with 5.50/10.00 or equivalent OGPA for General and 5 % relaxation for SC/ST/ OBC/SBC candidates.

Objective of the Course:

- To be familiar with various programme this can be undertaken.
- Nutritional problems at regional and national.
- To be able to plan, implement, monitor and evaluate programmes.

Learning outcome

- To familiarize students with fundamentals of food, nutrients and their relationship to Health
- To create awareness with respect to deriving maximum benefit from available food resources

Unit-I (Credit Hours: 12)

Energy: Energy content of foods. Body composition, Physiological fuel value, Measurement of Energy Expenditure: BMR, RMR, Thermic effect of feeding and physical activity, RDA Estimating energy requirement for individuals and groups, Food groups, Balanced diet,Exchang list

Unit-II(Credit Hours: 12)

Carbohydrates: Type, Source, Function, Dietary requirements and physiological significance.Glycaemic index of foods.

Proteins: Type, Source, Function, Dietary requirements. Evaluation methods and improvement of protein quality. PEM.

Unit-III(Credit Hours: 12)

Lipids: Type, Source, Function, Dietary requirements, EFA, Transport of lipoprotein,Prostaglandins.

Water: Regulation of intra and extra cellular volume, Electrolyte balance, Osmolality, Water balance and its regulation, Oral dehydration therapy.

Unit-IV(Credit Hours: 12)

Minerals: (Note: for each nutrient sources, bioavailability, metabolism, function, RDI, deficiency and toxicity, interactions with other nutrients are to be discussed).

Macro minerals: calcium, phosphorus, magnesium, sodium, potassium and chloride. Micro minerals: Iron, copper, zinc, manganese, iodine, fluoride.

Trace minerals: selenium, cobalt, chromium.

Unit-V(Credit Hours: 12)

Vitamins: Type, Source, Function, Dietary requirements, Deficiency and Toxicity of Fat soluble and Water soluble vitamins.

Reference Books

- Bamji, M.S., Rao, N.P & Reddy, V. (1996). Textbook of Human Nutrition. Oxford & IBH Publishing Co. (P). Ltd. Delhi.
- Gopalan, G. RamaShastri B.V &Balasuvramnian, S.C. (2000). Nutritive Value of Indian Foods. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad 500-007, India.
- Si Lakshmi, B. (2000). Nutrition Science. New Age International (P) Ltd. Pub. New Delhi
- Swaminathan, M. (2009). Textbook of Food and Nutrition. Bappco publishers,Bngalore.

Code of the Course: FSNT-DCC03
Title of Course: Principles of Food Science

Level of the Course: NHEQF level 7.0

Credit of the course: 4

Type of the course: DCC

Pre-requisites: Four Years Bachelor's degree in Home Science (B.Sc.) with 5.50/10.00 or equivalent OGPA for General and 5 % relaxation for SC/ST/ OBC/SBC candidates.

Objective of the Course:

- To enable students to obtain knowledge of different food groups and their contribution to nutrition.
- To help them study the different methods of cooking and their advantages and disadvantages.
- To enable them to gain experience in the preparation of foods with attention to the preservation of their nutritive value - oriented to Indian cooking.
- To help them understand the scientific principles governing the acceptability of food preparations.

Learning outcome

- Understand the food groups, cereals and their functions, applying the principles of methods of cooking
- Acquire knowledge on the various components of pulses, vegetables and fruits
- Learn the different aspects of meat, milk and their products.
- Knowledge on classification and nutritive value of nuts, fats and sugars.
- Describe the beverages, spices and condiments, food additives and adulterants

Unit- I (Credit Hours: 12)

Introduction to Food Science.

Effect of cooking and processing techniques on nutrients, Sensory evaluation of food.

Cereals, Millets and Pulses: Composition and nutritive value, Cereal cookery, Effect of cooking, processing and storage in nutritive value. Methods for improving nutritional quality of foods-fermentation, germination, supplementation, fortification.

Unit- II(Credit Hours: 12)

Vegetables and Fruits- Type, Composition, Nutritive value, Effect of cooking, processing andstorage on pigments and nutritive value, Post harvest changes.

Milk and milk products- Nutritional composition, Properties, Processing, Storage and Packaging. Effects of heat, acid and enzyme on its quality, Milk Cookery.

Sugar: Type, Function and Nutritional composition of sugar. Sugar cookery.

Unit- III(Credit Hours: 12)

Egg- Structure and Nutritional composition of egg, Evaluation of egg quality, Egg cookery.

Flesh Food- Type, Structure and Nutritional composition, Effect of cooking, processing andstorage in nutritive value. Ageing, Tenderization, Curing.

Unit-IV(Credit Hours: 12)

Fats and Oils- Type, Nutritive value and Function.Its role and importance.

Beverages and Spices-Classification and Importance.

Unit-V(Credit Hours: 12)

Food toxins, Food Additives, Adulterants, Preservatives, Packaging.

Reference Books

- Manay,M.andManay,S.N.(2014).FoodFactsandPrinciples.NewAgeInternational(P)Limited, New Delhi.
- Meyer,.L.H(1987).FoodChemistry.CBSPublishers.
- Srilakshmi, B. (2015). FoodScience. New Agernational (P) Limit, New Delhi
- Srilakshmi, B.C. (2011). Food Science (7th ed.). New Delhi, ND: New Age International Publications.
- Potter, N. N. (2013). Food Science. Netherlands: Springer Netherlands.
- Manay, S., & Swamy, S. (2001). Food Facts and Principles. New Delhi, ND: New Age International Publications.
- Rajagopal, M. V., Mudambi, S. R., Rao, S. M. (2015). Food Science. India: New Age International (P) Limited, Publishers.
- Roday, (2007). Food science and Nutrition. New Delhi, ND: Oxford university press

Code of the Course: FSNT-DCC04
Title of Course: Biochemistry of Nutrition

Level of the Course: NHEQF level 7.0

Credit of the course: 4

Type of the course: DCC

Pre-requisites: Four Years Bachelor's degree in Home Science (B.Sc.) with 5.50/10.00 or equivalent OGPA for General and 5 % relaxation for SC/ST/ OBC/SBC candidates.

Objective of the Course:

To introduce students to

1. The basic principles of biochemistry
2. An understanding of the functions of biological systems in relation to nutritional biochemistry
3. The skills in qualitative tests and quantitative estimation of nutrients.

Learning outcome

- Understand the significance of organic reactions with reference to biological systems
- Adequately explain the chemistry of carbohydrates, proteins, lipids, enzymes and nucleic acids.
- Comprehend the metabolic pathways of carbohydrates, proteins and lipids.
- Discern the hormonal regulation and interrelationship of the macronutrient's metabolism.

Unit I(Credit Hours: 12)

Concept of metabolism.

Composition of membrane structures, Transport process across cell membranes.

Introduction, Classification and Nutritional importance of nutrients- Carbohydrate, Protein andLipids.

Unit II(Credit Hours: 12)

Metabolism of Carbohydrate- Glycolysis, TCA cycle, Glycogenesis, Glycogenolysis (in brief), Glycolysis, Citric acid cycle & its significance, HMP shunt & Gluconeogenesis (in brief),Regulation of blood glucose level.

Unit-III(Credit Hours: 12)

Metabolism of Protein-Transamination, Deamination, Oxidation of amino acid, Ammonia formation & transport, Urea cycle. Synthesis and breakdown of body protein.

Unit-IV(Credit Hours: 12)

Metabolism of Lipid- Beta oxidation of fatty acids, Ketosis, Cholesterol & it's clinical significance.

Unit-IV(Credit Hours: 12)

Nucleic acid- DNA, RNA, Watson and Crick model and Chargaff's rule. Structure and function of

different ribonucleic acids. Replication, Transcription and Translation.

Unit V(Credit Hours: 12)

Electron transport chain and Oxidative phosphorylation.

Role of enzymes in metabolism- Definition, Classification, Mode of action, Factors affectingenzyme activity, Coenzymes and Co-factors.

Hormones and its role in biochemical pathway.

Reference Books

- Dandekar, S. (2011). Medical Biochemistry. B.L. Churchill Livingstone (P) Ltd. New Delhi, India.
- Satyanarayana, U. (2009). Biochemistry. Books and Allied (P) Ltd. Calcutta, India.
- Michael A Lieberman and Allan D. Marks, (1996). Basic Medical Biochemstry. Book.
- J. David Rawn (2004). Biochemistry. Panima Publishing Corporation, New Delhi.

Code of the Course: FSNT-DCC-Lab 1
Title of Course: Practical 1 (based on Paper 1 & 2)

Level of the Course: NHEQF level 7.0

Credit of the course: 4

Type of the course: DCC-Lab

Pre-requisites: Four Years Bachelor's degree in Home Science (B.Sc.) with 5.50/10.00 or equivalent OGPA for General and 5 % relaxation for SC/ST/ OBC/SBC candidates.

Practical

- Study of Different tissues (epithelial, muscular, connective and nervous tissues)
- Microscopic study of blood (WBC, RBC and Blood group)
- Effect of exercise on respiratory and pulse rate.
- Demonstration of Clotting and Bleeding time
- Preparation of Haematin crystals
- Study of permanent slides of various cells of immune system
- Calculation of BMR and activity increments.
- Identification of clinical signs and symptoms of various deficiency diseases.
- Recording of 7 day dietary intakes.
- Enlisting foodstuffs based on their nutrient content. Preparation of essential macro (protein, fibre) and micronutrient (calcium, iron vitamin C, A and B) rich recipe, calculation of nutritive value and cost per serving.

Code of the Course: FSNT-DCC-Lab 2
Title of Course: Practical 1 (based on Paper 3 & 4)

Level of the Course: NHEQF level 7.0

Credit of the course: 4

Type of the course: DCC-Lab

Pre-requisites: Four Years Bachelor's degree in Home Science (B.Sc.) with 5.50/10.00 or equivalent OGPA for General and 5 % relaxation for SC/ST/ OBC/SBC candidates**.**

Practical

- Measurement of FBS, RBS and PPBS.
- Measurement of Blood pressure by Sphygmomanometer.
- Estimation of normal constituents of urine (urea, uric acid creatinine).
- Estimation of abnormal constituents of urine (Glucose, protein, ketone bodies, Blood).
- Sensory evaluation of the given samples using descriptive method.Sensory evaluation of given sample with the help of 'Duo trio test' and prepareevaluation card for the same.
- Sensory evaluation of given samples using 'Triangle Test' and prepare an evaluation card for the same.
- To demonstrate the process of sugar re crystallization through the preparation of fondant, *shakkarpara* and fudge.
- To determine the best method of preparing a stable emulsion like mayonnaise.
- Preparation of fruit jam and fruit jelly.
- To study and detect various adulterants in food stuffs

Semester 2

Code of the Course: FSNT-DCC05
Title of Course: Advanced Nutritional Biochemistry

Level of the Course: NHEQF level 7.0

Credit of the course: 4

Type of the course: DCC

Pre-requisites: Four Years Bachelor's degree in Home Science (B.Sc.) with 5.50/10.00 or equivalent OGPA for General and 5 % relaxation for SC/ST/ OBC/SBC candidates.

Objective of the Course

- Calculation of BMR and activity increments.
- Identification of clinical signs and symptoms of various deficiency diseases.
- Recording of 7 day dietary intakes.
- Enlisting foodstuffs based on their nutrient content. Preparation of essential macro (protein, fiber) and micronutrient (calcium, iron vitamin C, A and B) rich recipe, calculation of nutritive value and cost per serving.

Learning outcome

- Understand the significance of organic reactions with reference to biological systems.
- Adequately explain the chemistry of carbohydrates, proteins, lipids, enzymes and nucleic acids.
- Comprehend the metabolic pathways of carbohydrates, proteins and lipids.
- Discern the hormonal regulation and interrelationship of the macronutrient's metabolism

Unit-I (Credit Hours: 12)

Health and Diseases- Defining and Scope of health and disease, Methods of assessment. Biochemical tests in assessment of nutritional status

Unit-II (Credit Hours: 12)

Assessment of Nutritional deficiency- Macronutrients and Micronutrients deficiency, Clinical and Subclinical Assessment.

Starvation- Alternative methods of energy generation, Interrelationships of organ.

Unit-III (Credit Hours: 12)

Metabolism of Alcohol- As energy source, Fatty liver disease and Liver Cirrohosis. Lipoprotein metabolism- Lipolysis, adipose tissues, LDL, HDL,VLDL, Chylomicron andAtherosclorosis.

Unit-III (Credit Hours: 12)

Reactive Oxygen Species and Antioxidant System- Free radical, Antioxidant enzyme,Mechanism.

Cancer- Concept of oncogenes, Pro-oncogenes, Malignancy and Role of diet.

Unit-IV (Credit Hours: 12)

Liver functions and their assessment - Measurements of protein, Serum enzyme levels, Bilepigment, Jaundice.

Renal functions tests - Various tests, GFR and Clearance.

Unit-V (Credit Hours: 12)

Blood tests: Measurements of biochemical blood parameters.

Metabolism errors: Inborn errors of metabolism, Endorphins and Stress biochemistry

Reference Books

- Anderson, L, Dibble, M.U. &Turkki. (1982). Nutrition in Health and Disease. JBLippincott Co. Toronto.
- Murray, R.K, Granner, D.K & Rodwell V.W. (2006). Harper's Illustrated Biochemistry. McGraw-Hill, Boston.Plummer, D.T. (2006). Practical Biochemistry. Tata McGraw Hill Publishing CompanyLtd. New Delhi, India.
- Nelson, D. L. (2003). Lehninger Principles of Biochemistry. Macmilan Worth Publishers, India.

Code of the Course: FSNT-DCC06
Title of Course: Instrumentation in Nutrition

Level of the Course: NHEQF level 7.0

Credit of the course: 4

Type of the course: DCC

Pre-requisites: Four Years Bachelor's degree in Home Science (B.Sc.) with 5.50/10.00 or equivalent OGPA for General and 5 % relaxation for SC/ST/ OBC/SBC candidates.

Objective of the Course

- Introduce students to various modern instrumental techniques in food analysis.
- Understand the applications, strengths and limitations of different methods.

Learning outcome

- Gaining the knowledge about techniques and instruments.
- Acquired the knowledge in analytical techniques in chemistry
- Gaining the knowledge about pharmacological terms.

Unit I (Credit Hours: 12)

Spectrophotometer-Principle, Methodology and Application of UV Spectroscopy, Visible, IR, NMR and ESR Spectroscopy, Atomic Absorption, Plasma Emission Spectroscopy

Unit II (Credit Hours: 12)

Chromatography-Principle, Methodology and Applications of gel filtration, Ion exchange Chromatography, Affinity Chromatography;

Unit III (Credit Hours: 12)

Thin Layer Chromatography, Gas Chromatography;High Performance Liquid Chromatography (HPLC) , Gas Liquid Chromatography (GLC).

Unit IV (Credit Hours: 12)

Electrophoresis- Principle and Applications of Native, SDS PAGE, Agarose Electrophoresis,2D Gel Electrophoresis.

Application of PCR, Colorimetric, Flame photometry and Reprography.

Unit V (Credit Hours: 12)

Non-invasive methods for assessment: Radiological, Bone mineral density, ECG, EEG, NMR. Advantages and Limitations.

Reference Books

- E Kress-Rogers, C J B Brimelow (2000). Instrumentation and Sensors for the food

industry, Second edition, CRC press, NW.

- Sharma BK (1986). Instrumental methods of chemical analysis, 8th edition, Goel Publishing house.
- Raghuramulu N., Madhavan Nair K. and Kalyansundaram S. (1983). A manual of laboratory techniques edited by NIN, ICMR .

Code of the Course: FSNT-DCC07
Title of Course: Food Microbiology & Food Safety

Level of the Course: NHEQF level 7.0

Credit of the course: 4

Type of the course: DCC

Pre-requisites: Four Years Bachelor's degree in Home Science (B.Sc.) with 5.50/10.00 or equivalent OGPA for General and 5 % relaxation for SC/ST/ OBC/SBC candidates.

Objective of the Course:

- Gain knowledge of the role of microorganisms in health and disease
- To understand the role of microorganisms in spoilage of various foods.
- To gain knowledge of microorganisms in relation to food and food preservation

Learning outcome

- Understand the general characteristics of microbes and its application in the field of nutrition. To test different foods for their quality
- To detect adulteration in different foods
- To be familiar with test used for quality control
- Define and distinguish the methods of sterilization and disinfection.
- Attain knowledge on the concept of microbes in food spoilage and
- Contamination.
- Identify and analyze the role of microorganism in human welfare
- Evaluate the preventive measures to food poisoning and food borne infections.

Unit – I (Credit Hours: 12)

Introduction of Microbes-General characteristics of microorganisms: yeasts, molds andbacteria and its importance in food industry.

Source of contamination- Air, Water, Soil, Sewage, Pecticide, Insecticide, Post processing contamination.

Unit II (Credit Hours: 12)

Microbes in Foods- Growth and survival of pathogens in food, Microbial toxins, Microbial infections and intoxications, Preventing measures and deactivation techniques.

Unit – III (Credit Hours: 12)

Food borne diseases- Causes and prevention of bacterial, fungal, viral and other infectious diseases.

Microbes in Fermentation- Role of microbes in fermentation of milk products, cereals, oriental foods, alcoholic beverages and other processed foodS. Therapeutic importance of fermented foods.

Unit – IV(Credit Hours: 12)

Food Spoilage- Spoilage of different food group- cereal, pulses, dairy products, meat, fish, eggs, poultry products, fruit and vegetables, Spoilage of various fresh and processed foods.

Unit – V(Credit Hours: 12)

Food Safety- General principles involved in their preservation, Low temperature preservation: Lethal effects of chilling, Freezing and Thawing; High temperature preservation: Pasteurization, sterilization, canning, thermal death time, Dehydration, Chemical preservation, Irradiations and its toxic effects,

Role of Biotechnology in Food Microbiology- Diagnosis of Diseases.

Reference Books

- Pelezar, M.J. Chan EGS and Krieg N.R.(1999). Microbiology
- Frazier, J. &Westhoff, D.C. (1988). Food Microbiology. 4th Ed. McGraw Hill.
- Prescott, L.M., Harley, JP and Klein DA (1999). Microbiology, WCB. Oxford.

Code of the Course: FSNT-DCC-Lab 3
Title of Course: Practical 1 (based on Paper 5 & 6)

Level of the Course: NHEQF level 7.0

Credit of the course: 4

Type of the course: DCC-lab

Pre-requisites: Four Years Bachelor's degree in Home Science (B.Sc.) with 5.50/10.00 or equivalent OGPA for General and 5 % relaxation for SC/ST/ OBC/SBC candidates.

Practical

- Planning of Macro and Micronutrients deficiency diseases.Diet planning for Inborn error diseases.
- Diet planning for Cancer patients.
- Estimation of Serum Cholesterol, LDL, HDL, TGEvaluation of Anti-oxidant parameter
- Calcium: Estimation of calcium in foods and serum.
- Phosphorus: Estimation of inorganic phosphorus in foods and serum.
- Ascorbic acid: Estimation of ascorbic acid in foods.
- Proteins: a. Estimation of protein in food stuffs.
- Estimation of albumin, globulin and albumin / globulin ratio in serum and urine.
- Estimation of hemoglobin
- Glucose: Estimation of glucose in blood and urine.
- Cholesterol: Estimation of cholesterol in blood
- Enzyme assay: Estimation of activity of serum alkaline phosphatase and transaminase
- Urea and Creatinine: Estimation of urea and creatine in serum and urine.
- Survey of pathological laboratories: To obtain information about the methods used for blood
- Chromatographic Separations: Liquid, GC, TLC, super critical fluid extraction chromatography. Electrophoresis.
- Measurement of specific gravity, freezing point, melting point, refractive index, gel strength, Brix, Densitometry, Refractometry, Polarimetry, Measurement of Colour.
- Chromatographic Separations: Liquid, GC, TLC, super critical fluid extraction chromatography.
- Electrophoresis.
- Viscosity and Consistency Measurements of Food. Measurements of Rheological properties
- Measurement of specific gravity, freezing point, melting point, refractive index, gel strength, Brix, Densitometry, Refractometry, Polarimetry, Measurement of Colour.
- Relative Humidity and Water Activity.

Code of the Course: FSNT-DCC-Lab 4
Title of Course: Practical 1 (based on Paper 7)

Level of the Course: NHEQF level 7.0

Credit of the course: 4

Type of the course: DCC-lab

Pre-requisites: Four Years Bachelor's degree in Home Science (B.Sc.) with 5.50/10.00 or equivalent OGPA for General and 5 % relaxation for SC/ST/ OBC/SBC candidates.

Practical

- Microscopic examination of bacteria with simple staining, negative staining and gramstain.
- Demonstration of different sterilization procedures of glassware.
- Preparation the different culture media and demonstration of sterilization procedurefor media and equipment.
- Isolation techniques of microbial cultures from soil, water and food: serial dilutions, Plating techniques.
- Determining the number of viable cells in the culture (standard plate count).
- Culturing and identification of microbes (Yeasts and Moulds) in different foodsamples.
- Determination of Coliform in water sample.

Code of the Course: FSNT-GEC-Th A
Title of Course: Basics of Statistics and Computer Application

Level of the Course: NHEQF level 7.0

Credit of the course: 4

Type of the course: GES-Th

Pre-requisites: Four Years Bachelor's degree in Home Science (B.Sc.) with 5.50/10.00 or equivalent OGPA for General and 5 % relaxation for SC/ST/ OBC/SBC candidates.

Objective of the Course:

- Learning of statistics and computer applications in research, statistical techniques to research data for analyzing & interpreting data meaningfully

Learning outcome

- To understand the role of statistics and computer applications in research.
- To apply statistical techniques to research data for analyzing & interpreting data meaningfully**.**

Unit-I(Credit Hours: 12)

Data, type of data, classification of measurement scale, Mean, Medium, Mode, Measures of central tendency and Variability

Unit-II(Credit Hours: 12)

Normal distribution. Parametric and Non-parametric test. Introduction and scope of computer

Unit-III(Credit Hours: 12)

Microsoft Word, Microsoft excel, Microsoft power point and its application.

Unit-IV(Credit Hours: 12)

Research Process–Meaning, Objective, Purpose, Characteristic, Type and Approaches. **Problem Identification and Formulation**- Defining research problem, Selection of research problem, hypothesis-Null and Alternative hypothesis, Significance and Importance.

Unit-V(Credit Hours: 12)

Research Designs –Meaning and importance, Concept of research design, Types of variables, confounded relationship, Different research design, Type of Experimental Design.

Design of Sample Survey-Introduction, Sampling and Non sampling error, Type of SamplingError: Non probability and Probability Error.

Practical

- Exercise based on data collection and tabulation.
- Exercised based on diagrammatic and graphical representation of statistical data.
- Exercised based on determination standard deviation, standard error, testing of significance.
- Student T test, Chi-Square test, F Test and analysis of variance- basic knowledge of these tests.
- Exercise based on Probability distributions (Binomial, Poisson and Normal). Handling of computer.
- Use and application of internet.
- Use of MS Excel (data entry, graph preparation chart preparation).
- Use of MS world.
- Use of MS power point.
- Different research design and SPSS.

Reference books:

- Kothari, C.R. (2008) Research Methodology. Wishwa Prakashan. New Delhi, India
- Elhance, D.L. (2008). Fundamentals of Statistics. Kitab Mahal, Patna.
- Rao, K.V. (2007) Biostatistics. Jaypee Brothers medical publishers, New Delhi.
- Sundar, R.P. & Richard, J. (2003). An Introduction to Biostastics. Prentice Hall, NewDelhi.
- Fundamentals of Computers by E. Balagurusamy (Author) Publisher: McGraw Hill Education (India) Private Limited
- Ms Office 2007 in a Nutshell by S. Saxena (Author) Publisher: S.Chand (G/L) &Company Ltd.
- Gay, L.R. (1981, 2nd Ed.): Educational Research, Charles. E. Merill, Columbus, Ohio.
- Dooley, D. (1995): Strategies for interpreting Qualitative Data; Sage Publications, California.
- Long, J.S. (Ed.)(1988): Common Problems Proper Solutions : Avoiding Errors in Quantitative Research. Beverly Hills, Sage Publications, California.
- Mukherjee, R. (1989): The Quality of Life: Valuation in Social ResearcH, Sage Publications, New Delhi.
- Stranss, A. and Corbin. J. (1990): Basis of Qualitative Research: Grounded Theory Procedures and Techniques, Sage Publications, California.

Semester 3

Code of the Course: FSNT-DCC-08

Title of Course: Food Chemistry and Food Analysis

Level of the Course: NHEQF level 7.0

Credit of the course: 4

Type of the course: DCC

Pre-requisites: Four Years Bachelor's degree in Home Science (B.Sc.) with 5.50/10.00 or equivalent OGPA for General and 5 % relaxation for SC/ST/ OBC/SBC candidates.

Objective of the Course

To introduce students to

- The basic principles of Food Chemistry and Food Analysis
- An understanding of the functions of biological systems in relation to nutritional biochemistry
- The skills in qualitative tests and quantitative estimation of nutrients.

Learning outcome

- Understand the significance of organic reactions with reference to biological systems.
- Adequately explain the chemistry of carbohydrates, proteins, lipids, enzymes and nucleic acids.
- Comprehend the metabolic pathways of carbohydrates, proteins and lipids.
- Discern the hormonal regulation and interrelationship of the macronutrient's metabolism

Unit – I(Credit Hours: 12)

Introduction to Food Chemistry: Definition and composition of food

Water: Structure of water, Type of water, Sorption phenomenon, Water activity, Role in packaging and shelf life.

Carbohydrates: Classification, Structure of important polysaccharides (starch, cellulose, hemicelluloses, pectin, gums), Modified cellulose and starches. Chemical reactions of carbohydrates – oxidation, reduction, acid and alkali.

Unit – II(Credit Hours: 12)

Lipids: Classification and Physico-chemical properties of lipids. Refining of crude oils, Hydrogenation and Winterization. Vegetable and animal fat. Frying and Shortening. Flavor changes in fats and oils, Lipid oxidation, Factors affecting lipid oxidation.

Proteins: Classification, Properties of protein (electrophoresis, sedimentation, and denaturation), Functional properties of protein (solubility, viscosity, gelation, emulsification and foaming).

Unit – III(Credit Hours: 12)

Vitamins and Minerals: Role of vitamins and minerals in food industry, Effect of various processing treatments and fortification of foods.

Food enzymes- Nature, Classification, Properties of Food enzyme, Enzyme activity in different food systems, Hydrolyses and Lipases, Utilization in Food Chemistry. Browning reaction in foods.

Unit – IV(Credit Hours: 12)

Principles of Proximate Analysis- Moisture, Ash, Crude Fat, Crude Fibre, Crude Protein and Carbohydrates by difference.

Principles and methods of Food Analysis.

Determination of Starch. Test for unsaturation of fats, rancidity of fats.

Unit – V(Credit Hours: 12)

Quantitative analysis of Protein by Biuret method, Ninhydrin method, Lowry's method. colorimetric methods of analysis of fat soluble and water soluble vitamins

Principles and methods for estimation of Minerals: Titrimetric and Gravimetric methods Methods for determining physical and rheological properties of food.

Reference Books:

- Damodaran, S., Parkin, K.L. and Fennema, O. R. (2007). Fennema's Food Chemistry, fourth edition,published by CRC Press.
- Meyer L.H. (2003). Food Chemistry, Reinhold Pub. Corp.
- Nielsen, S.S.(2003). Food Analysis, Third Ed., Kluwer Academic/Plenum Publishers, New York.
- Nielsen,S.S.(2003).FoodAnalysis,ThirdEd.,KluwerAcademic/PlenumPublishers,NewYork.
- Fung, D.Y.C. and Matthews, R. (1991): Instrumental Methods for Quality Assurance in Foods, Marcel Dekker, Inc. New York.
- Skoog, D.A., Holler, F.H. and Nieman (1998): Principles of Instrumental Analysis Saunders College Publishing, Philadelphia.
- Gruenwedel, D.W.; Whitaker, J.R. (editors) (1984): Food Analysis Principles and techniques, Volumes 1 to 8, Marcel Dekker, Inc., New York

Code of the Course: FSNT-DCC-09

Title of Course: Food Toxicology

Level of the Course: NHEQF level 7.0

Credit of the course: 4

Type of the course: DCC

Pre-requisites: Four Years Bachelor's degree in Home Science (B.Sc.) with 5.50/10.00 or equivalent OGPA for General and 5 % relaxation for SC/ST/ OBC/SBC candidates.

Objective of the Course

- Introduction to Food Safety and Toxicology, Hazards Microbiological, Nutritional Environmental, natural Toxicants, Pesticide residues and Food Additives, Microbial Problems in Food Safety.

Learning outcome:

This course is designed for students to:

- Familiarize with hazards and toxicity associated with food and their implications for health.
- Know the various kinds of hazards
- Be familiar with various tests

Unit – I(Credit Hours: 12)

1. Introduction to Food Safety and Toxicology: Hazards Microbiological, Nutritional, Environmental, natural Toxicants, Pesticide residues and Food Additives.

- Biotechnology and food safety
- HACCP

Unit – II(Credit Hours: 12)

Microbial Problems in Food Safety including Mycotoxins and viruses.

Unit – III(Credit Hours: 12)

Intentional Direct Additives: Preservatives, Nitrate and N-nitroso Compounds.

Unit – IV(Credit Hours: 12)

Naturally occurring toxicants & Foods contaminants: Sea food toxins, biogenic amines, coffee & methylxanthines, toxicity of mushrooms alkaloids, phenolic compounds, glucosinolates, protease inhibitors, phytate, other antinutritional compounds.

Unit – V(Credit Hours: 12)

Environmental pollution sources: Air, water Hazards involved, Water treatment and waste management.

References:

- OECD Documents (1996): Food Safety Evaluation. Organisation for Economic cooperation and Development Paris.
- World Health Organisation (1990): Strategies for Assessing the Safety of Foods Produced by Biotechnology. Report of a Joint FAO/ WHO Consultation – Geneva.
- Walker and Quattruooi, E. (Eds.) (1980): Nutritional and Toxicological Aspects of Food Processing Tayloss and Francis, New York
- Lava, K. : Muller, E. L.: Toxicological Aspects of foods; Elsevier Applied Science, London.
- Lee, L.W. (Ed.) (1995): Human Tissue Monitoring and Specimen Banking : Opportunities for Exposure Assessment, Risk Assessment and Epidemiologic Research Proceedings of a Symposium Research Triangle Park, NC, March 30 to April 1, 1993. Environ. Health

Code of the Course: FSNT-DSE-1A

Title of Course: Public Health and Nutrition-1

(Paper-1-Therapeutic Nutrition)

Level of the Course: NHEQF level 7.0

Credit of the course: 4

Type of the course: DSE

Pre-requisites: Four Years Bachelor's degree in Home Science (B.Sc.) with 5.50/10.00 or equivalent OGPA for General and 5 % relaxation for SC/ST/ OBC/SBC candidates.

Objective of the Course:

- Understand the importance of various macronutrients in relation to health.
- Acquire skills on the requirements of nutrients.
- Gain knowledge on nutritional deficiencies.

Learning outcome

- Conceptual knowledge in the principles of human nutrition in relation to health.
- Obtain skills on different methods of estimating total energy expenditure and
- requirements.
- Learn the role of carbohydrate, fiber and prevention of nutritional deficiencies.
- Comprehend the functions of fats and its association with health and diseases.
- Gain insight in determining the protein requirement and its role in malnutrition

Unit – I(Credit Hours: 12)

Introduction to Therapeutic Nutrition- Normal diet, Dietary modifications: Clear liquid diet, Soft diet, liquid diet, Total Enteral Nutrition and Total parental Nutrition.

Disease of the G. I. System- Introduction, Pathogenesis, Clinical manifestation and Dietary management of gastrointestinal Diseases, Malabsorption Syndrome, Lactose Intolerance, Postsurgical complications and management.

Unit – II(Credit Hours: 12)

Diseases of the Liver, Pancreas and Biliary System-Introduction, Pathogenesis, Clinical manifestation and Dietary Management- Hepatitis, Cirrhosis of Liver, Hepatic Encephalophathy, Diseases of Gall Bladder and Pancreas (Cholelithiasis, Cholecystitis,Cholecystectomy, Pancreatitis).

Unit – III(Credit Hours: 12)

Diabetes Mellitus and Hypoglycemia: Classification, Physiological symptoms and Diagnosis, Dietary care and Nutritional Therapy, Oral Hypoglycemic Agents.

Cardiovascular diseases- Introduction, Pathogenesis, Clinical manifestation and dietary management. Atherosclerosis. Role of nutrients to prevent Atherosclerosis, Hypertension, Hyperlipoproteinemia,

Congestive heart failure and Myocardial infraction.

Unit – IV(Credit Hours: 12)

Weight management-Introduction, Clinical manisfestation and Dietary management- Underweight, Overweight and Obesity.

Renal diseases-- Introduction, Pathogenesis, Clinical manisfestation and Dietary management- Nephiritis, Acute Kidney Failure, Chronic Kidney disease, Urinary calculi, Dialysis.

Unit – V(Credit Hours: 12)

AIDS and Cancer- Introduction, Pathogenesis, Clinical manisfestation and Dietary management during Burns, Allergy, AIDs and Cancer.

Interaction between Nutrients, and Drugs- Effect of drugs on absorption, utilization and metabolism of nutrients, Effect of nutrients on absorption and utilization of drugs.

Reference Books:

- Mahan, L.K. & Escott Stump, S. (2000). Krause's Food Nutrition and Diet Therapy 10thEd., WB Saunders & Co. London.
- Shils. M.E. (2006). Modern Nutrition in Health and Disease. Lippincot, Williams & Williams, USA.
- Passmore, R. & Eastwood, M. A. (1986). Human Nutrition & Dietetics. ELBS Churchill Livingstone.

Code of the Course: FSNT-DSE-2A

Title of Course: Public Health and Nutrition-2

(Paper-2-Community Nutrition)

Level of the Course: NHEQF level 7.0

Credit of the course: 4

Type of the course: DSE

Pre-requisites: Four Years Bachelor's degree in Home Science (B.Sc.) with 5.50/10.00 or equivalent OGPA for General and 5 % relaxation for SC/ST/ OBC/SBC candidates.

Objective of the Course

- To enable students to understand the importance of nutrition in national progress and the Significance of assessment of nutritional statues.
- To recognize the solutions to overcome problems of malnutrition in the company and the role of national and international agencies in this area.

Learning outcome

- Acquire the knowledge on the concepts of Nutritional Development of the Nation
- Relate the theoretical knowledge with the methods of evaluation of the nutritional status of an individual.
- Understand the various schemes and agencies involved in community nutrition
- Apply knowledge in the field of Infection and Immunization
- Comprehend the knowledge gained on the concepts of Child Nutrition with regards to Breastfeeding and Weaning foods

Unit – I(Credit Hours: 12)

Nutrition and health in National development

Nutritional problems confronting our country–malnutrition- types, causes, symptoms of over nutrition and under nutrition.

Food and Nutrition Security.

Unit – II(Credit Hours: 12)

Methods of assessment of nutritional status

dentification of risks groups.

Direct assessment– Diet surveys, Anthropometry, Clinical and Biochemical Estimations.

Indirect assessment– Food Balance Sheets, Agricultural Data, Ecological Parameters

and Vital Statistics.

Use of growth charts.

Unit – III(Credit Hours: 12)

Nutrition Education- Definition, Objectives and Types. (Lecture, Demonstration, Nutrition, Exhibition and Audio-Visual Aids)

National and International agencies in community nutrition - ICDS, SNP, ANP, Midday meal programme, FAO, WHO, UNICEF, CARE, AID, ICMR, CSIR, NIN, CFTRI

Unit –IV(Credit Hours: 12)

Breastfeeding and its advantages, Hazards of bottle feeding.

Complementary feeding- Definition, Planning, Formulating and Preparing of Home Based Weaning Foods, Importance of correct and timely weaning.

Unit – V(Credit Hours: 12)

Nutrition and infection- relationship,

Immunization and its importance, Immunization Schedule.

Modern methods of improving nutritional quality - Fortification & enrichment of foods.

Nutrient Supplementations - Types of supplements, advantages and disadvantages

REFERENCE

1. Nweze Eunice Nnakwe. (2017). Community Nutrition. Jones and Bartlett Publishers.
2. Elizabeth Eilender. (2016). Public Health and Community Nutrition. Momentum Press.
3. Ritchey, S. J. & Taper, J. (1983). Maternal and child Nutrition. New Delhi, ND: Harper and Row Publishers.
4. Mc Laren. D. S. (1983). Nutrition in the Community. John Wiley and sons.
5.Jelliffe.D.B. (1996). The Assessment of Nutritional status on the community-WHO Monographseries. Geneva.

Code of the Course: FSNT-DSE-1B

Title of Course: Food Processing and Management-1

(Paper-1 Institutional Food Management)

Level of the Course: NHEQF level 7.0

Credit of the course: 4

Type of the course: DSE

Pre-requisites: Four Years Bachelor's degree in Home Science (B.Sc.) with 5.50/10.00 or equivalent OGPA for General and 5 % relaxation for SC/ST/ OBC/SBC candidates.

Objective of the Course

- To acquire knowledge on the organizational aspects and functioning of different types of food service institutions
- Comprehend the notion and principles of organization management and financial management.
- Develop abilities to procure and store quantity food.
- Understand the fundamentals of sanitation and safety

Learning outcome

- Elucidate the origin and categorization of food service sectors.
- Employ the basic principles and tools of management for efficaciously handling an establishment
- Utilize the expertise obtained for food purchasing, storing and record maintenance
- Apply the understanding of concepts of management to book keeping and methods of pricing.
- Explore the importance of hygiene and safety in the food service units

Unit – I(Credit Hours: 12)

Food Services- Concept, Principle and Objective, Type of food services (hospital, hostel, school meal, industrial canteen, commercial hotels).

Food Services in hospitals- Requirement of equipments for food preparation, Distribution, Storage and Services.

Unit – II(Credit Hours: 12)

Food Service management- Menu planning, Receipt of food and its storage, Principles and Techniques in quantity food production.

Theories of Management and Approaches- Classical Theory, neoclassical approach, Quantitative approach, MBO approach, System approach, Behavioral and Human relation approach, Contingency approach, JIT approach, TQM approach.

Unit – III(Credit Hours: 12)

Developing objective and goals- Definition, Importance, Types of goal, Policies, Procedures,Rules.

Principles and procedures of management-Definition of management, Organization Interaction at work , Principles, Functions of management, Role and responsibilities.

Unit – IV(Credit Hours: 12)

Tools of management–Definition, classification, Organization chart, Structure, Function, Work improvement techniques.

Personnel management -Definition, Scope, Concept of personnel management, Approaches ofpersonnel management, Personnel policies, Training, Placement, Promotion, Personnel records,Work appraisals

Unit – V(Credit Hours: 12)

Financial management in food service institutions-Methods of food purchasing, Inventory management, Maintaining quality in food production and services.

Financial management-Definition, Scope of financial management, Financial accounting, Management accounting, Budgeting, Costing, Cost control, Accounting.

Hygiene and sanitation in preparation and serving area – Personal hygiene, Types, Sources of contamination, Prevention, Safety measures, Methods of controlling infestation, Methods of dish washing.

Reference Books

- Sethi, M. (2008). Institutional Food Management. New Age International (P) Ltd.
- Bansal, T. (2011). Hotel facility and planning. Oxford publishing, New Delhi.

Code of the Course: FSNT-DSE-2B

Title of Course: Food Processing and Management-2

(Paper-2 Food Ingredients and Processing)

Level of the Course: NHEQF level 7.0

Credit of the course: 4

Type of the course: DSE

Pre-requisites: Four Years Bachelor's degree in Home Science (B.Sc.) with 5.50/10.00 or equivalent OGPA for General and 5 % relaxation for SC/ST/ OBC/SBC candidates.

Objective of the Course:

- This course is designed for students to learn Impact systematic knowledge of basic and applied aspects of food processing and technology.
- Provide the necessary knowledge of basic principles and procedures in the production of important food products.

Learning outcome

- Impact systematic knowledge of basic and applied aspects of food processing and technology.
- Provide the necessary knowledge of basic principles and procedures in the production of important food products.
- Orient the students to potential use of various by products of food industry.

UNIT I (Credit Hours: 12)

Cereals and Legumes: **Cereals** - classification and structure of cereals. Wheat types, dough chemistry, quality of flour and flour treatment. Rice milling, aging of rice. Processing , pearling and matting of barley. Corn wet and dry milling, corn flakes, starch and its derivates syrup, germ oil, preparation of extruded products. **Legumes**-classification, processing pulses, Dhal milling, processing of soy bean and peanut.

UNIT II (Credit Hours: 12)

Vegetables and Fruits: **Vegetables-** Classification of vegetables, postharvest changes and storage. Vegetable products processing: Dehydrated, canned, frozen, pickled and vinegar pickled vegetables. Vegetable juices, pastes and powders. **Fruits-**Classification, postharvest handling and storage of fruits. Fruit Products: Dried, canned, deep frozen, rum fruits, pulp, slurries, marmalades, jams and jellies, plum sauce, thickened fruit syrup, juices, nectars, concentrates and powder.

UNIT III (Credit Hours: 12)

Milk and Milk Products: Sources, processing, standardization, toning, homogenization, pasteurization, sterilization, storage, transport and distribution. Milk products processing- cream, butter oil, cheese, cheese spread, condensed milk, evaporated milk, whole milk ,.skimmed milk powder, ice cream, khoa, channa

,panner, fermented milk products, yogurt, dahi, srikhand similar products. Instantization of milk and milk products.

UNIT IV (Credit Hours: 12)

Meat, fish and poultry products: sources of meat and meat products, effect of feed, breed and management of meat production and quality. Slaughtering of animals and poultry inspection and grading of meat. Factors affecting post mortem changes, properties, shelf life of meat . Meat quality evaluation. Mechanical deboning, meat tenderization, ageing, pickling and smoking of meat. Structure and functional properties of egg. Factors affecting egg quality and measure of egg quality. Types of fish structure, post mortem changes in fish. Storage and processing fish and fish products.

UNIT V (Credit Hours: 12)

Edible Fats and oils and Plantation crops: Edible Fats and oils- classification and Origin of individual fats and oils, production, processing of oils. Shortening-types and preparation. Mimic fats and fat powder. Plantation crops: Varieties, and processing of Tea, coffee and coco. Processing of spices-pepper, turmeric,cardamom, chilli, palm , vanilla and mustard.

References

1. Potter,N. and Hotchkiss,J.H.(1996).Food Science, Fifth Edition, CBS Publishers and Distributors, New Delhi.

2. Charley,H.(1982).Food Science ,JohnWiley and Sons, New York.

3. Salunke,D.K and Kodam,S.S. (2001).Handbook of vegetable science and Technology, Marcel Dekker,Inc,270,Madison Avenue, New York.

4. Borwankar,R.P and Shoemaker,C.E.(1992).Rheology of Foods.Elsevier Science Publishers Ltd., England.

5. Salunke,D.K and Kodam,S.S . (2001). Handbook of Vegetable Science and Technology, Marcel Dekker,Inc., 270,Madison Avenue, New York,NY,10016

Code of the Course: FSNT-DSE-Lab-1-A

Title of Course: Practical (based on DSE-1A & DSE 2A)

Level of the Course: NHEQF level 7.0

Credit of the course: 4

Type of the course: DSE-Lab

Pre-requisites: Four Years Bachelor's degree in Home Science (B.Sc.) with 5.50/10.00 or equivalent OGPA for General and 5 % relaxation for SC/ST/ OBC/SBC candidates.

Practical

- **Planning of diets for following disease conditions**

  Fever, Malabsorption disease, Lactose Intolerance.Hypertention and Chronic heart diseases.

  Liver diseases, Cholecystitis and Pancreatitis,Kidney diseases, Diabetes

  IDDM and NIDDM.

- **Diet management**: For AIDS, Burns, Trauma and Sepsis (Formula+diet)
- **Diet planning:** For Formula feeds (Total Parenteral Nutrition and Total Enteral Nutrition).
- Survey of therapeutic food in the market.
- **Diet and Nutrition surveys**

  Identifying vulnerable and at risk groups.

  Diet survey and breastfeeding and weaning practices of specific groups.

  Use of anthropometric measurements in children.

- **Methods of Extension used in community**

  Preparation of visual aids- charts, posters, models, etc. for exhibition

  Lecture Method and Demonstrations to target groups.

- **Field visits to–**

  Observe the working of nutrition programmes.

  Hospitals to observe nutritional deficiencies.

Code of the Course: FSNT-DSE-Lab-1-B

Title of Course: Practical (based on DSE-1B & DSE 2B)

Level of the Course: NHEQF level 7.0

Credit of the course: 4

Type of the course: DSE-Lab

Pre-requisites: Four Years Bachelor's degree in Home Science (B.Sc.) with 5.50/10.00 or equivalent OGPA for General and 5 % relaxation for SC/ST/ OBC/SBC candidates.

Practical

- Market survey for food items both raw and processed
- Survey of food service units
- Standardization of a recipe
- Preparing Quick Foods for scaling up for quantity production
- **Planning menus for the following:**

  Packed meals for office employees

  Nutritious tiffin for school children

  School/college canteens
- Demonstration of a specialized cuisine
- Develop a checklist for good hygiene practices
- Development of gluten in fermented doughs
- Effect of cooking on whole and split pulses
- Factor affecting gelatinization and setting quality of food starches
- Determination of smoking points of fats and oils
- Effects of pre preparation techniques on meat tenderization
- Effect of cooking on the coagulation property of eggs
- Effect of pH on cooking of vegetables and fruits
- Determination of subjective evaluation on foods

Code of the Course: FSNT-DEC-Lab-1

Title of Course: Baking and Confectionary technology

Level of the Course: NHEQF level 7.0

Credit of the course: 4

Type of the course: DSE-LAB

Pre-requisites: Four Years Bachelor's degree in Home Science (B.Sc.) with 5.50/10.00 or equivalent OGPA for General and 5 % relaxation for SC/ST/ OBC/SBC candidates.

UNIT-I (Credit Hours: 12)

INTRODUCTION: Raw materials required for bread making and their functional properties. Essential ingredients: Flour, yeast, water, salt. Other ingredients: Sugar, colour, flavor, fat, milk and milk powder and bread improvers. Functions of various raw materials used in baking industries Materials of Baking. Leaveners and yeast foods, shortenings, emulsifiers and antioxidants, Sweeteners and, water and salt, Ingredients from milk and eggs. Fruits, vegetables, and nuts, Spices, flavors and colors. Preservation methods.

UNIT-II (Credit Hours: 12)

BAKERY EQUIPMENT: Introduction to utensils and equipments used in bakery UNIT and their uses small equipments, big equipments and oven. Bulk handling of ingredients, Dough mixing and mixers, dividing, rounding, sheeting, and laminating, fermentation enclosures and brew equipment. Ovens and Slicers, Packaging materials and equipment**.**

UNIT-III (Credit Hours: 12)

BREAD MANUFACTURING PROCESS: Straight dough fermentation, Sponge and dough, Accelerated processing. Chorley wood bread process, Dough retarding and freezing, Stages in processing of bread and bread making methods and advantages and disadvantages of various methods of bread-making. Characteristics of good bread: Internal characters; external characters. Bread defects/faults and remedies. Spoilage of bread Causes, detection and prevention. Preparation pastries and pie–types of pastries–different methods of making pastries – methods of lamination process in pastries.

UNIT-IV (Credit Hours: 12)

BISCUITS AND COOKIES: Production of cakes and cookies/biscuits. Types of biscuit dough's – Developed dough, short dough's, semi-sweet, enzyme modified dough's and batters –importance of the consistency of the dough. Cake making: Ingredients and their function structure builders. Tenderizers, moisteners and flavor enhancers – Selection and preparation of mould Temperature and time required for different type of cake, problems of baking.

UNIT-V (Credit Hours: 12)

CONFECTIONERY PRODUCTS: Definition, importance of sugar confectionery and flour confectioner. Types of confectionery products-chocolate boiled sweets caramels toffees. Fondants. Manufacturing process and spoilage of confectionery products. Good manufacturing practices (GMP) in baking and confectionery industries. Computerization in plant and laboratory, Sanitation and safety.

Reference

- Matz, Samuel A., "Bakery Technology and Engineering", Third Edition, Chapman & Hall,
- London,
- Cauvain, Stanley P, and Yound, Linda S., " Technology of Bread Making", Second Edition
- Aspen publication, Maryland, 2005.
- Pomeranz. Y. "Modern Cereal Science and Technology". MVCH Publications, New
- York.2003.
- Samuel A., Matz., " Equipment for Bakers", Pan Tech International Publication, 2009.
- Manley, Duncan., " Biscuit Doughs Manual 2", Woodhead Publishing Ltd., England. 2009.
- Dubey, S.C. (2007). Basic Baking 5th Ed. Chanakya Mudrak Pvt. Ltd.
- Raina et.al. (2010). Basic Food Preparation-A Complete Manual. 4rd Ed. Orient Black Swan Ltd.
- Khanna K, Gupta S, Seth R, Mahna R, Rekhi T (2004). The Art and Science of
- Cooking: A Practical Manual, Revised Edition. Elite Publishing House Pvt Ltd.

Practical

Training in baking of

- Cream cake
- Sponge cake preparations
- Short crust pastry
- Breads, buns, dinner rolls and pizza base
- Biscuits and cookies

Semester 4

Code of the Course: FSNT-DCC10

Title of Course: Food Biotechnology and Nanotechnology

Level of the Course: NHEQF level 7.0

Credit of the course: 4

Type of the course: DCC

Pre-requisites: Four Years Bachelor's degree in Home Science (B.Sc.) with 5.50/10.00 or equivalent OGPA for General and 5 % relaxation for SC/ST/ OBC/SBC candidates.

Objective of the Course

- To learn Basic principles of molecular biology and biotechnology, Nanotechnology in food science, and Biological synthesis of nanoparticles.

Learning outcome

- Understand the biotechnological and Nano technological application in food science.
- Learn the different aspects of nanomaterials.

UNIT -I (Credit Hours: 12)

Basic principles of molecular biology and biotechnology: Introduction to Genetics, Population & Evolutionary genetics, Gene Mapping. Microbial gene transfer mechanisms, Mutation, Types of mutations, Molecular mechanism of mutations, practical applications, DNA repair Mechanisms, Recombinant DNA Technology. Nutrogenomics - concept, working, significance and relevance. Biosensors and novel tools and their application in food science.

UNIT -II (Credit Hours: 12)

Traditional applications of biotechnology in food - Fermented foods: eg dairy products, oriental fermentations, alcoholic beverages, and food ingredients. Health benefits of fermented foods. Types of fermented foods and importance of food fermentation in food preservation and nutritional enhancement. Examples of genetically modified crops- Bt brinjal , Bt maize and golden rice.

UNIT -III (Credit Hours: 12)

Plant and animal culture, transgenic plants, application of genetic engineering in food science and technology. Genetically modified foods – concept, types and application. Regulations concerning Genetically Modified Foods in India and at the International level; Ethical issues concerning GM foods; testing for GMOs; current guidelines for the production, release and movement of GMOs; labeling and traceability; trade related aspects; bio safety; risk assessment and risk management. Public perception of GM foods.IPR.

UNIT -IV (Credit Hours: 12)

Introduction to Nanotechnology: Characteristic scale for quantum phenomena, nanoparticles, nano-clusters, nanotubes, nanowires and nanodots. Nanobiotechnology: Nanoparticles and nucleic acid and protein based recognition groups – application in optical detection methods – Nanoparticles as carrier for genetic material - nanobioelectronic devices and polymer nanocontainers – microbial production of inorganic nanoparticles – magnetosomes.

UNIT -V (Credit Hours: 12)

Biological synthesis of nanoparticles: Biosynthesis of Nanoparticles: Biomineralization -Microbial Nanoparticle production. Biofunctionalizaion of gold nanoparticles – phospholipids polymer nanoparticles – magnetic nanoparticles–metallic nanoparticle. Application of nanotechnology in food Science in brief: Nanosensors for microbial, chemical contaminants; Foods incorporated with nanoscale antimicrobial compounds, antioxidants and flavours which would improve shelf-life or sensory characteristics such as flavour, odour.

Reference

- Dubey, R.C. “Textbook of Biotechnology” Chand publishing. 2009.
- Kalaiselvan, “Bioprocess technology” MJP Publishers, 2007.
- Glenn R. Gibson and Marcel Roberfroid “Handbook of Prebiotics”, CRC Press, 2008
- Shanmugham,S. “Nanotechnology” MJP publishers. 2011.

Code of the Course: FSNT-DSE-3A

Title of Course: Public Health and Nutrition-3

(Paper-3 Child Maternal and Nutrition)

Level of the Course: NHEQF level 7.0

Credit of the course: 4

Type of the course: DSE

Pre-requisites: Four Years Bachelor's degree in Home Science (B.Sc.) with 5.50/10.00 or equivalent OGPA for General and 5 % relaxation for SC/ST/ OBC/SBC candidates.

Objective of the Course

To introduce the students to the principles of Maternal and Child Nutrition.

- To enable students to obtain knowledge of Maternal and Child Nutrition planning.
- Understand the importance of various macronutrients in relation Maternal and Child Nutrition.

Learning outcome:

- Understand physiological changes in pregnancy and lactation.
- Get acquainted with growth and developmental changes.
- Understand the inter-relationship between nutrition and growth and development during life cycle.

UNIT -I (Credit Hours: 12)

Importance of Maternal Nutrition:

Importance of nutrition prior to and during pregnancy.

Pre-requisites for successful outcome. Effect of undernutrition on mother and child

including pregnancy outcome and Maternal and Child Health – Short term and Long term.

UNIT -II (Credit Hours: 12)

Physiology and endocrinology of pregnancy and embryonic and fetal growth and development.

Nutritional requirements during pregnancy

Adolescent Pregnancy

Pregnancy and AIDS

UNIT -III (Credit Hours: 12)

Pregnancy and TB

Intra-Uterine growth retardation

Complications of pregnancy and management and importance of antenatal care.

Congenital malformation, fetal alcohol syndrome and gestational diabetes mellitus.

UNIT -IV (Credit Hours: 12)

Lactation:

Development of mammary tissue and role of hormones

Physiology and endocrinology of lactation – Synthesis of milk components, let down reflex, role of hormones, lactational amenorrhea, and effect of breast feeding of maternal health.

Human milk composition and factors affecting breastfeeding and fertility

UNIT -V (Credit Hours: 12)

Management of lactation – Prenatal breastfeeding skill education. Rooming in, problems – sore nipples, engorged breast, inverted nipples etc.

Exclusive breastfeeding

Growth and development during infancy, childhood.

References

- International Food Policy Research Institute (1997). Care and Nutrition: Concepts and Measurement, International Food Policy Research Institute Washington DC., USA.
- International Child Health: A Digest of Current Information.3. Barker, D.J.P. (1998). Mothers, Babies and Health in Later Life. Edinburgh, Churchill Livingstone.
- Ward, R.H.T; Smith, S.K; Donnai, D. (Eds.) (1994) Early Fetal Growth and Development, London, RCOG Press.
- Sachdev; H.P.S. and Choudhary, P. (1995). Nutrition in Children – Developing Country Concerns. Cambridge Press, New Delhi.
- King, F.S. (1992). Helping Mothers to Breastfeed. Association for Consumers Action on Safety and Health, Mumbai.
- Wallace, H.M. and Giri, K.(1990). Health Care of Women and Children in Developing Countries. Third Party Publishing Co. Oakland.
- Tannor, J.M. (1988) Foctus into Man; Physical Growth Iron Conception to Maturity.Wheaton and Co. Ltd.., Great Britain.
- Luke, B. Johnson, T.R.B; Petrie, R.H. (1993). Clinical Maternal-Feta; Nutrition. Little Brown and Co. Bostun
- WHO (1999) Nutrition for Health and Development: Progress and Prospects on the Eve of the 21st Century WHO / NHD / 99.9 Geneva.

Code of the Course: FSNT-DSE-4A

Title of Course: Public Health and Nutrition-4

(Paper-4 Geriatric Nutrition)

Level of the Course: NHEQF level 7.0

Credit of the course: 4

Type of the course: DSE

Pre-requisites: Four Years Bachelor's degree in Home Science (B.Sc.) with 5.50/10.00 or equivalent OGPA for General and 5 % relaxation for SC/ST/ OBC/SBC candidates.

Objective of the Course

To introduce the students to the principles of Geriatric Nutrition.

- To enable students to obtain knowledge of Geriatric planning.
- Understand the importance of various macronutrients in ageing.

Learning outcome:

- Familiarize the students with the multifaceted aspects of ageing.
- Make the students competent for nutritional and health care of the elderly.

UNIT -I (Credit Hours: 12)

The ageing process-physiological, biochemical and body composition changes. Theories of ageing.

UNIT -II (Credit Hours: 12)

Socio-psychological aspects of ageing – special problems of elderly women.

UNIT -III (Credit Hours: 12)

Nutritional requirements of the elderly and dietary management to meet nutritional needs

UNIT -IV (Credit Hours: 12)

Chronic degenerative diseases and nutritional problems of the elderly – their etiopathogenesis, management, prevention and control.

UNIT -V (Credit Hours: 12)

Policies and programmes of the government and NGO sector pertaining to the elderly

References

- Kumar, V. (1996): Aging- Indian Perspective and Global Scenario. Proceedings of
- International Symposium of Gerontology and Seventh Conference of the Association of Gerontology (India).
- Bagchi, K. & Puri, S. (Ed.) (1999): Diet and Aging-Exploring Some Facets. Soc. For

- Gerontological Research, New Delhi and Help Age India, New Delh.

Code of the Course: FSNT-DSE-3B

Title of Course: Food Processing and Management-3

(Paper-3 Food Product Development and Quality Evaluation)

Level of the Course: NHEQF level 7.0

Credit of the course: 4

Type of the course: DSE

Pre-requisites: Four Years Bachelor's degree in Home Science (B.Sc.) with 5.50/10.00 or equivalent OGPA for General and 5 % relaxation for SC/ST/ OBC/SBC candidates.

Objective of the Course

- Understand Food needs & consumer preference Product Development and Quality Evaluation

Learning outcome

- This course involves going through the process of developing a new food product from concept, through to market analysis, design, development and evaluation.

UNIT I (Credit Hours: 12)

FOOD NEEDS & CONSUMER PREFERENCE - Market survey and its importance in; designing a questionnaire to find consumer needs for a product or a concept. Developing a Product to Meet the Requirements. Product life cycle. Creating brand value for the Product. The SWOT analysis

UNIT II (Credit Hours: 12)

DESIGNING NEW PRODUCTS - New Food Product Development (NPD) process and activities, The Stage-Gate model NPD success factors, new product design, food innovation case studies, market-oriented NPD methodologies, organization for successful NPD; Recipe Development; use of traditional recipe and modification; involvement of consumers, chefs and recipe experts; selection of materials/ingredients for specific purposes; modifications for production on large scale, cost effectiveness and return on investment, nutritional needs or uniqueness; use of novel food ingredients and novel processing technologies.

UNIT III (Credit Hours: 12)

STANDARDIZATION & LARGE SCALE PRODUCTION - Process design, equipment needed; establishing process parameters for optimum quality; Sensory Evaluation; Lab requirements; different techniques and tests; statistical analysis; application in product development and comparison of market samples; stages of the integration of market and sensory analysis.

UNIT IV (Credit Hours: 12)

QUALITY, SAFETY & REGULATORY ASPECTS - Product Stability; evaluation of shelf life; changes in sensory attributes and effects of environmental conditions; accelerated shelf life determination; developing

packaging systems for maximum stability and cost effectiveness; interaction of package with food; Regulatory Aspects; whether standard product and conformation to standards; Approval for Proprietary Product.

UNIT V (Credit Hours: 12)

PRODUCT COMMERCIALIZATION, LAUNCH, EVALUATION & CASE STUDIES - Outcomes and activities in product commercialization, Pre-launch trial, Steps in product launch, Evaluation of the Launch, product performance testing, developing test market strategies, Case Studies of some successes and failures, food choice models and new product trends.

REFERENCES

- Jacqueline H. Beckley, M. Michele Foley Elizabeth J. Topp &_J. C. Huang Witoon Prinyawiwatkul (2007). Accelerating New Food Product Design and Development. Blackwell Publishing Company. IFT Press. USA
- Howard R. Moskowitz, I. Sam Saguy & Tim Straus (2009). An Integrated Approach to New Food Product Development. Taylor and Francis Group, LLC.USA
- Mary Earle and Richard Earle (2008). Case studies in food product development Wood head Publishing Limited and CRC Press LLC.USA
- Creating New Foods. The Product Developer's Guide: Marie D. Earle and Richard L. Earle (2001). Chadwick House Group Ltd. New Zeeland.
- David H. Lyon, Mariko A. Francombe, Terry A. Hasdell and Ken Lawson (1992). Guidelines for sensory analysis in food product development and quality control. Chapman & Hall, 2-6 Boundary Row, London.

Code of the Course: FSNT-DSE-4B

Title of Course: Food Processing and Management-4

(paper-4 Food Processing, Packaging and Food Law)

Level of the Course: NHEQF level 7.0

Credit of the course: 4

Type of the course: DSE

Pre-requisites: Four Years Bachelor's degree in Home Science (B.Sc.) with 5.50/10.00 or equivalent OGPA for General and 5 % relaxation for SC/ST/ OBC/SBC candidates.

Objective of the Course

- To gain knowledge about various packaging materials and importance of packaging.

Learning outcome

- Gain knowledge about various packaging materials and importance of packaging.
- Be familiar with testing and evaluation of packing media.
- Be familiar with packaging laws and regulations.
- Be able to select appropriate packaging material for a variety of food stuffs vis-à-vis the need for preventing environment degrade

Unit – I(Credit Hours: 12)

Introduction to packaging: Primary packaging media ,Properties and application manufacturing and applications of paper and paperboard, metal, glass, plastics; combined package systems; Labels, caps and closures and adhesives, inks and lacquers, cushioning materials.

Unit – II(Credit Hours: 12)

Packaging of Food products: fruits and vegetables; packaging requirements of fresh fruits and vegetables; criteria for selection of proper packaging based on the shelf life desired.

Unit – III(Credit Hours: 12)

Environmental and safety issues in packaging: Packaging Laws and regulations, Coding and marking including bar coding; Environmental & Economic issues, recycling and waste disposal

Unit – IV(Credit Hours: 12)

Fundamentals of Food Processing- Concept, Prospects for future growth in India.
Food Spoilage and Food Preservation - Principle, Type and Scope of food preservation;.
Speciality and Functional foods: Introduction and Application. Organic food, Super food..

Unit – V(Credit Hours: 12)

Food Safety, Laws and Standards - Hazard Analysis and Critical Control Points (HACCP), Good Manufacturing Practices (GMP), Good Hygienic Practices (GHP), International Organisation for Standardization (ISO), Essential Commodities Act, Codex Alimentarius, World Trade Organisation (WTO), Technical Barrier to Trades (TBT), Sanitary Phyto-Sanitary (SPS) rules, Bureau of Indian Standards (BIS),AGMARK, Food Safety and Standards Act, 2006 (FSSA): Prevention of Food Adulteration Act (PFA), Milk and Milk Products Order (MMPO), Meat Food Products Order (MFPO), Fruits Products Order (FPO).

Reference Books

- Sacharow & Grifin, Food packing – AVI Publications.
- Hotchikess Food & Packaging Interaction – American Chemical Society.
- Stanley & Sacharow Food Packaging.
- Darry, R. & T. Blackie: Principles & Applications of MAP Academic & Professions.
- Bhatia S.C. Canning & Preservations of Fruits & Vegetables, new Delhi, India.
- Dalzett, J.M. Food Industry & The Environment – Capmann & Hallm London.
- Robertson, G. L. Food Packaging - New York, Marcell Dekker, INC
- Fellows, P. J. (2016). Food Processing Technology: Principles and Practice, Fourth Edition, Woodhead Publishing.
- Kiron Prabhakar (2016). A Practical Guide to Food Laws and Regulations, Bloomsbury Professional, India.

Code of the Course: FSNT-DSE-Lab 5-A

Title of Course: Practical (Based on paper 3A & 4A)

Level of the Course: NHEQF level 7.0

Credit of the course: 4

Type of the course: DSE-Lab

Pre-requisites: Four Years Bachelor's degree in Home Science (B.Sc.) with 5.50/10.00 or equivalent OGPA for General and 5 % relaxation for SC/ST/ OBC/SBC candidates.

Practical

- To impart basic cooking skill, planning and preparation of diets for pregnant and lactating women, preschool child and young adult.
- Planning of low cost nutrion recepies for infant and mother.
- Plotting and interpretation of growth chart for children below 5 years.
- Identification of clinical symptoms of common nutritional disorders in mother and child.
- Diet resilience through improving nutritional behavior of older adults living in the community.
- Nutritional care for elderly patients in the hospital.
- Preparation of low cost nutrient diet for elderly people.

Code of the Course: FSNT-DSE-Lab 5-B

Title of Course: Practical (Based on paper 3B & 4B)

Level of the Course: NHEQF level 7.0

Credit of the course: 4

Type of the course: DSE-Lab

Pre-requisites: Four Years Bachelor's degree in Home Science (B.Sc.) with 5.50/10.00 or equivalent OGPA for General and 5 % relaxation for SC/ST/ OBC/SBC candidates.

Practical

- Assessment of purity and quality using appropriate standard test for the following:

  Water including mineral water

  Milk and milk products

  Fats and oil including butter, ghee and hydrogenated fat

  Ice creams and sherbets • Cereals and cereal product • Pulses and legumes

  Spices ad condiments and salt, pickles, sauces and chutneys.

  Tea and Coffee

  Confectionery

  Specific food ingredients such as vinegar.

  Fruit juices, concentrates and beverages.

- Detection /Estimation of Contaminants
- Market survey of preserved food and vegetable
- Visit to food testing lab
- Simple test for food adulteration
- Case study on food safety issues

Paper: Dissertation

Dissertation will be of one semester only which will include Practical work, Report Writing andViva Voce on specific topic provided for Dissertation work to individual student.