FOOD and NUTRITION

West Bengal State University

2023-24

Food and Nutrition

Programme Objectives:

The objective of the programme is to facilitate students acquire understanding of the concepts, principles of food and nutrition in relation to human health, well - being, management of diseases, and implications for the society.

Programme Outcome:

On successful completion of the programme, the students are expected to

- acquire theoretical knowledge, important values, hands on skills, ability to apply in real life situations, as the thrust of the programme seeks to strike a balance between theory and its applicability
- progress academically smoothly into higher levels being inculcated with a spirit to know continually in the field of food and nutrition, or opt for self - employment/jobs in different related sectors.

Semester wise Outline Structure: Major courses

Semester(s)	Initial Codes (Credit)	Course Codes	Course Title
Semester 1	DS 1(5)	FNTDSC101T	BASICS OF FOOD AND NUTRITION
		FNTDSC101P	
Semester 2	DS 2(5)	FNTDSC202T	CHEMISTRY OF NUTRIENTS
		FNTDSC202P	
Semester 3	DS 3(5)	FNTDSC303T	NUTRITION THROUGH LIFESPAN
		FNTDSC303P	
Semester 4	DS 4(5)	FNTDSC404T	FOUNDATION OF HUMAN HEALTH - 1
		FNTDSC404P	
	DS 5(5)	FNTDSC405T	METABOLISM OF NUTRIENTS
		FNTDSC405P	
	DS 6(5)	FNTDSC406T	COMMUNITY NUTRITION
		FNTDSC406P	
	DS 7(5)	FNTDSC407T	FOUNDATION OF DIETETICS -1
		FNTDSC407P	
Semester 5	DS 8(5)	Will be notified	
	DS 9(5)		
	DS 10(5)		
	DS 11(5)		
Semester 6	DS 12(5)		
	DS 13(5)		
	DS 14(5)		
	DS 15(5)		
Semester 7	DS 16(5),		
	DS 17(5)		
Semester 8	DS 18(5)		
	DS 19(5)		
	DS 20(5)		
	DS 21(5)		

Note: A 5 credit Course will have 3 credit Theory and 2 credit Practical; 45 lecture hours may be allotted for a 3 credit Theory Course

SEMESTER 1

FNTDSC101T: BASICS OF FOOD AND NUTRITION

Course Objectives: To make basics of Food and Nutrition clearer and interesting

1. **Introduction to Food and Nutrition**

Foods: Energy giving, body building and protective. Nutrients: macro and micro nutrients, Diet and balanced diet, Menu.

Health and nutritional status. Malnutrition, functional food, prebiotics, probiotics, phytochemicals, nutraceuticals. Fibre. Functions of foods: physiological, psychological, social. Food groups, food pyramid, Relation between food and nutrition, health and diseases.

2. **Foods, Nutrients and Cooking of food**

Foods and their nutrient contents: Nutrients present in cereals and millets, pulses, nuts and oil seeds, fruits and vegetables, milk and milk products, flesh food, eggs, Condiment and spices, salt. Non-nutrient components of foods: phytate, tannins, oxalate, trypsin inhibitor, goitrogens and other toxic agents in food.

Cooking: Beneficial and adverse effects of cooking. Different methods of cooking-dry, moist, frying, and micro wave cooking- advantage, disadvantage and the effect of various methods of cooking on foods, Solar cooking.

3. **Food energy and energy requirements:**

The energy value of foods: Physical and physiological calories. Bomb calorimeter Energy requirement of an individual: Basal metabolic rate (BMR) BMR: Measurement (direct and indirect), factors affecting BMR, SDA of foods. Nutritional requirements and Recommended dietary allowances (RDA): factors affecting RDA, Application of RDA, Estimated Average Requirement (EAR), Reference man and woman.

4. **Food adjuncts** – spices, condiments, herbs
5. **Food Adulteration and colorants**: Definition, types

FNTDSC101P: BASICS OF FOOD AND NUTRITION (PRACTICAL)

1. General concepts of weights and measures, Eye estimation of raw and cooked foods.
2. Process involved in cooking, microwave, steaming, grilling, deep fat frying.
3. Preparation of food from different food groups and their significance in relation to health.
4. Detection of common adulterants

Course Outcome: On successful completion of the particular course, the students are expected to appreciate well the basics Food and Nutrition.

SEMESTER 2

FNTDSC202T: CHEMISTRY OF NUTRIENTS (THEORY)

Course Objectives: To provide in depth knowledge of structure, properties, and basic functions of different types of nutrients and also select food groups.

1. **Chemistry of Carbohydrates:** Carbohydrates: classification-mono-, di and polysaccharides; Stereoisomerism in carbohydrates. Physical and chemical properties of mono-, di-and polysaccharides**.**
2. **Chemistry of Lipids:** Lipids: Classification – Fatty acids, triglycerides, phospholipids, Glycolipids, sterols and steroids. Eiconoids. Edible fats and oils- physical and chemical properties, Hydrogenation and importance of fats in the diet. Physical and chemical properties of saturated, monounsaturated, polyunsaturated fatty acids, trans fatty acids, phospholipids, cholesterols and liposomes. Essential fatty acids**,** nuts
3. **Chemistry of Amino Acids and Proteins:** Proteins: Classification. Protein structure and organization: primary, secondary, tertiary and quaternary structure. Amino acids-classification. Physical and chemical properties of amino acid and protein. Biological value of proteins (BV), Net protein utilization (NPU) and Protein efficiency ratio (PER).
4. **Dietary Fibers:** definition; types, composition, health benefits
5. **Water:** Water in foods, water activity, phase transition of food containing water. Water activity and its influence on quality and stability of foods, methods for stabilization of food systems by control of water activity.
6. **Select Food groups**: Cereals, millets and Pulses: Structure, composition, important properties including toxic constituents, and health benefits

   Dairy Products – types, composition, properties and health benefits

   Flesh foods: types, composition and health benefits

   Sugar and sugar products including artificial sweeteners: composition and properties

FNTDSC202P: CHEMISTRY OF NUTRIENTS (PRACTICAL)

1. Qualitative tests for the identification of: Glucose, Galactose, Fructose, Sucrose, Lactose, Starch, Dextrin.
2. Qualitative tests for the identification of -Albumin, Gelatin, Peptone, urea, uric acid.
3. Determination of acid value of oils by titrimetric method.
4. Determination of specific gravity of liquid (fruit juice, blood).

Course Outcome: On successful completion of the particular course, the students are expected to have clear concept regarding the structures, properties, and basic functions of the nutrients and select food groups.

SEMESTER 3

FNTDSC303T: NUTRITION THROUGH LIFE SPAN (THEORY)

Course Objectives: To understand the relevant principles of human nutrition in different stages of life.

1. **Basics of Meal Planning:** Principles of meal planning, Food groups and Food exchange list, Factors affecting meal planning and food related behavior.

2. **Nutrition in Adults and Elderly:** Physiological changes in elderly. RDA and nutritional guidelines, dietary management. Nutritional concerns and healthy food choices for: Adult men and women, Elderly.
3. **Nutrition during Pregnancy:** Basic idea about physiological aspects of pregnancy Factors(non-nutritional)affecting pregnancy outcome, importance of adequate weight gain during pregnancy, antenatal care and its schedule, Nutritional requirements during pregnancy and modification of existing diet and supplementation, Deficiency of nutrients, especially energy, iron, folic acid, protein, calcium, iodine. Common challenges of pregnancy and their managements, especially - nausea, vomiting, pica, food aversions, pregnancy induced hypertension, obesity, GDM. Adolescent pregnancy.

4. **Nutrition during Lactation:** Basic idea about physiological aspects of lactation, Nutrition during Lactation: Nutritional requirements during lactation, dietary management, food supplements, galactagogues, preparation for lactation.

5. **Nutrition during Infancy:** Infant physiology relevant to feeding and care, colostrum: its composition and importance, Breastfeeding: principles, procedure, advantages, initiations; exclusive breastfeeding. Weaning, Introduction of supplementary foods. Bottle feeding – principles, requirements, hygiene issues. Preparation of formula. Mixed feeding. Artificial feeding, Management of preterm and low birth weight babies.

6. **Nutrition for Children and Adolescents:** Growth and development in children, RDA, nutritional guidelines, nutritional concerns and healthy food choices for: Preschool children, Schoolchildren, Adolescents

FNTDSC303P: NUTRITION THROUGH LIFE SPAN (PRACTICAL)

Planning and preparation of suitable meal for different age groups - infants, children, adolescents, adults, elderly and also in different physiological conditions – pregnancy and lactation.
Note: Emphasis should be given on principles and quantitative aspects.

Course Outcome: On successful completion of the particular course, the students are expected to have thorough idea regarding principles including specific requirements, sources of nutrients, and also relevant guidelines as applicable for different stages of life.

SEMESTER 4

FNTDSC404T: BASICS OF HUMAN HEALTH -1 (THEORY)

Course Objectives: To provide basic knowledge about the role of different human systems with regard to overall human health

1. **GI system:** Structure and function of different segments of GI tract and associated glands.
2. **Blood and Body Fluids:** Blood and its composition, Morphology, formation and functions of formed elements, Blood groups and its importance in transfusion, hazards of mismatch blood transfusion. Mechanism of blood coagulation, Hemoglobin- structure and function. Extra cellular fluid, lymph.
3. **Cardiovascular System:** Structure of heart, artery, vein and capillary, Properties of cardiac muscle, Cardiac cycle, cardiac output, heart rate, heart sounds, ECG- normal and abnormal. Systemic and pulmonary circulation. Blood pressure, pulse pressure Radial pulse, coronary circulation
4. **Respiratory System:** Structure of lungs: alveoli and airways. Respiratory volumes and capacities, Mechanics of breathing. Oxygen and carbon di oxide transport, Neural and chemical control of breathing.
5. **Renal Physiology, Skin and Body Temperature:** Anatomy of renal system: kidney, ureter, urethra and urinary bladder, Nephron: structure, Juxtaglomerular apparatus, GFR and GFI, Tubular functions, Urine formation: Counter current exchanger and multiplier. Role of kidney in water and electrolyte balance. ph regulation by kidney. Structure of skin. Sweat and sweat glands. Sebum. Core body temperature, heat loss and heat gain, Regulation of body temperature**.**

FNTDSC404P: BASICS OF HUMAN HEALTH -1 (PRACTICAL)

1. Determination of pulse rate in resting condition and after exercise (30beats/10beats method).
2. Determination of blood pressure by Sphygmomanometer (Auscultatory method).
3. Determination of Bleeding Time (BT) and Clotting Time (CT).
4. Detection of Blood group (Slide method).
5. Measurement of Hemoglobin level (Sahli`s or Drabkin method).

Course Outcome: On successful completion of the particular course, the students are expected to appreciate the relevant portions of basics of Human Health as is relevant for Food and Nutrition thoroughly.

FNTDSC405T: METABOLISM OF NUTRIENTS (THEORY)

Course Objectives: To provide idea about the general concept of metabolism of different nutrients in human body

1. **Enzymes:** Definition and structure. Enzyme substrate interaction. Enzyme kinetics, Michaelis Menten constant (K_m). Enzyme inhibition. Factors regulating enzyme activities, Isoenzymes, Pro-enzymes, Ribozymes, Abzymes, Concept of Rate limiting enzymes.

2. **Carbohydrate Metabolism:** Glycolysis. Glycogen metabolism. Metabolism of pyruvate. Outline of pentose phosphate pathway. Anaplerotic reactions. Gluconeogenesis and its importance.

3. **Lipid Metabolism:** Fatty acid synthesis and *de novo* biosynthesis of fatty acid; regulation and mechanism of chain elongation. Metabolism of cholesterol, its control and pathophysiological importance. β-oxidation of fatty acids.

4. **Amino acid Metabolism:** Essential amino acids. Transamination. Deamination. Trans-methylation. Decarboxylation. Glucogenic and ketogenic amino acids. Outline of urea cycle.

5. **Biological oxidation**: Mitochondrial electron transport chain. High energy phosphate bond. Formation of ATP.

FNTDSC405P: METABOLISM OF NUTRIENTS (PRACTICAL)

1. Estimation of Glucose in blood.
2. Estimation of Protein by Biuret and Lowry methods.
3. Estimation of urea and uric acid in blood.

Course Outcome: On successful completion of the particular course, the students are expected to have in depth understanding about metabolism of different nutrients in human system.

FNTDSC406T: COMMUNITY NUTRITION (THEORY)

Course Objectives: To provide basic knowledge about community health with special emphasis on nutritional aspects

1. Introduction to Community: Factors affecting health of the Community.

2. **Assessment methods:** Nutritional assessment of human: Clinical findings, nutritional anthropometry, biochemical tests, biophysical methods. Nutritional anthropometry: Need and importance, standard for reference, techniques of measuring height, weight, head, chest and arm circumference, interpretation of these measurements. Growth &Development, factors affecting growth and development. Use of growth charts**.**
3. **Diet survey:** Concept and importance, methods of dietary survey, Interpretation - concept of consumption unit, individual and total distribution of food in family, adequacy of diet in respect to RDA, concept of family food security**.**
4. **Clinical Signs:** Clinical Signs: Need and importance, identifying signs of PEM, vitamin A deficiency and iodine deficiency, Interpretation of descriptive list of clinical signs. Nutritional anaemia.
5. **Nutritional Monitoring and Surveillance:** Concept, objectives, procedure, and importance.
6. **Agencies and Programmes:** International, national, regional agencies and organizations. National nutritional intervention programmes to combat malnutrition: ICDS, Midday meal, Special nutrition program, National programs for prevention of anemia, Vitamin A deficiency and Iodine deficiency disorders.

FNTDSC406P: COMMUNITY NUTRITION (PRACTICAL)

1. Anthropometric Measurement of infant - Height, weight, circumference of chest, mid –upper arm circumference, precautions to be taken.
2. Comparison with norms and interpretation of the nutritional assessment data and its significance. Weight for age, height for age, weight for height, Z scores, body Mass Index (BMI), Waist – Hip Ratio (WHR).
3. Growth charts– plotting and interpretation.
4. Clinical assessment and signs of nutrient deficiencies especially PEM (Kwashiorkor, marasmus)
5. Estimation of food and nutrient intake: Household food consumption data, adult consumption unit, 24 hours dietary recall 24 hours record, Weighment method, food diaries, food frequency data, use of each of the above, information available through each individual, collection of data, estimation of intakes.

Course Outcome: students should be able to conduct nutritional assessments and also know about the interventions thoroughly after completing the particular course.

FNTDSC407T: FOUNDATION OF DIETETICS -1 (THEORY)

1. **Dietetics and Dietician**

Definition and objective of dietetics, Dieticians-Definition, Classification and Responsibility.

2. **Food groups**

Four food groups (Caribbean Food Guide; Canadian Food Guide; USA Food Pyramid; British Food Guide; Recommended Nutrient Intake (RNI); Dietary Value Intake; Dietary Reference Value, Five food group system of ICMR.

3. **Dietary guidelines**

Nutritive values as a basis for classification of food, Recommended Daily Allowances (RDA), Dietary guidelines for Indians and food pyramids.

4. **Menu Planning**

Menu Planning: Rationale for menu planning, Factors affecting food choice, Nutritional factors, other factors; Exchange list and food composition tables for menu planning, Steps in the development of exchange list, Factors to be considered when planning the regular balanced diet: adequacy, balance caloric control, moderation, variety and aesthetics.

5. **Basics of diet therapy**

Basic concepts of diet therapy: Therapeutic adaptations of normal diet, principles and classification of the therapeutic diets, Nutrient modifications.

6. **Diet for healthcare:** Team approach to healthcare. Assessment of Patients' needs. Intersectoral coordination

7. **Routine Hospital Diet:** Routine Hospital Diets: Regular, light, soft, fluid, parenteral and enteral feeding.

FNTDSC407P: FOUNDATION OF DIETETICS -1 (PRACTICAL)

Planning and preparation of normal diet, fluid diets, soft, semi solid diets, and nutrient modified diets.

Note: Emphasis should be given on principles and quantitative aspects.

Course Outcome: On successful completion of the particular course, the students are expected to have thorough idea regarding principles of routine as well as different types of diets for patients.