

SISTER NIVEDITA UNIVERSITY

Undergraduate course Applied nutrition and Dietetics

As per NEP 2020 regulation and according to UGC-CBC



Course Structure for

B.Sc. (Hons.) in Applied nutrition and Dietetics/ B.Sc. (Hons. with Research) in Applied nutrition and Dietetics

Category definition with credit breakup

| Sem | Major | | Non-Major | | MDC | AEC | SEC | VAC | INT | Credits/ Semester |
|-------------------------|--------------|------------------------|-----------|----|----------|----------|----------|----------|----------|----------------------|
| | MC | ME (Project/Course) | NM | NV | | | | | | |
| I | 8 | | 4 | 2 | - | 2 | 3 | 2 | - | 21 |
| II | 10 | | | 2 | 3 | 2 | 3 | 2 | - | 22 |
| III | 10 | | 4 | 2 | 3 | 2 | - | - | - | 21 |
| IV | 10 | | 4 | 2 | 3 | 2 | - | - | - | 21 |
| V | 14 | | | 2 | - | - | 3 | 2 | - | 21 |
| VI | 12 | | 4 | 2 | - | - | - | - | 3 | 21 |
| VII | 12 | 4 | 4 | | - | - | - | - | - | 20 |
| VIII | 12 | 8 | | | - | - | - | - | - | 20 |
| Credits / Course | 88/96 | | 32 | | 9 | 8 | 9 | 6 | 3 | - |

Major – Core Courses, Minor – Subject Minor and Vocational Education & Training, MDC – Multidisciplinary Courses, AEC – Ability Enhancement Courses, SEC – Skill Enhancement Courses, VAC – Value Added Courses, INT – Internship, Project – Dissertation/Project.

First Year

| Category | Course Name | Credit | Teaching Scheme | | |
|------------|--|--------|-------------------|---|---|
| | | | L | T | P |
| Semester I | | | | | |
| MC 1 | Basic Nutrition | 3 | 3 | | |
| | Basic Nutrition Lab | 1 | | | 2 |
| MC 2 | Food Science | 3 | 3 | | |
| | Food Science Lab | 1 | | | 2 |
| NM 1 | Chemistry | 3 | 3 | | |
| | Chemistry Lab | 1 | | | 2 |
| NV 1 | Vocational - EAA I (yoga/ Sports /NCC/NSS) | 1 | 1 | | |
| NV 2 | Vocational Skill Development I | 1 | 1 | | |
| AEC 1 | Communicative English I | 2 | 2 | | |
| SEC 1 | Computer Application | 3 | 3 | | |
| VAC 1 | Environmental Science I | 2 | 2 | | |
| | Total Credit: 21 | | Teaching Hours:24 | | |

| | | | | | |
|-------------|---|---|-------------------|--|---|
| Semester II | | | | | |
| MC 3 | Nutritional Biochemistry | 3 | 3 | | |
| | Nutritional Biochemistry Lab | 2 | | | 4 |
| MC 4 | Human Physiology I | 3 | 3 | | |
| | Human Physiology I Lab | 2 | | | 4 |
| NV 3 | Vocational - EAA II (yoga/ Sports /NCC/NSS) | 1 | 1 | | |
| NV 4 | Vocational Skill Development II | 1 | 1 | | |
| MDC 1 | Selected by Candidate (Elective) | 3 | 3 | | |
| AEC 2 | Communicative English II | 2 | 2 | | |
| SEC 2 | Basic Management Skill | 3 | 3 | | |
| VAC 2 | Environmental Science II | 2 | 2 | | |
| | Total Credit: 22 | | Teaching Hours:26 | | |

Second Year

| Semester III | | | | | |
|--------------|--|---|---|-------------------|---|
| MC 5 | Human Physiology II | 3 | 3 | | |
| | Human Physiology II Lab | 2 | | | 4 |
| MC 6 | Basic Nutrition through Life Cycle | 3 | 3 | | |
| | Basic Nutrition through Life Cycle Lab | 2 | | | 4 |
| NM 2 | Microbiology/Psychology Minor | 3 | 3 | | |
| | Microbiology/Psychology Minor Lab | 1 | | | 2 |
| NV 5 | Vocational - Mentored Seminar I | 1 | 1 | | |
| NV 6 | Vocational Skill Development III | 1 | 1 | | |
| MDC 2 | Selected by Candidate (Elective) | 3 | 3 | | |
| AEC 3 | Logical Ability / Foreign Language I | 2 | 2 | | |
| | Total Credit: 21 | | | Teaching Hours:26 | |

| Semester IV | | | | | |
|-------------|---------------------------------------|---|---|-------------------|---|
| MC 7 | Medical Nutrition Therapy I | 3 | 3 | | |
| | Medical Nutrition Therapy I Lab | 2 | | | 4 |
| MC 8 | Food Microbiology | 3 | 3 | | |
| | Food Microbiology Lab | 2 | | | 4 |
| NM 3 | Microbiology/Psychology Minor | 3 | 3 | | |
| | Microbiology/Psychology Minor Lab | 1 | | | 2 |
| NV 7 | Vocational - Mentored Seminar II | 1 | 1 | | |
| NV 8 | Vocational Skill Development IV | 1 | 1 | | |
| MDC 3 | Selected by Candidate (Elective) | 3 | 3 | | |
| AEC 4 | Logical Ability / Foreign Language II | 2 | 2 | | |
| | Total Credit: 21 | | | Teaching Hours:27 | |

Third Year

| Semester V | | | | | |
|------------------|-----------------------------------|---|-------------------|--|---|
| MC 9 | Basics of Molecular Biology | 3 | 3 | | |
| | Basics of Molecular Biology Lab | 2 | | | 4 |
| MC 10 | Medical Nutrition Therapy II | 3 | 3 | | |
| | Medical Nutrition Therapy II Lab | 2 | | | 4 |
| MC 11 | Public Health Nutrition | 3 | 3 | | |
| | Public Health Nutrition Lab | 1 | | | 2 |
| NV 9 | Vocational - Mentored Seminar III | 1 | 1 | | |
| NV 10 | Vocational Skill Development V | 1 | 1 | | |
| SEC 3 | Data Analysis | 3 | 3 | | |
| VAC 3 | Ethics study and IPR | 2 | 2 | | |
| | | | | | |
| Total Credit: 22 | | | Teaching Hours:27 | | |

| Semester VI | | | | | |
|------------------|---|---|-------------------|--|---|
| MC 12 | Nutraceuticals, Functional Food and Nutrigenomics | 3 | 3 | | |
| | Nutraceuticals, Functional Food and Nutrigenomics Lab | 1 | | | 2 |
| MC 13 | Food Preservation, Safety and Quality Control | 3 | 3 | | |
| | Food Preservation, Safety and Quality Control Lab | 1 | | | 2 |
| MC 14 | Sports Physiology and Nutrition | 3 | 3 | | |
| | Sports Physiology and Nutrition Lab | 1 | | | 2 |
| NM 4 | Microbiology/Psychology Minor | 3 | 3 | | |
| | Microbiology/Psychology Minor Lab | 1 | | | 2 |
| NV 11 | Vocational - Mentored Seminar IV | 1 | 1 | | |
| NV 12 | Vocational Skill Development VI | 1 | 1 | | |
| INT 1 | Internship | 3 | | | 6 |
| | | | | | |
| Total Credit: 20 | | | Teaching Hours:24 | | |

Forth Year

| Semester VII | | | | | |
|--------------|--|---|---|-------------------|---|
| MC 15 | Patient Counselling Techniques and Skill | 3 | 3 | | |
| | Patient Counselling Techniques and Skill Lab | 1 | | | 2 |
| MC 16 | Advanced Nutritional Science | 3 | 3 | | |
| | Advanced Nutritional Science Lab | 1 | | | 2 |
| MC 17 | Advanced Public Health Nutrition | 3 | 3 | | |
| | Advanced Public Health Nutrition Lab | 1 | | | 2 |
| NM 5 | Microbiology/Psychology Minor | 3 | 3 | | |
| | Microbiology/Psychology Minor Lab | 1 | | | 2 |
| Project | Project Minor/ Dissertation I | 4 | | | 8 |
| | | | | | |
| | | | | | |
| | Total Credit: 20 | | | Teaching Hours:20 | |

| Semester VIII | | | | | |
|-------------------|---|-----------|--------|----------------------|----|
| MC 18 | Advanced Medical Nutrition Therapy | 3 | 3 | | |
| | Advanced Medical Nutrition Therapy Lab | 1 | | | 2 |
| MC 19 | Research Methodology and Biostatistics | 4 | 4 | | |
| MC 20 | Theories of Human Development | 4 | 4 | | |
| Project / Courses | Dissertation II / (Analytical Techniques, Food Processing Technology) | 8 / (4+4) | (4+4)/ | | 16 |
| | | | | | |
| | Total Credit: 20 | | | Teaching Hours:21/29 | |

CORE COURSES (CC)

First Semester CC 1:

Basic Nutrition

Course objectives:

1. The students will be able to understand the importance of nutrition and different nutrients.
2. The students will be able to understand the importance of water in nutrition.
3. The students will be able to learn and classify the different forms of carbohydrates
4. The students will be able to understand the structure and functions of protein
5. The students will be able to understand the structure, functions and importance of the different types of lipids.
6. The students will be able to learn the importance of micronutrients.

Course Contents:

Unit 1: Introduction to nutrition

[3L]

Food as a source of nutrients, Nutrients – Concept, Definition of Nutrition, Brief History of Nutritional Science

Unit 2: Water

[4L]

Nutritional importance, function, sources, daily requirement, water balance, deficiency.

Unit 3: Carbohydrates

[6L]

Carbohydrates- Definition, classification, Structure and properties of Monosaccharides (glucose, fructose, galactose), Disaccharides (maltose, lactose, sucrose), Polysaccharides (Dextrin, starch, glycogen). Functions and food source.

Unit 4: Proteins

[6L]

Definition, composition, classification, functions food source and Protein deficiency. Essential & non-essential amino acids.

Assessment of protein quality (Protein score, Biological Value, Net Protein Utilization and Protein Efficiency Ratio, PDCAAS,

Unit 5: Lipids

[6L]

Definition, composition, classification, food source, functions, requirements, excess and deficiency. Different Types of fatty acids, role and nutritional significance (SFA, MUFA, PUFA, trans-FA).

Unit 6: Micronutrients**[15L]**

Vitamins (water and fat soluble) – Definition, classification, food sources, bio-availability, function, requirements, deficiency and excess thiamine, riboflavin, niacin, folic acid, pantothenic acid, pyridoxine, Cyanocobalamin, Ascorbic Acid, A, D, E, K.
Minerals - Definition, classification, food sources, bio- availability, function, requirements, deficiency and excess (Sodium, Potassium, Calcium, Phosphorus, Magnesium, Iron, Fluoride, Zinc, Iodine)

Unit 6: Dietary Fibers**[5L]**

Definition, classification, food sources, nutritional significance

Text/ Reference Books:

1. Srilakshmi. B – –Nutrition Science, V Edn, New Age International (P) Ltd, Publishers, Chennai
2. Passmore R. and Eastwood M.A, (1986), –Human Nutrition and Dietetics, English language book Society/Churchill Livingstone, Eighth edition, Hong Kong.
3. Neiman N. Catherine, (1990), –Nutrition, Wm.C. Brown Publishers. USA.
4. Shubhangini A. Joshi, (1992) –Nutrition and Dietetics, Tata Mc Grow- Hill publishing Company Ltd, New Delhi
5. Principles of Biochemistry A. Lehninger.

CC 1 Lab: Basic Nutrition Lab

- 1 Estimation of calorific value of food.
- 2 Estimation of moisture and ash content.
- 3 Qualitative tests for minerals (Calcium, Iron)
- 4 Qualitative tests for identification of Carbohydrates –Molisch's test
- 5 Identification of monosaccharides and reducing disaccharides: Barfoed's test
- 6 Detection of reducing Sugar-Benedict's test
- 7 Qualitative test for protein – Biuret Test
- 8 Qualitative test for Fatty Acids

CC 2: Food Science

Course objectives:

1. The students will be able to understand the importance of cereal and pulses in diet
2. The students will be able to understand the nutritional importance of milk and milk products.
3. The students will be able to learn the usage of eggs and other flesh products.
4. The students will be able to understand the nutritional importance of fruits and vegetables.
5. The students will understand the importance of sugar in preservation.
6. The students will understand the importance and application of fats in various food products.
7. The students will learn about the various types of beverages.
8. The students will understand the application of different food adjuncts in food processing.

Course Contents:

Unit 1: Introduction to foods, cereal and pulses [7L]

Definition and function of food. Classification of foods. Effects of cooking methods on nutritive value of foods.

Cereal- Structure and composition, Nutritional value, Processing- Milling, polishing, parboiling, flaking, parching, roasting

Pulses and legumes composition and nutritional value, processing, soaking, germination, use in variety of preparation.

Unit 2: Milk and milk products [7L]

Composition, classification, quality, processing, coagulation of milk, storage, uses, effect of heat. Nutritional aspects of milk and milk products and various kinds of processed milk.

Unit 3: Egg and Flesh foods [7L]

Composition & classification of egg & egg products. Selection, quality, purchase, storage, uses and nutritional aspects of egg and flesh foods (fish, poultry and meat).

Unit 4: Vegetables and fruits [7L]

Variety, use and nutritional aspects of vegetables and fruits. Effects of cooking on colour, texture, flavour, appearance and nutritive value.

Unit 5: Sugar and sugar cookery [5L]

Form of sugar and liquid sweeteners, Caramelization, Hydrolysis, Crystallization, Storage and use as preservatives.

Unit 6: Fats and oils**[7L]**

Types of fats and oils (animal and vegetable), changes during storage (hydrogenation, rancidity, emulsification) and processing uses and nutritional aspects. Nuts and oilseeds: Nutritive value. Identification of fats and oils (saponification number, acid number, iodine number)

Unit 7: Food Adjuncts**[5L]**

Food Adjuncts - Spices, condiments, herbs, extracts, concentrates essences - origin, classification, uses, specification.

Text/ Reference Books:

1. Swaminathan (1995): -Food & Nutrition, The Bangalore Printing & publishing co ltd., Vol I, Second Edition, Bangalore.
2. Srilakshmi (1997): -Food Science, New Age International (P) Ltd, Publishers, Pune.
3. Mudambi R. Sumathi & Rajagopal M.V (1983), -Foods & Nutrition, Willey Eastern Ltd, Second Edition, New Delhi.
4. Thangam. E. Philip (1965): Modern Cookery, Orient Longman, II edition. Vol II, Bombay.

CC 2 Lab: Food Science Lab

1. Use and care of kitchen equipment.
2. Controlling techniques - Weights and measures standard, household measures for raw and cooked food.
3. Food preparation and classifying recipes as good, moderate or poor, sources of specific nutrients, Amount of ingredients to be in standard recipe -
 - a) Portion size
 - b) Beverages - tea, coffee, cocoa, fruit juice, milkshakes.
 - c) Cereals and flour mixtures - basic preparation & their nutritive value - steamed rice, chapati, paratha, sandwiches, noodles, cookies & cakes.
4. Vegetables & fruits - Simple salads, Curries, fruit salad, soup
5. Milk and milk products: Curd, paneer, Milk based simple desserts
6. Meat - cuts of meat - Meat preparations, Poultry, Fish, poached and scrambled egg, fried omelette.
7. Soups - Basic, clear and cream of tomato soup.

Second Semester

CC 3: Nutritional Biochemistry

Course Objectives:

1. The students will learn the fundamental concepts of pH and the role of acid, bases, and buffers in regulating the pH.
2. The students will develop an idea about metabolism and how energy transfer takes place in a biological system.
3. The students will learn about the different types of enzymes and their respective biological roles as well as their application in clinical diagnosis.
4. The students will learn about the metabolic pathways involving carbohydrates and their physiological significance.
5. The students will learn about the metabolic pathways involving amino acids and proteins as well as their physiological significance.
6. The students will acquire knowledge about the metabolic pathways involving fats and their physiological significance.
7. The students will develop the genetic causes of errors associated with metabolism of nutrients, and the symptoms and mode of treatment.

Course Contents:

Unit 1: Acid base balance concepts & disorders

[5L]

General concept of acid base, pH, Buffers, Acidosis, Alkalosis

Unit 2: Enzymes

[8L]

Enzymes – Definition, types and classification of enzymes, definition and types of coenzymes, concept of enzyme inhibition, diagnostic value of serum enzymes - Creatinine kinase, LDH, SGOT, SGPT, Amylase

Unit 3: Carbohydrate metabolism

[8L]

Introduction, Types of metabolic pathways- catabolism, anabolism, Aerobic and anaerobic pathways: Glycolysis, Gluconeogenesis, Glycogenolysis, Glycogenesis, TCA cycle. Electron Transport Chain and Oxidative phosphorylation – Concept. Balance sheet of glucose oxidation. Pentose phosphate pathway (HMP shunt). Regulation of bloodglucose level. Hyperglycemia & hypoglycemia.

Unit 4: Lipid metabolism

[8L]

Beta oxidation of fatty acids, Ketosis, Cholesterol and its clinical significance, Lipoproteins-composition and functions in brief, Atherosclerosis. Biosynthesis of cholesterol.

Unit 5: Protein metabolism

[8L]

Biodegradation of amino acids – deamination, transamination, decarboxylation, urea cycle

Unit 6: Inborn Error of Metabolism

[8L]

Introduction, concept, disorders of protein, carbohydrate and lipid metabolism

Text/ Reference Books:

1. Nutritional Biochemistry. Tom Brody. Elsevier 2nd Ed.
2. Harper's Illustrated Biochemistry. V Rodwell, D Bender, K Botham and P. A Weil. 31st Ed. McGraw-Hill Education /Medical.
3. Lehninger Principles of Biochemistry. D.L.Nelson and M.M.Cox. 4th ed. W.H.Freeman,2004.
4. Biochemistry. Jeremy M. Berg, John L. Tymoczko and Lubert Stryer. W. H. Freeman;6thEdition
5. Biochemistry. U Satyanarayana. Elsevier India; 5thedition

CC 3 Lab: Nutritional Biochemistry Lab

1. Preparation of buffers (acidic, neutral and alkaline) and determination of pH.
2. Quantitative test for carbohydrate – Anthrone test
3. Estimation of proteins by Lowry's method
4. Estimation of proteins by Bradford method
5. Separation of amino acids - Thin layer chromatography.
6. Estimation of SGPT, SGOT, ALP

CC4: Human Physiology -I

Course Objectives:

1. The students will be able to outline the basic structure of a cell and the different cellular organelles. The students will also get an understanding of the intercellular communication
2. The students will be able to summarise the different parts of the digestive system, learning about the structure and functions of the accessory organs of digestion
3. The students will be able to develop an understanding of the formation, composition and functions of blood, also should be able to compare between the different types of disorders of blood and blood vessels.
4. The students will be able to analyse the structure of the heart and explain the major cardiovascular disorders like Angina pectoris, myocardial infarction etc.
5. The students will be able to illustrate the functions of the different components of the excretory system and explain the various diseases of the same.
6. The students will be able to summarise the structure and functions of the upper respiratory passages and evaluate the various disturbances in respiration like Apnea, dyspnea etc.

Course Contents:

Unit 1: Cell and Tissues

[7L]

Basic structure and function of cell, cell membrane and different cellular organelles. Molecular aspects of transport (Passive diffusion, facilitated diffusion, active transport). Levels of cellular organization. Organelles, Extracellular Matrix, tissues, organs and systems. Tissues - Structure and functions of epithelial, connective, muscular and nervous tissue.

Unit 2: Digestive system

[8L]

Accessory organs of digestion – Structure and functions – Teeth, Tongue, Salivary glands; Saliva – Composition and functions. Organs of Digestion – Oesophagus, Stomach, Small intestine and Large intestine – Structure and functions, Movements of the digestive system. Associated organs of digestion – Liver, Gall bladder, Pancreas (Digestive function) and Spleen. Disorders and Diseases – anorexia, Achlorhydria, Types of ulcer (peptic ulcer, gastric ulcer and duodenal ulcer), gastritis, jaundice

Unit 3: Circulatory system

[8L]

Blood – Formation, composition and functions, blood coagulation, blood groups and Rhesus factor, blood transfusion. Disorders – Anemia, Leukemia, Hemophilia. Blood vessels – Types of Blood vessels. Disorders – Varicose veins, arteriosclerosis. Blood Pressure – Factors affecting blood pressure, hypertension, Pulse. Lymphatic system – Lymph glands and its functions; Lymph - Composition and functions.

Unit 4: Cardio-vascular System

[7L]

Heart - Structure and functions, cardiac cycle, conduction system of the heart, ECG and its significance. Regulation of Cardio-vascular System. Disorders – Tachycardia, Bradycardia, Angina pectoris, myocardial infarction.

Unit 5: Excretory system**[8L]**

Organs of Excretion – Structure and functions of kidney, ureter, urinary bladder, urethra. Mechanism of urine formation, composition of urine, Micturition. Role of kidney in maintaining pH of blood. Acid-base balance. Disorders and Diseases – nocturnal enuresis, polyurea, diuresis, uremia, hematuria, nephritis.

Unit 6: Respiratory system**[7L]**

Upper respiratory passages – nasal cavities, pharynx, larynx and trachea. Lungs – Structure and functions, Lung capacity, Respiratory Quotient. Exchange and Transportation of respiratory gases. Oxygen dissociation curve, mechanism of breathing. Neural and Chemical Regulation of respiration. Role of haemoglobin and buffer systems. Disturbances in respiration – Apnea, Dyspnea, Hypoxia. Diseases – Bronchitis, Tuberculosis, Pneumonia, Asthma.

Text/ Reference Books:

1. Meyer B J, Meij H S and Meyer A C., Human Physiology, AITBS Publishers and Distributors.
2. Wilson, K.J.W and Waugh, A. (1996): Ross and Wilson, Anatomy and Physiology in Health and Illness, 8th Edition, Churchill Livingstone.
3. Ranganathan, T.S. (2004): A Textbook of Human Anatomy, Chand & Co. N.Delhi.
4. Jain, A.K., Textbook of Physiology, Vol. I and II, Avichal Publishing Co., New Delhi.
5. Chatterjee C.C. (1987): Human Physiology, Vol. I & II, Medical Allied Agency, Calcutta.
6. Guyton, A.G. and Hall, J.B. (1996): Text Book of Medical Physiology, (9th Edition, W.B. Sanders Company, Prism Books (Pvt.) Ltd., Bangalore

CC 4 Lab: Human Physiology -I lab

1. Microscopic study of different tissues - Epithelial, connective, muscular & nodes of Ranvier
2. Microscopic study of digestive organs – Oesophagus, stomach, small intestine, large intestine, liver, Pancreas.
3. Microscopic study of respiratory organs - Lung, trachea
4. Microscopic study of excretory system - Kidney
5. Blood Grouping
6. Microscopic examination of prepared slides - Fresh mount of blood and stained blood smear
7. Identification of WBCs.

Third Semester
CC 5: Human Physiology -II

Course Objectives:

1. The students will be able to outline the basic parts of the nervous system and define the various diseases of the nervous system.
2. The students will be able to summarise the structure and functions of the different sense organs like eyes, ears, skin etc.
3. The students will be able to classify the hormones of the endocrine system and develop an understanding of the various hormonal disorders due to over-secretion and under-secretions from the endocrinal glands.
4. The students will be able to analyse the structure and function of the male and the female reproductive systems, also understand the physiology of lactation.
5. The students will be able to illustrate the structure and functions of the skeletal system, also identify and explain the various disorders of bones and muscles.

Course Contents:

Unit 1: Nervous system

[9L]

Central nervous system - Brain and spinal cord – structure and function. Blood-Brain Barrier, Cerebrospinal fluid. Peripheral nervous system - cranial and spinal nerves.

Autonomic nervous system – parasympathetic and sympathetic system – conduction of nerve impulse, synapse, reflex arc, reflex action. Synaptic transmission and neurotransmitters. Diseases and Disorders - insomnia, Alzheimer’s disease, schizophrenia, hydrocephaly, meningitis.

Unit 2: Sense organs

[9L]

Eye – Structure and functions. Physiology of vision. Defects in vision – myopia and hypermetropia, astigmatism. Diseases, glaucoma, cataract. Ear – Structure and functions. Nose – Structure and functions, Sinusitis. Tongue - Structure and functions. Skin – Structure and functions.

Unit 3: Endocrine system

[9L]

Hormones –Classification. Cell surface receptor and intracellular receptor. Endocrine glands - Pituitary, Thyroid, Parathyroid, Pancreas (endocrine function), Adrenal – Their structure and functions. Disorders of over and under secretion.

Unit 4: Reproductive system

[9L]

Male reproductive system – Structure and functions. Spermatogenesis. Female reproductive system – Structure and functions. Oogenesis. Menstrual cycle, Puberty, Menopause. Fertilization, Development of fertilized ovum (Brief account) – Placenta and its functions – Parturition. Hormonal control of reproduction. Physiology of lactation – Hormonal control in lactation. Abortion,

Unit 5: Musculoskeletal system

[9L]

Skeletal system – Structure of bone, Functions of the skeletal system. Joints – Types of joints. Muscular system – Functions of the muscles. Muscular contraction. Diseases and disorders - arthritis, osteoporosis, tetany, muscle fatigue

Text/ Reference Books:

1. Meyer B J, Meij H S and Meyer A C., Human Physiology, AITBS Publishers and Distributors.
2. Wilson, K.J.W and Waugh, A. (1996): Ross and Wilson, Anatomy and Physiology in Health and Illness, 8th Edition, Churchill Livingstone.
3. Ranganathan, T.S. (2004): A Textbook of Human Anatomy, Chand & Co. New Delhi.
4. Jain, A.K., Textbook of Physiology, Vol. I and II, Avichal Publishing Co., New Delhi.
5. Chatterjee C.C. (1987): Human Physiology, Vol. I & II, Medical Allied Agency, Calcutta.
6. Guyton, A.G. and Hall, J.B. (1996): Text Book of Medical Physiology, (9th Edition, W.B. Sanders Company, Prism Books (Pvt.) Ltd., Bangalore

CC 5 Lab: Human Physiology -II Lab

1. Blood count - red blood corpuscles count
2. Blood count - white blood corpuscles count
3. Determination of coagulation time.
4. Recording blood pressure using sphygmomanometer, effect of exercise on pulse rate, and blood pressure.
5. Microscopic structure of various glands – Thyroid, pituitary, adrenal
6. Microscopic structure of reproductive organs – Ovary, uterus, mammary gland, testis

CC 6: Basic Nutrition through life cycle

Course Objectives:

1. The students will be able to understand the importance of RDA and other equations approved by ICMR for assessment of nutritional status.
2. The students will be able to understand the nutritional needs and formulate diet plan for infants and toddlers.
3. The students will be able to understand the nutritional needs and formulate diet plan for school-going children and adolescents.
4. The students will be able to understand the nutritional needs and formulate diet plan for adults.
5. The students will be able to understand the nutritional needs and formulate diet plan for pregnant and lactating women.
6. The students will be able to understand the nutritional needs and formulate diet plan for elderly people.

Course Contents:

Unit 1: Basic principles of meal and menu planning [6L]

Understanding Nutrition, Balanced diet, food groups, food exchange list, Food composition table, Nutritional requirements and RDA - concept, planning of balanced diet. Factors to be considered in meal/menu planning. Indian meal patterns - vegetarian & non-vegetarian. Nutritive value of common Indian recipes.

Unit 2: Nutrition during infancy and early childhood [8L]

Infancy - Growth and development, nutritional requirements, breast feeding, infant formula. Introduction of supplementary foods.
Early childhood. (Toddlers and Preschoolers) - Growth and nutrient needs, nutrition related problems,

Unit 3: Nutrition for school children and adolescents [8L]

School children - Nutritional requirements, Importance of snacks, school lunch. Adolescents - Growth, Nutrient needs, food choice, eating habits, factors influencing needs.

Unit 4: Nutrition during adulthood [8L]

Nutritional requirements in adulthood.

Unit 5: Nutrition in pregnancy and lactation**[10L]**

Pregnancy - Physiological stages of pregnancy, nutrition requirements, food selection and complications of pregnancy.

Lactation - Physiology of lactation, nutritional requirements.

Unit 6: Geriatric nutrition**[5L]**

Nutrient needs, nutrition related problems, Factors affecting food intake and nutrient use

Text/ Reference Books:

1. Mahan, L.K. Arlin, M.T. Krause's Food, Nutrition and Diet Therapy, 8th Ed. W.B. Saunders Company, London
2. Srilakshmi, B. (2005): Dietetics, V Edition, New Age International (P) Ltd, Publishers, Chennai
3. Shubangini A Joshi, (1998): Nutrition and Dietetics, Tata Mc Graw Hill Pub. Co. Ltd., New Delhi.
4. Williams S.R. Nutrition and Diet Therapy, 6th Ed. Times Mirror / Mosby College Publishing, St. Louis.
5. Raheena Begum. A Test Book of Foods, Nutrition and Dietetics, Sterling Publishers, New Delhi.
6. Robinson, C.H., Lawler, M.R., Chenoweth, W.L., and Garwick A.E. Normal and Therapeutic Nutrition, 17th Ed., Macmillan Publishing Co.
7. ICMR-NIN: Nutrient requirements for Indians, 2020
8. ICMR-NIN: Indian Food Composition Tables, 2017
9. NIN: Dietary Guidelines for Indians – A manual

CC 6 Lab: Basic Nutrition through life cycle lab

1. Standardization of common recipes with their yield
2. Steps of preparing an Exchange list
3. Eye estimation of food stuffs
4. Supplementary feeding - Preparation of weaning foods
5. Planning and preparation of diet for toddler and pre-schoolchild
6. Planning and preparation of diet for schoolchildren/adolescents
7. Planning and preparation of diet for adult men and women, during different activities viz. sedentary, moderate, heavy worker
8. Planning and preparation of diet for pregnant and nursing mother
9. Planning and preparation of diet for older adults

Fourth Semester
CC 7: Medical Nutrition Therapy I

Course Objectives:

1. The students will be able to understand the importance of basics of medical nutrition therapy.
2. The students will be able to understand the importance of routine hospital diets and feeding.
3. The students will be able to understand the nutritional needs and formulate diet plan for both obese and underweight individuals.
4. The students will be able to understand the nutritional needs and formulate diet plan for patients suffering with infectious diseases.
5. The students will be able to understand the nutritional needs and formulate diet plan for individuals suffering with specific food allergies.
6. The students will be able to understand the nutritional needs and formulate diet plan for individuals suffering with deficiency diseases.

Course Contents:

Unit 1: Basics of Medical Nutrition Therapy [7L]

Concept and principles of Medical Nutrition Therapy. Therapeutic adaptation of normal diets. Role of dietitian in hospital and community.

Unit 2: Routine hospital diets and feeding [10L]

Diet Prescription, Regular diet, light diet, soft diet, fluid diet. Mode of Feeding: Oral Feeding, Enteral feeding - tube feeding. Parenteral Feeding - Central and peripheral, Assessment of patient needs (Definition and Concept).

Unit 3: Diet in obesity and underweight [7L]

Identification of overweight and obese- Aetiological factors contributing to obesity and prevention. Complications of obesity. Treatment – Low Energy diets, behavioral modification. Underweight – aetiology and assessment. Treatment - high energy diets.

Unit 4: Diet in Infections [7L]

Fever and infections – aetiology, symptoms, diagnostic tests and dietary management.

Unit 5: Diet in Allergy [7L]

Diet in Allergy - Definition, Symptoms, diagnostic tests and dietary management in allergy. Elimination diet and desensitization.

Unit 6: Diet in relation to deficiency diseases [7L]

Pathogenesis and dietary management in Nutritional Anemia, PEM, Vitamin A deficiency.

Text/ Reference Books:

1. Mahan, L.K. and Escott-Stump, S. Krause's Food, Nutrition and Diet Therapy, 10th Ed. W.B.SaundersCompany,London.
2. Srilakshmi. B, (2005): Dietetics, V Edition, New Age International (P) Ltd, Publishers, Chennai
3. Williams S.R. (1993): Nutrition and Diet Therapy, 7th Ed. Times Mirror / Mosby College Publishing,St. Louis.
4. Antia F.P, Clinical Dietetics and Nutrition, Oxford UniversityPress.
5. Shills, M.E, Oslon, J.A, Shike, M and Ross, A.C. (1999): Modern Nutrition in Health and Disease, 9thEdition.
6. ICMR-NIN: Nutrient requirements for Indians, 2020
7. ICMR-NIN: Indian Food Composition Tables, 2017
8. NIN: Dietary Guidelines for Indians – A manual

CC 7 Lab: Medical Nutrition Therapy I Lab

1. Planning and preparation of clear fluid diet, full fluid diet and soft diet.
2. Planning and preparation of diet for overweight/obesity
3. Planning and preparation of diet for underweight
4. Planning and preparation of diet for iron deficiency anaemia
5. Planning and preparation of diet for vitamin A deficiency
6. Planning, preparation of diet for Fever and infections; Viral fever, Typhoid, Tuberculosis
7. Planning, preparation of diet for Food and/or Drug Allergy

CC 8: Food Microbiology

Course Objectives:

1. The students will be able to discover the basic introduction of microbiology.
2. The students will be able to identify the morphology of different microorganisms.
3. The students will be able to understand spoilage and contamination of various food products.
4. The students will be able to assess microbial intoxications and infections.
5. The students will be able to identify the concept, methods and processes of sterilization and disinfection in controlling microorganisms.
6. The students will be able to discuss the relevance of microbiological standards for food safety (food hygiene and sanitation).

Course Contents:

Unit 1: Introduction to microbiology

[7L]

Brief history of microbiology - Louis Pasteur, Robert Koch, Edward Jenner. Pure culture techniques and maintenance of cultures.

Unit 2: Morphology of microorganisms

[10L]

Classification, growth and multiplication, growth curve. Effects of environmental factors on growth of microorganism - pH, water activity, redox potential, temperature, oxygen, time and nutrients present in the substrate.

Characteristics - Bacteria, Fungi - *Mucor*, *Rhizopus*, *Aspergillus*, *Penicillium*. Yeasts - *Saccharomyces*. Algae - chlamydomonas, spirogyra. Animal viruses and Bacteriophages - classification and replication. Protozoa - *Entamoeba histolytica*, *Paramecium*, *Plasmodium*.

Role of microorganisms in food processing and product development. Beneficial effect of bacteria, fungi algae and yeasts.

Unit 3: Microbiology of different foods

[7L]

Sources of contamination and spoilage of: Cereal and cereal products like bread, flour and bakery products; Sugar and sugar products like honey, maple syrup and candies; Vegetables and fruits; Meat products like sausage, bacon and ham, fish, egg and poultry; Milk and its products; Canned foods.

Food poisoning and food borne infection.

Unit 4: Microbial intoxication and infections

[7L]

Sources of contamination of food, toxin production and physiological action, sources of infection of food by pathogenic organisms, symptoms and method of control.

Most common food borne pathogens and disease: *Norovirus*, *Salmonella*, *Clostridium perfringens*, *Campylobacter*, *Staphylococcus aureus*, *Clostridium botulinum* (botulism), *Listeria*, *Escherichia coli* (*E. coli*), *Vibrio cholerae* (In brief)

Unit 5: Control of microorganisms

[7L]

Concepts of sterilization and disinfection, methods of sterilization and disinfection. Common disinfectants used in home and at industries. Tests to identify the effectiveness of sterilization and disinfection. Normal microbiological criteria for food consumption, testing milk and water for

quality.

Unit 6: Food hygiene and sanitation

[7L]

Importance of food hygiene and sanitation with relevance to food industry. General principles of food hygiene in rural and urban areas in relation to food preparation, processing, packaging, storage and transport and personal hygiene. Hygiene and sanitation with relevance to the physical structures of the site and building.

Text/ Reference Books:

1. Frazier W C., (2002): Food Microbiology, Mc Graw Hill Book Co., 6th edition, N.Delhi.
2. Pelczar, M.I and Reid, R.D, (1993): Microbiology, 5th edition, McGraw Hill Book Company, New York.
3. Lansing M. Prescott: Microbiology, McGraw Hill Higher Education; 5th edition
4. Jay, James, M (2000): Modern Food Microbiology, 2nd edition, CBS Publisher.

CC 8 Lab: Food Microbiology Lab

1. Microscopic identification of microorganisms (prepared slides).
2. Preparation of culture media and sterilization techniques.
3. Isolation of pure culture – Streak plate method, Serial dilution method.
4. Hanging drop preparation for motility of bacteria.
5. Staining of bacteria – simple staining using Methyl violet, methylene blue, carbol fusion.
6. Staining of Bacteria- Gram-staining.
7. Microbiology of air.
8. Microbiology of water.
9. Microbiology of soil.
10. Microbiological analysis of processed food.
11. Microbiological analysis of unprocessed food.
12. Testing quality of milk – Detection of Acidity (Clot on Boiling test, Alcohol test), Direct microscopic count, Standard plate count, Methylene Blue Reductase test, Phosphatase test, Turbidity test.

Fifth Semester

CC 9: Basics of molecular biology

Course Contents:

Unit 1: Introduction to Molecular Biology

[7L]

DNA and RNA Scope and History. Structure of DNA-Nucleoside, Nucleotide, Base pairing, Base stacking, Double Helix, features of Watson and Crick model, major and minor groove. Forms of DNA- A, B, Z. Structure and function of mRNA, rRNA, tRNA. Secondary structures in RNA.

Unit 2: Replication

[8L]

Types and functions of DNA polymerases in Prokaryote and Eukaryote. Replication in prokaryote and Eukaryote. Proof reading activity, 5'→3' exonuclease activity, topoisomerase activity, Telomeric DNA replication (in brief) and Plasmid Replication-theta model.

Unit 3: DNA Damage and Repair

[7L]

DNA damage, Mutation, DNA Repair- Nucleotide excision repair, base excision repair, mismatch repair, photo- reactivation.

Unit 4: Transcription and Post Transcriptional Modifications

[8L]

Fine structure of prokaryotic and eukaryotic gene. RNA polymerases in prokaryote and eukaryote, types and function. Transcription of mRNA, rRNA, and tRNA genes in Prokaryote (in brief). Post transcriptional processing of mRNA (in brief).

Unit 5: Translation and Post Translational modification

[7L]

Genetic code and Wobble hypothesis. Translation in prokaryote and eukaryote. Post translational modifications.

Unit 6: Nutrigenomics and gene-nutrient interaction

[8L]

Nutrigenomics: Scope and Importance to Human Health and Industry. Transporter gene polymorphisms -interaction with effects of micronutrients in humans. Nutrigenomics approaches to unravelling physiological effects of complex foods. The intestinal microbiota - role in nutrigenomics Modulating the risk of cardiovascular disease, diabetes obesity.

Text/ Reference Books:

1. James D. Watson, Tania A. Baker, Stephen P. Bell, Alexander Gann, Michael Levine and Richard Losick. Molecular Biology of the Gene. Pearson Benjamin Cummings; 7th edition
2. H. Lodish, A. Berk, S. L. Zipursky, M. P. Scott and J. Darnell, Molecular Cell Biology, 4th Ed. W. H. Freeman & Co., 2003.
3. B. Lewin, Genes VIII, International Edition, Pearson Education, 2004.

CC 9 Lab: Basics of molecular biology lab

1. Isolation of chromosomal DNA from bacterial cells.
2. Isolation of genomic DNA from plant
3. Bacterial transformation.
4. Isolation of Plasmid DNA by alkaline lysis method
5. Agarose gel electrophoresis of genomic DNA & plasmid DNA

CC 10: Medical Nutrition Therapy II

Course Objectives:

1. The students will be able to understand the nutritional needs of individuals suffering with diseases of the gastro intestinal tract and formulate dietary plan.
2. The students will be able to understand the nutritional needs and formulate diet plan for individuals suffering from cardiovascular diseases.
3. The students will be able to understand the nutritional needs and formulate diet plan for patients suffering with kidney diseases.
4. The students will be able to understand the nutritional needs and formulate diet plan for individuals suffering with diabetes.
5. The students will be able to understand the nutritional needs and formulate diet plan for individuals suffering with liver diseases.

Course Contents:

Unit 1: Diseases of the gastro intestinal tract and related diet

[9L]

Etiologic factors, symptoms, diagnostic tests and dietary treatment for Esophagitis and hiatus hernia, Diarrhoea and Constipation – high and low fiber diet. Gastritis, Peptic Ulcer and Ulcerativecolitis. Malabsorption Syndrome –Celiac Sprue – Gluten restricted diet, Steatorrhoea-Fat restricted diet.

Unit 2: Diseases of cardio vascular system and related diet

[9L]

Aetiological factors, symptoms, diagnostic tests and dietary treatment for Atherosclerosis, Ischemic Heart Disease, Congestive Cardiac Failure, Hypertension-DASH diet, High fibre, low fat, Sodium restricted diet.

Unit 3: Diseases of the kidney and related diet

[9L]

Aetiological factors, symptoms, diagnostic tests and dietary management of kidney diseases (Acute and chronic). Low Sodium and low potassium diet. Use of Sodium and Potassium exchangelists.

Unit 4: Disease of the pancreas and related diet

[9L]

Diabetes Mellitus - Classification, Aetiological factors, symptoms, diagnostic tests, metabolic changes and complications, Dietary management of Type-II DM, Glycemic Index and glycemeload.

Unit 5: Disease of liver and related diet

[9L]

Liver - Aetiological factors, symptoms, diagnostic tests and dietary management for Viral Hepatitis.

Text/ Reference Books:

1. National Institute of Nutrition, (2005): Dietary Guidelines for Indians – A Manual, Hyderabad.
2. Srilakshmi. B, (2005): Dietetics, V Edition, New Age International (P) Ltd, Publishers, Chennai.
3. Mahan, L.K. and Escott-Stump, S. (2000) Krause's Food, Nutrition and Diet Therapy, 10 Ed. W.B. Saunders Company, London.
4. Williams S.R. (1993): Nutrition and Diet Therapy, 7 St. Louis. Ed. Times Mirror / Mosby College Publishing,
5. Antia F.P, Clinical Dietetics and Nutrition, Oxford University Press.
6. Shills, M.E, Oslon, J.A, Shike, M and Ross, A.C. (1999): Modern Nutrition in Health and Disease.
7. ICMR-NIN: Nutrient requirements for Indians, 2020
8. ICMR-NIN: Indian Food Composition Tables, 2017
9. NIN: Dietary Guidelines for Indians – A manual

CC 10 Lab: Medical Nutrition Therapy II Lab

1. Planning and preparation of diet for:
 - i. Hypertension and atherosclerosis, Congestive Cardiac Failure, DASH Diet
 - ii. Diabetes Mellitus.
 - iii. Viral hepatitis.
 - iv. Peptic ulcer, constipation and celiac sprue.
 - v. Acute Kidney Infection
2. Estimation of Blood Glucose level using kit.
3. Estimation of Total Cholesterol and Triglyceride level using kit.
4. Development of IEC materials for CVD, CKD, Diabetes Mellitus

CC 11: Public Health Nutrition

Course Objectives:

1. The students will be able to understand the concept and scope of public health nutrition.
2. The students will be able to identify and assess the various nutritional problems prevailing in a community and employ methods for rectification.
3. The students will be able to understand the concepts of nutritional epidemiology.
4. The students will learn the importance and role of several national/international agencies.
5. The students will learn about the various methods for assessing nutritional status and identify at-risk individuals.

Course Contents:

Unit 1: Concept and scope of public health nutrition

[9L]

Nutritional status of community. Meaning, need, objectives and importance of nutritional assessment. Role of nutrition and health in national development. Methods of assessing nutritional status:

- a) Sampling techniques, Identifications of risk groups.
- b) Direct assessment - Diet surveys, anthropometric, clinical and biochemical estimation.
- c) Indirect assessment- Food balance sheet, chemical estimation, ecological parameters and vital statistics.

Unit 2: Nutritional problems of the community and improvement methods

[9L]

Common nutritional problems in India - Causes - Nutritional and non-nutritional. Incidence of nutritional problems, signs and symptoms, treatment – PEM, Micro-nutrient deficiencies (Vitamin A, Iron, Iodine), Fluorosis, Obesity.

Improvement of nutrition of a community:

- a) Modern methods for improvement or nutritional quality of food: food fortification, food enrichment and nutrient supplementations.
- b) Nutrition education themes and messages in nutrition and health, Antenatal and postnatal care.

Unit 3: Nutritional epidemiology

[9L]

Identification of problem, analysis of causes, Methods of dietary data on the household level, national level and food consumption pattern of individual (prospective method and retrospective method) advantage and disadvantage of the methods. Biological markers for food intake. Validation of data, their interpretation. Methods of prevention, setting a strategy, implementations and evaluation of the programme.

Unit 4: Function of important agencies and nutritional welfare programme [9L]

National and International agencies in uplifting the nutritional status -WHO, UNICEF, CARE, ICMR, ICAR, CSIR, CFTRI. Various nutrition related welfare programmes, ICDS, Mid-day Meal, NIDDCP, Vitamin A prophylaxis program and nutritional anemia control program.

Unit 5: Nutritional Assessment Methodologies [9L]

Diet Surveys: need, importance, methods, interpretation, concept of consumption unit, verifying the adequacy of the diet with respect to RDA. Diet survey by i) weighment of raw food method, ii) 24 hours dietary recall method, iii) Food frequency questionnaire method.

Clinical signs, biochemical and biophysical methods: need, importance, identifying signs of deficiencydiseases, interpretation of the clinical signs, biochemical and biophysical values in major diseases.

Anthropometry: Need, importance, standards for reference, techniques of measuring height, weight, head circumference, chest circumference, mid-arm circumference, skin fold thickness, waist hip ratio, calculation of BMI, interpretation of the measurements, use of growth tables and charts for various agegroups.

Text/ Reference Books:

1. Agarval, A.N.1981: Indian Economy problems of development and planning
2. Shukla, P.K. (1982): Nutritional Problems in India
3. Jelliffle, D.B(1968): Child Health in the tropics.
4. Ghosh, S (1989): You and your child.
5. Misra, S.K. and puri, V.K(1992): Indian Economy
6. Thankamma Jacob (1976): Food Adulteration.
7. Park, J.E. and Park, K (1994): Text book of Preventive and Social Medicine.
8. Prevention of Food Adulteration Act (1994): Govt of India.

CC 11 Lab: Public Health Nutrition Lab

1. Diet Survey and Nutritional Assessments:

- (a) Identification of vulnerable and risk groups.
- (b) Use of anthropometric measurement in children.

2. Preparation of visual aids.

3. Field visit to observe the working of nutrition and health-oriented programs (survey-based result).

4. Estimation of Hemoglobin by Cyanmethemoglobin method

5. Estimation of Iodine in salt.

6. Estimation of Total protein in serum.

7. Estimation of Vitamin A in serum using kit.

Sixth Semester

CC 12: Nutraceuticals, Functional Foods and Nutrigenetics

Course Objectives:

1. The students will be able to define functional foods and nutraceuticals.
2. The students will be able to understand the chemistry and physiological effects of functional foods and nutraceuticals.
3. The students will be able to understand the role of selected functional food and nutraceuticals in health promotion and disease prevention and treatment.
4. The students will be able to define the increasing role of nutraceuticals and functional foods in future in the management of diseases.
5. The students will be able to interpret the gene-diet interaction, basic knowledge about nutrigenomics, polymorphism etc.

Course Contents:

Unit 1: Introduction to nutraceuticals and functional food [10L]

Nutraceuticals: Historical perspective, classification, scope & future prospects. Applied aspects of the Nutraceutical Science. Sources of Nutraceuticals.

Functional food: Overview; definition, classification; functional food, functional food science, food technology and its impact on functional food development; markers for development of functional foods; key issues in Indian functional food industry and nutraceutical. Relation of functional foods and nutraceutical (FFN) to foods and drugs

Unit 2: Nutraceuticals against different diseases [10L]

Concept of free radicals and antioxidants; antioxidants role as nutraceuticals and functional foods. Nutraceuticals in treatment for cognitive decline, Nutraceutical remedies for common disorders like Arthritis, Bronchitis, circulatory problems, hypoglycemia, Nephrological disorders, Liver disorders, Osteoporosis, Psoriasis and Ulcers. Brief idea about some Nutraceutical rich supplements e.g., Bee pollen, Caffeine, Green tea, Lecithin, Mushroom extract, Chlorophyll, Kelp and Spirulina.

Unit 3: Nutraceuticals and the Future of Medical Science: [10L]

Increasing role of Nutraceuticals in management of health and diseases, development of designer foods for specific chronic diseases like diabetes, cardiovascular diseases, AIDS and degenerative diseases like Parkinson, functional foods for specific sports, oligosaccharides, dietary fibers of microbial and plant origin as Nutraceuticals of future, Role of changing food preferences and globalization on selection of Nutraceutical products.

Unit 4: Nutrigenomics and gene-diet interaction

[15L]

Basic Knowledge about Genetic Engineering.

Nutrigenomics: Scope and Importance to Human Health and Industry. Transporter gene polymorphisms -interaction with effects of micronutrients in humans. Nutrigenomics approaches to unravelling physiological effects of complex foods. The intestinal microbiota - role in nutrigenomics Modulating the risk of cardiovascular disease, diabetes obesity.

Text/ Reference Books:

1. Handbook of Nutraceuticals and Functional Foods Edited by Robert E.C. Wildman, RoutledgePublishers.
2. Nutraceuticals by L. Rapport and B. Lockwood, Pharmaceutical Press.
3. Methods of Analysis for Functional Foods and Nutraceuticals Edited by W.Jeffrey,
4. Hursts, Routledge Publishers.
5. Functional foods, designer foods, pharma foods, Nutraceuticals, Israel Goldberg
6. (Ed.), Aspen publishers Inc., Gaithersburg, Maryland, USA,1999.
7. TA Brown. GENE Cloning
8. Journal Nutrients 2012, 4, 1898-1944; Molecular Nutrition Research—The Modern Way ofPerforming Nutritional Science.
9. Journal Nutrients 2013, 5, 32-57; Nutrigenetics and Metabolic Disease: Current Status andImplications for Personalized Nutrition
10. J Nutrigenetics Nutrigenomics 2011; 4:69–89; Nutrigenetics and Nutrigenomics: Viewpoints onthe Current Status and Applications in Nutrition Research and Practice.
11. J Am Diet Assoc. 2006; 106:569-576; Nutrigenomics: From Molecular Nutrition to Preventionof Disease.
12. The Journal of Nutrition; Nutritional -Omics|| Technologies for Elucidating the Role(s)ofBioactive Food Components in Colon Cancer Prevention.

CC 12 Lab: Nutraceuticals, Functional Food and Nutrigenetics Lab

1. Quantification and Analysis of Functional food/ Nutraceutical product (Any Four)
 - a. Rich in Vitamins
 - b. Rich in Minerals
 - c. Rich in proteins
 - d. Rich in carotenoids and vitamin A
 - e. Rich in medicinally important secondary metabolites
 - f. Rich in antioxidants
2. Demonstration of the following:
 - a. Demonstration of PCR
 - b. Plasmid DNA and Genomic DNA isolation.

- c. Preparation of restriction enzyme digests of DNA samples.
3. To prepare a market survey report on the any one Nutraceutical functional food-product.

CC 13: Food Preservation, Safety and Quality Control

Course Objectives:

1. The students will be able to learn about the physiology of work and exercise.
2. The students will be able to understand the physiological basis of work.
3. The students will be able to learn about the concept of exercise, physical activity and physical fitness.
4. The students will be able to learn about the bioenergetics of sports: work power, energy, and sources of energy.
5. The students will be able to learn about the training principles, different training methods and application of the principles.
6. The students will be able to interpret the principles of dietetics in formulating diets for athletes.

Course Contents:

Unit 1: Food Additives:

[10L]

- i. Food Preservatives
- ii. Food colours
- iii. Emulsifiers and stabilisers
- iv. Thickening Agents
- v. Flavours and flavour enhancers.
- vi. Anti-oxidants
- vii. Chelating Agents
- viii. Flour Improver
- ix. Leavening Agent.
- x. Humectants and anti-caking agents.
- xi. Non-nutritive sweeteners.

Unit 2: Food Preservation

[10L]

- i. Basic principles of food preservation- Asepsis, removal of microorganisms and antibiotic conditions

- ii. Preservation using high temperature, canning, TDT, heat resistance of micro-organisms and spores, heat resistance TDT curves.
- iii. Low temperature freezing: Growth of microorganisms at low temperature and effect of sub-freezing and freezing temperature on microorganisms.
- iv. Drying (dehydration)- Methods, factors in control of drying treatment of food before and after. Microbiology of dried and intermediate moisture foods.
- v. Chemical preservation
- vi. Advantages & Disadvantages of different food preservation methods.

Unit 3: Adulteration in food and food safety

[10L]

- i. Basic knowledge of common food adulterants in (i) Spices ii) Grains iii) Coffee iv) Tea v) Oil fats vi) Milk
- ii. Aspects of food safety- HACCP, GMP, Agmark (Meaning, Quality evaluation, steps involved, Implementation and problem), role of ISI
- iii. Concept of sanitation and hygienic production of food:

Unit 4: Food quality and quality control

[8L]

Meaning, objectives, important considerations, principles of – quality control of food, raw material and inspection of finished products. Factors influencing microbial association with foods, control of microflora at different stages of processing. Total Quality Management (TQM) - Parameters, evolution, elements TQM, need for TQM and of implementation of TQM in the food industries.

Unit 5: Index of nutritional quality (INQ)

[7L]

Need for INQ, INQ as an evaluating tool in the food industry, nutrition labelling of foods. Methods of assessing food quality - Cereals and Pulses, fruits and vegetables, milk, meat and its products, egg, Oils, fats, nuts and oilseeds.

Text/ Reference Books:

1. Park K, (2005): Park's Textbook of Preventive and Social Medicine, Banarsidas BhanotPub., Jabalpur.
2. Srilakshmi. B, (2005): Dietetics, V Edition, New Age International (P) Ltd, Publishers,Chennai.
3. Jelliffe D, (1996): Assessment of Nutritional Status on the Community – WHO Monograph, SeriesNo.53, Geneva.
4. Gupta P and Thakhar R, (2003): Nutritional Disorder and Community Health, Pointer Publishers,Jaipur.
5. Dr. Swaminathan.M, Food and Nutrition,2 Publishing. Edition 1985, Reprint 2006. The Bangalore Printing and Publishing Co.
6. Whitney,E.N. and Rolfes, S.R Understanding Nutrition, 10 Publishing company, Belmont.CA edition 2005 Thomson/Wadsworth.

CC 13 Lab: Food Preservation, Safety and Quality Control Lab

1. Detection of common adulterants in food:
 - i. Milk and milk products,
 - ii. Oil and fat,
 - iii. Food grain and their products,
 - iv. Tea and coffee
 - v. Fish
 - vi. Spices (turmeric and red chilli)
2. Quality criteria for milk – a) MBRT b) Clot on boiling
3. Interpretation of label for locally available food products through market survey.

CC 14: Sports Physiology and Nutrition

Course Objectives:

1. The students will be able to learn about the physiology of work and exercise.
2. The students will be able to understand the physiological basis of work.
3. The students will be able to learn about the concept of exercise, physical activity and physical fitness.
4. The students will be able to learn about the bioenergetics of sports: work power, energy, and sources of energy.
5. The students will be able to learn about the training principles, different training methods and application of the principles.
6. The students will be able to interpret the principles of dietetics in formulating diets for athletes.

Course Contents:

Unit 1: Introduction to work physiology: [7L]

Definitions in work and exercise Physiology, Fundamental concepts of work; work characteristics, work cycle and work pauses (Work-rest cycle).

Unit 2: Physiological basis of work: [7L]

Physical work load; Static and dynamic work. Physiological responses to static and dynamic work. Relationship between oxygen consumption and heart rate. Physiological assessment of work load, cardiovascular and respiratory indices for evaluating work load.

Unit 3: Exercise and Physical fitness: [7L]

Basic concept of Exercise, physical activity and physical fitness. Physical Working Capacity, concept of maximal physical working capacity VO_2 max, and its estimation by different methods. Factors affecting VO_2 max. Effect of exercise and training on cardiovascular system. Effect of exercise and training on respiratory system. Effect of exercise and training on muscular system. Physiological concept of physical fitness, warming up, conditioning and fatigue. Types of assessment of health and fitness of athletes.

Unit 4: Bioenergetics: [8L]

Work power and energy, sources of energy. Aerobic and anaerobic capacity, EPOC, lactate threshold and lactate tolerance and their limitations. Determination of energy cost by direct and indirect

methods. Athletic performance based on aerobic capacity and O₂ debt. Energy sources during exercise (Phosphagen, Anaerobic system and aerobic system).

Unit 5: Training Principles:

[8L]

Training principles, different training methods. Training principles for different sporting activities. Over-training and de-training and their physiological effects.

Unit 6: Nutrition and Optimal Performance:

[8L]

Dietary and nutritional recommendations for sports (Energy nutrients, Vitamins, minerals, fluid and electrolytes). Micro and macronutrient nutrient supplements, small introduction on ergogenic aids Nutritional allowances as given by NIN to different groups of players. Pre-competition, during competition and post- competition meal.

Text/ Reference Books:

1. Essentials of exercise physiology. McArdle, W. D., Katch, F. I., & Katch, V. L. (2006). Lippincott Williams & Wilkins.
2. Nancy Clark's sports nutrition guidebook. Clark, N. (2019). Human Kinetics.
3. Exercise Physiology Fitness and Sports Nutrition Srilakshmi, B., Suganthi, V., & Ashok, C. K. (2017). New Age International (P) Limited.
4. The complete guide to sports nutrition. Bean, A. (2022). Bloomsbury Publishing.

CC 14: Sports Physiology and Nutrition Lab

1. Measurement of resting and working heart rate using thirty beats and ten beats methods respectively. Measurement of blood pressure before and after exercise.
2. Determination of BMI, BSA, PI, waist hip ratio, body fat percentage and body type.
3. Recording of heart rate and blood pressure during static and dynamic work, determination of workload from heart rate and cardiac indices and classification of work load.
4. Preparation of meal for different sports category.

Seventh Semester

CC 15: Patient counselling technique and skill

Course Objectives:

1. The students will be introduced to the concept of counselling as a profession.
2. The students will imbibe the qualities of a good counsellor by learning the various techniques of counselling.
3. The students will be able to understand and apply the skill sets of a sound nutritional counsellor to become a successful nutritionist.
4. The students will be able to inculcate communication skills which will help them in taking up nutrition counselling as a profession.

Course Contents:

Unit 1: Introduction **[10L]**

- a) Meaning and goals
- b) Counselling as a profession: training, skills and ethics
- c) The effective counsellor: personality and self of the counsellor
- d) Counselling process and relationship

Unit 2: Techniques of Counselling **[11L]**

- a) Psychoanalytic techniques
- b) Humanistic approaches
- c) Behavioral techniques
- d) Cognitive techniques

Unit 3: Counselling and educating patient **[12L]**

- a) Introduction to nutrition counselling
- b) Determining the role of nutrition counsellor
- c) Responsibilities of the nutrition counsellor
- d) Practitioner v/s client managed care
- e) Conceptualizing entrepreneur skills and behaviour
- f) Communication and negotiation skills.

Unit 4: Practical consideration in giving dietary advice and counselling - **[12L]**

- a) Factors affecting and individual food choice.
- b) Communication of dietary advice
- c) Consideration of behavior modification
- d) Motivation.

Text/ Reference Books:

1. Jee Curroie, Bare Foot Councillor, Bangalore.
2. Morgan and King – Introduction to Psychology
3. Briany Thomas (ed) Manual of Dietetic Practice. 1986, Published by British Dietetic Association

CC 15 Lab: Patient counselling technique and skill Lab

Teaching aids used by dietitians-

Preparation of charts, leaflets, posters etc., preparation of teaching material for patients suffering from Digestive disorders, Hypertension, Diabetes, Atherosclerosis & Hepatitis and cirrhosis.

Project in the areas of patient counselling technique and skill

CC16: Advanced Nutritional Science

Course objectives:

1. The students will be able to summarise the concept of macro and micro nutrients and their different functions also develop an understanding of the Emerging Concepts in Human Nutrition.
2. The students will be able to outline the concepts of major physiological systems of the human body like the digestive system, endocrine system, immune system etc.
3. The students will be able to understand and apply the concept of Recommended Dietary Allowance, learn about the Factors affecting RDA and the General principles of deriving RDA.
4. The students will be able to illustrate the concept of Total Energy Requirement and Basal Metabolic Rate (BMR).
5. The students will be able to learn and analyse nutrition in special conditions like nutrition in space, nutrition under stress, nutrition in high altitudes which will help them to handle special situations 'therapeutically'.

Course Contents:

Unit 1: Nutritional biochemistry:

[10L]

Macro nutrients (Carbohydrates, Protein, Fat): Metabolism and regulation, Digestion, Absorption, Transport and storage.

Micro nutrients (Vitamins): Fat soluble and Water-soluble vitamins- Sources, functions, requirements, Transport, utilization and storage, metabolites, deficiencies and toxicity.

Micro nutrients (Minerals: Sodium, Potassium, Magnesium, Calcium, Phosphorous, Iron, Zinc, Fluorine and Iodine)- Metabolic functions, sources, regulation (Homeostatic balance), Absorption, storage and transport, recommended dietary allowances, effect of deficiency and Toxicity due to over load.

Importance of water and roughage in diet. Water & electrolytes balance. Regulation of water balance and Acid-Base balance.

Emerging Concepts in Human Nutrition, Ongoing nutrition transition and its implications. Changing trends in life style patterns in population groups and their implications.

Unit 2: Applied physiology:

[10L]

Body Composition: Methods of estimating body composition, Measurement of muscle mass and body fat percentage, Variations in LBM and fat, Influence of nutrition and other factors on body composition.

Digestive System: Mechanism of HCl secretion— physiological, nutritional and pharmacological aspects. Absorption of fat, minerals, vitamins. Bile formation and secretion; Nature of exo- and endopeptidases and their mechanism of action in protein digestion; Role of mucosal associated lymphocytes in health and disease; Neuroendocrine control of hunger and satiety. Physiology of obesity and starvation. The genomics of leptin mediated responses-obesity and its regulation.

Excretory System: Renal mediated maintenance of fluid osmolarity, Respiratory and renal mechanism mediated maintenance of Acid-Base balance. Clinical imbalance of acid-base imbalance.

Endocrine System and Reproductive System: Mechanism of action—Steroid and Protein hormones, Gastro-intestinal hormones: Site of origin, chemical nature and mode of action.

Immune System: Cells and organs of Immune system. Innate immunity and Acquired immunity, Antigen, hapten and allergen. Immunoglobulins- different isotypes. Antigen-Antibody interactions. T cell cytotoxicity. Cell-mediated effectors function, Cytokines, Hypersensitivity reactions. Autoimmunity- autoimmune diseases, Immunodeficiency.

Unit 3: RDA

[6L]

Definitions, recommended dietary Allowances-Factors affecting RDA, General principles of deriving RDA, Determination of RDA of different nutrients, Requirements and practical applications of RDA.

Unit 4: Energy Metabolism:

[9L]

Energy Balance-Units, Direct & Indirect Calorimetry, Determination of energy value of food, Relation between oxygen required and calorimeter value. Total Energy Requirement. Basal Metabolic Rate (BMR): Measurement of Basal Metabolism-Direct, calorimetry and Indirect calorimetry, resting energy expenditure, Factors effecting Physical activity, Factors affecting Basal metabolic Rate, Thermic Effect of Food (Definition and factors affecting), Non-Exercise Activity Thermogenesis – NEAT (Definition and factors affecting).

Unit 5: Nutrition in special condition:**[10L]**

Space nutrition: Classification of space food, processing of food for space flight, planning and serving food, Weight management (Different types of diets in fashion), Nutrition in stress, Nutritional needs in extreme environmental conditions (high altitude), Disaster management (famine, drought, war).

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1. Chattopadhyay Ghosh S and Base N. (2015). UchhaMadhaymikKhadda O Pusti, Calcutta Book House.
2. Raut SK, Mitra K and Chowdhury P. AdhunikPustibigyan, Book India Academic Publishers.
3. Arora K (2008). Theory Of Cookery, Frank Brothers.
4. Srilakshmi B.(2018).Nutrition Science. New Delhi: New Age International.
5. Sahoo S and Sahoo SK. (2016). Pustibigyan, Kolkata: ChayaPrakashani.
6. Sohi D. A Comprehensive Textbook of Nutrition & Therapeutic Diets, New Delhi: Jaypee Brothers Medical Publishers.
7. Mudambi SR and Rajagopal MV.(2012). Fundamentals of Foods, Nutrition and Diet Therapy. 6th ed. New Delhi: New Age International.
8. Roday S. Food Science & Nutrition, Oxford University Press.
9. Mann and Truswell: Essentials of Human Nutrition, Oxford University Press
10. Meyer B J, Meij H S and Meyer A C., Human Physiology, AITBS Publishers and Distributors.
11. Wilson, K.J.W and Waugh, A. (1996): Ross and Wilson, Anatomy and Physiology in Health and Illness, 8th Edition, Churchill Livingstone.
12. Ranganathan, T.S. (2004): A Textbook of Human Anatomy, Chand & Co. N.Delhi.
13. Jain, A.K., Textbook of Physiology, Vol. I and II, Avichal Publishing Co., New Delhi.
14. Chatterjee C.C. (1987): Human Physiology, Vol. I & II, Medical Allied Agency, Calcutta.

CC 16: Advanced Nutritional Science Lab

1. Calculation of BMR and Energy Expenditure.
2. Calculation of Chemical Score and NDP Cal percentage
3. Evaluation of protein quality
4. Planning and evaluation of dishes for supplementary feeding program.
5. Calcium and Nitrogen balance study

CC 17: Advanced Public Health Nutrition

Course objectives:

1. The students will develop an overview of public health.
2. The students will be able learn about the Rural and Urban Health and Nutrition Scenario.
3. The students will be able to gain in-depth knowledge about the functioning of the National Nutrition Policy and Intervention Programmes.
4. The students will be able to learn and apply the various methods of Nutrition, Monitoring and Surveillance.
5. The students will be able to learn about the importance of Food security and the process by which it can be ensured.

Course Contents:

Unit 1: Overview of Public health:

[9L]

Public health set up in the country: National level and State level - Union Ministry of Health and Family Welfare, Director General of Health Services, Indian System of Medicine, Department of Health Research, Directorate of Health, Health and Family Welfare, Directorate of Medical Education: Ministry of Women and Child Welfare. Indian Public Health System Regional level and District level – Role of Regional Director of Health, Regional Districts Hospitals, District Level Hospitals, Sub-divisional/Taluka Level, Community Health Centers Sub-divisional/Mandal Level, in Public Health, PHC Level and sub-centres.

Unit 2: Rural and Urban Health and Nutrition Scenario:

[9L]

Infant and young child feeding – Importance of infant and young child feeding, Supplementary feeding, Growth monitoring and promotion, Breastfeeding promotion. Common Nutritional problems- Undernutrition/overnutrition, Malnutrition (PEM, Vit A, Fe, I), Food fortification, Prophylactic micronutrient supplementation of at-risk groups, Immunization and parasite control.

Unit 3: National Nutrition Policy and Intervention Programmes

[9L]

National Plan of Action on Nutrition, POSHAN Abhiyaan, Integrated Child Development Services, Mid-day meal for school children, Iodine Deficiency Disorder Control Program, National Anaemia Control Programme; National Iron Plus Initiative, Vit A Programme.

Unit 4: Nutrition, Monitoring and Surveillance

[9L]

Definition of Nutrition monitoring and surveillance, Milestones in the development of Nutrition surveillance, –AA approach, monthly monitoring and surveillance report, Nutrition surveillance in the context of ICDS. Nutrition in Disaster Management – Natural and manmade disasters resulting in emergency situations, Nutritional problems in disasters particularly in vulnerable groups.

Unit 5: Food security

[9L]

National food security mission, Food security at the National level, Measures to improve the household food security, National Food Security Act.

REFERENCE BOOKS

1. Chattopaday Ghosh S and Basu N.(2015). Ucca Madhaymik Khadda O Pusti, Calcutta Book House.
2. SrilakshmiB. (2018). Nutrition Science, 6thed. New Delhi: New Age International Publishers
3. Park K (2017). Textbook of Preventive and Social Medicine, 24th Ed. Jabalpur: Bhanot Pub.
4. VVR Seshubabu (2006). Review in Community Medicine, 2nd ed. Hyderabad: Paras Medical Books Publishing Ltd

CC 17: Advanced Public Health Nutrition Lab

Assessment of nutritional status of different age group (Infants, pre-school, children, adolescents, adults & elderly, Pregnant & lactating females)

- a. Learning anthropometric techniques – Recording & interpretation of height, weight, BMI, Fat percentage, waist hip ration, bone mineral density, skin fold thickness, chest, head & mid upper arm circumference, infant weight & length
- b. Measurement of blood pressure, temperature, blood glucose, biochemical assessment to identify deficiency diseases namely PEM, anaemia etc.
- c. Clinical assessment – Identifying clinical manifestations (signs & symptoms) of various nutrition related problems
- d. Dietary survey – Use of different techniques to assess dietary intake of a given population

Eighth Semester

CC 18: Advanced Medical Nutrition Therapy

Course objectives:

1. The students will be able to learn and understand the factors in patient care, counselling and coordinated nutritional services for the patient and study the different nutritional assessment tools for patients (MUST, SGA, MNA etc), also learn about Special feeding methods - Enteral & parenteral feeding.
2. The students will be able to understand the nutritional needs of individuals suffering from different types of infections (fevers), diseases of the gastro intestinal tract, cardiovascular diseases, pulmonary disorders, kidney diseases and liver diseases and formulate suitable dietary plans.
3. The students will be able to understand the nutritional needs and formulate diet plan for neurological disorders (Alzheimer's, Parkinson's, neurological stroke) cancers and burn patients.
4. The students will be able to understand the concept of Drug nutrient interaction.
5. The students will be able to learn Standard guidelines for clinical nutrition (ASPEN/ ESPEN/ KDQOI/WHO/ADA/IDA-2020 etc.)

Course Contents:

| | |
|---|------|
| Unit 1. Factors in patient care, counselling and co-ordinated nutritional services for the patient, feeding the patient, psychological aspects & assessment of patient's needs – Different nutritional assessment tools for patients (MUST, SGA, MNA etc), Special feeding methods - Enteral & parenteral feeding. | [21] |
| Unit 2. Metabolic syndrome- Definition, assessment, significance | [31] |
| Unit 3. Physiological changes & diet for different types of infections (Fever) | [31] |
| Unit 4. Physiological changes & diet for GI disorders and liver disorders | [51] |
| Unit 5. Physiological changes & diet for Cardiac disorders | [31] |
| Unit 6. Physiological changes & diet for pulmonary disorders | [21] |
| Unit 7. Physiological changes & diet for kidney disorders | [31] |
| Unit 8. Physiological changes, specialized feeding techniques, and diet for neurological disorders- (Alzheimer's, Parkinson's, neurological stroke). | [51] |
| Unit 9. Physiological changes & diet for different types of cancers: Nutritional impact of cancer treatments. | [41] |
| Unit 10. Physiological changes & diet for endocrinal disorders (Diabetes, and Thyroid Disorders). | [41] |
| Unit 11. Physiological changes & diet in burn | [41] |
| Unit 12. Drug nutrient interaction: effect of nutrient on drugs and effects of drugs on nutrient. | [41] |
| Unit 13. Standard guidelines for clinical nutrition (ASPEN/ ESPEN/ KDQOI/WHO/ADA/IDA-2020 etc.) | [31] |

REFERENCE BOOKS

1. Food Science- B. Srilakshmi.
2. Norman P.N. Food Science, The AVI Publishing Co. 1962.
3. Charley H. Food Science John Wiley & Sons, 1982.
4. Text book of Human Nutrition. Bamji, Rao & Reddy
5. Therapeutic nutrition. B.Srilakshmi
6. Nutrition & Dietetics & Nutrition. Antia F.P. & Abraham P.
7. Human Nutrition & Meal Planning. Sheel Sharma
8. Nutritional problems of India: Shukla P.K.
9. Catering Management – Mohini Shetty & Surjeet Malhan
10. Normal & Therapeutic nutrition. Robinson CH, Lawler MR, Chenoweth WL and Garwick AW (1986) 17th Ed. Macmillan Publishing Company, Newyork,, Collier Macmillan Canada, Inc. Toronto, Collier Macmillan publishers, London.
11. Textbook of biochemistry by E.S. West, W.R. Todd, H.S. Nelson, T.T. Van Brugger, Oxford I.B.H. Publishing Co., New Delhi, Bombay, Calcutta.
12. Lehninger, A.L. Biochemistry, Worth Publishing Inc. N.Y.
13. Textbook of biochemistry for Medical Students by A.V.S. Rama Rao, L.K. & S. Publishers, Tanaku
14. Molecular Nutrition – The Practical Guide. Jeffrey I, Mechanick MD, Michael A., Via MD and Shan Zhao, Endocrine Press, 2018.
15. Nutrition care & therapeutic nutrition. Krause.
16. Normal & Therapeutic nutrition. Robinson CH, Lawler MR, Chenoweth WL and Garwick AW (1986) 17th Ed. Macmillan Publishing Company, Newyork,, Collier Macmillan Canada, Inc. Toronto, Collier Macmillan publishers, London.
17. Modern nutrition in health & disease. Shils M.E. And Young V.R. Bombay K.M. Verghese Company (vi edition 1988)
18. Nutrition & Dietetics& nutrition, Antia F.P. Oxford University Press (III edition) 1989
19. Clinical Dietetics Manual – Indian Dietetic Association

CC 18 Lab: Advanced Medical Nutrition Therapy Lab

Planning and preparation of1: Diet in Diabetes

2: Diet in Hypertension.3: Diet in Obesity

4: Diet in Dyslipidaemia 5: Diet in hypertension 6:
Diet in NAFLD
7: Diet in Renal Disease (CKD and AKI) 8: Diet in GI
Disorders.

CC 19: Research Methodology and Biostatistics

Course objectives:

1. The students will be able to demonstrate the basic concepts of Statistics and its data representations
2. The students will be able to Make use of the knowledge about the different measures of Central Tendency and Dispersion
3. The students will be able to Interpret the different aspects of Bivariate data analysis
4. The students will be able to apply the knowledge of the various Sampling schemes and basic ideas of Probability
5. The students will be able to develop in depth knowledge about the different ways of analysis of mean and variance through testing of hypothesis
6. The students will be able to explain the basic ideas of different research methodologies and research ethics to be used in the field of Nutrition.
7. The students will be able to learn about ethical perspectives of research.

Course Contents:

Unit 1: Introduction to statistics and data representation 1. Meaning & scope of statistics. 2. Presentation of data - tabulation, graphic & diagrammatic presentation by graphs, bars, chart, etc.

[4L]

Unit 2: Measure of central tendency and dispersion 1. Measures of central tendency – mean, median, mode. 2. Measures of dispersion - mean deviation, standard deviation, variance, range, skewness, kurtosis.

[6L]

Unit 3: Correlation and regression 1. Correlation & regression interpretation.

[4L]

Unit 4: Sampling and probability 1. Sampling techniques. 2. Data gathering instruments - questionnaires, interviews, measurements & scales, reliability & validity of measuring instruments. 3. Methods of collecting information - census & sampling, various sampling schemes. 4. Ideas of probability.

[6L]

Unit 5: Analysis of mean and variance 1. Methods of estimating population means, & its standard error in simple random sampling & stratified random sampling. 2. Student's t test - its application, significance, confidence interval in normal population for mean, when variance is known & unknown. 3. Non parametric inference: sign, median, run test & X test. (as goodness of fit & independence of

attributes in 2x2 & r x c contingency tables). 4. Design of experiments - analysis of variance, completely randomized & random block designs.

[10L]

Unit 6: Hypothesis and research methodologies 1. Hypothesis - null hypothesis - level of significance. 2. Types of research: descriptive/historical, experimental, survey, case study, definition & identification of research problem, selection of problem, basic assumption & limitation of problem. 3. Planning, executing & analysis of large-scale surveys with special emphasis on surveys in Nutrition. Presentation & preparation of report for publication. [10L]

Unit 7: Research ethics 1. Research ethics

[5L]

REFERENCE BOOKS

1. Simpson & Kafka: Basic Statistics (Oxford & I.B.H. Publishers)
2. Gupta S.P.: Statistical Methods (Sultan Chand & Co.)
3. Goon, Gupta, Das: Fundamentals of statistics, Vol I and II. Gupta
4. Phillip B.S.: Social research, strategy & techtics.
5. Devdas R.P.: Hand book of Research Methodology. Kulandaivel (Sri RamKrishna Mission Vidyalaya 1971)
6. Kothari, C. R. (2004). Research Methodology: Methods and Techniques. India: New Age International (P) limited.& IBH Publishing Co.
7. Rohlf, F. J., Sokal, U. R. R. (1995). Biometry. United Kingdom: W. H. Freeman.

CC 20: Theories of Human Development

Course objectives:

1. Students will be introduced to the key themes of human development and get an understanding of the various theories.
2. Students will be able to gain a new perspective on the developmental stages of human life by learning specifically about certain theories like Darwin's and Lorenz's.
3. Students will be able to understand psychodynamic, psychosexual and psychosocial theories of human development.
4. Students will also be able to apply the learned theories in everyday life.

Course Contents:

Unit 1. Introduction to theories in Human Development: Key themes in the study of Human Development- Nature/nurture, active/ passive, continuity/discontinuity, individual differences and similarities.

Understanding a theory, Role of theories in understanding Human Development.

[12L]

Unit 2. Perspectives on Human development: Evolutionary and Ethological /Biological: Darwin, Lorenz, Bowlby, Ecological: Bronfenbrenner, Behavioral: Pavlov, Skinner, Bandura

[15L]

Unit 3. Selected theories of human development: Psychodynamic; psychosexual and psychosocial theories; Freud, Erikson, Cognition: Piaget, Vygotsky, Models and Theories of Intelligence: Guilford, Spearman and Gardner, Humanistic: Maslow and Rogers. **[12L]**

Unit 4. Theories in everyday life: Eclectic theoretical orientation, Ethno theories. **[6L]**

REFERENCE BOOKS

1. Berger JM (2010): Personality, 8th Ed. Thomson-Wadsworth: Berger Belmont, CA.
2. Allen BP (2006): Personality theories: Development, growth and diversity, 5th Ed. Pearson Education / Allyn & Bacon.
3. Santrock JW (2007): Lifespan Development, 3rd Ed. Tata- McGraw Hill, New Delhi.
4. Rice FP (1995): Human Development: A Lifespan Approach. New Jersey, Prentice-Hall

Analytical techniques

Course objectives:

1. Students will learn about the different parts of a microscope.
2. Students will gather knowledge about modern genomic techniques like DNA sequencing methods, western blot etc.
3. Students will be analyzing the techniques of separation and purification of biomolecules and macromolecules.
4. Students will be learning about the Recombinant DNA Technology concept

Course contents:

Unit 1: Microscopy: Introduction to light microscope, Optical sectioning, Imaging living cells and tissues, Measuring cellular dynamics, The electron microscope (EM) [8L]

Unit 2: Modern Genomics Techniques: DNA sequencing methods, strategies for genome sequencing. Methods for analysis of gene expression at RNA and protein level, large scale expression, western blot, such as micro array-based techniques. Isolation, separation and analysis of carbohydrate and lipid molecules. RFLP, RAPD and AFLP techniques. [10L]

Unit 3: Mass Spectrometric Techniques: Principles and application following spectroscopy in biological systems: Absorption Spectroscopy (UV-visible), Fluorescence and Phosphorescence, Circular Dichroism (CD), Infrared spectroscopy (IR), Resonance Raman spectroscopy; Electron spin resonance (ESR) [10L]

Unit 4: Separation and purification of biomolecules and macromolecules: Principles of chromatography, High-performance liquid chromatography, Adsorption chromatography, Partition chromatography, Ion-exchange chromatography, Gas chromatography, gel filtration, affinity chromatography, TLC, HPLC [8L]

Unit 5: Recombinant DNA Technology: Restriction endonuclease, - types and roles, Vector (plasmid pBR 322), Marker gene, Steps of cloning technique, PCR and its application, Genomic DNA and cDNA library. [9L]

Text/ Reference Books:

1. Principles and Techniques of Biochemistry and molecular Biology, 7th edition, by Keith Wilson and John Walker
2. Food Processing and Preservation Paperback, by G Subbalakshmi (Author), Shobha A Udipi
3. Food Processing and Preservation Paperback –by Sivasankar
4. Fundamentals of Food Science Technology Processing and Preservation Hardcover –by N. K. Jain

Food Processing Technology

Course objectives:

1. Students will learn about the various processes of food processing like processing of rice and formation of rice products.
2. Students will understand the methods of storage and handling of fresh fruits and vegetables.
3. Students will gain knowledge on food product formation like formation jams and jellies from fruits, formation of fish protein hydrolysate from fish.
4. Students will learn about various changes in flesh food after slaughter, also get an idea about Utilization of egg-derived products.

Course contents:

Unit 1: Processing of rice and rice products. Milling of wheat, corn, barley, oat; Production of wheat products, including flour and semolina. Puffed cereals from broken rice. [7L]

Unit 2: Storage and handling of fresh fruits and vegetables, Production of fruits and vegetable juices, Preparation of jam, jelly, marmalade, and tomato products (sauce and ketchup), Production of pectin, vitamins from apple pomace; Production of citrus oil from peels of citrus fruits, candied peel [8L]

Module 3: Fish byproducts - production of fish meal, fish protein concentrate, fish protein hydrolyzate fish liver oil and fish silage; Production of chitin, chitosan; Production of non-food items from fish processing wastes. [10L]

Module 4: Slaughtering of animals; Meat cuts and portions of meat, muscle; Classification, composition and nutritional value of poultry meat; Color of meat; Post mortem changes of meat; Meat processing - curing and smoking; Fermented meat products (sausages and sauces) [10L]

Module 5: Structure, composition and nutritional values of eggs; Egg processing, Byproduct Utilization – commercial processing of lecithin and other egg solids, Utilization of egg-derived products as food ingredients; Fertilizer from shells. [10L]

Text/ Reference Books:

1. Food Science by Potter
2. Fruit and Vegetable Preservation by Srivastava and Sanjeev Kumar
3. Principles of Food Science, Vol-I by Fennema Karrel
4. Preservation of Fruits & Vegetables by Girdhari Lal, Sidhapa and Tandon
5. Post Harvest Technology of
6. Processed Meats; Pearson AM & Gillett TA; 1996, CBS Publishers.
7. Egg and poultry meat processing; Stadelman WJ, Olson VM, Shemwell GA & Pasch S; 1988, Elliswood Ltd.
8. Developments in Meat Science – I & II, Lawrie R; Applied Science Pub. Ltd.
9. Egg Science & Technology; Stadelman WJ & Cotterill OJ; 1973, AVI Pub.
10. Fish as Food; Vol 1 & 2; Bremner HA; 2002, CRC Press.
11. Fish Processing Technology, Rogestein & Rogestein

Food processing lab

- 1.** Preparation of orange squash.
- 2.** Preparation of mango jam.
- 3.** Preparation of guava jelly.
- 4.** Preparation of tomato ketchup.
- 5.** Preparation of mango pickle.
- 6.** Preparation of dried carrot.