ಬೆಂಗಳೂರು ಉತ್ತರ ವಿಶ್ವವಿದ್ಯಾಲಯ

ಟಮಕ, ಕೋಲಾರ – 563103

CHOICE BASED CREDIT SYSTEM

(Semester Scheme with Multiple Entry and Exit Options for Under Graduate Course)

SYLLABUS AS PER NEP GUIDELINES

SUBJECT: CLINICAL NUTRITION AND DIETETICS

2021-22 onwards

B.Sc., CLINICAL NUTRITION AND DIETETICS

SEMESTER 1

Course Title: FUNDAMENTALS OF NUTRITION (DSC-1)

Course Title: FUNDAMENTALS OF NUTRITION (DSC- 1)	
Total Contact Hours: 45	Course Credits: 3+2
Formative Assessment Marks: 40	Duration of ESA/Exam: 3 hours
Model Syllabus Authors:	Summative Assessment Marks: 60

CONTENTS	**45 Hours**
Unit –1 INTRODUCTION	**15 Hours**
Understanding terminologies: Food, nutrition, health, nutrients, nutritional status, malnutrition-under nutrition over nutrition and optimum nutrition, diet, diet therapy, therapeutic nutrition, kilocalorie, joule, diet diversity, body mass index, daily values, nutrient density. Methods of determining human nutrient need. **Food and nutrient requirements:** Guidelines and Recommendations, development of National Nutritional Requirements, translation of nutritional requirements into Dietary Guidelines. food group system, functions of food Physiological, Psychological and Social factors affecting food intake and food habits, Recommended Dietary allowance (RDA), General Principles of Deriving RDA, Use of Recommended Dietary Allowances (RDAs), Limitations of RDAs, Balanced diet, use of Food exchange list. Food pyramid, my plate, basic of menu planning for family.	
Unit – 2 ENERGY	**15 Hours**

Definition, units of energy, energy value of food. Components of energy requirement, factors affecting energy requirements, methods of measuring energy expenditure. RMR, Physical Activity Level (PAL), BMR, factors affecting B.M.R, determination of BMR by calculation (Harris Benedict). Energy needs of the body (reference man and reference woman), Energy requirement during work, thermic effect of food, SDA. Human body composition – Methods of assessment (direct and indirect), Changes in body composition during life cycle. Factors affecting body composition: body weight and physical activity	
Unit – 3 FOOD PREPARATION AND HEALTH	**15 Hours**
Selection of foods, preliminary preparation of food, principles of cooking, methods of cooking - Boiling, Steaming, Pressure cooking, Microwave oven, Frying (shallow, deep fat), Smoking point of oil, Combination method, methods of cooking: advantages and disadvantages. Effect of cooking on nutritive value, methods of enhancing nutritive value Nutrition and Health- Inter-relationship between food, nutrition, and health. Food choices – nutrients and nourishment, cognitive and environmental influences. Nutrient and food guides for health promotion. Balanced diet- definitions and its Importance	

Practical – 2 Credits

FUNDAMENTALS OF NUTRITION – PRACTICAL **60 Hours**

1. Identification of foods under four food groups.
2. Calculation of Glycaemic index in foods
3. Weights and measures of common foods - (Raw and Cooked weight)
4. Cooking methods - Preparing a recipe by Boiling & steaming
5. Cooking methods - Preparing a recipe by Pressure cooking and Microwave
6. Cooking methods - Preparing a recipe by Frying (shallow, deep fat), Smoking point of oil and combination method
7. Calculation of energy requirement for an adult man and a woman and children
8. Anthropometric Measurement - Height, weight, skinfold thickness, Mid - upper arm circumference.
9. Comparison and interpretation of the nutritional assessment data and its significance - body Mass Index (BMI), fat mass, Waist - Hip Ratio (WHR).
10. Estimation of food and nutrient intake - 24 hours dietary recall, food frequency
11. Proximate analysis of foods.

References:

1. Mudambi S R and Rajagopal M V, *Fundamentals of Foods, nutrition & Diet therapy,* New Age International Publishers, 6th Edition. 2020
2. Bamji, M.S, *Textbook of Human Nutrition,* Oxford & IBH Publishing Co Pvt. Ltd,4th Edition. 2019
3. Srilakshmi B, *Dietetics*, New Age International Publishers, 8th Edition. 2019
4. Swaminathan, M, Handbook of Food and Nutrition, The Bangalore Press, 5th Edition. 2018
5. Sunetra Roday, *Food Science and Nutrition,* Oxford university Press, 3rd Edition. 2018
6. Srilakshmi B, *Nutrition Science*, New Age International Publishers, 6th Edition. 2017
7. Shubhangaini A Joshi, *Nutrition and Dietetics*, McGraw-Hill, 4th Edition. 2017
8. Williams, *Basic nutrition and Diet therapy*, Elsevier India, 1st South Asia Edition. 2016
9. Carolyn D. Berdanier; Johanna T. Dwyer; David Heber , *Handbook of Nutrition and Food,* 3rd Edition.2014
10. Gibney M.J, *Nutrition and Metabolism,* Wiley- Blackwell, 2003
11. Emma. S. Weigley, *Robinson's Basic Nutrition and Diet Therapy*, Pearson publication, 1st Edition. 1996

B.Sc., CLINICAL NUTRITION AND DIETETICS

SEMESTER 1

Title of the Course: ESSENTIALS OF MACRO NUTRIENTS

Course Title: ESSENTIALS OF MACRO NUTRIENTS (DSC- 2)	
Total Contact Hours: 45	Course Credits: 3+2
Formative Assessment Marks: 40	Duration of ESA/Exam: 3 hours
Model Syllabus Authors:	Summative Assessment Marks: 60

CONTENTS	**45 Hours**
Unit –1 CARBOHYDRATES	**15 Hours**
Composition, classification, digestion, absorption and metabolism, Functions, Sources and Requirements, excess and deficiencies. Dietary fiber – definition, classification, sources, role of fiber in Nutrition. Resistant starch, fructo-oligosaccharides, other oligosaccharides: Chemical composition and physiological significance. Glycemic Index and glycemic load. Review of nutritional significance of carbohydrates and changing trends in dietary intake of different types of carbohydrates and their implications.	
Unit – 2 PROTEINS	**15 Hours**
Composition, classification of proteins and amino-acids, functions, digestion, absorption and metabolism, Requirements and Sources, Effect of deficiency. Assessment of Protein quality. BV, PER, NPU and chemical score.	
Unit – 3 LIPIDS	**15 Hours**
Classification, functions, digestion, absorption and metabolism, Sources and Requirements - SFA, MUFA, PUFA: functions and deficiency, Role of n-3 and n-6 fatty acids, Trans Fatty Acids, dietary guidelines (International and National) for visible and invisible fats in diets.	

Practical – 2 Credits

1. Planning and preparation of energy dense recipes
2. Planning and preparation of low energy recipes
3. Planning and Preparation of low Glycemic index recipes, Calculation of Glycemic index and Glycemic load
4. Planning and preparation of high & low fiber recipes
5. Planning and preparation of protein dense recipes
6. Planning and preparation of low protein recipes
7. Planning and preparation of n-3 and n-6 rich recipes
8. Qualitative analysis of carbohydrates
9. Qualitative analysis of Amino acids
10. Estimation of carbohydrate by DNS method
11. Estimation of protein by Lowry's method

References:

1. Mudambi S R and Rajagopal M V, *Fundamentals of Foods, nutrition & Diet therapy*, New Age International Publishers, 6th Edition. 2020
2. Bamji, M.S, *Textbook of Human Nutrition,* Oxford & IBH Publishing Co Pvt. Ltd,4th Edition. 2019
3. Srilakshmi B, *Dietetics*, New Age International Publishers, 8th Edition. 2019
4. Swaminathan, M, *Handbook of Food and Nutrition*, The Bangalore Press, 5th Edition. 2018
5. Srilakshmi B, *Nutrition Science*, New Age International Publishers, 6th Edition. 2017
6. Longvah T Anathan R, Bhaskarachary K, and Venkaiah k, *Indian food composition table*, NIN.ICMR, 2nd Edition. 2017
7. Gibney M.J, *Nutrition and Metabolism,* Wiley- Blackwell, 2003
8. Carolyn D. Berdanier, *Advanced Nutrition, Macronutrients,* CRC press, 2nd Edition.2000
9. Emma. S. Weigley, *Robinson's Basic Nutrition and Diet Therapy*, Pearson publication, 1st Edition. 1996

B.Sc., CLINICAL NUTRITION AND DIETETICS

SEMESTER 1

Title of the Course: FOOD SANITATION & HYGIENE (DSC-3)

Course Title: FOOD SANITATION AND HYGYEINE (DSC-3)	
Total Contact Hours: 45	Course Credits: 3
Formative Assessment Marks: 40	Duration of ESA/Exam: 3 hours
Model Syllabus Authors:	Summative Assessment Marks: 60

CONTENTS	**45 Hours**
Unit –1 INTRODUCTION	**15 Hours**
Terminologies – Sanitation, hygiene, food safety, food sanitation, contamination, food spoilage, danger zone. Significance of sanitation in food catering units, hospital kitchens, food handlers. FSSAI: Safe food handling and hygiene practices - guidelines. Introduction - Serving safe food, food borne illnesses, preventing food borne illnesses, key practices for ensuring food sanitation. Personal hygiene - importance, sanitary habits, and practices, use of protective clothing during food preparation in large establishments.	
Unit – 2 PURCHASE AND HYGIENE	**15 Hours**
Purchasing and Storage - Choosing a supplier, Inspection Procedures, Receiving and Inspecting Specific Food, Storage - General Storage Guidelines, Types of Storage, storing specific food, storage techniques - dry food storage, refrigerated storage, freezer storage. Hygiene in Service - Hygiene procedures in food preparation, holding and display food for service, serving food safely, off-site services, hot holding of foods, Safe use of left - over food, hygiene in food service, protective display of food. Storage and disposal of waste – Classification of waste, methods of disposal.	
Unit – 3 CLEANING AND SANITATION	**15 Hours**

Cleaning and Sanitation - Sanitation Standards for Equipment, installing and maintaining kitchen equipment, Cleaning and Sanitizing - Cleaning vs. Sanitizing, machine dishwashing, manual dishwashing, sanitizing food contact surfaces, cleaning the Premises, storing utensils, tableware, and equipment, using cleaning agents, developing a cleaning Program. Pest control methods and its importance.	

References

1. Roday. S, *Food Hygiene and Sanitation*, McGraw-Hill, 2nd Edition. 2017
2. Lawley, R., Curtis L. and Davis, J, *The Food Safety Hazard Guidebook*, RSC publishing, 2015
3. Y. H. Hui, *Plant sanitation for Food processing and Food service*, CRC Press, 2nd Edition.2015.
4. Pierre-Jean Raugel, *Rapid Food Analysis and Hygiene Monitoring*, Springer, 2012
5. Mario Stanga, *Sanitation: Cleaning and Disinfection in the Food Industry*, Wiley, 2010.
6. Norman G. Marriott, *Principles of sanitation*, Springer, 5th Edition. 2010.
7. H. L. M. Lelieveld et.al., *Hygiene in Food Processing: Principles and Practice*s, Woodhead Publishing series, 2003.
8. Y. H. Hui, L. Bernard Bruinsma, J. Richard Gorham, Wai-Kit Nip, Phillip S. Tong, Phil Ventresca, *Food Plant Sanitation*, CRC Press, 2002.
9. De Vries, *Food Safety and Toxicity*, CRC Press, 1996
10. Richard Hayes, *Food Microbiology and Hygiene*, Springer, 2nd Edition. 1995

B.Sc., CLINICAL NUTRITION AND DIETETICS

SEMESTER 1

Title of the Course: FUNDAMENTALS OF FOOD & HEALTH(OE-1)

Course Title: FUNDAMENTALS OF FOOD AND HEALTH (OE-1)	
Total Contact Hours: 45	Course Credits: 3
Formative Assessment Marks: 40	Duration of ESA/Exam: 3 hours
Model Syllabus Authors:	Summative Assessment Marks: 60

CONTENTS	**45 Hours**
Unit – 1 OVERVIEW OF FOOD & MACRONUTRIENTS	**15 hours**
Overview of Food & Nutrients, Food choice and factors influencing food choice Classification of nutrients – macronutrients and micronutrients. Energy, Carbohydrates, Protein and Fats Classification, Functions and Sources Impact of macronutrients on health – Deficiency and Excess.	
Unit - 2 MICRONUTRIENTS & WATER	**15 hours**
Micronutrients - Classification, Functions and Sources in detail, Impact of micronutrients on health – Deficiency and Excess, Water –Types, Role, Distribution of water in Body, Body fluids and electrolytes. Regulation of Water and Electrolyte balance and its imbalance	
Unit – 3 COMPONENTS OF HEALTH	**15 hours**
Health – Definition, Components, Factors influencing health, Dietary guidelines Issues of public concern, Malnutrition, Anemia, Vitamin A deficiency, Obesity, Diabetes and Hypertension. Functional foods – Probiotics, prebiotics and phytochemicals, Health supplements, processed foods, organic foods, Nutrition label – understanding and importance	

References:

1. Mudambi S R and Rajagopal M V, *Fundamentals of Foods, nutrition & Diet therapy*, New Age International Publishers, 6th Edition. 2020
2. Bamji, M.S, *Textbook of Human Nutrition*, Oxford & IBH Publishing Co Pvt. Ltd,4th Edition. 2019
3. Srilakshmi B, *Dietetics*, New Age International Publishers, 8th Edition. 2019
4. Swaminathan, M, Handbook of Food and Nutrition, The Bangalore Press, 5th Edition. 2018
5. Srilakshmi B, *Nutrition Science*, New Age International Publishers, 6th Edition. 2017
6. Longvah T Anathan R, Bhaskarachary K, and Venkaiah k, *Indian food composition table*, NIN.ICMR, 2nd Edition. 2017
7. Gibney M.J, *Nutrition and Metabolism*, Wiley- Blackwell, 2003
8. Carolyn D. Berdanier, *Advanced Nutrition, Macronutrients*, CRC press, 2nd Edition.2000
9. Emma. S. Weigley, *Robinson's Basic Nutrition and Diet Therapy*, Pearson publication, 1st Edition. 1996

B.Sc., CLINICAL NUTRITION ND DIETETICS

SEMESTER 1

Title of the Course: HEALTHY LIFE STYLE AND NUTRITION (OE-1)

Course Title: Healthy lifestyles and Nutrition (OE- 1)	
Total Contact Hours: 45	Course Credits: 3
Formative Assessment Marks: 40	Duration of ESA/Exam: 03Hours
Model Syllabus Authors:	Summative Assessment Marks: 60

CONTENTS	**45 Hours**
Unit – 1 INTRODUCTION TO FOOD AND NUTRITION	**15 Hours**
History of nutrition, Relationship of food and health, Factors influencing food intake & food habits: Physiologic, Factors that determine food intake, Environmental & behavioral factors influencing food acceptance Energy and macronutrients – Carbohydrates, Protein, Fat - functions, sources deficiency disorders and recommended intakes. Micronutrients: Minerals – calcium, Iron, Iodine, and other elements, Vitamins – Fat Soluble & Water Soluble.	
Unit – 2 NUTRITION FOR LIFE CYCLE	**15 Hours**
Nutritional assessment - direct and indirect methods, Nutritional requirements for pregnancy and lactation, Nutritional requirements for growing children, Nutritional requirements for adult and elderly.	
Unit – 3 PLANNING OF DIET	**15 Hours**
Basic principles of planning diet, Dietary guides and balanced diets**.** Principles of planning a normal diet: characteristics of a normal diet, meeting nutrient requirements of individuals and family. Use of Dietary guidelines for Indians. Objectives of diet therapy- Regular diet and rationale for modifications in energy and other nutrients, texture, fluid, soft diets etc. Nutrition for health and fitness- Role of nutrition in fitness, Nutritional guidelines for health and fitness, Nutritional supplements, Importance and benefits of physical activity.	

References:

1. Mudambi S R and Rajagopal M V, *Fundamentals of Foods, nutrition & Diet therapy*, New Age International Publishers, 6th Edition. 2020
2. Manay & Shadakshara Swamy, *Food facts &principles*, New Age International Publication, 2020
3. Swaminathan, M, Handbook of Food and Nutrition, The Bangalore Press, 5th Edition. 2018
4. Srilakshmi B, *Nutrition Science*, New Age International Publishers, 6th Edition. 2017
5. Chadha R and Mathur P eds. *Nutrition: A Lifecycle Approach*, Orient Blackswan, New Delhi. 2015
6. Carolyn D. Berdanier; Johanna T. Dwyer; David Heber , *Handbook of Nutrition and Food*, 3rd Edition.2014
7. Barbara A. Bowmaw and Robert M. Russell, *Nutrition*, ILSI press, 9th Edition. 2008.
8. C. Gopalan, B.V. Ramasastri and S.G. Balasubramaniam, *Nutritive value of Indian foods*, NIN, ICMR, 2007.
9. Gibney M.J, *Nutrition and Metabolism*, Wiley- Blackwell, 2003

B.Sc., CLINICAL NUTRITION AND DIETETICS

SEMESTER 2

Title of the Course: HUMAN PHYSIOLOGY (DSC-4)

Course Title: HUMAN PHYSIOLOGY (DSC – 4)	
Total Contact Hours: 45	Course Credits: 3
Formative Assessment Marks: 40	Duration of ESA/Exam: 3 hours
Model Syllabus Authors:	Summative Assessment Marks: 60

CONTENTS	**45 Hours**
UNIT 1- BASIC CELLS AND TISSUES	**13 Hours**
Structure and Function of Cell, Physiological properties of protoplasm. Levels of cellular organization and function – cell organelles and tissues - Structure and functions of epithelial, connective, muscular and nervous tissue, organs and systems – Brief review, Cell membrane transport across cell, membrane and intercellular communication, cell multiplication Introduction of biological membranes to understand molecular transport, transport of large molecules, receptor mediated endocytosis, exocytosis. Molecular aspects of transport; Passive diffusion, facilitated diffusion, active transport. active transport - sodium potassium pump.	
Unit – 2 - ORGAN SYSTEM I	**16 Hours**
Digestive System - Digestive system: Physiology and functions - Digestive glands: salivary, gastric, liver, pancreas. Digestion of nutrients- Proteins, fats, carbohydrates. Hunger and thirst mechanism. Motility and hormones of GIT. Regulation of food intake – role of hunger and satiety centers, effect of nutrients. **Circulatory System -** Blood: Composition and homeostasis. Formation and functions of plasma proteins, erythropoiesis. Blood groups & histocompatibility. Composition & functions of CSF and Lymph. Structure & functions of heart.	

Respiratory system - Outlined structure of respiratory system, Primary function of respiratory system, Mechanism of respiration, Transport of gases and artificial respiration. Role of lungs in the exchange of gases, Transport of oxygen and CO_2. **Excretory System -** Structure and functions of Kidney, nephron, glomerular filtration, tubular absorption and secretion. Urine formation. **Nervous System:** Review of structure and function of neuron - conduction of nerve impulse, synapses, and role of neurotransmitters, Organization of central and Peripheral nervous system.	
Unit – 3 ORGAN SYSTEM II	**16 Hours**
Skeletal & Muscular System - Ultra structure of skeletal muscle and bone. Muscular system: Muscle type, structure: Muscle proteins – contractile and non-contractile. Energetics of muscle contraction, Muscular dystrophies. **Reproductive System and Endocrine System -**Male reproductive system – Structure and functions. Female reproductive system – Structure and functions. Menstrual cycle, Puberty, Menopause. Fertilization, Development of fertilized ovum (Brief account) Placenta and its functions – Parturition. Endocrinology- Functions of hormones of the pituitary, Steroid hormones their functions and mechanism of action. **Immune System -** Organs and cells of Immune system, Primary and secondary Lymphoid organs. Immunity– Definition, Types. Antigens - Chemical nature of antigens, epitope. Immunoglobulins -Types, structures and Functions. Hypersensitivity reactions- definition and types.	

PRACTICAL: 2 Credits **60 Hours**

1. Microscopic study of tissues- Epithelial, connective, and muscular tissues
2. Preparation of blood film and staining with Leishman's staining
3. Smear preparation of human blood for RBC and WBC count
4. Estimation of hemoglobin by Sahli- Hellige (Colorimetric) hematin method
5. Determination of blood groups and Rh factor
6. Determination of bleeding time by Duke's method
7. Determination of Blood clotting time by Wright's method
8. Clinical examination of urine

a) Physical examination: volume colour, odour, appearance, pH.

b) Test for abnormal constituents of urine: Sugar, blood, albumin, Bile salts and ketone bodies.

9. Pulse, B.P and respiratory rate at rest and after exercises
10. Estimation of Blood Urea

References:

1. Lehninger, *Principles of Biochemistry*, W.H. Freeman and Co Ltd, 8th Edition. 2021
2. CC. Chatterjee, *Human Physiology*, CBS publishers, 13th edition. 2020
3. H.S.Ravikumar Patil et.al., A textbook of Human Physiology, Wiley, 2020
4. Guyton and Hall, Textbook of Medical Physiology, Elsevier, 14th Edition. 2020
5. K Sambulingam, *Essentials of Medical physiology*, Jaypee Publishers 3rd edition. 2019
6. Barrett et.al., *Gannong's Review of Medical Physiology*, Mcgraw Hill, 26th Edition, 2019
7. Cindy L. Stanfield, *Principles of Human Physiology*, Pearson publishers,6th Edition. 2017
8. Copper, Geoffery, M, *The Cell- A Molecular Approach*, Oxford University Press, 6th Edition.2013
9. Gary G Mathews, *Cellular Physiology of Nerve and Muscle*, Wiley Balckwell, 4th Edition.2002
10. Thomas Devlin, *Textbook of Biochemistry with Clinical correlations*, John Wiley and Sons, 1999
11. A.J. Vander, et.al., *Human Physiology: The mechanisms of Body functions*, McGraw-Hill, 5th Edition. 1990

B.Sc., CLINICAL NUTRITION AND DIETETICS

SEMESTER 2

Title of the Course: ESSENTIALS OF MICRONUTRIENTS (DSC-5)

Course Title: ESSENTIALS OF MICRONUTRIENTS (DSC – 5)	
Total Contact Hours: 45	Course Credits: 3
Formative Assessment Marks: 40	Duration of ESA/Exam: 3 hours
Model Syllabus Authors:	Summative Assessment Marks: 60

CONTENTS	**45 Hours**
Unit –1 VITAMINS	**15 Hours**
Definition and classification, Fat soluble vitamins - Physiological functions, Sources, Requirements, Deficiency and Hypervitaminosis of Vitamin A, D, E and K. Water Soluble vitamins – Physiological functions, Sources, Requirements and Deficiency of B Complex Vitamins- Thiamine, Riboflavin, Niacin, Pyridoxine, Folic Acid, Pantothenic Acid, Cyanocobalamin and Vitamin C**.** Interaction with other nutrients and its effects.	
Unit – 2 MINERALS	**15 Hours**
Definition, Classification, Distribution in the body, Functions, Sources and requirement and Effects of Deficiency of Calcium, Phosphorus, Magnesium, Sodium, Potassium, Manganese, Selenium, Iron, Zinc, Iodine, Molybdenum, Cobalt and Fluorine, Trace Elements - Distribution in the body, Functions, Sources and requirement and Effects of Deficiency of Vanadium, Silicon, Boron, Nickel, Lithium, Lead, Cadmium, Sulphur.	
Unit – 3 WATER AND ELECTROLYTES	**15 Hours**
Water – Molecular structure, Ionic Product of water, Importance, distribution in the body, functions of water and sources, effects on biomolecules, Effect of non-polar compounds on water, water intake and loss. Dehydration, edema. Electrolytes - Types, sources, composition of body fluids, Regulation of electrolyte content and maintenance of pH, maintenance of fluid and electrolyte balance and imbalance, Renin- Angiotensin system, Clinical Investigation of Sodium, Potassium Chloride	

Practical: 2 Credits

1. Planning and preparation of Vitamin A rich recipes
2. Planning and preparation of Vitamin C rich recipes
3. Planning and preparation of Vitamin B complex rich recipes
4. Planning and preparation of Calcium rich recipes
5. Planning and preparation of Iron rich recipes
6. Planning and preparation of Folate rich recipes
7. Estimation of Iron in food sources
8. Estimation of Calcium in milk
9. Estimation of Vitamin C in food sources
10. Estimation of Vitamin A in food samples
11. Estimation of total mineral content in a food sample using muffle furnace

References:

1. Mudambi S R and Rajagopal M V, *Fundamentals of Foods, nutrition & Diet therapy*, New Age International Publishers, 6th Edition. 2020
2. Bamji, M.S, *Textbook of Human Nutrition*, Oxford & IBH Publis.,4th Edition. 2019
3. Srilakshmi B, *Dietetics*, New Age International Publishers, 8th Edition. 2019
4. Swaminathan, M, *Handbook of Food and Nutrition*, The Bangalore Press, 5th Edition. 2018
5. Srilakshmi B, *Nutrition Science*, New Age International Publishers, 6th Edition. 2017
6. Longvah T Anathan R, Bhaskarachary K, and Venkaiah k, *Indian food composition table*, NIN.ICMR, 2nd Edition. 2017
7. Gibney M.J, *Nutrition and Metabolism*, Wiley- Blackwell, 2003
8. Michael Zimmermann, *Burgerstein's Handbook of Nutrition*, Thieme. 9th Edition. 2001
9. Carolyn D. Berdanier, *Advance Nutrition Micronutrients (Modern Nutrition)*, CRC Press. 1st Edition. 1997
10. Emma. S. Weigley, *Robinson's Basic Nutrition and Diet Therapy*, Pearson publication, 1st Edition. 1996

B.Sc., CLINICAL NUTRITION AND DIETETICS

SEMESTER 2

Title of the Course: FOOD SAFETY AND SECURITY (DSC-6)

Course Title: FOOD SAFETY AND SECURITY (DSC-6)	
Total Contact Hours: 45	Course Credits: 3
Formative Assessment Marks: 40	Duration of ESA/Exam: 3 hours
Model Syllabus Authors:	Summative Assessment Marks: 60

CONTENTS	**45 Hours**
Unit –1 FOOD SAFETY	**15 Hours**
Definition of food safety and food spoilage, factors affecting food safety and food spoilage: GMP, GAP, SSOP, GHP, food adulteration - definition, types of adulteration in various foods- intentional, incidental, and metallic contaminants Food Laws and Regulations National Legislation - Essential Commodities Act, Standard of Weight and Measures Act, ISI, Mark of BIS, Agmark, BIS. GRAS and permissible limits for chemical preservatives and legal aspects for γ -irradiations. Recent concerns in food safety: New and Emerging Pathogens. Genetically modified foods / Transgenics / Organic foods. Newer approaches to food safety. PFA, FPO, Food Safety and Standards Bill 2005, International Laws and Agreements - FAO, WHO, Codex Alimentarious, WTO, JECFA, APEDA, ISO 22000 series, Hazard Analysis Critical Control Point (HACCP): principles of HAACP, applications of HACCP Current Food Safety Standards in India, Current Food Safety regulations 2001, Food Safety and Standards Authority of India, objectives of developing food safety standards, enforcement of structure and procedure, role of food analyst, safety analysis, action by designated officer and report of food analyst.	
Unit – 2 FOOD AND NUTRITION SECURITY	**15 Hours**
Definition, Food production, access, distribution, availability, losses, consumption, Food distribution strategies and storage of food. Socio-cultural aspects and Dietary Patterns: Their implications for Nutrition and Health. Nutritional Status - Determinants of nutritional status of individual and populations, Nutrition and Non-nutritional indicators -Socio-cultural, Biologic, Environmental, Economic.	

Major Nutritional Problems – An overview etiology, prevalence, clinical manifestations, preventive and therapeutic measures for: Macro and micronutrient deficiencies.	
Unit – 3 NUTRITION AND HEALTH POLICIES	**15 Hours**
Plan of action and programs, Approaches and Strategies for improving nutritional status and health, Programmatic options- their advantages and demerits. feasibility, political support, available resources (human, financial, infrastructural). Case studies of selected strategies and programs: their rationale and context. How to select interventions from a range of possible options: Health-based interventions, Food-based interventions including fortification and genetic improvement of foods, supplementary feeding, nutrition education for behavior change. Health economics and economics of malnutrition- Its impact on productivity and national development, Cost-Benefit, Cost effectiveness, Cost efficiency	

References:

1. *Release of Fact sheets for National Family Health Survey (NFHS)-5,* Ministry of Health and Family Welfare, GOI, 2019-2020. https://main.mohfw.gov.in/newshighlights-26
2. Prabodh Halde, Sanjeev Kumar Sharma, *Objective Food Science and Safety standards,* Jain Brothers; 2nd edition. 2019
3. Bamji, M.S, *Textbook of Human Nutrition,* Oxford & IBH Publishing Co Pvt. Ltd,4th Edition. 2019
4. William H. & Carol Anne, *Food Safety for the 21st Century: Managing HACCP and Food Safety Throughout the Global Supply Chain,* Wiley; 2nd edition.2018
5. Bill Pritchard et.al., *Routledge Handbook of Food and Nutrition Security,* Routledge, 2018
6. G. Satyavani Sridhar Seetharaman, *Food and Nutritional Security: Role of Food Assistance*, Write and print publications, 2018
7. Arpitha Verma, *Women's Health and Nutrition: Role of State and Voluntary Organizations*, Rawat, 2017
8. Swaminathan M.S., *Remember your Humanity- Pathway to sustainable Food security*, NIPA, 2012
9. Panda, *Sustainable Food and Nutrition security in National Economy,* Agrobios (India), 2010
10. Murray, C. and Lopez, A, *Global Burden of Disease and Injury,* Harvard University Press, 1996
11. Achaya, K.T., *Interfaces between agriculture nutrition and food science*, The United Nations University, 1985.

B.Sc., CLINICAL NUTRITION AND DIETETICS

SEMESTER 2

Title of the Course: FOOD SAFETY AND HYGIENE (OE-2)

Course Title: FOOD SAFETY AND HYGIENE (OE- 2)	
Total Contact Hours: 45	Course Credits: 3
Formative Assessment Marks: 40	Duration of ESA/Exam: 3 hours
Model Syllabus Authors:	Summative Assessment Marks: 60

CONTENTS	**45 Hours**
Unit – 1 INTRODUCTION TO FOOD SAFETY	**15 hours**
Concept and meaning of Food Safety, food adulteration, food hazards Food laws and regulations – National (FSSAI) and international (FAO) food laws, newer approaches to food safety. PFA, FPO, Food Safety and Standards Bill 2005, International Laws and Agreements - FAO, WHO, Codex Alimentarious, Governing bodies, Exposure, estimation, toxicological requirements and risk analysis. Safety aspects of water and beverages, Safety assessment of food contaminants and pesticide residues.	
Unit – 2 FOOD SAFETY AND FOOD HYGIENE	**15 hours**
Food contaminants- Physical, Chemical and Biological contaminants, reduce microbial contamination and control growth, Eliminate source of contaminants Sanitation: Definition, principle and purposes. Food hygiene law and the importance of food safety. Food Safety Hazards. Temperature control, food deliveries, refrigeration, low and high-risk foods, use by dates and best before dates, and stock rotation (FIFO). Cross-Contamination Hand hygiene, further hygiene considerations, protective clothing, reporting illness and first aid.	
Unit – 3 FOOD PROTECTION	**15 hours**

Food protection: General Principles, methods of food protection and food preservation - Thermal transfer methods, Chemical methods, Biocontrol methods, Irradiation methods, Foodborne Illness – Food Borne infections and Intoxications. Risk Factors, Food worker Education and training.	

References:

1. Alok Kumar, *Fundamentals of Food Hygiene Safety and Quality*, Dreamtech press, 2019
2. Ram Lakhan Singh and Sukanta Mondal, *Food Safety and Health*, Academic Press, 2019
3. Prabodh Halde, Sanjeev Kumar Sharma, *Objective Food Science and Safety standards*, Jain Brothers; 2nd edition. 2019
4. William H. & Carol Anne, *Food Safety for the 21st Century: Managing HACCP and Food Safety Throughout the Global Supply Chain*, Wiley; 2nd Edition.2018
5. Sunetra Roday, *Food Hygiene and Sanitation With case studies*, Tata McGraw, 2nd Edition, Hill.2017
6. Paul L. Knechtges, *Food Safety-Theory and Practice*, Jones & Bartlett Learning, 2012

David McSwane et.al., *Essentials of Food safety and Sanitation*, Pearson's, 4th Edition, 2004

B. Sc., CLINICAL NUTRITION AND DIETETICS

SEMESTER 2

Title of the Course: FOOD ADULTERATION (OE- 2)

Course Title: FOOD ADULTERATION (OE- 2)	
Total Contact Hours: 45	Course Credits: 3
Formative Assessment Marks: 40	Duration of ESA/Exam: 3 hours
Model Syllabus Authors:	Summative Assessment Marks: 60

CONTENTS	**45 Hours**
Unit – 1 COMMON FOOD ADULTERANTS	**15 hours**
Adulteration – Definition – Types of adulterants in different food, Adulteration through Food Additives – Intentional and incidental. Health hazards and risks. Historical Food legislation in India; Central food laboratory, Municipal laboratories. National Food laws- PFA specification for food products. Salient features of Food Safety & Standards Act, 2006, Structure of FSSAI, ISO 22000, GMP, GHP, ISO 9001 (Food Safety Management System), Prevention of food adulteration Act	
Unit – 2 FOOD LAWS AND STANDARDS	**15 hours**
Consumer protection: Role of agencies such as AGMARK, ISI and Quality Control Laboratories in protecting consumer rights. International food laws- Codex Alimentarius, FDA, USDA, FAO and WHO. Other International regulatory bodies like EFSA –European food safety authority Food standards of Australia and New Zealand, Saudi Arabia food regulations	
Unit – 3 ANALYSIS OF FOOD ADULTERANTS	**15 hours**
Food Adulteration tests for common foods- Spices, Cereals and pulses, milk and milk products, Coffee, tea, Ghee, Oil and fats, sugar and sugar products. Identification of New adulterants in different foods, Toxic effects of food adulterants. Food additives; colouring matter, preservatives, poisonous metals, antioxidants and emulsifying and stabilizing agents, insecticides	

References:

1. Bare Act, *Prevention of Food Adulteration Act, 1954 along with Rules,* Universal Law Publishing, 2016
2. Shyam Narayan Jha & Pranay, *Rapid Detection of Food Adulterants and Contaminants - Theory and Practice,* 2016
3. Sumeet Malik, Handbook of Food Adulteration and Safety Laws, Eastern Book company, 2012
4. Edwin Morris Bruce, *Detection of common Food Adulterants,* Nebu Press, 2011
5. N. Raghuramulu et.al., *Manual of Laboratory Techniques*, NIN, 2nd Edition.2003
6. A.Y. Sathe, A First Course in Food Analysis, New Age international, 1999

Program Name	**BSc Clinical Nutrition and Dietetics**		Semester	**Third Sem**
Course Title	**Life Span Nutrition (Theory)**			
Course No.	**CNDT3.1**	**DSC 7**	No. of Credits	**3+2**
Contact hours	**45 Hrs**		Duration of SEA/Exam	**2 Hours**
Formative Assessment Marks	**40**		Summative Assessment Marks	**60**

Course Pre-requisite(s): Certificate with minimum 45%

Course Outcomes (COs): At the end of the course the student should be able to:

1. To understand the nutrition requirements of different agegroups
2. To understand the guidelines of dietrequirements
3. To determine nutrient requirements/needs of individuals at different stages oflife
4. To discuss the major nutrition related concerns at each stage oflife

Content	**45 Hrs**
Unit–I Nutrition in pregnancy and lactation	
Pregnancy: Physiologic changes during pregnancy, nutritional requirements and dietary guidelines, gestational weight gain, dietary problems, complications during pregnancy, adolescent pregnancy, pre - conceptional nutrition. Lactation: Physiology of lactation, composition of breast milk, importance of breast feeding, advantages and disadvantages of breast feeding, factors affecting breast feeding, lactogogues, nutritional requirement and dietary guidelines,	15 Hrs
Unit -II - Nutrition- pediatrics	
Infancy: Nutritional requirements and dietary guidelines, Growth and development, Types of feeding – breast feeding, formula feeding, complementary feeding, failure to thrive in infants. Pre-school and school age: Nutritional requirements and dietary guidelines, Importance of breakfast and packed lunch, factors influencing food intake, nutritional problems.	15 Hrs
Unit -III Nutrition in adolescents, adult, and geriatrics	
Adolescents: Physiological changes during puberty, nutritional requirements, and dietary guidelines, eating disorders,	15 Hrs

Adults: Nutritional requirements and dietary guidelines, importance of weight management. Geriatrics:Physiologicalchangesduringoldage,Nutritionalrequirementsanddietaryguidelines, nutritional problems	

Course Title	**Life Span Nutrition (Practical)**	Practical Credits	**2**
Course No.	**CNDP3.1**		
Plan, prepare and evaluate			
1. A day's diet for pregnantwomen. 2. A day's diet for lactatingwomen. 3. Complimentary foods suitable forinfants. 4. Packed lunch for schoolchildren. 5. Nutrient dense recipes foradolescents.			
6. A day's diet for adultman 7. A day's diet for adultwoman 8. Suitable recipes forgeriatrics. 9. Nutrient rich breakfastrecipes 10. Healthysnacks			

References	
1	Chadha R and Mathur P, Nutrition: A life cycle Approach. Orient Blackswan New Delhi, 2015.
2	SethVandSinghKN,DietPlanningthroughlifecycle:Part1NormalNutrition.APracticalManual, Elite Publishing House Pvt.Ltd. New Delhi,2006.
3	SrilakshmiB(2014) Dietetics, 4th and 7th edition, New Age International Publications, New Delhi.
4	Shubhangini A Joshi (2011) Nutrition and Dietetics, with Indian case Studies, 3rd edition, Tata McGraw Hill Publication, New Delhi
5	Mahan,L.K&Ecott-Stump,S(2000):Krause'sFood,NutritionandDietTherapy,12thEdition,W.B SaundersLtd
6	Bamji, M.S, Reddy, V. (1998), Text Book of Human Nutrition, Oxford & IBH Publishing Co, New Delhi.
7	Gibney M.J, Elia M Ljingquist. O (2005), Clinical Nutrition, Backwell Science Publishing Co.

Program Name	**BSc Clinical Nutrition and Dietetics**		Semester	**Third Sem**
Course Title	**DIETETICS I (Theory)**			
Course No.	**CNDT3.2**	**DSC 8**	No. of Credits	**3+2**
Contact hours	**45 Hrs**		Duration of SEA/Exam	**2 Hours**
Formative Assessment Marks	**40**		Summative Assessment Marks	**60**

Course Pre-requisite(s): Certificate with minimum 45%

Course Outcomes (COs): At the end of the course the student should be able to:

1. Understand the concept of nutrient modifications in therapeuticdiets.
2. Understand the principles of diet and nutrition in infections andfever
3. Learn dietary requirements in therapeuticconditions
4. Understand the concept and importance of Weightmanagement

Content	**45 Hrs**
Unit–I Introduction to Dietetics	
The dietician: responsibilities, code of ethics, Definition and Objectives of diet therapy, medical nutrition therapy. Factors to be considered in planning therapeutic diets. Routine hospital diets – NPO, Liquid Diets- Clear Liquid Diet, Full Liquid Diet, Soft diet Special feeding methods (Enteral and Parenteral)	10 Hrs
Unit -II - Nutrition in Febrile Conditions	
Causes and nutritional management in; a) Infection- Host defence mechanisms, causes, types, Metabolic changes during infection, nutritionalmanagement b) Fever - types of fevers [long term (typhoid, TB, malaria) and short term (covid, dengue, chikungunya), metabolic changes duringfevers.	15 Hrs

Unit -III Nutrition for Weight Management	
Body weight components, Assessment: BMI, WHR, Energy imbalance: underweight, overweight, obesity	20 Hrs
Obesity - classification, theories, etiology, risk factors, nutritional management and dietary modifications, Role of hormones in control of appetite and weight management–action of leptin, ghrelin, insulin, estrogen, neural and hormonal count, other types of peptide hormones. Underweight- classification, etiology, risk factors, nutritional management and dietary modifications,	

Course Title	**DIETETICS –I (Practical)**	Practical Credits	**2**
Course No.	**CNDP3.2**		
Plan, prepare and evaluate			
1. Routine hospital diets a. Clear fluid, b. Full fluid, c. Soft diet, d. Bland diet e. Blenderiseddiet			
2. A day's diet fortyphoid 3. A day's diet forTuberculosis 4. High calorie and high protein recipes for febrileconditions 5. Therapeutic recipes (micronutrient rich) forinfections 6. A day's low-calorie diet for obeseperson. 7. A day's high calorie diet for underweightperson.			

References	
1	Modern Nutrition in Health and Disease 10th edition by Maurice E. Shils
2	Alfred H.Katz, Prevention and health, the Haworth, Press, New York 1999.
3	Nutritional biochemistry of vitamins. David a bendor.
4	Achayya, K.T.:(1998) A Historical Dictionary of Indian Foods, Oxford Publishing Co.
5	Mahindru, S.N. (2002). Food Additives Characteristics, Detection andEstimation,Tata McGraw-Hill Publishing Co. Ltd. NewDelhi.
6	Research Methodology By C.R Kothari
7	International Life Sciences Institute Present Knowledge in Nutrition – latest edition.
8	Krause's food and nutrition care process,14th edition
9	Mahan,LK&Escott-Stump,(2000),Krause's food nutrition and diet therapy,12th edition
10	Sareen S,(2005)Advanced nutrition in human metabolism,4thedition,USA,IAPEN, BAPEN website
11	Williams, S.R. (1993): Nutrition and Diet Therapy, 7th Edition, Times Mirror/Mosby College Publishing.
12	Davis, J. and Sherer, K. (1994): Applied Nutrition and Diet Therapy for Nurses, 2nd Edition, W.B. Saunders Co.

Program Name	**BSc Clinical Nutrition and Dietetics**		Semester	**Third Sem**
Course Title	**Nutritional Biochemistry (Theory)**			
Course No.	**CNDT3.3**	**DSC 9**	No. of Credits	**3**
Contact hours	**45 Hrs**		Duration of SEA/Exam	**2 Hours**
Formative Assessment Marks	**40**		Summative Assessment Marks	**60**

Course Pre-requisite(s): Certificate with minimum 45%

Course Outcomes (COs): At the end of the course the student should be able to:

1. Understand the basics of Biomolecules – Macronutrients and micronutrients
2. Role of biomolecules as nutrients and their requirement for physiologicalfunctions
3. Learn the biochemical mechanisms of nutrition andmetabolism.
4. Understand the mechanism and carbohydrate metabolism and inter relationship betweenmetabolic pathways

Content	**45 Hrs**
Unit–I Macronutrients	
Carbohydrates: Classification, Caloric value, Recommended daily allowances, Dietary sources, Functions, Digestion, absorption and storage, metabolism of carbohydrates, Malnutrition: Deficiencies and Overconsumption Protein: Classification, Caloric value, Recommended daily allowances, Dietary sources, Functions, Digestion, absorption and storage, metabolism of carbohydrates, Malnutrition: Deficiencies and Overconsumption Fat: Classification, Caloric value, Recommended daily allowances, Dietary sources. Functions, Digestion,absorptionandstorage,metabolism,Malnutrition:DeficienciesandOverconsumption	15 Hrs
Unit -II - Fat soluble vitamins and Water-soluble vitamins	

Classification, Recommended daily allowances, Dietary sources, Functions, Absorption, synthesis, metabolism storage & excretion, Deficiencies, Hypervitaminosis Water and electrolytes: Daily requirements, regulation of water metabolism, distribution ofbody water, Maintenance of fluid & electrolyte balance, Over hydration, dehydration and water intoxication, Electrolyteimbalances.	15 Hrs
Macro and micro minerals:Classification, Recommended daily allowances, Dietary sources ,Functions , Absorption, synthesis, metabolism storage & excretion , Deficiencies , Over consumption and toxicity	
Unit -III Carbohydrates Metabolism	
Introduction to metabolism, Metabolism of glucose (glycolysis), fructose and galactose; Metabolism of pyruvate and lactate; Metabolism of acetyl CoA (TCA cycle); energetic of glucose metabolism, Synthesis of ribose (HMP Shunt); Synthesis of glucose from noncarbohydrates (gluconeogenesis); Metabolism of Glycogen- Glycogenesis and Glycogenolysis,	15 Hrs

References	
1	Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (2000): 25th Ed. Harpers Biochemistry. Macmillan Worth Publishers.
2	Nelson, D.L. and Cox, M.M. (2000): 3rd Ed. Lehninger's Principles of Biochemistry, Macmillan Worth Publishers.
3	Devlin, T.M. (1997): 4th Ed. Text book of Biochemistry with Clinical Correlations, Wiley LissInc
4	Stryer, L. (1998): 4th Ed. Biochemistry, WH Freeman and Co.
5	Conn,E.E.,Stumpf,P.K.,Bruening,G.andDoi,R.H.(2001):5thEd.OutlinesofBiochemistry,John Wiley andSons.
6	Voet, D. Voet, J.G. and Pratt, C.W. (1999). Fundamentals of Biochemistry.
7	Tietz, N.W. (1976) Fundamentals of Clinical Chemistry. WB Saunders Co.
8	King, E.J. and Wootton, I.D.P. (1956). 3rd ed. Micro-Analysis in Medical Biochemistry. J and A Churchill Ltd.
9	Plummer, D.T. (1987). 3rd ed. An Introduction to Practical Biochemistry. McGraw-Hill Book Co.

Program Name	**BSc Clinical Nutrition and Dietetics**		Semester	**Third Sem**
Course Title	**Traditional Foods and Health (Theory)**			
Course No.	**CNDT3.4**	**OE -3**	No. of Credits	**3**
Contact hours	**45 Hrs**		Duration of SEA/Exam	**2 Hours**
Formative Assessment Marks	**40**		Summative Assessment Marks	**60**

Course Pre-requisite(s): Certificate with minimum 45%

Course Outcomes (COs): At the end of the course the student should be able to:

1. Understand the basics of Biomolecules – Macronutrients and micronutrients
2. Role of biomolecules as nutrients and their requirement for physiologicalfunctions
3. Learn the biochemical mechanisms of nutrition andmetabolism.
4. Understand the mechanism and carbohydrate metabolism and inter relationship betweenmetabolic pathways

Content	**45 Hrs**
Unit–I Introduction to Traditional foods	
Definition of Traditional foods, food as religious and cultural symbols; importance of food in understanding human culture - variability, diversity. Indian traditional foods and cuisine: History and evolution Specialty ingredients in regional cuisines – herbs, extract, spices, masala powders and cooking oils of different regions Geographical Indication (GI) tag for traditional foods **Health Aspects of Traditional Foods**: Comparison of traditional foods with typical fast foods / junk foods – cost, food safety, nutritional facts, and benefits; traditional foods used for specific ailments /illnesses, emotional benefits.	15 Hrs
Unit -II - Traditional Food Patterns	
Typical breakfast, meal, and snack foods of different regions of India. Regional foods that have gone Pan Indian / Global. Popular regional foods; Traditional fermented foods, pickles and preserves, beverages, snacks, desserts and sweets, street foods.	15 Hrs

Regional cuisines of India- Traditional foods of south Indian, north Indian, west Indian and east Indian cuisine.	
Unit -III Commercial production of Traditional foods	
Processing and manufacture of traditional foods- paneer, butter and ghee manufacture. Commercial production and packaging of traditional beverages such as tender coconut water, neera, lassi, buttermilk, dahi. Commercialproductionofintermediatefoods–gingerandgarlicpastes,tamarindpastes,masalas (spice mixes), idli and dosabatters.	15 Hrs

References	
1	Sen, Colleen Taylor Food Culture in India Greenwood Press, 2005.
2	Davidar, Ruth N. Indian Food Science: A Health and Nutrition Guide to Traditional Recipes: East West Books, 2001
3	WyaneGisslen. Professional Cooking. John Wiley& Sons, New Jersey. 2015. 8th edn
4	Jagmohan Negi. Fundamentals of Culinary Art. S. Chand and Company Pvt. Ltd., New Delhi. 2013. 3.
5	JagmohanNegi.FoodPresentationTechniques(GarnishingandDecoration).S.ChandandCompany Pvt. Ltd., New Delhi. 2013.4.
6	Eva Medved. Food Preparation and Theory. Prentice-Hall Inc., Englewood Cliffd, New Jersey. 1986.
7	Al-Khusaibi, M., Al-Habsi, N., & Rahman, M. S. (Eds.). (2019). Traditional Foods: History, Preparation, Processing and Safety. Springer Nature.
8	Kristbergsson, K., & Oliveira, J. (2016). Traditional Foods: General and Consumer Aspects (Integrating Food Science and Engineering Knowledge Into the Food Chain, 10)(2016 ed.).
9	Galanakis, C. M. (Ed.). (2019). Innovations in traditional foods. Woodhead Publishing.

Program Name	**BSc Clinical Nutrition and Dietetics**		Semester	**Fourth Sem**
Course Title	**DIETETICS II (Theory)**			
Course No.	**CNDT4.1**	**DSC -10**	No. of Credits	**3+2**
Contact hours	**45 Hrs**		Duration of SEA/Exam	**2 Hours**
Formative Assessment Marks	**40**		Summative Assessment Marks	**60**

Course Pre-requisite(s): Certificate with minimum 45%

Course Outcomes (COs): At the end of the course the student should be able to:

1. Learn the pathophysiology of gastrointestinal disorders and their dietarymanagement.
2. Understand the pathophysiology of diabetes mellitus, dietary management, andtreatment
3. Learn the pathophysiology of Hypertension and Cardiovascular diseases and its dietary management.

Content	**45 Hrs**
Unit–I Diet in gastrointestinal disorders	
Pathophysiology and MNT for Indigestion, peptic ulcer, constipation, diarrhea, lactose intolerance, gluten enteropathy, irritable bowel syndrome	10 Hrs
Unit -II - Diabetes Mellitus	
a) Definition, Types (IDDM, NIDDM, MODY, GDM) etiological classification (WHO), etiology, symptoms, tests (blood and urine) – GTT, RBS, FBS, PPBS, HbA1c (Normal and abnormal values), complications (long and short term) b) NutritionalandDietarymanagementofIDDM,NIDDMandGDM,useoffoodexchangelist, Glycemic index and glycemic load of foods, carbohydrate counting, carbohydrate load, Oral hypoglycemic drugs, Insulin – long acting, short acting, intermittentacting c) Importance of physicalactivity	20 Hrs
Unit -III Hypertension and Cardiovascular disorders	
a) Hypertension - Etiology, risk factors, symptoms, types, nutritional and dietary management, role of physicalactivity. b) Cardiovascular disorders– • Etiology, risk factors, nutritional and dietarymanagement	15 Hrs

• Atherosclerosis – role of fat in the development ofatherosclerosis • Congestive HeartFailure • Dyslipidemia • Importance of physicalactivity	

Course Title	**DIETETICS –II (Practical)**	Practical Credits	**2**
Course No.	**CNDP4.1**		
Plan, prepare and evaluate			
1. A day's diet for pepticulcer 2. A day's diet forconstipation 3. A day's diet for diarrhoealcondition 4. Recipes for lactoseintolerance 5. Recipes for glutenenteropathy			
6. Prepare a list of low, medium, and high GIfoods 7. A day's diet for NIDDM (case profile) 8. A day's diet for GDM (caseprofile) 9. A day's diet for Hypertension (caseprofile) 10. A day's diet for atherosclerosis (caseprofile)			

References	
1	Modern Nutrition in Health and Disease 10th edition by Maurice E. Shils
2	Alfred H.Katz, Prevention and health, the Haworth, Press, New York 1999.
3	Nutritional biochemistry of vitamins David a bendor.
4	Achayya, K.T.:(1998) A Historical Dictionary of Indian Foods, Oxford Publishing Co.
5	Mahindru,S.N.(2002).FoodAdditivesCharacteristics,DetectionandEstimation,TataMcGraw-Hill Publishing Co. Ltd. NewDelhi.
6	Research Methodology By C.R Kothari
7	International Life Sciences Institute Present Knowledge in Nutrition – latest edition.
8	Krause's food and nutrition care process, 14th edition
9	Mahan, L K & Escott-Stump, (2000), Krause's food nutrition and diet therapy,12th edition
10	Sareen S, (2005) Advanced nutrition in human metabolism, 4th edition, USA

Program Name	**BSc Clinical Nutrition and Dietetics**	Semester	**Fourth Sem**
Course Title	**Community Nutrition (Theory)**		

Course No.	**CNDT4.2**	**DSC -11**	No. of Credits	**3+2**
Contact hours	**45 Hrs**		Duration of SEA/Exam	**2 Hours**
Formative Assessment Marks	**40**		Summative Assessment Marks	**60**

Course Pre-requisite(s): Certificate with minimum 45%

Course Outcomes (COs): At the end of the course the student should be able to:

1. Learn the concept of malnutrition and nutritionalepidemiology
2. Understand major nutritional problems prevalence, prevention, andcontrol
3. Understand policies and programs to combat community nutrition programs discussed inclass.
4. Know the role of organizations working towards combatingmalnutrition.

Content	**45 Hrs**
Unit–I Introduction	
Meaningandscopeofcommunitynutrition;Multidisciplinaryapproachofpublichealthnutrition; Concept of food security, nutrition security, nutrition monitoring, nutrition surveillance, health economics, epidemiological studies, nutritionalepidemiology. Malnutrition: etiology, prevalence, vicious cycle of malnutrition, economics of malnutrition. MajorNutritionalproblems:Prevalenceatnationalandinternationallevel;Preventionandcontrol of: Vitamin A deficiency, IDD, Anaemia, Coronary heart disease, Hypertension, Diabetes Mellitus,Diarrhoea,lowbirthweight,Child,andmaternalmalnutrition;PrevalenceofZnandCu deficiency.	15 Hrs
Unit -II - Nutrition policy and programs	
National nutrition policy: need for nutrition policy, policy strategies and their implementations. National Nutrition programs- Objectives and functions of National Anaemia prophylaxis programs; Vitamin A prophylaxis programs; Goitre control program ; ICDS; SNP; ANP Sustainable development goals; National nutrition policy-Aims, Short term and long-term intervention, implementation, Vision for the 21st century.	15 Hrs

Unit -III Organizations to combat malnutrition	
Objectives and functions, National organizations concerned with Food and Nutrition- ICMR, NIN, CFTRI, DFRL, NIPCCD InternationalorganizationsconcernedwithFoodandNutrition-FAO,WHO,UNICEF,WORLD BANK Approaches and strategies for improving nutritional status and health: Health–based interventions, Food–based interventions including fortification and genetic improvement of foods, supplementary feeding, Nutrition education for behaviour change, environmental sanitation.	15 Hrs

Course Title	**Community Nutrition (Practical)**	Practical Credits	**2**
Course No.	**CNDP4.2**		

Plan, prepare and evaluate

1. Preparation of audio-visual aids: Poster, Chart, Flash card, power point presentation and one video clipping.
2. Planning and Preparation of low-cost recipes for IronDeficiency.
3. Planning and Preparation of low-cost energy rich and protein rich recipes.
4. Planning and Preparation of low-cost recipes for Vitamin A deficiency
5. Planning and preparation of Complementary Foods (emphasis of premixes and ARF).
6. Planning and preparation of indigenous low cost, nutritive recipes (using methods to enhance the nutritive value of foods at home level) suitable for various vulnerable groups.
7. Visit to Food and Nutrition Board and NIPCCD
8. Planning and conducting nutrition Health Education activity using various teaching aids for vulnerablegroups.
9. PlanningandconductinganExhibitionwithreportwritingontopicsrelatedtocommunitynutritionand health.

References	
1	BamjiSM,RaoNPandReddyV,Textbookofhumannutrition,oxfordandIBHpublishingco.,New Delhi.
2	GopalanC,Combating undernutrition-basic issues and practical approaches, Nutrition Foundation of India,1987.
3	GopalanC,Women and nutrition in India, NFI,New Delhi,1992.
4	Jelliffe D.D.1966. The assessment of Nutritional Status of the Community. WHO, monograph series.
5	Jelliffe D.D.1966. The assessment of Nutritional Status of the Community. WHO, monograph series.
6	Michael.J.G,Barrie.M.M:Public health nutrition,Blackwell publishing,2005.
7	Nweze Eunice Nnakwe., Community Nutrition – planning health promotion and disease prevention., Jones and Bartlett publishers, 2009.
8	Park.K,Park's textbook of preventive and social medicine.,12th edition.M/S Banarsidasbhanot publishers,2009.
9	Reddy V, PrahladRao N, Sastry G and Nath KK, Nutrition trends in India, Hyderabad, NIN,1993

Program Name	**BSc Clinical Nutrition and Dietetics**		Semester	**Fourth Sem**
Course Title	**Nutrition In Physical Activity (Theory)**			
Course No.	**CNDT4.3**	**DSC -12**	No. of Credits	**3**
Contact hours	**45 Hrs**		Duration of SEA/Exam	**2 Hours**
Formative Assessment Marks	**40**		Summative Assessment Marks	**60**

Course Pre-requisite(s): Certificate with minimum 45%

Course Outcomes (COs): At the end of the course the student should be able to:

1. Learnhownutritioninfluenceshumandevelopment,exerciseperformance,recoveryandphysiological adaptations
2. Understand macronutrient metabolism during and after exercise and outline the requirements of these nutrients forathletes
3. Understand the physiological functions of vitamins, minerals, and major nutrients inathletes.
4. Learn the composition of common sports drinks and ergogenic aids and discuss how these can beused appropriately and safely before, during and after exercise

Content	**45 Hrs**
Unit–I Introduction to body composition	
Definition of physical fitness, Benefits of Fitness, Components of fitness. Conditioning by training – overload principle. Body's response to physical activity- Weight training, cardiorespiratory conditioning, muscle conditioning, Physical activity pyramid Balanced fitness program. Human Body Composition: Significance of studying body composition. Two compartment and multiple compartment models Methods of Assessment: Nutritional Anthropometry, BOD POD, Bioelectric impedance,DEXA, Whole body K counter. Factors affecting body composition: Age, Body weight, physicalactivity	10 Hrs
Unit -II - Macro Nutrients	
Carbohydrate as an energy source for sport and exercise. Carbohydrate stores, Fuel for aerobic and anaerobic metabolism, Glycogen re-synthesis, CHO Loading, CHO composition for pre-exercise, during and recovery period.	20 Hrs

Role of Fat as an energy source for sports and exercise. Fat stores, regulation of fat metabolism, factorsaffectingfatoxidation(intensity,duration,trainingstatus,CHOfeeding),effectoffasting and fatingestion Proteinandaminoacidrequirements,FactorsaffectingProteinturnover,Proteinrequirementand metabolism during endurance exercise, resistance exercise and recovery process. Protein supplement.	
Unit -III Important micronutrients for exercise	
Role of Vitamins and specific mineral needs during exercise, Dehydration, Exercise induced oxidative stress and role of antioxidants. Female athletic triad, sports anaemia Dietary supplements and ergogenic aids (nutritional, pharmacological and physiological). Popular and famous Ergogenic aids – Anti doping agency - list of banned drugs/substances	15 Hrs

References	
1	Bucci, L., 1993 Nutrients as Ergogenic Aids for Sports and Exercise. Boca Raton, FL.:CRC Press.
2	Advances in Sport and Exercise Science: Nutrition and Sport , Edited by Don MacLaren. , ChPublished by Churchhill Livingstone, Elsevier. 2007
3	Sports Medicine: The school age athlete by Bruce Reider. 1996. Published by W.B. Saunders.
4	Nutrition for Serious Athletes. Dan Banardot. 2000; Human Kinetics.
5	Energy-Yielding Macronutrients and Energy Metabolism in Sports Nutrition. Edited by Judy A Driskell , Ira Wolinsky, CRC Press 2000.
6	Recommended Dietary Intakes for Indian Sportsman and Women. Satyanarayan, K; Nageshwar Rao. C; NarsingaRao,B.S.; Malhotra, M.S. (1985)., Hyderabad, National Institute of Nutrition.
7	Bucci, L., 1993 Nutrients as Ergogenic Aids for Sports and Exercise. Boca Raton, FL.:CRC Press.
8	Advances in Sport and Exercise Science: Nutrition and Sports, Edited by Don MacLaren, ChPublished by Churchhill Livingstone, Elsevier. 2007
9	Sports Medicine: The school age athlete by Bruce Reider. 1996. Published by W.B. Saunders.
10	Nutrition for Serious Athletes. Dan Banardot. 2000; Human Kinetics.
11	Energy-Yielding Macronutrients and Energy Metabolism in Sports Nutrition. Edited by Judy A Driskell, Ira Wolinsky, CRC Press 2000.
12	Recommended Dietary Intakes for Indian Sportsman and Women. Satyanarayan, K; Nageshwar Rao.

Program Name	**BSc Clinical Nutrition and Dietetics**		Semester	**Fourth Sem**
Course Title	**Nutrition in Weight Management (Theory)**			**OPEN ELECTIVE**
Course No.	**CNDT4.4**	**OE -4**	No. of Credits	**3**
Contact hours	**45 Hrs**		Duration of SEA/Exam	**2 Hours**
Formative Assessment Marks	**40**		Summative Assessment Marks	**60**

Course Pre-requisite(s): Certificate with minimum 45%

Course Outcomes (COs): At the end of the course the student should be able to:

1. Learn about the concept health, nutrition, macro, andmicronutrients
2. Learn about the importance of nutrients, sources, anddeficiencies
3. Understand the basics of weight management, ideal body weight,BMI
4. Understand the role of physical activity in goodhealth

Content	**45 Hrs**
Unit–I	
Health - Definition a) Balanced diet- factors affecting food intake b) Food groups andServing c) My Plate d) Classification of Macro and micronutrients e) Functions, Food Sources and Deficiency ofnutrients	15 Hrs
Unit -II	
a) Weightmanagement b) Overweight,underweight c) Ideal body weight,BMI d) Dietary guidelines and health hazards- overweight and underweight e) Role of physical activity in weight management	15 Hrs

Unit -III Important micronutrients for exercise	
a) Components of Physicalfitness b) Health benefits offitness c) Types of physical activity- Structured andunstructured.	15 Hrs
d) Physical activitypyramid e) Yoga and meditation in health: Effect of Yoga and meditation on physical and mentalhealth	

References	
S1	Melvin H Williams (2005) Nutrition for Health, Fitness and Sports 7thEdn
2	Mahan L K and Ecott-Stumps (2000) Krause's Food, Nutrition and Diet Therapy, 10thedn,W B Saunders Ltd
3	Whitney and Rolfers S R (1999) Understanding Nutrition, 8thEdn West/Wadsworth, An International Thomson Publishing Company
4	Jayaprakash. C.S 2003 Sports Medicine, Jaypee brother's medical publishers (P) ltd New Delhi.