

SNDT Women's University

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Syllabus

MSc CLINICAL NUTRITION AND DIETETICS



SNDT Women's University
1, Nathibai Thackersey Road,
Mumbai 400 020
Revised – 2015

M.Sc. Clinical Nutrition and Dietetics-2015

Objectives:

- 1. To impart knowledge and develop capacities of the students through state of the art higher education in the area of Clinical Nutrition and Dietetics, Medical Nutrition Management*
- 2. To develop students to become health care professionals for services in various fields of clinical nutrition and medical nutrition management and related areas such as hospitals academics, research, industry, clinical nutrition department, training, extension and community service.*
- 3. To develop capacities and abilities and enable them to pursue higher education and research in Clinical Nutrition and Dietetics*

SEMESTER-I

Code No	Courses	Total Credits	Th-Cr	Pr-Cr	Int Cr/M	Ext Cr/M	Total Marks	U/C	Component
17101	Nutritional Biochemistry	4	4	-	2/50	2/50	100	U	CC
17102	Macronutrients	4	4	-	2/50	2/50	100	U	CC
17103	Medical Nutrition Therapy I Th	4	-	4	2/50	2/50	100	C	CC
17104	Medical Nutrition Therapy I Pr	4	4	-	2/50	2/50	100	U	CC
17105	Pathophysiology and Metabolism in Disease	4	4	-	2/50	2/50	100	U	CC
17191	Advanced Nutrition Practicals	4	-	4	2/50	2/50	100	C	IDC
Total		24	16	8	12/300	12/300	600		

SEMESTER-II

Code No	Courses	Total Credits	Th - Cr	Pr - Cr	Int Cr/M	Ext Cr/M	Total Marks	U/C	Component
00201	Research Methodology	4	4	-	2/50	2/50	100	U	CC
17201	Applied Food Science and Product Modification	4	-	4	2/50	2/50	100	U	AC
17202	Vitamins	4	4	-	2/50	2/50	100	U	CC
17203	Medical Nutrition Therapy II Th	4	4	-	2/50	2/50	100	U	CC
17204	Medical Nutrition Therapy II Pr	4	-	4	2/50	2/50	100	U	CC
17291 17292 17293	Clinical Nutrition Or Nutrition for Sports and Exercise Or Catering Management Pr	4	4	-	2/50	2/50	100	C	IC
Total		24	16	8	12/300	12/300	600		

SEMESTER-III

Code No	Courses	Total Credits	Th-Cr	Pr-Cr	Int Cr/M	Ext Cr/M	Total Marks	U/C	Component
17301	Minerals	4	-	4	2/50	2/50	100	U	CC
17302 17303	Public Nutrition and Health Or Maternal and Child Nutrition	4	4	-	2/50	2/50	100	C	AC
17304	Pediatric Nutrition	4	2	2	2/50	2/50	100	U	AC
17305	Nutrition in Cancer and Critical Care	4	4	-	2/50	2/50	100	U	AC
00301	Statistical Applications in Research	4	4	-	2/50	2/50	100	U	AC
17391 17392	Functional Foods, Biodynamic Principles, Nutraceuticals or Geriatric Nutrition	4	-	4	2/50	2/50	100	C	IC
	Total	24	14	10	12/300	12/300	600		

SEMESTER-IV

Code No	Courses	Total Credits	Th - Cr	Pr-Cr	Int Cr/M	Ext Cr/M	Total Marks	U/C	Component
00401	Dissertation	8	-	8	4/100	4/100	200	U	CC
00402	Internship	8	-	8	4/100	4/100	200	C	AC
17491	Scientific Writing	4	4	-	4/100	-	100	C	IC
17492	Dietetic Techniques and Patient Counseling	4	-	4	2/50	2/50	100	C	IC
17493	Or Alternative and Complimentary systems for Health								
17494	Or Nutrigenomics								
	Total								
		24	4	20	14/350	10/250	600		

1. Core Component

Sem	Course	Credits
I	Nutritional Biochemistry**	4
	Macronutrients	4
	Medical Nutrition Therapy I Th	4
	Medical Nutrition Therapy I Pr	4
	Pathophysiology and Metabolism in Disease	4
II	Research Methodology	4
	Vitamins	4
	Medical Nutrition Therapy II Th	4
	Medical Nutrition Therapy II Pr	4
III	Minerals	4
IV	Research	8
	Total	48

2. Applied Component

Sem	Course	Credits
I	-	-
II	Applied Food Science and Product Modification	4
III	Public Nutrition and Health / Maternal and Child Nutrition	4
	Pediatric Nutrition	4
IV	Nutrition in Cancer and Critical Care	4
	Statistical Applications in Research	4
	Internship	8
	Total	28

3. Intra / Inter Disciplinary component

Sem	Course	Credits
I	Advanced Nutrition Practicals	4
II	Clinical Nutrition / Nutrition for Sports and Exercise / Catering Management Pr	4
III	Functional Foods, Biodynamic Principles, Nutraceuticals / Geriatric Nutrition	4
IV	Scientific Writing	4
	Dietetic Techniques and Patient counseling / Alternative and Complimentary systems for Health / Nutrigenomics	4
	Total	20

NUTRITIONAL BIOCHEMISTRY

4 Credits (Th)

Objectives:

This course will enable the students to:

1. Augment the knowledge of biochemistry acquired at the undergraduate level
2. Understand the mechanisms adopted by the human body for regulation of metabolic pathways
3. Develop an insight into interrelationships between various metabolic pathways
4. Understand integration of cellular level metabolic events to nutritional disorders and imbalances.
5. Become proficient for specialization in nutrition

Contents:

Module No	Topics and Details	Number of credits
1	<p>a. Membrane structure, composition and Transport of metabolites across membranes</p> <p>b. Acid base balance and its regulation</p> <p>c. Enzymes</p> <ul style="list-style-type: none">- Kinetics of monosubstrate and bisubstrate catalysed reactions (including inhibition)- Enzyme specificity, regulation of enzyme activity and synthesis- Enzymes in clinical diagnosis <p>d. Detoxification in the body-metabolism of xenobiotics (Phase I and Phase II enzymes)</p> <p>e. Cell Signaling : Overview of extracellular cell signaling, G protein couple receptors and their effectors, enzyme linked receptors and their effectors, second messengers, map kinase pathways</p> <p>f. Free radicals, ROS and oxidative damage</p>	2
2	<p>Review of :</p> <p>a. Carbohydrate Metabolism : Intestinal transport of carbohydrates, Transport of glucose across various cells, Cellular metabolism of carbohydrates Glycogen</p>	1

	<p>metabolism Regulation of carbohydrate metabolism at substrate level, enzyme level, hormonal level and organ level, Disorders of carbohydrate metabolism. Definition, classification, structure and properties of glycoproteins and proteoglycans</p> <p>b. Metabolism of Lipids : Metabolism is to be discussed with reference to: Intestinal transport of lipids, Cellular uptake and metabolism of lipids (beta-oxidation, denovo synthesis of fatty acids, synthesis and breakdown of unsaturated fatty acids, cholesterol, phospholipids and triacylglycerol) Lipoprotein metabolism, VLDL and LDL (‘Forward’ Cholesterol transport) VLDL and LDL (Endogenous TAG transport), HDL (‘Reverse’ Cholesterol transport), Regulation of lipid metabolism at substrate level, enzyme level, hormonal level and organ level, Disorders of lipid metabolism, Dyslipidemias, Lipid storage diseases</p> <p>c. Protein Metabolism: Metabolism of amino acids- biosynthesis and catabolism - energy, glucose and ketone bodies, protein amino acids, non-protein amino acids (including urea cycle, transamination, one-carbon metabolism), Creatine and creatinine, Plasma proteins – Nature, properties and functions, Biologically active peptides, polypeptides and transport proteins, Inborn errors of amino acid metabolism</p> <p>d. Intermediary Metabolism: Review of regulation of intermediary metabolism- equilibrium and non-equilibrium reactions, committed steps, allosteric modifications, covalent modulation, hormonal induction and repression, cross-over theorem, starve-feed cycle, caloric homeostasis and futile cycles, Tricarboxylic acid cycle</p> <p>e. Biological Oxidation : Electron transport chain and oxidative phosphorylation</p>	
3	<p>Biochemical aspects of purine and pyrimidines</p> <ol style="list-style-type: none"> Metabolism of purines Metabolism of pyrimidines Role of purine and pyrimidine nucleotides in metabolism. <p>Biochemistry of Nucleic Acids</p> <ol style="list-style-type: none"> Metabolism of DNA Metabolism of RNAs 	1

	<p>c. DNA replication, mutation, repair and recombination concepts d. Disorders of nucleic acid metabolism</p> <p>Protein Biosynthesis</p> <p>a. Gene expression and its regulation, transcription, translation, post-translational modification b. Inhibitors of protein biosynthesis c. Gene expression in mitochondria d. Systems Biology including Metabolomics and Proteomics</p>	
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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 Liss Inc
4. Stryer, L. (1998): 4th Ed. Biochemistry, WH Freeman and Co.
5. Conn, E.E., Stumpf, P.K., Bruening, G. and Doi, R.H. (2001): 5th Ed. Outlines of Biochemistry, John Wiley and Sons.
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.

MACRONUTRIENTS

4 Cr (Th)

Objectives:

This course will enable the students to:

1. Gain in-depth knowledge of the physiological and metabolic role of macronutrients, fat soluble vitamins and electrolytes and their importance in human nutrition.
2. Enable the understanding of basis of human nutritional requirements and recommendations through the life cycle and translate the knowledge into practical guidelines for dietary needs.
3. Familiarize with the recent advances in nutrition and apply this knowledge in planning for public health programmes.

Contents:

Module No	Topics and Details	No of Credits
1	Human Nutritional Requirements – Development and Recent Concepts. a.Methods of determining human nutrient needs b.Description of basic terms and concepts in relation to human nutritional requirements. c.Guidelines and Recommendations - Development of International and National Nutritional Requirements - Translation of nutritional requirements into Dietary Guidelines Body Composition a. Significance of body composition and changes through the life cycle b. Methods for assessing body composition (both classical and recent) and their applications. Nutrition in Special Conditions: Space Travel, High Altitudes, Low Temperature, Submarines. Energy a.Components of energy requirements: BMR, RMR, thermic effect of feeding, physical activity. Factors affecting energy requirements, methods of measuring energy expenditure.	1

	<p>b. Estimating energy requirements of individuals and groups.</p> <p>c. Regulation of energy metabolism and body weight: Control of food intake – role of leptin and other hormones.</p>	
2	<p>Carbohydrates</p> <p>a. Review of nutritional significance of carbohydrates and changing trends in dietary intake of different types of carbohydrates and their implications</p> <p>b. Dietary fibre: Types, sources, role and mechanism of action</p> <p>c. Resistant starch, fructo-oligosaccharides, other oligosaccharides: Chemical composition and physiological significance</p> <p>d. Glycemic Index and glycemic load</p> <p>e. Carbohydrates and gene expression</p> <p>Proteins</p> <p>a. Overview of role of muscle, liver and G.I. tract in protein metabolism</p> <p>b. Amino acid and peptide transporters</p> <p>c. Therapeutic applications of specific amino acids</p> <p>d. Peptides of physiological significance</p> <p>e. Proteins, amino acids and gene expression</p>	2
3	<p>Lipids</p> <p>a. Nutritional significance of fatty acids – SFA, MUFA, PUFA: functions and deficiency</p> <p>b. Role of n-3 and n-6 fatty acids</p> <p>c. Prostaglandins</p> <p>d. Trans Fatty Acids</p> <p>e. Conjugated linoleic acid</p> <p>f. Nutritional Requirements and dietary guidelines (International & National) for visible and invisible fats in diets.</p> <p>g. Lipids and gene expression</p>	1

References:

1. Annual Reviews of Nutrition. Annual Review Inc, California, USA.
2. Shils, M.E.; Olson, J.; Shike, M. and Roos, C. (1998): Modern Nutrition in Health and Disease. 9th edition. Williams and Williams. A Beverly Co. London.
3. Bodwell, C.E. and Erdman, J.W. (1988) Nutrient Interactions. Marcel Dekker Inc. New York
4. World Reviews of Nutrition and Dietetics.
5. WHO Technical Report Series.

6. Indian Council of Medical Research. Recommended Dietary Intakes for Indians - Latest Recommendations.
7. Indian Council of Medical Research. Nutritive Value of Indian Foods - Latest Publication.
8. Berdanier, C.D. and Haargrove, J.L. (ed) (1996): Nutrients and Gene Expression: Clinical Aspects. Boca Raton, FL CRC Press.
9. Baeurle, P.A. (ed) (1994) Inducible Gene Expression. Part I: Environmental Stresses and Nutrients. Boston: Birkhauser.
10. Chandra, R.K. (ed) (1992): Nutrition and Immunology. ARTS Biomedical. St. John's Newfoundland.
11. International Life Sciences Institute Present Knowledge in Nutrition – latest edition

Journals:

1. Nutrition Reviews
2. Journal of Nutrition
3. American Journal of Clinical Nutrition
4. British Journal of Nutrition
5. European Journal of Clinical Nutrition
6. International Journal of Vitamin and Nutrition Research
7. International Journal of Food Science and Nutrition
8. Nutrition Research
9. Annals of Nutrition and Metabolism

MEDICAL NUTRITION THERAPY I

4 Cr (Th)

Objectives

This course will enable the students to:

1. Understand the promotive and therapeutic role of diet and nutritional care
With reference to weight management, fevers & infections and diseases of the gastro-intestinal tract and hepatobiliary system
2. Understand the etiology, physiologic and metabolic anomalies of acute and chronic diseases and patient needs
3. Know the effect of the various diseases on nutritional status and nutritional and dietary requirements.
4. Able to recommend and provide appropriate nutritional care based on pathophysiology, prevention/ and treatment of the various diet-related disorders/ diseases.
5. Be able to use different nutritional support systems to nourish the patient

Contents

Module No	Topics and Details	No of Credits
1	<p>Nutritional (and dietary) Care Process</p> <p>A) in health</p> <ul style="list-style-type: none">- Depending on the state of growth & development of the individual- at various activity levels and socioeconomic status. <p>B) in disease</p> <ul style="list-style-type: none">- Nutritional screening/ assessment and identification of nutritional problem- Nutritional Intervention and Diet Modification based on interpretation of- Patient data- clinical, biochemical and other relevant data- Nutrition Education and Counseling- Evaluation of Nutritional care	1

	<p>Delivery of Nutritional Support – Meeting nutritional needs</p> <p>A. Enteral tube feeding Different Enteral feeding access routes Practical Aspects</p> <p>B. Parenteral nutrition</p> <p>Exchange lists as a tool in planning diets</p>	
2	<p>Nutrition for weight management: Disorders of energy balance</p> <p>A. Obesity Components of body weight Adipose tissue- structure, regional distribution and storage Regulation of body weight Types of obesity Assessment of obesity Health risks Causes of obesity: neural, hormonal, and psychological Management of obesity</p> <ul style="list-style-type: none"> - Dietary Modification : past and present approach - Psychology of weight reduction : psychotherapy and behaviour modification Physical activity and exercise - Pharmacological treatment - Surgical treatment effect on satiety and other factors - Maintenance of Reduced weight <p>B. Underweight/Excessive Leanness/ Undernutrition</p> <ul style="list-style-type: none"> - Pathophysiology, Causes and assessment including fever and infectious diseases (Tuberculosis, AIDS) - Health risks and effect on nutritional status - Dietary Management - Psychotherapy <p>C. Eating disorders: Anorexia Nervosa and Bulimia Nervosa</p>	1

3	<p>Medical Nutrition therapy for Upper Gastrointestinal tract Diseases /Disorders</p> <p>a) Diagnostic Tests for the G.I. diseases</p> <p>b) Pathophysiology and Nutritional care and diet therapy in</p> <p> i) Diseases of oesophagus; oesophagitis, Hiatus hernia</p> <p> ii) Disorders of stomach: Indigestion, Gastritis, Gastric and duodenal ulcers</p> <p>Management: associated with H. pylori infection, NSAIDS</p> <p>Dietary management: traditional approach and liberal approach</p> <p>c) Gastric Surgery: Nutritional care, dumping syndrome</p> <p>Medical Nutrition therapy for Lower gastrointestinal tract Diseases/Disorders</p> <p>Common Symptoms of Intestinal dysfunction</p> <ul style="list-style-type: none"> - Flatulence, constipation, haemorrhoids, diarrhoea, steatorrhoea, typhoid <p>b) Diseases of the large intestine:</p> <ul style="list-style-type: none"> - Diverticular disease, Irritable bowel syndrome, inflammatory bowel disease <p>c) Malabsorption Syndrome/Diseases of Small intestine</p> <ul style="list-style-type: none"> - Celiac (Gluten –induced) sprue, tropical sprue, intestinal brush border enzyme deficiencies, Lactose intolerance, protein- losing enteropathy <p>d) Principles of dietary Care: Fibre, residue</p> <p>Modified fibre diets</p> <p>e) Intestinal surgery: Short bowel syndrome, Ileostomy, Colostomy, Rectal surgery</p> <p>Medical Nutrition therapy for Diseases of the Hepato - Biliary Tract</p> <p>a. Nutritional care in liver disease in context with results of specific liver function tests</p> <ul style="list-style-type: none"> - Dietary care and management in viral hepatitis(different types) , cirrhosis of liver, hepatic encephalopathy, Wilson’s disease <p>b. Dietary care and management in diseases of the gall bladder and pancreas i.e. biliary dyskinesia, cholelithiasis, cholecystitis, cholecystectomy, pancreatitis, Zollinger-Ellison syndrome</p>	2
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MEDICAL NUTRITION THERAPY I (PRACTICALS)

(4 Cr)

Contents:

Module No	Topics and Details	No of Credits
1	<p>Collection and storage of biological samples for clinical investigations</p> <p>Market survey of commercial nutritional supplements and nutritional support substrates</p> <p>Nutritional (and dietary) Care Process</p> <p>A) in health</p> <ul style="list-style-type: none">- Depending on the state of growth & development of the individual- at various activity levels and socioeconomic status. <p>The Nutritional care process</p> <p>B) in disease</p> <ul style="list-style-type: none">- Nutritional screening/ assessment and identification of nutritional problem- Nutritional Intervention and Diet Modification based on interpretation of- Patient data- clinical, biochemical and other relevant data- Delivery of Nutritional Support – Meeting nutritional needs and practical aspects <p>a) Enteral tube feeding</p> <p>b) Parenteral Nutrition</p> <ul style="list-style-type: none">- Nutrition Education and Counseling-Evaluation of Nutritional care <p>Exchange list as a tool in planning diets</p>	1
2	<p>Nutrition for weight management: Disorders of energy balance</p> <p>B. Obesity</p> <p>Assessment of obesity</p> <p>Management of obesity</p> <ul style="list-style-type: none">- Dietary Modification : past and present approach- Psychology of weight reduction : psychotherapy and behaviour modification- Physical activity and exercise	1

	<ul style="list-style-type: none"> - Maintenance of Reduced weight <p>B. Underweight/Excessive Leanness/Undernutrition including Tuberculosis and AIDS</p> <ul style="list-style-type: none"> - assessment - Dietary Management - Psychotherapy <p>Eating disorders: Anorexia Nervosa and Bulimia Nervosa</p>	
3	<p>Medical Nutrition therapy for Upper Gastrointestinal tract Diseases /Disorders</p> <ul style="list-style-type: none"> a) Diagnostic Tests for the G.I. diseases b) Pathophysiology and Nutritional care and diet therapy in <ul style="list-style-type: none"> i) Diseases of oesophagus; oesophagitis, Hiatus hernia ii) Disorders of stomach: Indigestion, Gastritis, Gastric and duodenal ulcers <p>Management: associated with H. pylori infection, NSAIDS Dietary management: traditional approach and liberal approach</p> <ul style="list-style-type: none"> c) Gastric Surgery: Nutritional care, dumping syndrome <p>Medical Nutrition therapy for Lower gastrointestinal tract Diseases/Disorders</p> <p>Common Symptoms of Intestinal dysfunction</p> <ul style="list-style-type: none"> - Flatulence, constipation, haemorrhoids, diarrhoea, steatorrhoea, <ul style="list-style-type: none"> b) Diseases of the large intestine: <ul style="list-style-type: none"> - Diverticular disease, Irritable bowel syndrome, inflammatory bowel disease <ul style="list-style-type: none"> c) Malabsorption Syndrome/Diseases of Small intestine <ul style="list-style-type: none"> - Celiac (Gluten –induced) sprue, tropical sprue, intestinal brush border enzyme deficiencies, Lactose intolerance, protein- losing enteropathy <ul style="list-style-type: none"> d) Principles of dietary Care: Fibre, residue Modified fibre diets <ul style="list-style-type: none"> e) Intestinal surgery: Short bowel syndrome, Ileostomy, Colostomy, Rectal surgery <p>MNT for Diseases of the Hepato - Biliary Tract</p> <ul style="list-style-type: none"> a) Nutritional care in liver disease in context with results of specific liver function tests <ul style="list-style-type: none"> - Dietary care and management in viral hepatitis(different types) , cirrhosis of liver, hepatic encephalopathy, Wilson’s disease <p>Dietary care and management in diseases of the gall bladder and pancreas i.e. biliary dyskinesia, cholelithiasis, cholecystitis, cholecystectomy, pancreatitis, Zollinger-Ellison syndrome</p>	2

References:

1. Mahan, L.K. and Escott-Stump, S. (2000): Krause's Food Nutrition and Diet Therapy, 10th Edition, W.B. Saunders Ltd.
2. Shils, M.E., Olson, J.A., Shike, M. and Ross, A.C. (1999): Modern Nutrition in Health and Disease, 9th Edition, Williams and Wilkins.
3. Escott-Stump, S. (1998): Nutrition and Diagnosis Related Care, 4th Edition, Williams and Wilkins.
4. Garrow, J.S., James, W.P.T. and Ralph, A. (2000): Human Nutrition and Dietetics, 10th Edition, Churchill Livingstone.
5. Williams, S.R. (1993): Nutrition and Diet Therapy, 7th Edition, Times Mirror/Mosby College Publishing.
6. Davis, J. and Sherer, K. (1994): Applied Nutrition and Diet Therapy for Nurses, 2nd Edition, W.B. Saunders Co.
7. Walker, W.A. and Watkins, J.B. (Ed) (1985): Nutrition in Pediatrics, Boston, Little, Brown & Co.
8. Guyton, A.C. and Hall, J.E. (1999): Textbook of Medical Physiology, 9th Edition, W.B. Saunders Co.
9. Ritchie, A.C. (1990): Boyd's Textbook of Pathology, 9th Edition, Lea and Febiger, Philadelphia.
10. Fauci, S.A. et al (1998): Harrison's Principles of Internal Medicine, 14th Edition, McGraw Hill.
11. World Cancer Research Fund (1997). Food, Nutrition and the Prevention of Cancer- A Global perspective, Washington E.D. WCRF.

Journals and Other Reference Series

1. Nutrition Update Series
2. World Review of Nutrition and Dietetics
3. Journal of the American Dietetic Association
4. American Journal of Clinical Nutrition
5. European Journal of Clinical Nutrition
6. Nutrition Reviews

PATHOPHYSIOLOGY AND METABOLISM IN DISEASE

4 Cr (Th)

Objectives

This course will enable the students to:

1. to understand the pathophysiological changes in different organs, tissues and systems in different disease conditions across the lifespan
2. to understand the metabolic changes occurring in disease conditions
3. Comprehend the implications of functional interrelationships in a diseased body
4. to know and interpret the various diagnostic indicators/parameters
5. to apply this knowledge for planning nutritional care of individuals

Contents:

Module No	Topic and Details	No of Credits
1	Basic concepts of pathophysiology and metabolism of adaptation a. Altered cellular and tissue biology b. Fluid and electrolyte, acids and bases c. Immunity d. Inflammation e. Hypersensitivity, infection and Immunodeficiency f. Stress and Disease g. Musculoskeletal system-Biochemistry and Pathophysiology, Osteoporosis, Osteomalacia, Osteoarthritis Cellular Proliferation and Cancer a. Biology of Cancer b. Tumor spread and treatment c. Clinical manifestations of cancer	1
2	Endocrine System a. Mechanisms of hormone regulation b. Alteration of hormonal regulation c. Hypo and Hyperfunctions of Pituitary, Adrenal cortex and medulla, Hypo and Hyperthyroidism d. Type I, Type II and other types of Diabetes	2

	<p>Digestive system: Biochemistry and Pathophysiology</p> <ul style="list-style-type: none"> a. Manifestations of gastrointestinal dysfunction, b. Acute and chronic gastritis, Ulcers c. Malabsorption syndrome d. Pancreatic insufficiency and Pancreatitis e. Liver dysfunction, Hepatitis, Cirrhosis, Cholelithiasis f. Ulcerative colitis, Crohn’s disease <p>Renal and Urological Biochemistry and Pathophysiology</p> <ul style="list-style-type: none"> a. Alteration of renal and urinary tract function b. Urinary tract obstruction, kidney stones, c. Cystic pyelonephritis, glomerulonephritis, 20ephritic syndrome, renal failure 	
4	<p>Alterations of Haematologic functions:</p> <ul style="list-style-type: none"> a. Anemias and clinical manifestations b. Thalasemia, sickle cell anemia <p>Cardiovascular, lymphatic and pulmonary system</p> <ul style="list-style-type: none"> a. Alteration of cardiovascular functions, atherosclerosis, arteriosclerosis, Thrombus, embolus, dysrhythmias Myocardial ischemia, Myocardial infarction, Heart failure stroke b. Hypertension c. Dyslipidemias d. Alterations of pulmonary function- sings and symptoms of pulmonary disease Respiratory distress syndrome in adults and newborn Obstructive pulmonary diseases Asthma and cystic fibrosis 	1

ADVANCED NUTRITION PRACTICALS

4 Cr (Pr)

Objectives:

This course will enable students to use, apply and interpret various methods for assessment of nutritional status, assessment of dietary/nutrient intakes, physical activity and energy expenditure, and interpret tests used for lipid profile and glycemic control.

Contents:

Module No	Topics and Details	No of Credits
1	<p>A. Assessment of Nutritional Status- reliability, validity accuracy, precision</p> <p>Measurement of weight and height – assessment of nutritional status for adults, young and older children</p> <p>Calculation of BMI, interpretation</p> <p>Use of WHO reference standards</p> <p>Wasting, stunting, underweight, severe and moderate malnutrition</p> <p>Calculation of z-scores and use of software</p> <p>Circumference Measurements – chest, head, mid arm. Waist, hip and ratios wherever applicable</p> <p>Applications to children and adults</p> <p>B. Body Composition: Use of skinfold, bioelectric impedance, DEXA</p> <p>Calculation of body fat</p> <p>C. Dietary Protein Evaluation and Assessment of Protein Status:</p> <ul style="list-style-type: none">- Assessment of protein quality- Chemical Score, PDCAAS- In vitro protein digestibility- Estimation of serum albumin, globulin and albumin:globulin ratio	2
2	<p>Dietary assessment and Assessment of Energy Expenditure</p> <ul style="list-style-type: none">- Food frequency questionnaire- 24-diet recall, 24-hour diet record- Weighment method <p>Assessment of energy expenditure –</p> <ul style="list-style-type: none">- Indirect calorimetry : use of ergometer, treadmill, heart rate monitoring- Recording physical activities- Factorial estimation of energy expenditure: MET, PAL- Study of food labels- calculation of DV- In vitro starch digestibility	1

3	Biomarkers of Carbohydrate and Protein Metabolism <ul style="list-style-type: none"> - Fasting and Postprandial Blood Glucose estimation, OGTT, Glycosylated Hemoglobin, - Glycemic index and glycemic load - Insulin index - Measurement of lipid levels in serum Interpretation	1
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RESEARCH METHODOLOGY

4 credits (Th)

Objectives:

This course will enable students to:

1. develop a scientific approach and know the processes of research
2. develop the competence for selecting methods and tools appropriate for research topics
3. understand concepts of statistical measures of central tendency, dispersion, variability and probability

Contents:

Module No	Topics	Number of Credits
1	The Research Process <ol style="list-style-type: none"> a. Scientific approach to enquiry in comparison to native, common sense approach b. Knowledge, theory and research c. Role, need and scope of research in the discipline of Home Science <p><i>Assignment : Differentiate between investigative reporting and research report (with examples to be brought by students as exercise)</i></p> Steps in Research Process and Elements of Research <ol style="list-style-type: none"> a. Identifying interest areas and prioritizing Selection of topic and considerations in selection b. Review of related literature and research c. Variables- types of variables including discrete and continuous 	1

	<p>variables Conceptual definitions and operational definitions d. Concepts, hypotheses and theories e Hypothesis- meaning, attributes of a sound hypothesis, Stating the hypothesis and types of hypothesis Hypothesis testing- null hypothesis, sample distribution, level of significance, critical regions, Type I and Type II errors f. Research Design Research questions, objectives and assumptions</p> <p>Assignment: <i>Types of variables</i> <i>Hypothesis formations and research questions from Research readings – students identify hypothesis/research questions – Discussion</i></p> <p>Ethics in Research</p>	
2	<p>Types of Research a. Basic and Applied research, Qualitative and Quantitative research (brief review of differences) b. Historical research c. Descriptive research methods – survey, case study, correlational study, content analysis, causal-comparative research d. Analytic studies- pre-experimental, experimental research, quasi experimental research e. Qualitative research, Ethnography f. Evaluative research- general characteristics, use of qualitative methods in enquiry Scope and importance in Home Science</p> <p>Assignment: <i>Differentiate between (a) basic and applied research (Exercise to be based on actual research papers published in accredited journals)</i> <i>(b) qualitative and quantitative research</i> <i>Based on Journal contents undertake a critical appraisal of studies/research papers and discuss types of Research with examples</i></p>	1
3	<p>Sampling a. Rationale, characteristics- meaning, concept of population and sample, and utility b. Types of sampling and generalizability of results c. Probability sampling - simple random sample, systematic random sample, stratified random sampling etc - random and non-random samples, random numbers and use d.. Non-probability sampling - purposive samples, incidental samples, quota samples, snowball samples e.. General consideration in determination of sample size</p>	1
4	<p>Tools for Data Collection a.Primary and secondary methods of data collection</p>	1

	<p>b. Different types of questionnaires, rating scales, check lists, schedules, attitude scales, inventories, standardized tests, interviews, observation</p> <p>c. Development of tools, estimation of reliability and validity of tools</p> <p>d. Procedure for preparation of the tool, administration of tools for data collection</p> <p>e. Procedure for data collection</p> <p>f. Planning for data analysis-coding of responses</p> <p>Assignment : <i>Construction of tools for data collection a) types of questions b) Questionnaire c) interview schedule d) observation d) scales</i></p> <p><i>For a given topic students to frame and discuss the different possibilities of methods and tools</i></p>	
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References

1. Bell, J. (1997): *Doing Your Research Project: A Guide for First-time Researchers in Education and Social Science*, Viva Books, New Delhi
2. Bell, J. (1997): *How to Complete Your Research Project Successfully: A Guide for First-time Researchers*, UBSPD, New Delhi.
3. Bulmer, M.C. (1984): *Sociological Research Methods: An Introduction*, Macmillan, Hong Kong.
4. Festinger, L. and Katz, D. (ed.) (1977): *Research Methods in the Behavioral Sciences*, Amerind Publishing, New Delhi.
5. Holloway, I. (1997): *Basic Concepts of Qualitative Research*, Blackwell Science, London.
6. Jain, G. (1998): *Research Methodology: Methods and Techniques*, Mangal Deep, Jaipur.
7. Kothari, C.R. (2000): *Research Methodology: Methods and Techniques*, Wishwa Prakashan, New Delhi.
8. Kumar, A. (1997): *Social Research Method (The Art of Scientific Investigation)*, Anmol Publication, New Delhi.
9. Kumar, A. (2002): *Research Methodology in Social Sciences*, Sarup and Sons, New Delhi.
10. McBurney, D.H. (2001): *Research Methodology*, Thomson-Wadsworth, Australia.
11. Pande, G.C. (1999): *Research Methodology in Social Sciences*, Anmol Publication, New Delhi.

APPLIED FOOD SCIENCE AND PRODUCT MODIFICATION (PRACTICAL)

(4 Cr)

Objectives:

This course will enable students to:

1. Understand and apply various aspects of food science for dietary management and product development.
2. Develop products, which meet nutritional needs of consumers.
3. Understand theoretical concepts about sensory evaluation of food.
4. Use different sensory methods for evaluating variety of foods.
5. Analyse and interpret sensory evaluation data.

Contents:

Module No	Topic and Details	Number of Credits
1	Conducting the Test: <ul style="list-style-type: none">- Preparing samples- Presenting samples- Using reference samples- Reducing panel response error- Consumer oriented tests- Product oriented tests- Shelf life studies- Product matching- Product mapping Taint Investigation and Prevention	1
2	Reducing viscosity and bulk in foods Increasing energy density Applications of fermentation, germination, malting	1
3	Use of different food ingredients for development of health foods – artificial sweeteners, modified starches, fat replacers, increasing fibre content, functional ingredients, low sodium food adjuncts, protein concentrates, whey New Food Products	2

	<p>1. Definition, Classification</p> <p>2. Characterization Factors shaping new product development- Social concerns, health concerns impact of technology and market place influence.</p> <p>3: Planning, standardizing and testing the product, nutritional content</p>	
	<p>Tapping traditional foods and unconventional sources of foods.</p> <p>Modifying traditional foods</p> <p>Planning, standardizing and testing the product, nutritional content</p>	

References:

1. Lyon, D.H.; Francombe, M.A.; Hasdell, T.A.; Lawson, K. (eds) (1992): Guidelines for Sensory Analysis in Food Product Development and Quality Control. Chapman and Hall, London.
2. Amerine, M.A.; Pangborn, R.M.; Roessler, E.B. (1965): Principles of Sensory Evaluation. Academic Press, New York.
3. Kapsalis, J.G. (1987): Objective Methods in Food Quality Assessment. CRC Press, Florida.
4. Martens, M.; Dalen, G.A.; Russwurm, H. (eds) (1987): Flavour Science and Technology. John Wiley and Sons, Chichester.
5. Moskowitz, H.R. (eds) (1987): Food Texture: Instrumental and Sensory Measurement. Marcel Dekker Inc. New York.
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19. Resurrecion, A.V.A. (1998). *Consumer Sensory Testing for Product Development*. Aspen Publishers Inc., Guthersburg, Maryland USA.
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22. Man, C.M.D. and James A.A. (1994) *Shelf life Evaluation of Foods*. Blackie Academic and Professional, London.
23. Shapton, D.A. and Shapton, N.F.(1991) *Principles and Practices for the Safe Processing of Foods*. Butterworth Heinemann Ltd , Oxford.
24. Graf, E. and Saguy, I. S. (1991). *Food Product Development : From concept to the Market place*, Van Nostrand Reinhold New York.
25. Oickle, J.G.(1990) *New Product Development and Value Added*. Food Development Division Agriculture, Canada.
26. Proc. Food Processors Institute : *A key to Sharpening your Competitive Edge*. Food Processors Institute, Washington, DC.

Journals:

1. *International Journal of Food Science and Technology*.
2. *Food Technology*
3. *Journal of Food Technology*
4. *Trends in Food Science and Technology*
5. *Critical Reviews in Food Science and Nutrition*

VITAMINS

4 Credits (Th)

Objectives:

This course will enable the students to:

1. Gain in-depth knowledge of the physiological and metabolic role of vitamins and their role in human nutrition.
2. Understand the basis of human nutritional requirements and recommendations through the life cycle and translate the knowledge into practical guidelines for dietary needs.
3. Be familiar with the recent advances in nutrition and apply this knowledge in planning for public health programmes.
4. Understand the pharmacological actions of various vitamins and their implications.

Contents:

For each of the vitamins, the following will be discussed:

- ❖ Historical background
- ❖ Structure and chemistry
- ❖ Food sources
- ❖ Metabolism (digestion, absorption, transport, storage and elimination), Bioavailability and factors affecting bioavailability.
- ❖ Biochemical and physiological functions
- ❖ Assessment of status
- ❖ Interaction with other nutrients, regulation of gene expression (wherever applicable)
- ❖ Pharmacological and therapeutic effects
- ❖ Requirements, methods for estimating requirements and recommended daily allowance.
- ❖ Deficiency, overload and toxicity.

Module No	Topics	No of credits
1	Fat Soluble Vitamins Vitamin A and Beta Carotene Vitamin D Vitamin E Vitamin K	1.5
2	Water Soluble Vitamins Ascorbic acid Thiamin Riboflavin Niacin Pyridoxine Folic acid Vitamin B ₁₂ Biotin	2
3	Quasi vitamins (in brief) Choline/Betaine Myo Inositol Carnitine Bioflavinoids	0.5

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1. Annual Reviews of Nutrition. Annual Review Inc, California, USA.
2. Shils, M.E.; Olson, J.; Shike, M. and Roos, C. (1998): Modern Nutrition in Health and Disease. 9th edition. Williams and Williams. A Beverly Co. London.
3. Bodwell, C.E. and Erdman, J.W. (1988) Nutrient Interactions. Marcel Dekker Inc. New York
4. World Reviews of Nutrition and Dietetics.
5. WHO Technical Report Series.
6. Indian Council of Medical Research. Recommended Dietary Intakes for Indians - Latest Recommendations.
7. Indian Council of Medical Research. Nutritive Value of Indian Foods - Latest Publication.
8. Berdanier, C.D. and Haargrove, J.L.(ed) (1996): Nutrients and Gene Expression: Clinical Aspects. Boca Raton, FL CRC Press.
9. Baeurle, P.A. (ed) (1994) Inducible Gene Expression. Part I: Environmental Stresses and Nutrients. Boston: Birkhauser.
10. Chandra, R.K. (ed) (1992): Nutrition and Immunology. ARTS Biomedical. St. John's Newfoundland.

Journals:

1. Nutrition Reviews
2. Journal of Nutrition
3. American Journal of Clinical Nutrition
4. British Journal of Nutrition
5. European Journal of Clinical Nutrition
6. International Journal of Vitamin and Nutrition Research
7. International Journal of Food Science and Nutrition
8. Nutrition Research
9. Annals of Nutrition & Metabolism

MEDICAL NUTRITION THERAPY II Theory

4 credits

Objectives:

This course will enable the students to:

1. Understand the promotive and therapeutic role of diet and nutritional care
With reference to Endocrine disorders, renal disorders, cardiovascular system, musculoskeletal system
2. Understand the etiology, physiologic and metabolic anomalies of acute and chronic diseases and patient needs
3. Know the effect of the various diseases on nutritional status and nutritional and dietary requirements.
4. Able to recommend and provide appropriate nutritional care based on pathophysiology, prevention/ and treatment of the various diet-related disorders/ diseases

Contents

Module No	Objectives	Topics and Details	Number of credits
1	<ol style="list-style-type: none">1. To understand the etiology as well physiological and metabolic alterations in metabolic disorders2. To understand the therapeutic role of diet in managing diseases and related complications3. To apply the principles of dietary	Nutrition for Endocrine Disorders Nutrition for Diabetes Mellitus and hypoglycemia A) Aetiology, classification, pathophysiology symptoms and diagnosis B) Management of DM <ol style="list-style-type: none">i) Home blood glucose monitoringii) Glycosylated hemoglobiniii) Urine testing C) Blood sugar lowering agents <ol style="list-style-type: none">i) Oral hypoglycemic agentsii) Insulin D) Exercise E) Nutritional management <ol style="list-style-type: none">i) Diet planning for Type1, Type2ii) For Special conditions<ol style="list-style-type: none">a) Pregnancyb) Elderlyc) Surgery	1

	<p>management to specific conditions</p>	<p>d) Illness e) Physical activities</p> <p>F) Acute complications – pathophysiology, diagnosis, types, treatment i) Hypoglycemia ii) Ketoacidosis iii) Somogyi effect iv) Dawn phenomenon</p> <p>G) Long term complication - pathophysiology, diagnosis, types, and treatment i). Macrovascular ii). Microvascular</p> <p>Nutrition in Diseases of Other Endocrine organs</p> <ul style="list-style-type: none"> - Functions of the adrenal cortex, thyroid and parathyroid gland, their insufficiencies, clinical symptoms and metabolic implications. - Dietary treatment as supportive to other form of therapy - Hyper and Hyperthyroidism (goiter) - Hypocalcaemia <p><i>Evaluation: Presentations on recent research papers and evidence-based guidelines for management</i></p>	
<p>2</p>	<ol style="list-style-type: none"> 1. To understand the various risk factors for pulmonary and cardiovascular diseases. 2. To explain the pathogenesis of the disease and complications 3. To explain the dietary management in relation to the 	<p>Nutrition in Cardiovascular Diseases and Pulmonary Disorders</p> <p>Nutrition in Cardiovascular diseases</p> <p>Review of Normal circulatory system (in brief), Blood pressure,i) Regulation, Short-term (sympathetic nervous system) and long-term (kidneys), ii) Hypertension – classification (secondary and essential) iii) Risk Factors for hypertension iv) Dietary management-DASH approach v) Use of various drugs (In brief)</p> <p>Hyperlipidemia and Hyperlipoproteinemia</p>	<p>2</p>

	<p>physiologic and meatabolic alterations of the diseases.</p>	<p>i) Classifications ii) Dietary management iii) Drug management – (in brief) D. Atherosclerosis - Etiology and understanding the pathogenesis i) Coronary Heart Disease - Angina Pectoris and Myocardial Infarction - Clinical manifestation and importance of cardiac enzymes to aid in the detection of CHD - Dietary management E. Congestive Heart Failure - Pathogenesis - Pathogenesis of sodium and water retention Risk factors Clinical manifestation Cardiac Cachexia Treatment - Nutritional Care F. Cerebrovascular Disease and Peripheral Vascular Disease - In brief etiology and dietary care G. Rheumatic and Congenital Heart Disease - Clinical manifestation, pathogenesis and nutritional care</p> <p>Nutritional Management in Pulmonary Disease a. Effects of Malnutrition on Respiration b. Chronic Obstructive Pulmonary Disease c. Pneumonia</p> <p><i>Evaluation: Identification of videos on normal cardiovascular and pulmonary functions</i> <i>Identification of visual presentation on atherosclerosis and cardiac disease</i> <i>Presentations and discussion of the above</i> <i>Concept mapping</i></p>	
3	<p>1.To understand the pathophysiology of various renal disorders and musculoskeletal disorders</p>	<p>Nutrition in Renal Diseases and Disorders of the MusculoSkeletal System - Physiology and function of normal kidney – A brief review - Classification of kidney diseases a. GlomeruloNephritis</p>	

	<p>2. To explain the interrelationship between the disease conditions and nutritional status</p> <p>3. To understand the therapeutic role of diet vis-à-vis the severity and medical management.</p>	<p>Etiology, characteristics Objectives, Principles of dietary treatment and management</p> <p>b. Nephrotic Syndrome Etiology, Objectives, Principles of dietary treatment and management</p> <p>c. Uremic Renal Failure</p> <p>i) History, General importance of protein nutrition in renal failure and uremia</p> <p>ii) Causes and Dietary management in Acute Renal Disease</p> <p>iii) Causes and Dietary management in Chronic Renal Disease</p> <p>iv) Dietary modification in chronic renal disease with complications</p> <p>v) Sodium and Potassium Exchange list</p> <p>d) Types of dialysis and their nutritional care –Haemodialysis, CAPD, Continuous Ambulatory peritoneal dialysis)</p> <p>e) Renal Transplant and its nutritional care</p> <p>f) Nephrolithiases- etiology, types of stones and nutritional care (acid & alkaline ash diet)</p> <p>g) Chronic renal disease in Children (in brief)</p> <p>MNT for Rheumatic disorders (of the musculoskeletal system)</p> <p>Pathophysiology of inflammation in</p> <p>i)Rheumatic Diseases ii) Osteoarthritis iii) Rheumatoid Arthritis, Gout</p> <p>Pharmacologic therapy and Nutritional Care</p> <p><i>Evaluation:</i></p> <p><i>Concept mapping</i></p> <p><i>Discussion and presentations- recent researches on role of nutrition and management</i></p> <p><i>Discussion of evidence based guidelines</i></p>	
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Medical Nutrition Therapy II - Practicals

4 Credits (Pr)

Contents:

The practicals should focus on:

1. Market survey of commercial nutritional supplements and nutritional support substrates
2. Commonly used tests for diagnosis of various diseases- system wise
 - Interpretation of patient data and diagnostic tests of drawing up of patient diet prescription, using a case study approach.
 - Follow up – acceptability of diet prescription, compliance, discharge diet plan for each of the diseases

Module No	Topics and Details	No of Credits
1	<p>Nutrition for Diabetes Mellitus and hypoglycemia</p> <p>A) Nutritional management</p> <p>i) Diet planning for Type1, Type2 diabetes mellitus</p> <p>ii) For Special conditions</p> <p>a) Pregnancy</p> <p>b) Elderly</p> <p>c) Surgery</p> <p>d) Illness</p> <p>e) Physical activities</p> <p>B) Acute complications – nutritional care</p> <p>i) Hypoglycemia</p> <p>ii) Somogyi effect</p> <p>iii) Dawn phenomenon</p> <p>C) Long term complication – prevention and nutritional care</p> <p>i). Macrovascular</p> <p>ii). Microvascular</p> <p>Nutrition in Diseases of Other Endocrine organs</p> <p>- Dietary treatment as supportive to other form of therapy in diseases of the adrenal cortex, thyroid and parathyroid gland</p> <p>- Hyper and Hyperthyroidism (goiter)</p> <p>- Hypocalcaemia</p>	2
2	<p>Nutrition in Cardiovascular Diseases and Pulmonary Disorders</p> <p>Nutrition in Cardiovascular Diseases</p> <p>Dietary management of Hypertension-DASH approach</p>	1

	<p>Developing low sodium recipes</p> <p>Dietary management of Hyperlipidemia and Hyperlipoproteinemia</p> <p>Dietary management</p> <p>i) Coronary Heart Disease - Dietary management</p> <p>ii). Congestive Heart Failure - Nutritional Care</p> <p>iii) Cerebrovascular Disease and Peripheral Vascular Disease: dietary care</p> <p>iv). Rheumatic and Congenital Heart Disease: nutritional care</p>	
3	<p>Nutrition in Renal Diseases and Musculoskeletal disorders</p> <p>Sodium and Potassium Exchange list</p> <p>A. GlomeruloNephritis</p> <p>Principles of dietary treatment and management</p> <p>B. Nephrotic Syndrome</p> <p>Principles of dietary treatment and management</p> <p>C. Uremic Renal Failure</p> <p>ii) Dietary management in Acute Renal Disease</p> <p>iii) Dietary management in Chronic Renal Disease</p> <p>iv) Dietary modification in chronic renal disease with complications</p> <p>D) Types of dialysis and their nutritional care –Haemodialysis, CAPD, Continuous Ambulatory peritoneal dialysis)</p> <p>E) Renal Transplant and its nutritional care</p> <p>F) Nephrolithiases- nutritional care (acid & alkaline ash diet)</p> <p>MNT for Rheumatic disorders (of the musculoskeletal system)</p> <p>Nutritional Care for -</p> <p>i) Rheumatic diseases ii) Osteoarthritis iii) Rheumatoid arthritis iv) Gout</p>	1

References:

1. Mahan, L.K. and Escott-Stump, S. (2000): Krause's Food Nutrition and Diet Therapy, 10th Edition, W.B. Saunders Ltd.
2. Shils, M.E., Olson, J.A., Shike, M. and Ross, A.C. (1999): Modern Nutrition in Health and Disease, 9th Edition, Williams and Wilkins.
3. Escott-Stump, S. (1998): Nutrition and Diagnosis Related Care, 4th Edition, Williams and Wilkins.
4. Garrow, J.S., James, W.P.T. and Ralph, A. (2000): Human Nutrition and Dietetics, 10th Edition, Churchill Livingstone.

5. Williams, S.R. (1993): Nutrition and Diet Therapy, 7th Edition, Times Mirror/Mosby College Publishing.
6. Davis, J. and Sherer, K. (1994): Applied Nutrition and Diet Therapy for Nurses, 2nd Edition, W.B. Saunders Co.
7. Walker, W.A. and Watkins, J.B. (Ed) (1985): Nutrition in Pediatrics, Boston, Little, Brown & Co.
8. Guyton, A.C. and Hall, J.E. (1999): Textbook of Medical Physiology, 9th Edition, W.B. Saunders Co.
9. Ritchie, A.C. (1990): Boyd's Textbook of Pathology, 9th Edition, Lea and Febiger, Philadelphia.
10. Fauci, S.A. et al (1998): Harrison's Principles of Internal Medicine, 14th Edition, McGraw Hill.
11. World Cancer Research Fund (1997). Food, Nutrition and the Prevention of Cancer- A Global perspective, Washington E.D. WCRF.

Journals and Other Reference Series

1. Nutrition Update Series
2. World Review of Nutrition and Dietetics
3. Journal of the American Dietetic Association
4. American Journal of Clinical Nutrition
5. European Journal of Clinical Nutrition
6. Nutrition Reviews

CLINICAL NUTRITION THEORY

4 Credits

Objectives:

The course will enable the students to:

1. Understand the etiology, physiologic and metabolic anomalies of acute and chronic diseases and patient needs.
2. To assess nutritional status of patients.
3. Be familiar with recent advances in the medical nutritional management of various diseases.

Module No	Topic and Details	No of Credits
1	<p>A. Cellular adaptations to stress.</p> <p>a. Types of stress</p> <p>b. Changes in hormonal secretion, CNS and immune system. Cellular changes</p> <p>c. Effects on cells and tissues</p> <p>B. Diet, nutrient and drug interactions.</p> <p>a. Effect of drugs on ingestion, digestion, absorption and metabolism of food and nutrients.</p> <p>C. Nutrition and Immune response</p> <p>a: Role of individual nutrients in immune response and function</p> <p>b: Effect of undernutrition and overnutrition on immune function</p> <p>c: Immunoenhancers, immunosuppressants, conditionally essential nutrients. d. Effect of food, nutrients and nutritional status on drug dosage and efficacy.</p> <p>D. Ageing</p> <p>Physiological changes with ageing</p> <p>Bone health</p> <p>Osteoporosis</p> <p>Rheumatoid arthritis</p>	1.5

2	<p>A. Nutrition and the gastro intestinal tract a.Malabsorption and its patho-physiology, Carbohydrate intolerance. b.Parasitic infections c.Acute and chronic infections d.Diarrhea e.Recent advances in gastroenterology and nutrition f.Diet and gut microflora</p> <p>B. Nutrition and oral health a.Structure, development and maturation b.Dental caries c.Recent advances in role of nutrition in dental health</p>	1
3	<p>A. Nutrition and cardiovascular diseases a.Role of lipids, carbohydrates, protein, and other nutrients b. Bile acid metabolism c.Prostaglandins</p> <p>B. Diabetes mellitus and complications-Recent advances</p> <p>C. Nutrition and Renal Disease a.Nephrotic syndrome b.Nephritis c.ESRD d.Renal Transplant e.Nephrolithiasis Recent advances</p>	1
4	<p>Nutrition and Cancer Carcinogenesis and Mutagenesis- Carcinogens in Food Epidemiology Investigations of Diet-Cancer relationship Development of cancer Types of cancer and effect on metabolism and nutritional status Nutrients and their relationship with cancer Recent developments in nutrition and cancer.</p> <p>Nutrition and HIV/AIDS</p>	0.5

References:

1. Mahan, L.K. and Escott-Stump, S. (2000): Krause's Food Nutrition and Diet Therapy, 10th Edition, W.B. Saunders Ltd.
2. Shils, M.E., Olson, J.A., Shike, M. and Ross, A.C. (1999): Modern Nutrition in Health and Disease, 9th Edition, Williams and Wilkins.

3. Escott-Stump, S. (1998): Nutrition and Diagnosis Related Care, 4th Edition, Williams and Wilkins.
4. Garrow, J.S., James, W.P.T. and Ralph, A. (2000): Human Nutrition and Dietetics, 10th Edition, Churchill Livingstone.
5. Williams, S.R. (1993): Nutrition and Diet Therapy, 7th Edition, Times Mirror/Mosby College Publishing.
6. Davis, J. and Sherer, K. (1994): Applied Nutrition and Diet Therapy for Nurses, 2nd Edition, W.B. Saunders Co.
7. Walker, W.A. and Watkins, J.B. (Ed) (1985): Nutrition in Pediatrics, Boston, Little, Brown & Co.
8. Guyton, A.C. and Hall, J.E. (1999): Textbook of Medical Physiology, 9th Edition, W.B. Saunders Co.
9. Ritchie, A.C. (1990): Boyd's Textbook of Pathology, 9th Edition, Lea and Febiger, Philadelphia.
10. Fauci, S.A. et al (1998): Harrison's Principles of Internal Medicine, 14th Edition, McGraw Hill.
11. World Cancer Research Fund (1997). Food, Nutrition and the Prevention of Cancer- A Global perspective, Washington E.D. WCRF

Journals and Other Reference Series

1. Nutrition Update Series
2. World Review of Nutrition and Dietetics
3. Journal of the American Dietetic Association
4. American Journal of Clinical Nutrition
5. European Journal of Clinical Nutrition
6. Nutrition Reviews
7. Clinical Nutrition
8. Asia Pacific Journal of Clinical Nutrition
9. Nutrition in Clinical Practice
10. Current Opinion in Clinical Nutrition and Metabolic Care
11. International Journal of Clinical Nutrition and Dietetics
12. Guidelines /Position statements of ASPEN, ESPEN, ADA, IDF
13. Canadian Journal of Clinical Nutrition
14. Annals of Nutrition and Metabolism

NUTRITION FOR SPORTS AND EXERCISE THEORY

4 credits

Objectives:

This course will enable students to:

1. Understand the special nutritional requirements for physical activities related to sports and exercise
2. Apply the knowledge to improve the performance of sportspersons

Module No	Topics and Details	No of Credits
1	Introduction , Nutritional considerations for sports / exercising person as compare to normal active person. Energy substrate for activities of different intensity and duration, aerobic and anaerobic activities. Fluid balance in sports and exercise, importance, symptoms and prevention of dehydration, Sports drink,	1
2	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.	1
3	Role of Fat as an energy source for sports and exercise. Fat stores, regulation of fat metabolism , factors affecting fat oxidation (intensity, duration , training status, CHO feeding) , effect of fasting and fat ingestion Protein and amino acid requirements , Factors affecting Protein turnover, Protein requirement and metabolism during endurance exercise, resistance exercise and recovery process. Protein supplement.	1
4	Important micronutrients for exercise. B complex vitamin and specific minerals. Exercise induced oxidative stress and role of antioxidants	1

	<p>Chronic dieting and eating disorder. Female athletic triad, sports anemia</p> <p>Dietary supplements and ergogenic aids (nutritional, pharmacological and physiological)</p>	
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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 Churchill 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; Narsinga Rao,B.S.; Malhotra, M.S. (1985)., Hyderabad, National Institute of Nutrition.

CATERING MANAGEMENT PRACTICALS

4 Credits

Objectives:

This course will enable students to:

1. Plan and prepare various recipes/products on large scale.
2. Estimate cost and sales price of food products
3. Plan menus for quantity food service within specified cost limits

Module No	Topic and Details	No of Credits
1	<p>Rice Preparations :</p> <p>Plain and fried rice, jeera rice, pulao, masala rice, tomato rice, vegetable biryani, prawn pulao, moghlai biryani, mutton biryani, chicken biryani, yakhani pulao, lime rice, coconut rice, curd rice, khichdi, dal dhokli</p> <p>Wheat Preparations</p> <p>Chapati, paratha plain, paratha stuffed, types of puries, bhatura, nan, Lacha paratha</p>	1
2	<p>Pulse Preparations :</p> <p>Punjabi Dal, sambar, dal fry, simple dal, sprouted pulses, alu-chole, masala rajmah, tur dal with greens.</p> <p>Egg Preparations :</p> <p>Egg curry, Baked egg, Scrambled egg, Poached egg, Boiled egg – soft omlet, soufflé, egg custard, caramel custard.</p> <p>Meat Preparations :</p> <p>Kofta curry, rogan josh, mutton chilli fry, mutton palak, vindaloo murg masala, brain masala, Tandoori chicken,</p>	1

	chicken curry, prawn curry, fish curry	
3	<p>Vegetable Preparations :</p> <p>Alu matar, alu palak, alu dal, fried vegetable, palak paneer, vegetable kofta, vegetable kurma, vegetable au gratin.</p> <p>Salads :</p> <p>Tossed, Russian, mouled, decorative dressing-mayonnaise, kuchumbers, raitas-boondi, salad dressings – mayonnaise, Italian French etc</p> <p>Soups – clear cream, chowder, mixed veg., tomato cream, carrot, and accompaniments, cream, mulligatawny, minestrone, madras, consumers’ – chicken, meat, coin soup, spinach soup, gazpacho chowder, sauces – white sauce, cheese sauce, mayonnaise sauce, curry sauce, Breads – Banana, high fibre bread and cookies, bread sticks, buns.</p> <hr/> <p>Snacks :</p> <p>Variety of sandwiches, veg. puff, fried snacks, fermented and steamed snacks, vegetable pies, vegetable hamburgers, veg. & meat loaf, chicken casserole doughnuts</p> <p>Sweets (Adapted for therapeutic purposes)</p> <p>Sheera, Ladoo, Shrikhand, Puranpoli, Kheer, Rasagulla, Kulfi, Fruit salad, Custard, Puddings, Jellies, Icecreams, Trifle, Bread Pudding, Coffee mousse, Gateau, Tarts</p>	2

MINERALS

4 Credits

(Th)

Objectives:

This course will enable the students to:

- Gain in-depth knowledge of the physiological and metabolic role of vitamins and minerals and their role in human nutrition.
- Understand the basis of human nutritional requirements and recommendations through the life cycle and translate the knowledge into practical guidelines for dietary needs.
- Be familiar with the recent advances in nutrition and apply this knowledge in planning for public health programmes.
- Understand the pharmacological actions of various vitamins and their implications.

Contents:

For each of the minerals/elements, the following will be discussed:

- ❖ Historical background
- ❖ Structure and chemistry
- ❖ Food sources
- ❖ Metabolism (digestion, absorption, transport, storage and elimination), Bioavailability and factors affecting bioavailability.
- ❖ Biochemical and physiological functions
- ❖ Assessment of status
- ❖ Interaction with other nutrients, regulation of gene expression (wherever applicable)
- ❖ Pharmacological and therapeutic effects
- ❖ Requirements, methods for estimating requirements and recommended daily allowance.
- ❖ Deficiency, overload and toxicity.

Module No	Topics and Details	No of Credits
1	Macrominerals a. Calcium and Phosphorus b. Magnesium c. Sodium, Potassium, Chloride	1
2	Microminerals a. Iron b. Copper c. Manganese d. Iodine e. Fluoride	2

	f: Zinc g. Selenium h. Cobalt i. Chromium j Molybdneum	
3	Ultra Trace Elements a. Vanadium b. Silicon c. Boron d. Nickel e:Lithium, Lead ,Cadmium, Sulphur,Arsenic	1

References:

11. Annual Reviews of Nutrition. Annual Review Inc, California, USA.
12. Shils, M.E.; Olson, J.; Shike, M. and Roos, C. (1998): Modern Nutrition in Health and Disease. 9th edition. Williams and Williams. A Beverly Co. London.
13. Bodwell, C.E. and Erdman, J.W. (1988) Nutrient Interactions. Marcel Dekker Inc. New York
14. World Reviews of Nutrition and Dietetics.
15. WHO Technical Report Series.
16. Indian Council of Medical Research. Recommended Dietary Intakes for Indians - Latest Recommendations.
17. Indian Council of Medical Research. Nutritive Value of Indian Foods - Latest Publication.
18. Berdanier, C.D. and Haargrove, J.L.(ed) (1996): Nutrients and Gene Expression: Clinical Aspects. Boca Raton, FL CRC Press.
19. Baeurle, P.A. (ed) (1994) Inducible Gene Expression. Part I: Environmental Stresses and Nutrients. Boston: Birkhauser.
20. Chandra, R.K. (ed) (1992): Nutrition and Immunology. ARTS Biomedical. St. John's Newfoundland.

Journals:

10. Nutrition Reviews
11. Journal of Nutrition
12. American Journal of Clinical Nutrition
13. British Journal of Nutrition
14. European Journal of Clinical Nutrition
15. International Journal of Vitamin and Nutrition Research
16. International Journal of Food Science and Nutrition
17. Nutrition Research
18. Ann Nutr Metab

PUBLIC NUTRITION AND HEALTH

4 Credits (Th)

Objectives:

This course will enable the students to:

1. Develop a holistic knowledge base and understanding of the nature of important nutritional problems and their prevention and control for the disadvantaged and upper socio-economic strata in society
2. Understand the causes /determinants and consequences of nutritional problems in society
3. Be familiar with various approaches to nutrition and health interventions, programmes and policies.

Contents:

Module No	Topics and Details	No of Credits
1	<p>Concept of public nutrition</p> <ol style="list-style-type: none">a. Relationship between health and nutritionb. Role of public nutritionists in the health care delivery <p>Sectors and Public Policies relevant to nutrition and health.</p> <p>Primary Health Care of the Community</p> <ol style="list-style-type: none">a. National Health Care Delivery Systemb. Determinants of Health Statusc. Indicators of Health <p>Population Dynamics</p> <ol style="list-style-type: none">a. Demographic transitionb. Population structurec. Fertility behaviord. Population policye. Fertilityf. Interrelationship between Nutrition and Quality of Life <p>Food and Nutrition Security</p> <ol style="list-style-type: none">a. Food production<ul style="list-style-type: none">❖ Access❖ Distribution	1

	<ul style="list-style-type: none"> ❖ Availability ❖ Losses ❖ Consumption <p>b. Food Security</p> <p>c. Socio-cultural aspects and Dietary Patterns:</p> <p>Their implications for Nutrition and Health</p>	
2	<p>Nutritional Status</p> <p>a. Determinants of nutritional status of individual and populations</p> <p>b. Nutrition and Non-nutritional indicators</p> <ul style="list-style-type: none"> ❖ Socio-cultural ❖ Biologic ❖ Environmental ❖ Economic <p>c: Assessment of nutritional status of individuals of different ages- MUAC, Wt for age, Ht for age, Wt for ht, Ponderal index, BMI Applications and limitations in different field situations- choice of an indicator</p> <p>Major Nutritional Problems – etiology, prevalence, clinical manifestations, preventive and therapeutic measures for:</p> <p>a. Macro and micro nutrient deficiencies</p> <p>b. Other nutritional problems like lathyrism, dropsy, aflatoxicosis, alcoholism and fluorosis.</p> <p>c. Overweight, obesity and chronic degenerative diseases</p>	1
3	<p>Approaches and Strategies for improving nutritional status and health:</p> <p>a. National Food , Nutrition and Health Policies - Plan of action and programmes</p> <p>b. Programmatic options- their advantages and demerits. Feasibility Political support Available resources (human, financial, infrastructural)</p> <p>c. Case studies of selected strategies and programmes: their rationale and context, how to select interventions from a range of possible options:</p> <p>d.. Health-based interventions, Food-based interventions including fortification and genetic improvement of foods, supplementary feeding, Nutrition education for behaviour change.</p> <p>Health economics and economics of malnutrition</p> <p>a. Its impact on productivity and national development</p> <p>b. Cost-Benefit</p> <ul style="list-style-type: none"> ❖ Cost effectiveness ❖ Cost efficiency 	2

References:

1. Owen, A.Y. and Frankle, R.T. (1986): Nutrition in the Community, The Art of Delivering Services, 2nd Edition Times Mirror/Mosby.
2. Park, K. (2000): Park's textbook of preventive and social medicine, 18th Edition, M/s. Banarasidas Bhanot, Jabalpur.
3. SCN News, UN ACC/SCN Subcommittee on Nutrition.
4. State of the World's Children, UNICEF.
5. Census Reports.
6. Berg, A. (1973): The Nutrition Factor, the Brookings Institution, Washington.
7. Beaton, G.H. and Bengoa, J.M. (Eds) (1996): Nutrition in Preventive Medicine, WHO.
8. Bamji, M.S., Rao, P.N., Reddy, V. (Eds) (1996): Textbook of Human Nutrition, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
9. Gopalan, C. and Kaur, S. (Eds) (1989): Women and Nutrition in India, Nutrition Foundation of India.
10. Gopalan, C. and Kaur, S. (Eds) (1993): Towards Better Nutrition, Problems and Policies, Nutrition Foundation of India.
11. Gopalan, C. (Ed) (1987): Combating Undernutrition – Basic Issues and Practical Approaches, Nutrition Foundation of India.
12. Achaya, K.T. (Ed) (1984): Interfaces between agriculture nutrition and food science, The United Nations University.
13. National Family Health Survey I & II (1993, 2000): International Institute for Population Studies, Mumbai.
14. National Plan of Action on Nutrition (1995): Food & Nutrition Board, Dept. Of WCD, Govt. of India.
15. National Nutrition Policy (1993): Dept. of WCD, Govt. of India.
16. Nutrition Education for the Public (1997): FAO Food and Nutrition Paper, 62, FAO.
17. Allen, L. and Ahluwalia, N. (1997) Improving Iron Status Through Diet: The Application of Knowledge Correcting Dietary Iron Bioavailability in Human Populations. OMNI/USAID, Arlington, VA, USA
18. Nestel, P. (ed) (1995). Proceedings: Interventions for Child Survival. OMNI/USAID Arlington, VA, USA
19. Documents and Reports published by the International Vitamin A Consultative Group
20. Documents and Reports of the International Nutritional Anemia Consultative Group
21. Howson, C.; Kennedy, E. and Horwicz, A. (eds) (1998). Prevention of Micronutrient Deficiencies: Tools for Policymakers and Public Health Workers. Committee on Micronutrient Deficiencies, Board on International Health, Food and Nutrition Board, National Academy Press, Washington D.C. USA.
22. Micronutrient Initiative (1998) Food Fortification: to end Micronutrient Malnutrition. The Micronutrient Initiative, Ottawa, Canada.

23. Murray, C.; Lopez, A. (eds) (1994) Global Comparative Assessments in the Health Sector Disease Burden, Expenditures and Intervention Packages. Collected articles from the Bulletin of the World Health Organization, Geneva, Switzerland.
24. Murray, C. and Lopez, A. (eds)(1996) Global Burden of Disease and Injury Harvard University Press, Cambridge, MA, USA.
25. Ross, J.; Horton, S. (1998) Economic Consequences of Iron Deficiency. The Micronutrient Initiative, Ottawa, Canada.
26. World Health Organization (1998) World Health Report: Life in the 21st century. Report of the Director General. WHO, Geneva, Switzerland
27. Ramakrishnan, U. (eds) (2001). Nutritional Anemias. CRC Press in Modern Nutrition, CRC Press, Boca Raton, FL.

MATERNAL AND CHILD NUTRITION

4 Credits (Th)

Objectives:

This course will enable the students to:

- Be familiar with physiological changes in pregnancy and lactation.
- Be familiar with growth and developmental changes from conception till adolescence.
- Understand the inter-relationship between nutrition and growth and development during life cycle.
- Apply their knowledge in community and public nutrition/health programmes.

Contents:

Module No	Topics and Details	No of Credits
1	<p>Changing concepts and controversies in Maternal and Child Nutrition.</p> <p>Importance of Maternal Nutrition during Pregnancy : Unit 1. Importance of nutrition prior to and during pregnancy. Unit 2. Pre-requisites for successful outcome. Effect of undernutrition on mother-child dyad including pregnancy outcome and Maternal and Child Health – Short term and Long term. Unit 3. Physiology and endocrinology of pregnancy and embryonic and fetal growth and development Unit 4. Nutritional requirements during pregnancy Unit 5. Adolescent Pregnancy Unit 6. Pregnancy and AIDS, Pregnancy and TB Unit 7. Intra-uterine growth retardation critical windows of development and programming concepts Unit 8. Complications of pregnancy and management and importance of antenatal care. Unit 9. Congenital malformations, fetal alcohol syndrome and gestational diabetes mellitus.</p>	1
2	<p>Lactation and Infant feeding Unit 1. Development of mammary tissue and role of hormones Unit 2. Physiology and endocrinology of lactation – Synthesis of milk components, let down reflex, role of hormones, lactational amenorrhea, effect of breast feeding on maternal health Unit 3. Human milk composition and factors affecting</p>	1

	<p>breastfeeding and fertility, maternal nutritional status and milk composition.</p> <p>Unit 4. Management of lactation – Prenatal breastfeeding skills education. Rooming in, problems – sore nipples, engorged breast, inverted nipples</p> <p>Unit 5. Exclusive breastfeeding Baby friendly Hospitals Initiative</p> <p>Unit 6. Breast feeding in the age of AIDS</p> <p>Feeding of infants and children and dietary management, key issues in infant Feeding</p>	
3	<p>Infant physiology and the preterm and LBW infants: Implications for feeding and management. Growth and development during infancy, childhood and adolescence.</p> <p>a. Normal pattern of growth and development b.: Norms/standards for growth c: Growth monitoring and promotion, growth faltering, Failure to thrive</p>	1
4	<p>Malnutrition in mothers and children: etiology and management (in brief), Consequences of malnutrition on physical development, mental development, cognitive development. Effect of deficiencies of specific nutrients</p> <p>Current Nutrition and Health Status of Women and Children in India.</p> <p>Policies and programmes for promoting maternal and child nutrition & health. International, national and state level Concept of small family, methods of family planning, merits and demerits.</p>	1

References:

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2. International Child Health: A Digest of Current Information
3. Barker, D.J.P. (1998). Mothers, Babies and Health in Later Life. Edinburgh, Churchill Livingstone
4. Ward, R.H.T; Smith, S.K.; Donnai, D. (eds) (1994) Early Fetal Growth and Development. London, RCOG Press
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8. Tanner, J.M. (1988) Foetus into Man: Physical Growth from Conception to Maturity. Wheaton and Co Ltd. Great Britain
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10. ACC/SCN Reports
11. WHO (1999) Nutrition for Health and Development: Progress and Prospects on the Eve of the 21st century. WHO/NHD/99.9. Geneva
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13. Haggerty, PA; Rustein SO (1999) Breastfeeding and Complementary Infant Feeding and the Postpartum Effects of Breastfeeding. Demographic and Health Surveys Comparative Studies Calverton, MA., Macro International.
14. Koletzo, B.; Hernell, O.; Michaelson, K. (2000) Short and Long Term Effects of Breastfeeding on Infant Health. Plenum Press, New York
15. Huffman, S.L.; Baker, J.; Schumann, J.; Zehner, E.R. (1998) The Case for Promoting Multiple Vitamin/Mineral Supplements for Women of Reproductive Age in Developing Countries. LINKAGES Project. Washington DE. AED.
16. WHO/ University of California, Davis (1998) Complementary Feeding of Young Children in Developing Countries. Review of Current Scientific Knowledge. Geneva, WHO.
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18. UNICEF (1997). The Care Initiative: Assessment, Analysis and Action to improve care for Nutrition. New York, UNICEF
19. WHO (1999) Management of severe malnutrition. A manual for physicians and other senior health workers. Geneva, WHO.

PEDIATRIC NUTRITION

2

Credits (Th) + 2 credits (Pr)

Objectives:

This course will enable the students to:

1. Know the nutritional requirements at different stages from infancy through adolescence and the recommendations/guidelines of expert groups.
2. Realise the importance of nutritional care and nourishment of children with various ailments.
3. Understand the specific needs of children and the effects of various diseases on nutritional status and nutritional requirements at these stages of the life cycle.
4. Be competent to recommend / provide appropriate nutritional care based on pathophysiology, prevention/ and treatment of the various diet-related disorders/ diseases

Theory

Contents

Module No	Topics and Details	No of credits
1	Infant and Young Child Feeding Practices Breast feeding: Composition of Human Milk, Recommendations, exclusive breastfeeding, prelacteal feeds, duration of breastfeeding, advantages of breast feeding, contraindications, types of Infant formulas. Complementary feeding, issues and concerns Growth, Development and Nutritional Requirements of Infants/Children/Adolescents - Growth., development and body composition from infancy, preschool, childhood, puberty and adolescence Nutritional requirements at different stages of infancy, childhood and adolescence, factors influencing food intake, packed lunch Assessment of nutritional status and growth, growth charts and	1

	<p>milestones</p> <p>Preterm/ VLBW infants – Complications, Role of parenteral and enteral nutrition (trophic feeds – gut priming)</p> <p>Undernutrition in childhood – PEM, FTT, SAM, Fe deficiency, vit A deficiency – causes, consequences, management (in brief), Catch-up growth</p> <p>Overnutrition - causes, consequences, management</p>	
2	<p>Nutritional considerations for special conditions –</p> <p>Nutritional Management of Inborn Errors of Metabolism - PKU, Maple syrup urine disease, Homocystinemia, Tyrosinemia, Galactosemia, Glycogen storage disorder</p> <p>Diarrhea and constipation - causes, consequences, management</p> <p>Epilepsy and dietary approaches – ketogenic diet, atkins and recent advances</p> <p>Role of diet and nutritional challenges in developmental disabilities- autism spectrum disorders, cerebral palsy, Attention-deficit hyperactivity disorder</p> <p>Type 1 DM – Impact on growth and management</p> <p>Nephrotic syndrome and CKD in children - Impact on growth and management</p> <p>Food Allergies</p>	1

Pediatric Nutrition Practicals

Contents

Module No	Topics and Details	No of credits
1	<p>Pediatric Nutritional Assessment:- Anthropometric measurements, biochemical parameters, clinical and dietary assessment methods. Measuring, recording and plotting growth on growth charts. Use of growth reference/ standards (Field work)</p> <p>Normal nutrition for infants – Guidelines on breastfeeding and complementary feeding. Market survey of infant formulae and complementary foods. Planning complementary feeds as per the guidelines. Preparation of ARF.</p> <p>Nutrition in childhood and adolescence: Planning for preschool child, the school-aged child and adolescents</p>	1
2	<p>Nutritional concerns: -</p> <p>Guidelines for management for PEM, SAM, Fe deficiency and vitamin A deficiency</p> <p>Nutritional requirements for Inborn Errors of Metabolism - PKU, Maple syrup urine disease, Homocystinemia, Tyrosinemia, Galactosemia, Glycogen storage disorder</p> <p>Nutritional Management of diarrhea</p> <p>Ketogenic diet, Atkins diet</p> <p>Feeding challenges for developmental disabilities, feeding devices</p> <p>Nutritional requirements and management of - type 1 DM, nephrotic syndrome and CKD</p>	1

References:

1. Mahan, L.K. and Escott-Stump, S. (2000): Krause's Food Nutrition and Diet Therapy, 10th Edition, W.B. Saunders Ltd.
2. Shils, M.E., Olson, J.A., Shike, M. and Ross, A.C. (1999): Modern Nutrition in Health and Disease, 9th Edition, Williams and Wilkins.
3. Escott-Stump, S. (1998): Nutrition and Diagnosis Related Care, 4th Edition, Williams and Wilkins.
4. Garrow, J.S., James, W.P.T. and Ralph, A. (2000): Human Nutrition and Dietetics, 10th Edition, Churchill Livingstone.

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8. Guyton, A.C. and Hall, J.E. (1999): Textbook of Medical Physiology, 9th Edition, W.B. Saunders Co.
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10. Fauci, S.A. et al (1998): Harrison's Principles of Internal Medicine, 14th Edition, McGraw Hill.
11. World Cancer Research Fund (1997). Food, Nutrition and the Prevention of Cancer- A Global perspective, Washington E.D. WCRF.
12. Kumar, V. (1996): Aging – Indian Perspective and Global Scenario. Proceedings of International Symposium of Gerontology and Seventh Conference of the Association of Gerontology (India).
13. Bagchi, K. & Puri, S. (Ed) (1999): Diet and Aging – Exploring Some Facets. Soc. for Gerontological Research, New Delhi and Help Age India, New Delhi.
14. Chaudhary, A. (Ed) (2001): Active Aging in the New Millennium, Pub. Anugraha, Delhi.
15. Shills, M.E., Olson, J.A., Shike, M. and Ross, A.C. (Ed) (1999): 9th Edition, Williams and Wilkins.
16. Sharma, O.P. (Ed.) (1999): Geriatric Care in India – Geriatrics and Gerontology: A Textbook, M/s. ANB Publishers.
17. Aiken, L.R. (1978): The Psychology of Later Life, Philadelphia WB Saunders Company.
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21. Desai, K.G. (1985): Problems of the Retired People in Greater Bombay, TISS, Series No. 27.
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25. Pinkston, P.H. and N.K. Linsk (1984): Care of the Elderly: A family approach, New York, Pergamon Press.
26. Watson, R. R. (ed) (2000) Handbook of Nutrition in the Aged. 3rd edition. CRC Press. Boca Raton
27. Nutrition Screening Initiative (1991 and 1992). Nutrition Screening Manual for Professionals Caring for Older Americans. Washington, D.C. Green Margolis, Mitchell, Burns and Associates
28. Chernoff, R. (ed) (1991). Geriatric Nutrition: The Health Professionals' Handbook, Gaithersburg, MD: Aspen
29. The Nutrition Screening Initiative (1994). Incorporating Nutrition Screening and Interventions into Medical Practice: A Monograph for Physicians.

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31. Bock, G.R.; and Whelen, J. (eds) The Childhood Environment and Adult Disease. Chichester, U.K. Wiley
32. Berg, R.L. and Casells, J.S. (1990) The Second Fifty Years: Promoting Health and Preventing Disability. Washington E.C. National Academy Press.

Journals:

1. American Journal of Clinical Nutrition,
2. Gerontology,
3. Journal of the American Geriatric Society,
4. Age Ageing,
5. Journal of Applied Gerontology,
6. Age,
7. Journal of Gerontology
8. Archives of Diseases in Childhood,
9. Acta Paediatrica Scandinavica,
10. Indian J of Pediatrics
11. UNU Food and Nutrition Bulletin
12. Journal of Pediatric Gastroenterology and Nutrition

NUTRITION IN CANCER AND CRITICAL CARE

4 Credits (Th)

Objectives:

The course will enable the students to:

1. Understand the physiology, metabolism and special requirements of the critically ill.
2. Be familiar with the special nutritional support techniques and feeding formulations to meet their nutritional needs.

Contents:

Module No	Objectives	Topic and Details	No of credits
1	<ol style="list-style-type: none">1. To understand the different nutritional support systems, indications for use, their administration, and complications.2. To know about the composition of different formulations used in enteral and parenteral nutrition.	<p>Nutritional support systems and other life – saving measures for the critically ill.</p> <p>Enteral and parenteral nutrition support. Role of immune enhancers, conditionally essential nutrients, immune suppressants, and special diets in critical care.</p> <p>Enteral Nutrition :</p> <ol style="list-style-type: none">i). Various sites for Enteral nutritionii). In brief, discussion on Ryle's tube and its careiii).Types of feeds, advantages and disadvantage of home-based feeds, Commercial formula feeds.iv). Incorporation of easily digestible foods.v).Requirements of nutrients according to problems eg. Renal, respiratory etc.	1

		<p>Total Parental Nutrition</p> <p>i). The importance of TPN</p> <p>ii). Long term effect of its use</p> <p>iii).Site of TPN and its care</p> <p>iv).Composition</p> <p>Diet related ethical issues in the terminally ill.</p> <p>Nutritional Support System and Complications including refeeding syndrome and rehabilitation diets.</p> <p><i>Evaluation: Market survey on availability, composition and price of EN and TPN formulations</i></p>	
2	<p>1. To explain the pathophysiologic and metabolic consequences of cancer</p> <p>2. To understand the preventive and therapeutic role of diet and nutritional care.</p>	<p>Nutrition and Cancer</p> <p>Etiology and Pathogenesis of carcinogenesis</p> <p>Metabolic and Nutritional Alterations in Malignancy</p> <p>Interrelationships of nutritional status and systemic effects of cancer, Cancer cachexia</p> <p>Nutritional impacts of cancer therapy</p> <p>Types of therapy</p> <p>Bone Marrow Transplant and its nutritional care</p> <p>Nutritional support of the Cancer patient</p> <p><i>Evaluation: Review of Recent research on role of therapeutic nutrition in cancer</i></p>	1

3	<p>1.To understand the pathophysiologic, metabolic and clinical aspects of various critical care conditions</p> <p>2. Know the specific nutritional requirements and management of the conditions</p>	<p>Patho-physiological, clinical and metabolic aspects, special nutritional requirements, nutritional goals and monitoring the therapy in critical illnesses, nutritional screening and nutritional status assessment of the critically ill, recommendations and guidelines of expert groups, role of immune enhancers, conditionally essential nutrients:</p> <p>CV complications, stroke,</p> <p>Respiratory failure</p> <p>Multi organ failure</p> <p>Hepatic failure</p> <p>Surgery and its complications</p> <p>Sepsis and burns</p> <p><i>Evaluation: Review of evidence – based guidelines for the above conditions</i></p> <p><i>Discussion and presentation on evidence-based guidelines</i></p>	2
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References:

1. Zaloga, G.P. (1994): Nutrition in Critical Care, Times Mirror/Mosby.
2. Shils, M.E., Olson, J.A., Shike, M. and Ross, A.C. (Ed) (1999): Modern Nutrition in Health and Disease. 9th Edition, Williams and Wilkins.
3. Shikora, S.A. and Blackburn, G.L. (Ed) (1999). Nutritional Support – Theory and Therapeutics, Chapman and Hall, ITP (International Thomson Publishing).
4. Mahan, L.K. and Escott – Stump, S. (2000): Krause’s Food Nutrition and Diet Therapy, 10th Ed. W.B. Saunders Ltd.
5. Phillips, G.D. and Lodgers C.L. (1986). Parenteral and Enteral Nutrition. A Practical Guide. Churchill Livingstone.

6. Kinney, J.M. and Borum, P. R. (editors) (1989) Perspectives in Clinical Nutrition. Urban and Schwarzenberg.
7. Torosian, M. H. (editor) (1995) Nutrition for the Hospitalised Patient. Basic Science & Principles of Practice.
8. Keynes, W. M. and Fowler, P.B.S. (1984) Clinical Endocrinology. William Heinemann Medical Books, London.
9. Shields, R. (editor) (1992) Bailliere's Clinical Gastroenterology, Bailliere Tindall London
10. Galambos, J. P. (1979) Cirrhosis in the series Major Problems in Internal Medicine, W. B. Saunders Company Philadelphia.

STATISTICAL APPLICATIONS IN RESEARCH

4 credits (Pr)

Objectives

This course will enable students to:

1. Discriminate between parametric and non-parametric tests
2. Learn to apply statistical tests for data analysis for both large and small samples
3. Know how to interpret the results of statistical analysis of data
4. Be able to summarize data and present it using tables and graphs
5. Develop skills for preparation of research proposals
6. Understand the components of a research report

Module No	Topics	Number of credits
1	<p>Introduction to Statistics Definition, conceptual understanding of statistical measures, popular concepts and misuse of statistics</p> <p>Normal Distribution and its Properties a. Normal distribution b. Binomial distribution c. Probability, use of normal probability tables, area under normal distribution curve d. Parametric and non-parametric tests</p> <p>Data Management Planning for data analysis – coding of responses, preparation of code book Coding of data Use of statistical programs - MS Excel - SPSS</p>	1
2	<p>Data Analysis a. Quantitative analysis, descriptive statistics, inferential statistics : Uses and limitations, Summation sign and its properties b. Proportions, percentages, ratios c. Measures of central tendency-mean, median, mode-arithmetic mean and its uses, mid – range, geometric mean, weighted mean d. Measures of dispersion /variability- range, variance, standard deviation, standard error, coefficient of variation, Kurtosis, skewness Grouped data-frequency distribution, histogram, frequency polygons, percentiles, quartiles, tertiles, ogive</p>	1

	<p>e. Large and Small Sample tests and interpretation</p> <ul style="list-style-type: none"> - Z-test for single proportions and difference between proportions - Large sample test for single mean and difference between means - Small sample tests- 't'-test, paired 't'-test, 'F' Test 	
3	<p>Chi square test and its interpretation</p> <ul style="list-style-type: none"> a. General features, goodness of fit b. Independence of Attributes <p>Correlation and Regression and its interpretation</p> <ul style="list-style-type: none"> a. Basic concepts b Linear regression and correlation coefficient <p>Regression and prediction</p> <ul style="list-style-type: none"> c. Rank correlation, Product-moment method <p>Analysis of Variance and its interpretation</p> <ul style="list-style-type: none"> a. One-factor analysis of variance b. Two-factor analysis of variance <p>Design of Experiments</p> <ul style="list-style-type: none"> a. Completely randomized design b. Randomized block design c. Latin square design d. Factorial design 	1
4	<p>Presentation of Data</p> <ul style="list-style-type: none"> a. Tabulation and Organization of data- frequency distributions, cumulative frequency distribution, contingency tables b. Graphical presentation of data- histogram, frequency polygon, ogive, stem and leaf plot, box and whiskers plot, <p>Graphs for nominal and ordinal data- pie diagram, bar graphs of different types, graphs for relation between two variables, line diagram. Use of illustrations Cautions in visual display of data</p> <p>The Research Report Basic components of a research report- prefatory material, introduction and Review of Related Literature, Methodology, Results, Discussion, Conclusion, Summary, Abstract, Bibliography and Appendices</p> <p>Students to design a research study on a topic-</p> <ul style="list-style-type: none"> - specify type of research - sample selection - protocol/operationalization - tools - tests for statistical analysis <p>Preparation of a Research Proposal</p>	1

FUNCTIONAL FOODS, BIODYNAMIC PRINCIPLES AND NUTRACEUTICALS

4 Credits (Th)

Objectives:

This course is designed to enable students to:

1. Gain knowledge about functional foods, biodynamic principles and nutraceuticals
2. Have thorough understanding about the health effects
3. Be familiar with applications in industry.

Contents:

Module No	Topics and Details	No of Credits
1.	<p>Introduction: Definition, history, classification – Type of classification (Probiotics, probiotics and synbiotics; Nutrient vs. Non-nutrient; according to target organ; according to source or origin). Metabolism of xenobiotics (review)</p> <p>Probiotics</p> <ol style="list-style-type: none"> a. Taxonomy and important features of probiotic micro-organisms. b. Health effects of probiotics including mechanism of action. c. Probiotics in various foods: fermented milk products, non-milk products etc. d. Quality Assurance of probiotics and safety. <p>Prebiotics</p> <p>Unit 1. Definition, chemistry, sources, metabolism and bioavailability, effect of processing, physiological effects, effects on human health and potential applications in risk reduction of diseases, perspective for food applications for the following:</p> <ul style="list-style-type: none"> • Non-digestible carbohydrates/oligosaccharides: • Dietary fibre • Resistant starch • Gums 	1
2	<p>Potential health benefits of the following biodynamic principles: Definition, chemistry, sources, metabolism and bioavailability, effect of processing, physiological effects, effects on human health and potential applications in risk reduction of diseases, perspective for food</p>	2

	<p>applications for:</p> <ul style="list-style-type: none"> • Polyphenols: Flavonoids, catechins, isoflavones, tannins Curcumin, Resveratrol • Phytoestrogens/ Isoflavones • Phytosterols • Glucosinolates • Pigments : Lycopene, Carotenoids • Organo sulphur compounds • Other components – Phytates, Protease inhibitors, saponins, Amylase inhibitors, haemagglutinins 	
3.	<p>Non- nutrient effect of specific nutrients : Proteins, Peptides and nucleotides, Conjugated linoleic acid and n-3 fatty acids, Vitamins and Minerals. Active biodynamic principles in spices, condiments and other plant materials and their evidence based effects</p>	1

References:

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2. Yurawecz, M.P., M.M. Mossoba, J.K.G. Kramer, M.W. Pariza and G.J. Nelson eds (1999) Advances in Conjugated Linoleic Acid Research, Vol. 1. AOCS Press, Champaign.
3. Wildman, R.E.C. ed. (2000) Handbook of Nutraceuticals and Functional Foods, CRC Press, Boca Raton.
4. Fuller, R. ed. (1992) Probiotics the scientific basis, London: Chapman and Hall, New York.
5. Fuller, R. ed. (1997) Probiotics Applications and Practical Aspects, London: Chapman and Hall, New York.
6. Salminen, S. A. Von Wright (eds) (1998): Lactic acid bacteria: microbiology and functional aspects, 2nd edition, Marcell Dekker Inc. New York.
7. Goldberg, I. Ed (1994): Functional Foods: Designer Foods, Pharma Foods, Nutraceuticals, Chapman & Hall, New York.
8. Wood, B.J.B. ed. (1992): The lactic acid bacteria in health and disease, Elsevier Applied Science, London.

9. Gibson, G., Williams, C. eds (2000): Functional Foods. Woodhead Publishing Ltd. U.K.
10. Young, J. (1996): Functional Foods: Strategies for successful product development. FT Management Report Pearson Professional Publishers, London.
11. Frei, B. (1994): Natural antioxidants in human health and disease. Academic Press, San Diego.
12. Tannock, G.W. (1999): Probiotics: A critical review, Horizon Scientific Press, UK.

GERIATRIC NUTRITION

4 credits Theory

Objectives:

This course will enable the students to:

1. Understand the multifaceted aspects of aging
2. Understand the specific needs of elderly and the effects of various diseases on nutritional status and nutritional requirements at these stages of the life cycle
3. Be competent to recommend / provide appropriate nutritional care based on pathophysiology, prevention/ and treatment of the various diet-related disorders/ diseases

Module No	Topic and Details	No of Credits
1	The Ageing Society- Global and Indian scenario Epidemiology Life Expectancy vs Life Span Usual vs Successful Ageing Changes associated with Ageing process Cellular aspects of ageing Physiological changes: body composition gastrointestinal, cardiac, respiratory, renal, muscular, skeletal, neural(including brain and spinal cord), endocrine and metabolic, changes and impact on health and nutritional status Functional manifestations of ageing: constipation, impaired fluid and electrolyte balance, altered thermoregulation, sleep disturbances	1
2	Common molecular theories of ageing and nutritional interventions Factors influencing ageing – endogenous and exogenous	1

	<p>Benefits of calorie restriction and exercise</p> <p>Nutritional requirements – factors influencing and dietary plans for senior citizens</p> <p>Promoting successful ageing-traditional and modern methods</p>	
3	<p>Nutritional and health status of elderly. Factors influencing food consumption and nutritional status of elderly</p> <p>Undernutrition in the Elderly – risk factors,</p> <p>Common diseases in elderly: Etiopathogenesis, manifestations and interventions -</p> <p style="padding-left: 40px;">Gastrointestinal disturbances, cardiac, renal, respiratory diseases, mental changes including depression, dementia, Parkinson’s, Alzheimer’s, bone and muscle related abnormalities, Sarcopenia, frailty</p> <p>Role of Nutrition in prevention of age related diseases</p> <p>Nutrient drug interactions</p>	1
4	<p>Assessment of nutritional status – mini nutrition index, assessment of frailty</p> <p>Policies and programmes of the government and NGO sector pertaining to the elderly</p> <p>Promoting fitness and well being- use of various modern and traditional approaches</p>	1

NOTE: Module 4 is to be done through field visits and as independent project through the following:

1. Visit to old age homes
2. Assessment of physical fitness, food intake and nutritional status
3. Planning and preparation of diets for the elderly in health and sickness.
4. Developing protocol for promoting fitness and health vis-à-vis health status/disease.

References:

1. Mahan, L.K. and Escott-Stump, S. (2000): Krause's Food Nutrition and Diet Therapy, 10th Edition, W.B. Saunders Ltd.
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3. Escott-Stump, S. (1998): Nutrition and Diagnosis Related Care, 4th Edition, Williams and Wilkins.
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6. Davis, J. and Sherer, K. (1994): Applied Nutrition and Diet Therapy for Nurses, 2nd Edition, W.B. Saunders Co.
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8. Guyton, A.C. and Hall, J.E. (1999): Textbook of Medical Physiology, 9th Edition, W.B. Saunders Co.
9. Ritchie, A.C. (1990): Boyd's Textbook of Pathology, 9th Edition, Lea and Febiger, Philadelphia.
10. Fauci, S.A. et al (1998): Harrison's Principles of Internal Medicine, 14th Edition, McGraw Hill.
11. World Cancer Research Fund (1997). Food, Nutrition and the Prevention of Cancer- A Global perspective, Washington E.D. WCRF.
12. Kumar, V. (1996): Aging – Indian Perspective and Global Scenario. Proceedings of International Symposium of Gerontology and Seventh Conference of the Association of Gerontology (India).
13. Bagchi, K. & Puri, S. (Ed) (1999): Diet and Aging – Exploring Some Facets. Soc. for Gerontological Research, New Delhi and Help Age India, New Delhi.
14. Chaudhary, A. (Ed) (2001): Active Aging in the New Millennium, Pub. Anugraha, Delhi.
15. Shills, M.E., Olson, J.A., Shike, M. and Ross, A.C. (Ed) (1999): 9th Edition, Williams and Wilkins.
16. Sharma, O.P. (Ed.) (1999): Geriatric Care in India – Geriatrics and Gerontology: A Textbook, M/s. ANB Publishers.
17. Aiken, L.R. (1978): The Psychology of Later Life, Philadelphia WB Saunders Company.
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19. Binstock, R.H. and E. Shanes (eds) (1986): Handbook of Aging and Social Sciences V.N. Reinhold Co, New York,.
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26. Watson, R. R. (ed) (2000) Handbook of Nutrition in the Aged. 3rd edition. CRC Press. Boca Raton
27. Nutrition Screening Initiative (1991 and 1992). Nutrition Screening Manual for Professionals Caring for Older Americans. Washington, D.C. Green Margolis, Mitchell, Burns and Associates
28. Chernoff, R. (ed) (1991). Geriatric Nutrition: The Health Professionals' Handbook, Gaithersburg, MD: Aspen
29. The Nutrition Screening Initiative (1994). Incorporating Nutrition Screening and Interventions into Medical Practice: A Monograph for Physicians.
30. Watson, R.R. (ed) (1985) CRC Handbook of Vitamins in the Aged ERC Press, Boca Raton, Florida
31. Bock, G.R.; and Whelen, J. (eds) The Childhood Environment and Adult Disease. Chichester, U.K. Wiley
32. Berg, R.L. and Casells, J.S. (1990) The Second Fifty Years: Promoting Health and Preventing Disability. Washington E.C. National Academy Press.

Journals:

1. *American Journal of Clinical Nutrition,*
2. *Gerontology,*
3. *Journal of the American Geriatric Society,*
4. *Age Ageing,*
5. *Journal of Applied Gerontology,*
6. *Age,*
7. *Journal of Gerontology*

SCIENTIFIC WRITING

Objectives:

This course will enable students to:

- Appreciate and understand the importance of different types of scientific writing /documentation.
- Develop competence in writing and abstracting skills.

Contents:

Module No	Topic and Details	Number of credits
1	Literature search and use of databases Styles and formats for writing references Writing a Book review	1
2	Writing review of literature on an upcoming area Review paper including bibliography	1
3	1 Writing a scientific paper including abstract and identification of key words	1
4	Writing a research proposal for various funding agencies	1

DIETETIC TECHNIQUES AND PATIENT COUNSELLING

1 Credit (Th) + 3 Credits

(Pr)

Objectives:

This course will prepare the students to:

- Understand the principles and procedures of nutrition counseling and the role of the counselor.
- Develop an understanding how: (a) lifestyles influence health and well-being; (b) acute and chronic disease affects the emotional and psychological state and the behavior of the individuals.
- Be familiar with various techniques used in counseling.
- Be able to use various types and techniques of counseling to motivate patients to achieve well-being.

Contents:

Module No	Topics and Details	No of Credits
Theory		
1	<p>Counselling – Definition, Expectations, goals, scope and limits.</p> <p>Counsellor – Characteristics of an effective counselor</p> <p>The Client – Characteristics, expectations</p> <p>The Counselling Process: Techniques for obtaining relevant information</p> <ol style="list-style-type: none"> 1. Clinical Information 2. Medical History and General Profile 3. Dietary Diagnosis <ul style="list-style-type: none"> • Assessing food and nutrient intakes • Lifestyles, physical activity, stress 4. Nutritional Status 5. Correlating relevant information and identifying areas of need <ul style="list-style-type: none"> Stage I: Problem exploration and clarification Stage II: Developing new perspectives and setting goals Stage III: Implementation follow up and evaluation 	1
2	<p>Counselling Theories and Approaches: Key Concepts and Techniques</p> <p>Counselling techniques, strategies and communication skills</p> <p>Rapport building and opening techniques</p> <p>Questioning, listening, reflecting, acceptance, silence, leading reassurance, non-verbal behaviour, terminating skills.</p> <p>Group Counselling</p>	

Practicals		
3	Developing resources and aids for education and counseling	1
4	<p>Working with:</p> <p>1. Hospitalised patients (adults, pediatric, elderly, handicapped), adjusting and adopting to individual needs</p> <p>Outpatients (adults, pediatric, elderly, handicapped), patients education, techniques and modes</p> <p>Follow up Monitoring and Evaluation of outcome: Home visits.</p>	2

References:

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