

ANNEXURE-I

Revised Scheme of Studies for M.Sc. (Hons.) Human Nutrition and Dietetics

HNAD-501	Bioactive components and health	3(2-1)
HNAD-502	Nutrigenomics and proteomics	3(3-0)
HNAD-503	Clinical nutrition and dietetics	3(1-2)
HNAD-504	Personalized nutrition	3(3-0)
HNAD-505	Nutrition in institutions	3(2-1)
HNAD-506	Diet diversification and health promotion	3(3-0)
HNAD-507	Paediatric and geriatric nutrition	3(3-0)
HNAD-508	Human immunology	3(2-1)
HNAD-509	Vegetarian nutrition	3(3-0)
HNAD-510	Public health nutrition	3(2-1)
HNAD-511	Nutritional disorders and disease prevention	3(2-1)
HNAD-512	Lab. techniques in human nutrition	3(1-2)
HNAD-513	Research methods in human nutrition	3(3-0)
HNAD-514	Advanced community nutrition	3(2-1)
HNAD-515	Applied dietetics	3(2-1)
HNAD-516	Nutritional epidemiology	3(3-0)
HNAD-517	Advances in functional foods and nutraceuticals	3(3-0)
HNAD-518	Special problem	1(1-0)
HNAD-519	Seminar	1(1-0)
HNAD-520	Thesis	6(0-6)

HND-501**Bioactive Components and Health****3(2-1)**

Name of the course	Bioactive Components and Health
Course No.	HND-501
Credit Hours	3(2-1)
Theory	Bioactive substances in food: Dietary fiber, prebiotics, bioactive peptides, probiotics, anthocyanins, carotenoids, plant sterols, mono and polyunsaturated fatty acids, tocopherols, polyphenolics, naphthoquinones, alkaloids, glucosinolates, phycotoxins in seafood, mushroom toxins, mycotoxins, phytoestrogens, β -carboline alkaloids, nitrates and nitrites, acrylamide, furan, chloropropanols and their fatty acid esters, heterocyclic amines; The role of bioactive compounds in human health; Bioactive components in foods of plant origin: Fruits and vegetables, mushrooms, pulses, cereals; Bioactive components in foods of animal origin: Milk and milk products; Bioactive components in foods of microbial origin: Microalgae, bacteria; Heterocyclic amines from cooked food; Dietary recommendations for bioactive food components; Regulatory issues and functional health claims for bioactive compounds; New technologies for isolation and analysis of bioactive compounds.
Practical	Extraction and characterization of selected bioactive compounds from foods of plant, animal and microbial sources through conventional and advanced techniques; Preparation of food products enriched with bioactive food components.
Suggested Readings	<ol style="list-style-type: none">1. Bitterlich, A. and S. Fischl. 2012. Bioactive Compounds: Types, Biological Activities and Health Effects. Nova Science Publishers, Hauppauge, New York, USA.2. Gilbert, J. and H.Z. Şenyuva. 2008. Bioactive Compounds in Foods. Blackwell-Wiley, John Wiley and Sons Ltd., Chichester, West Sussex, UK.3. Ibañez, E., M. Herrero, J.A. Mendiola and M. Castro-Puyana. 2012. Extraction and Characterization of Bioactive Compounds with Health Benefits from Marine Resources. In: Marine Bioactive Compounds: Sources, Characterization and Applications. Springer, New York, USA.4. Park, Y.W. 2009. Bioactive Components in Milk and Dairy Products. Blackwell-Wiley, John Wiley and Sons Ltd., Chichester, West Sussex, UK.

HND-502 Nutrigenomics and Proteomics**3(3-0)**

Name of the course	Nutrigenomics and Proteomics
Course No.	HND-502
Credit Hours	3(3-0)
Theory	Nutritional omics: Genomics, proteomics and metabolomics; Omics for the development of novel phyto-medicines, functional and nutraceutical foods; Nutrigenomics: Concepts, tools and expectation; Opportunities and challenges in the nutrigenetics/nutrigenomics and health; Improving the nutritional value of cereal grains using genomic approach; Genomics applied to nutrients; The evolution of human disease; Recent advances in nutraceuticals and functional foods; Molecular basis of bioactive food components and human health; Molecular mechanisms of genetic variation linked to diet; Micronutrients and genomic stability and function; Contemporary dietary patterns; Proteomics: Need, scope, challenges, applications in nutrition research; Genomics, proteomics and health; Treatment of genetic disorders; Gene expression, profiling and genomic approaches to address various health issues
Suggested Readings	<ol style="list-style-type: none"> 1. Bagchi, D., F.C. Lau and M. Bagchi. 2010. Genomics, Proteomics and Metabolomics in Nutraceuticals and Functional Foods. Blackwell-Wiley, John Wiley and Sons Ltd., Chichester, West Sussex, UK 2. Korf, B.R. and M.B. Irons. 2013. Human Genetics and Genomics, 4th Ed. Blackwell-Wiley, John Wiley and Sons Ltd., Chichester, West Sussex, UK 3. Lucock, M. 2007. Molecular Nutrition and Genomics: Nutrition and the Ascent of Humankind. John Wiley and Sons Inc., Hoboken, New Jersey, USA 4. Twyman, R.M. 2009. Principles of Proteomics. Garland Science/BIOS Scientific Publishers, Abingdon, Oxon, UK

HND-503 Clinical Nutrition and Dietetics**3(1-2)**

Name of the course	Clinical Nutrition and Dietetics
Course No.	HND-503
Credit Hours	3(1-2)
Theory	Changing behavior and dietary counseling; Diets through the lifecycle: Preconception, pregnancy, infants, children, adolescents and elderly people; Clinical nutrition in health disorders: Cardiovascular disease, stroke, diabetes, obesity, irritable bowel disease, colorectal cancer, gastrointestinal diseases, pancreatic disease, thermal injury, liver disease, respiratory diseases, palliative care, renal disease, HIV infection and severe malnutrition; Prescription of nutritional products; Nutrition support in critically ill patients; Nutritional epidemiology; Enteral and parenteral nutrition; Nutraceuticals, alternative medicine, dietary

	supplements; Personalized nutrition and personalized medicines; Research methods in clinical nutrition and dietetics; Drug-nutrient interaction; Food allergy and intolerance.
Practical	Dietary reference values and food-based dietary guidelines. Energy and nutrient requirements through the life cycle: Health and disease; Assessment of nutritional status in clinical practice; Preparation of diet charts through the life cycle for various diet linked disorders; Visit of nutrition clinics; Practicing nutrition: Mock clinic.
Suggested Readings	<ol style="list-style-type: none"> 1. Elia, M., O. Ljungqvist, R. Stratton and S.A. Lanham. 2013. Clinical Nutrition, 2nd Ed. Blackwell-Wiley, John Wiley and Sons Ltd., Chichester, West Sussex, UK. 2. Katsilambros, N., C. Dimosthenopoulos, M.D. Kontogianni, E. Manglora and K.A. Poulia. 2011. Clinical Nutrition in Practice. Blackwell-Wiley, John Wiley and Sons Ltd., Chichester, West Sussex, UK. 3. Payne, A. and H.M. Barker. 2011. Advancing Dietetics and Clinical Nutrition. Churchill Livingstone, Elsevier Ltd., London, UK. 4. Sardesai, V. 2012. Introduction to Clinical Nutrition, 3rd Ed. CRC Press, Taylor and Francis Group, Boca Raton, Florida, USA.

HND-504 Personalized Nutrition

3(3-0)

Name of the course	Personalized Nutrition
Course No.	HND-504
Credit Hours	3(3-0)
Theory	Personalized nutrition and public health; Scientific principles of personalized nutrition; Consumer attitude towards personalized nutrition; Ethics of personalized nutrition; Future of personalized nutrition; Exploring the proteome for markers of health; Molecular mechanisms of longevity regulation and calorie restriction; Metabolomics and personalized metabolic signatures; Personalized nutrition for the prevention and treatment of health disorders: CVD risks, chronic inflammation, diabetes, cancer, obesity; Metabolic programming during pregnancy; Maternal nutrition: Nutrients and control of expression; Dietary and genetic effects of atherogenic dyslipidemia; Nutrition communication; Marketing and consumer behavior perspectives on personalized nutrition; Opportunities and challenges in tailoring foods to match people's genes.
Suggested Readings	<ol style="list-style-type: none"> 1. Ferguson, L.P. 2014. Nutrigenomics and Nutrigenetics in Functional Foods and Personalized Nutrition. CRC Press, Taylor and Francis Group, Boca Raton, FL, USA. 2. Kaput, J. and R.L. Rodriguez. 2006. Nutritional Genomics: Discovering the Path to Personalized Nutrition. John Wiley and Sons, Inc., Hoboken, New Jersey, USA.

	<ol style="list-style-type: none"> 3. Kok, F., L. Bouwman and F. Desiere. 2008. Personalized Nutrition: Principles and Applications. CRC Press, Taylor and Francis Group, Boca Raton, FL, USA. 4. Simopoulos, A.P. and J.A. Milner. 2009. Personalized Nutrition: Translating Nutrigenetic/Nutrigenomic Research into Dietary Guidelines. S. Karger AG, Basel, Switzerland.
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HND-505	Nutrition in Institutions	3(2-1)
Name of the course	Nutrition in Institutions	
Course No.	HND-505	
Credit Hours	3(2-1)	
Theory	<p>Foodservice industry; Management of the foodservice department; Nutrition in schools: Children’s dietary choices; Nutritional standards in developed world; Government and non-government initiatives to improve the diets of children; Catering staff; Procurement of school meals; Free school meals; Good practices of school feeding; Nutrition in hospitals; Care homes for the elderly: Food provision and catering facilities; Nutrition for prisoners: Catering standards; Menu; Nutrition and criminal behavior, prisons worldwide. Armed forces: Nutritional requirements of armed forces personnel, food and nutrient guidelines, provision of food during operations, catering training, nutrition education, competitions; Nutrition in child care centers: Special needs meals, planning and serving healthy meals, teaching preschoolers about healthy eating habits; Causes and consequences of under-nutrition, nutrition support, treatment, monitoring and follow up.</p>	
Practical	<p>Nutritional assessment of individuals: School children, special children, elderly people; Energy and nutrient values of meals available in different institutions: School, hospital, prisons, care homes, armed forces; Preparation of health menus for individuals of different institutions; Visit to the ongoing nutrition programs; Visit of SOS village and care homes; Recommendations of adequate nutrition.</p>	
Suggested Readings	<ol style="list-style-type: none"> 1. CCFP (Child Care Food Programs). 2013. Nutrition and Menu Planning For Children in the Child Care Food Program. Florida Department of Health, Bureau of Child Care Food Programs, Tallahassee, FL, USA. 2. CE (Council of Europe). 2009. Nutrition in Care Homes and Home Care: From Recommendations to Actions. Council of Europe Publishing, Strasbourg Cedex, France. 3. Cross, M. and B. MacDonald. 2009. Nutrition in Institutions. Wiley-Blackwell. John Wiley and Sons Ltd., Chichester, West Sussex, U.K. 4. Puckett, R.P. 2012. Foodservice Manual for Health Care Institutions, 4th Ed. Wiley-Blackwell. John Wiley and Sons Ltd., Chichester, West Sussex, U.K. 	

HND-506 Diet Diversification and Health Promotion 3(3-0)

Name of the course	Diet Diversification and Health Promotion
Course No.	HND-506
Credit Hours	3(3-0)
Theory	Global and regional food consumption patterns and trends; Diversifying into healthy diets; Food-based approaches to meet vitamin and mineral needs; Fat intake, diet variety and health promotion; Diversification in indigenous and ethnic food culture; Role of organic and functional foods in diet diversification; Supplementation, food fortification and dietary diversification; Health effects of phytoestrogens; Exploitation of convenience food in view of a diet diversification; Making the healthy choice an easy choice; Diversification and food choice from consumer's view; Addressing micronutrient malnutrition to achieve nutrition security; Strategies for preventing multi-micronutrient deficiencies; Food-based low-cost strategies to combat micronutrient deficiencies in developing countries; Agricultural interventions and nutrition; Foundations for health promotion: Objectives, health policy, ethical issues, emerging populations, delivery systems, therapeutic relationship; Assessment for health promotion: Individual, family, community; Interventions for health promotion: Screening, health education, nutrition counseling, exercise, stress management, holistic health strategies; Applications of health promotion: Prenatal period, infants, toddlers, preschool and school-age children, adolescents, young, middle-age and older adults.
Suggested Readings	<ul style="list-style-type: none"> • Edelman, C.L., C.L. Mandle and E.C. Kudzma. 2014. Health Promotion throughout the Life Span, 8th Ed. Mosby Elsevier Inc., Riverport Lane, St. Louis, Missouri, USA. • Elmadfa, I. 2005. Diet Diversification and Health Promotion. Karger Medical and Scientific Publishers, Basel, Switzerland. • Thompson, B. and L. Amoroso. 2011. Combating Micronutrient Deficiencies: Food-Based Approaches. Published jointly by CABI and FAO, Rome, Italy.

HND-507 Paediatric and Geriatric Nutrition 3(3-0)

Name of the course	Paediatric and Geriatric Nutrition
Course No.	HND-507
Credit Hours	3(3-0)
Theory	Infant nutrition: Growth, nutritional requirements, dietary reference intakes; Development and chemical composition of body; Pre- and peri-conceptual nutrition; Maternal physiology and nutrition during reproduction; Physiological and nutritional aspects of placenta; Lifestyle and maternal health interactions between mother and fetus; Infant

	<p>nutritional assessment; Breastfeeding, formula feeding, complementary feeding; Nutritional needs of pre-term infant; Nutrition of low-birth-weight and very-low-birth-weight infants; Feeding guidelines for children and adolescents; The aging society and nutrition epidemiology; Molecular theories of aging and nutritional interventions; Nutritional requirements in older adults; Role of nutrition in the prevention of age-associated diseases; Health disorders in older adults; Nutritional assessment in older persons; Geriatric assessment and its interaction with nutrition; Prescription for enteral nutrition; Prescription for parenteral nutrition; Nutrition management in nursing homes and assisted living environment; Drug-nutrient interactions during old age; Multicultural and ethical issues; Practical approaches to management.</p>
Suggested Readings	<ol style="list-style-type: none"> 1. Kleinman, R.E. and F.R. Greer. 2013. Pediatric Nutrition, 7th Ed. American Academy of Pediatrics, Washington, DC, USA. 2. Morgan, J.B. and J.W. Dickerson. 2003. Nutrition in Early Life. Blackwell-Wiley, John Wiley and Sons Ltd., Chichester, West Sussex, UK. 3. Morley, J.E. and D.R. Thomas. 2007. Geriatric Nutrition. CRC Press, Taylor and Francis Group, Boca Raton, FL, USA. 4. Sonnevile, K. and C. Duggan. 2013. Manual of Pediatric Nutrition, 5th Ed. People's Medical Publishing House, Shelton, CT, USA.

HND-508	Human Immunology	3(2-1)
Name of the course	Human Immunology	
Course No.	HND-508	
Credit Hours	3(2-1)	
Contents	<p>Pathogenesis of disease, host-pathogen interactions, and host response to disease. Includes instruction in antigen and antibody structure and function, effector mechanisms, receptors, histocompatibility, host-pathogen recognition, disease modelling, autoimmune systems, antibody formation, cytotoxic responses, regulation of immune response, virulence determinants, intercellular signalling, immunosuppression, immunotherapy, immunogenetics, disease markers, transplantation, antibody humanization, and microbial pathogenesis.</p>	
Practical	<p>Gel diffusion test, Immuno-blotting, Immuno-electrophoresis, Immuno-enzyme technique, Immuno-fluorescence.</p>	
Suggested Readings	<ol style="list-style-type: none"> 1. S. K. Mohanty, K. Sai Leela, 2013. A text book of immunology. JP Medical Ltd. India. 2. Arvind Kumar, 2013. A text book of immunology. TERI Press, India. 3. Goldsby RA, Kindt TK, Osborne BA and Kuby J (2003) Immunology, 5th Edition, W.H. Freeman and Company, New York, New York, 4. Janeway CA, Travers P, Walport M, and Shlomchik M (2001) Immunobiology, 6th Edition, Garland Publishing, New York, New York 	

HND-509 Vegetarian Nutrition		3(3-0)
Name of the course	Vegetarian Nutrition	
Course No.	HND-509	
Credit Hours	3(3-0)	
Theory	Vegetarian diets: Descriptions and trends; Historical context of vegetarianism; Religion, spirituality and vegetarian diet; Public health risk to benefit ratio of vegetarian diets; Vegetarian diets and chronic disease prevention; Vegetarianism and coronary heart diseases; Vegetarian diets and cancer risk; Vegetarian diets and obesity prevention; Vegetarian diets in the prevention of osteoporosis, diabetes, and neurological diseases; Low meat consumption and longevity; Adequacy of vegetarian diets through the lifecycle and special groups; Growth and development of vegetarian children and adolescents; Vegetarian diets in pregnancy and lactation; Nutritional considerations for an aging population; Implications of the vegetarian diet for athletes; Nutrients of concern in vegetarian diets; Health-promoting phytochemicals: Beyond the traditional nutrients; Vegetarian diets and dietary guidelines for chronic disease prevention; Developing a vegetarian food guide; Recommendations for vegetarian diets. Global issues and non-nutritional perspectives of vegetarian diets.	
Suggested Readings	<ol style="list-style-type: none"> 1. Davis, B. and V. Melina. 2008. <i>Becoming Vegan: the Complete Guide to Adopting a Healthy Plant-Based Diet</i>. Book Publishing Co., Summertown, TN, USA. 2. Frey, R. 2013. <i>Power Vegan: Plant-Fueled Nutrition for Maximum Health and Fitness</i>. Agate Publishing, Chicago, USA. 3. Sabate, J. and R. Ratzin-Turner. 2001. <i>Vegetarian Nutrition</i>. CRC Press LLC, Boca Raton, FL, USA. 4. Walsh, S. 2007. <i>Plant Based Nutrition and Health</i>. Vegan Society Ltd. Cheshire, UK. 	

HND-510 Public Health Nutrition		3(2-1)
Name of the course	Public Health Nutrition	
Course No.	HND-510	
Credit Hours	3(2-1)	
Theory	Understanding public health: Dynamics, governmental responsibility, knowledge and skills of public health nutritionist; Public health nutrition: Concept and guiding principles, history, ethics, key problems, food and nutrition policy, identify key nutritional problem, over- and under-nutrition; Applying nutrition to public health: Nutritional epidemiology; Accessing and intervening in the community's nutrition needs: Assessment of nutritional status in individuals and populations, targeting	

	at risks, infant feeding, changing public eating behavior, food choices and dietary guidelines; Advocating and influencing health and nutrition policies; Providing nutrition care services in public health primary care; Protecting the public's nutritional health: Safe guarding the food supply, food security and adequate food access for the public, security of the food supply and bioterrorism preparedness; Staffing public health nutrition programs and services; Networking for nutrition; Global developments in the food system.
Practical	Dietary guidelines; Food guidelines and dietary quality; Nutrition screening and monitoring tools; Dietary intake assessment methods for individuals and groups; Dietary and anthropometric assessment methods for children and adults: Stature, weight, BMI, body composition, frame size, circumference and skin fold measurements; Physiological assessment of children and adults; Energy assessment and physical activity, environmental challenges and assessment.
Suggested Readings	<ol style="list-style-type: none"> 1. Edelstein, S. 2011. Nutrition in Public Health: A Handbook for Developing Programs and Services. Jones and Bartlett Learning International, London, UK. 2. Gibney, M.J., B.M. Margetts and J.M. Kearney. 2004. Public Health Nutrition. Blackwell Sciences Ltd., Oxford, UK. 3. Kaufman, M. 1990. Nutrition in Public Health: A Handbook for Developing Programs and Services. An Aspen Publishers Inc., Gaithersburg, Maryland, USA. 4. Lawrence, M. and T. Worsley. 2007. Public Health Nutrition: From Principles to Practice. Open University Press, McGraw-Hill Education, Maidenhead, Berkshire, UK.

HND-511 Nutritional Disorders and Disease Prevention 3(2-1)

Name of the course	Nutritional Disorders and Disease Prevention
Course No.	HND-511
Credit Hours	3(2-1)
Theory	A study of nutrition and its related disorders: Under nutrition and starvation, obesity, protein energy malnutrition, rickets, osteomalacia, scurvy, beriberi, pellagra, nutritional anaemia, neuropathies, xerophthalmia, keratomalacia and blindness. Introduction of nutritional metabolic disorders. Principles of clinical dietetics management, medical terminology, medical documentation, design and implementation of nutrition care plans. Nutrition and the patient with cancer: the relationship of nutrition and breast cancer, colon cancers, prostate cancer and lung cancer. Nutrients role in prevention and development of cardiovascular disease. Dietary macronutrients and other dietary components and cardiovascular risk. Nutrition and congestive heart failure. Nutrition and bone health: the role of nutrition in the prevention

	of osteoporosis. The role of nutrition in prevention and treatment of obesity. Nutritional care in endocrine disorders: the role of nutrition in prevention and treatment of diabetes mellitus. The role of nutrition in prevention and treatment of gastrointestinal diseases. Obesity; genetics of human obesity, role of physical activity, macronutrient intake and body weight, behavioral risk factors for obesity, diet and physical activity, role of taste and appetite in body, weight regulation, obesity and risk for diabetes. Drug-nutrient interaction. Diet and hypertension. Nutritional support in disabling disease and rehabilitation.
Practical:	Students will develop handouts related to Nutrition Management. Gestational, nutritional prevention/management, GI tract disorders and nutrient considerations. Lactose intolerance and nutrient considerations. IBD. Nutrition and Liver Disease. Cancer prevention. Cardiovascular disease prevention nutrition. The medical record/nutrition care process. Eating disorders. Guidelines to maintain health.
Books Recommended:	<ol style="list-style-type: none"> 1. Coulston, A.M. Rock, C.L. and Monsen, E.R. 2001. Nutrition in the Prevention and Treatment of Disease. New York: Academic Press. 2. Birmingham, J.J. 1990. Medical Terminology: A Self-Learning Text. 2nd ed. Philadelphia: CV Mosby Company. 3. Mahan, L.K. and Escott, S.S. 1996. Krause's Food, Nutrition and Diet Therapy. 10th ed. Philadelphia: W.B. Saunders. 4. Pronsky, Z.M. 1997. Powers and Moore's Food Medication Interactions. 10th ed. Pottstown, PA.: Food-Medication Interactions. 5. Shils, M.E., Shike, M., Ross A.C., Caballero, B. and Cousins, R. 2006. Modern Nutrition in health and disease. 10th ed. Baltimore, MD; Lippincott Williams and Wilkins. 6. Ananda, S.P.1993. Essentials and Toxic trace elements in human health and disease: An update. Wiley- Liss Publishers, New York. Pp. 391.

HND -512	Laboratory Techniques in Human Nutrition	3(1-2)
Name of the course	Laboratory Techniques in Human Nutrition	
Course No.	HND -512	
Credit Hours	3(1-2)	
Theory	Theoretical aspects of proximate analysis, mineral analysis. Vitamin and their analysis using instrumental techniques. Chromatographic analysis. Quantitative examination of blood. Serum Chemistry, Hematological indices, immunological assay using ELISA, PCR and genetic analysis, protein characterization, etc.	
Practical:	Sampling and preparation for analysis. Proximate analysis for moisture, ash, silica, ether extract, crude protein, and the use of micro-kjeldahl distillation apparatus. Crude fiber and nitrogen free extract. Determination of calcium, phosphorous, iron, vitamin A and Vitamin C. Qualitative examination of milk. Determination of total solids and ash.	

	Determination of density and freezing point of milk. Determination of tritrate acidity. The protein, lactose and chlorides of milk. Chromatographic analysis. Circular chromatography, ascending single dimensional chromatography, descending single dimensional chromatography and two-dimensional chromatography. Quantitative examination of blood. Determination of glucose, cholesterol, hemoglobin, iron and plasma proteins in blood. Urine, analysis. Detection of sugar, albumen, ketones, bile salts, total nitrogen, urea, creatinine and sulphur in the urine.
Books Recommended	<ol style="list-style-type: none"> 1. Hawk P. B., B.L Oser and H.W. Sumerson 1967. Practical physiological Chemistry. (14th Ed) McGraw Hill Book co. New York. 2. Keinneth. H. 1990. Official Methods of analysis of the Association of analytical Chemistry. AOAC. Inc. Virginia. USA. 3. Meyer, H.L. 1987. Food Chemistry CBS Publisher and Distributors Delhi. 4. Murry, R.K., D.K Grammer, P.A. Mayer and V.W. Rodwell. 1993. Biochemistry. (22nd Ed). Print ice Hall, U.K.

HND-513 Research Methods in Human Nutrition 3(3-0)

Name of the course	Research Methods in Human Nutrition
Course No.	HND-513
Credit Hours	3(3-0)
Theory	An introduction to the research process and its application to research in human nutrition. Students will complete a research project of their choice, encompassing the major components of research activity, including a review of the literature, hypotheses generation, data collection and analysis, and discussion. Emphasis will be placed on how to define and approach research problems in a way consistent with the practice of human nutrition professionals. Experience with the use of the SPSS-X computer program is provided.
Suggested Readings	Internet

HND-514 Advanced Community Nutrition 3(2-1)

Name of the course	Advanced Community Nutrition
Course No.	HND-514
Credit Hours	3(2-1)
Contents	Introduction; Community nutrition and nutritional epidemiology, health and nutritional status of Pakistani population. Nutritional and public health programs; Importance, types, key features, planning, implementation and evaluation of an epidemiologic program. Assessment of nutritional status; Anthropometry, Biochemical, Clinical and Dietary methods assessment. Nutrition through life cycle, nutritional

	requirements and recommendations during infancy, preschool and school age children, adolescence and adulthood. Nutritional requirements and recommendations of populations groups with special need; pregnant and lactating mothers, geriatrics, nutritional anemia's, goiter, lactose and gluten intolerance, protein energy malnutrition, obesity, diabetes, hypertension, coronary heart diseases and other degenerative disorders.
	Comparison of DRI's of different countries, Assessment of nutritional status of different age groups, calculating basal energy needs. Term paper of a nutritional survey
Suggested Readings	<ol style="list-style-type: none"> 1. Boyle MA, Holben DH. (2010) Community Nutrition in Action, An Entrepreneurial Approach.5th Edition. Thomson & Wadsworth 2. Shela Chander Vir. 2011. Public Health Nutrition in Developing Countries. Woodhead Publishing India 3. Sari Edelstein. 2010. Nutrition in Public Health. Jones and Bartlett Learning International, UK. 4. Gail C. Frank. 2008. Community Nutrition 2nd Ed. Jones and Bartlett Publishers, Canada. 5. Walter Willet. 1998. Nutritional Epidemiology. Oxford University Press. 6. Margetts, B.M. and M. Neslon. 1997. Design Concepts in Nutritional Epidemiology. Oxford University Press.

HND-515 Applied Dietetics 3(2-1)	
Name of the course	Applied Dietetics
Course No.	HND-515
Credit Hours	3(2-1)
Contents	Applied dietetics: Scope, profession; Pakistani diets and food composition database; Dietician: Classification, responsibility, diet counselling; Role of nutrients in diet; Carbohydrates, lipids, proteins, vitamins and minerals; Diet menu planning: Importance, principles, factors affecting and steps involved in planning diet; Balanced diet and nutrition: Balanced diet, diet during normal life cycle, relationship of nutrients to growth process, nutrition for different age groups, nutrition for aging and aged, complication in late adulthood; Microorganisms and their application in foods; Types of therapeutic diet and modification of normal diets during illness.
Practical	Preparation and evaluation of different dietetic foods; Use of nutrition databases; Sensory evaluation and consumer acceptability; Nutritional labelling of different food products; Visit to the hospitals; Diet charts for healthy and diseased persons; Diet charts for different life stages; Effects of processing on nutrients.

Suggested Readings	<ol style="list-style-type: none"> 1. Aruna, T. and A. Arlene. 2012. Multicultural Handbook of Food, Nutrition and Dietetics. John Wiley and Sons, New York, USA. 2. Josh. 2010. Nutrition and Dietetics, 3rd Ed. Tata McGraw-Hill Education, Gautam Budh Nagar, India. 3. Nielsen, S.S. 2010. Food Analysis Laboratory Manual, 2nd Ed. Springer, New York, USA. 4. Srilakshmi, B. 2012. Dietetics, 6th Ed. New Age International Pvt. Ltd., New Delhi, India. 5. Weaver, C.M. and J.R. Daniel. 2003. The Food Chemistry Laboratory: A Manual for Experimental Foods, Dietetics, and Food Scientists. CRC Press, Taylor and Francis Group, Boca Raton, FL, USA.
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HND-516	Nutritional Epidemiology	3(3-0)
Course Code.	HND-516	
Course Title	Nutritional Epidemiology	
Credit Hours	3(3-0)	
Theory	<p>History and definition of nutritional epidemiology; Importance and applications of nutritional epidemiology. Epidemiologic methods, brief overview; Focuses on research designs and methods to describe distribution and determinants of disease and health events in populations. Covers measures of disease frequency, descriptive epidemiology, overview of study designs, measures of excess risk, causal inference, screening, measurement error, misclassification, effect modification, and confounding. Considers how epidemiologic studies may be designed to maximize etiologic inference. Covers infectious disease epidemiologic studies, randomized controlled trials, cohort studies, case-control studies, cross-sectional studies, ecological and multilevel studies, and selected topics such as meta-analysis. Trends in maternal and infant mortality, environmental factors suspected of causing congenital malformations in human beings, small for gestational age infant problems of prematurity, nutritional factors to be considered in evaluation history, in- depth nutritional assessment, over and under feeding related to feeding cues, screening parameters and criteria for referral, World Health Assembly targets, WHO antenatal care recommendations for nutrition, Framework of interventions for maternal nutrition; Women’s dietary diversity and dietary patterns, Health care access and utilization; Gaps and bottlenecks for maternal nutrition programming, Opportunities for maternal nutrition programming, Development of the Maternal Nutrition Strategy, goal of the Pakistan Maternal Nutrition Strategy 2022–2027 (MNS). Nature of variation in diet; Reproducibility and validity of food-frequency questionnaires. Recall</p>	

	remote of diet. The surrogates sources of dietary information. Correction for the effects of measurement error; Issues in analysis and presentation of dietary data; Nutrition monitoring and surveillance; Emerging issues in nutritional epidemiology ; Future research directions
Books Recommended	<ol style="list-style-type: none"> 1. Epidemiology. An Introduction. by Kenneth Rothman, (Oxford University Press, 2002) 2. Epidemiology:” Beyond the Basics by Moyses Szklo and Javier Nieto (2nd edition, Jones and Bartlett Publications, 2007) 3. Nutritional health: Strategies for disease prevention, edited by Norman J. Temple, Ted Wilson, David R. Jacobs, (Humana Press, 2006) Principles of Nutritional Assessment, Second Edition by Rosalind S. Gibson (Oxford University Press, 2005) 4. Briefelss, R., Nutritional Monitoring in the United States, In Present Knowledge in Nutrition, 10th Edition (Erdman, JW, MacDonald, IA, Zeisel, SH, eds.) Washington: International Life Science Institute, 2012 5. Willett, W. C. (2012). Nutritional epidemiology (3rd ed.). Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199754038.001.0001 6. Hu, F. B. (2002). Dietary pattern analysis: a new direction in nutritional epidemiology. Current Opinion in Lipidology, 13(1), 3-9. https://doi.org/10.1097/00041433-200202000-00002

HND-517	Advances in Functional Foods and Nutraceuticals	3(3-0)
Course Code.	HND-519	
Course Title	Advances in Functional Foods and Nutraceuticals	
Credit Hours	3(3-0)	
Theory	Functional foods and nutraceuticals: past, present and future; functional foods and their impact on nutrition and health-obesity, diabetes, cardiovascular diseases, hypertension and cancer; functional ingredients and bioactive molecules; isoflavones, lycopene, polyphenols, dietary fiber, omega-3 fatty acids, conjugated linoleic acid, antioxidants, probiotic and probiotic; functional foods from different food groups; cereals, dairy, meat, fruits and vegetables; regulatory system governing the production and distribution of functional food-national and international; standard and regulations FDA, EC, FAO/WHO, health Canada; guidelines for the assessment of functional foods; marketing and regulatory issues; conventional and emerging food processing technologies for functional food production.	
Books Recommended	<ol style="list-style-type: none"> 1. Wildman, R.E.C. 2006. Handbook of nutraceuticals and functional foods, 2nd Ed. CRC Press, New York, U.S.A. 2. Shi, J., G. Mazza and M.L. Maguer. 2002. Functional foods: biochemical and processing aspects, Vol. 2. CRC Press, New York, U.S.A. 3. FAO (Food and Agriculture Organization of the United Nations). 2007. Report on functional foods. Food and Agriculture Organization 	

	of the United Nations, Rome, Italy. 4. Shi, J., C.T. Ho and F. Shahidi. 2005. Asian functional foods. Marcel Dekker/CRC Press, New York, U.S.A.
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HND-518	Special Problem	1(1-0)
Name of the course	Special Problem	
Course No.	HND-514	
Credit Hours	1(1-0)	
Contents	-	
Suggested Readings	-	

HND-519	Seminar	1(1-0)
Name of the course	Seminar	
Course No.	HND-515	
Credit Hours	1(1-0)	
Contents	-	
Suggested Readings	-	

HND-520	Thesis	6(0-6)
Name of the course	Thesis	
Course No.	HND-516	
Credit Hours	6(0-6)	
Contents	-	
Suggested Readings	-	