

## ANNEXURE-IV

### Scheme of Studies for B.Sc. (Hons.) Human Nutrition and Dietetics

Sr. No.	Course Code	Title of Course	Credit Hours
<b>1<sup>st</sup> Semester</b>			
1.	HND-101	Fundamentals of Human Nutrition	3(3-0)
2.	FST-101	Essentials of Food Science & Technology	3(2-1)
3.	Biochem 101	Principles of Biochemistry	3(2-1)
4.	GEC-121	Quantitative reasoning (Mathematics)	3(3-0)
5.	GEC-123	Overview of Natural sciences	3(3-0)
6.	GEC-125	Functional English	2(2-0)
7.	GEC-127	Islamic Studies /Ethics	2(2-0)
<b>Total Credit Hours</b>			<b>19</b>
<b>2<sup>nd</sup> Semester</b>			
1.	HND-203	Physiology and biochemistry of macronutrients	3(3-0)
2.	HND-102	Human Physiology-1	3(2-1)
3.	HND-104	Elementary anatomy and histology	3(2-1)
4.	HND-106	Fundamentals of microbiology	3(2-1)
5.	HND-108	Fundamentals of community nutrition	2(2-0)
6.	GEC-225	Civic/ Nutrition & Community engagement	3(3-0)
<b>Total Credit Hours</b>			<b>17</b>
	Quran-102	Nazir a Quran	1(1-0)
<b>3<sup>rd</sup> Semester</b>			
1.	HND-201	Human Physiology-II	3(2-1)
2.	HND-205	Assessment of Nutritional status	3(2-1)
3.	HND-208	Physiology & biochemistry of micronutrients	3(2-1)
4.	GEC-221	Biostatistics & Public Health	3(2-1)
5.	GEC-223	Information, Computer and technologies ICT	3(2-1)
6.	GEC-126	Arts & Humanities	2(2-0)
7.	GEC-124	Expository writing and Communication skills	2(2-0)
<b>Total Credit Hours</b>			<b>19</b>
<b>4<sup>th</sup> Semester</b>			
1.	HND-202	General and Systemic Pathology	3(2-1)
2.	HND-204	Nutrition through the life cycle	3(3-0)
3.	FST-301	Food Analysis and Sensory Evaluation	3(1-2)
4.	GEC-222	Entrepreneurship development	2(2-0)
5.	GEC-220	Social sciences for nutritional protection	3(3-0)
6.	GEC-122	Ideology & Constitution of Pakistan	2(2-0)

Quran- 102

**Total Credit Hours**  
Nazir a Quran

**16**  
1(1-0)

**5<sup>th</sup> Semester**

1.	HND-301	Nutritional Psychology	3(3-0)
2.	HND-303	Dietetics-I	3(2-1)
3.	HND-305	Nutritional Epidemiology & Intervention	3(2-1)
4.	HND-307	Meal planning and nutritional significance	3(2-1)
5.	HND-309	Functional and nutraceutical foods	3(3-0)
6.	HND -311	Nutrition Education & counselling skills	3(2-1)
<b>Total Credit Hours</b>			<b>18</b>

**6<sup>th</sup> Semester**

1.	FST-302	Food Safety, Toxicology & Public health	3(3-0)
2.	HND-302	Dietetics-II	3(2-1)
3.	HND-304	Infant and young child feeding	3(2-1)
4.	HND-306	Introductory Pharmacology & Pharmacognosy	3(2-1)
5.	HND-308	Drug-Nutrient Interactions	2(2-0)
6.	HND-310	Food & drug laws	2(2-0)
7.	HND-312	Personal & professional development	2(2-0)

**Total Credit Hours****18**

Quran-102

Nazir a Quran

1(1-0)

**7<sup>th</sup> Semester**

1.	HND-401	Public Health Nutrition	3(3-0)
2.	HND-403	Nutritional practices in clinical care	3(2-1)
3.	HND-405	Research methods and Professional writing	3(3-0)
4.	HND-407	Principles of Nutritional Immunology	3(3-0)
5.	HND-409	Sports Nutrition	3(2-1)
6.	HND-411	Experimental Cooking & Product development	3(1-2)

**Total Credit Hours****18**

Quran-102

Nazir a Quran

1(1-0)

**8<sup>th</sup> Semester**

1.	HND-402	Project Management	3(0-3)
2.	HND-404	Internship + Project report Writing	6(0-6)
3.	HND-406	Public Nutrition & International health policies	3(3-0)
4.	HND-408	Food issues & consumer behaviour	2(2-0)
5.	HND- 410	Food service management	3(2-1)

**Total Credit Hours****17**

<b>Total Credit Hours</b>	<b>=</b>	<b>143</b>
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1 <sup>st</sup> Semester			
Sr. No.	Course Code	Title of Course	Credit Hours
1.	HND-101	Fundamentals of Human Nutrition & Public Health	3(3-0)
2.	FST-103	Essentials of Food Science & Technology	3(2-1)
3.	Biochem-101	Principles of Biochemistry	3(2-1)
4.	GEC-121	Quantitative reasoning (Mathematics)	3(3-0)
5.	GEC-123	Overview of Natural sciences	3(3-0)
6.	GEC-125	Functional English	2(2-0)
7.	GEC-127	Islamic Studies /Ethics	2(2-0)
8.	GEC-129	Ideology & Constitution of Pakistan	2(2-0)
<b>Total Credit Hours</b>			<b>21</b>

HND-101		Fundamentals of Human Nutrition	3(3-0)
<b>Course Code</b>	<b>HND-101</b>		
<b>Course Title</b>	<b>Fundamentals of Human Nutrition</b>		
<b>Credit Hours</b>	<b>3(3-0)</b>		
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To present and discuss concepts and principles that are fundamental to the discipline of human nutrition</li> <li>• To know about the basic components (carbohydrates, proteins, fats, mineral and vitamins)</li> <li>• To discuss basic concepts of public health</li> <li>• To present concise overview of nutritional problems</li> </ul>		
<b>Theory</b>	<p>Introduction: food, nutrients, nutrition, malnutrition - global and local scenario, diet, balanced diet, food groups, foundations of healthy diet, meal planning. An overview of macromolecules i.e. carbohydrates, fats &amp; oil, and proteins focussing on types, role in body, recommended intake and energy value, contents in food. Special discussion on dietary fibre, bulk and alternative sweeteners, protein synthesis and degradation, Vitamins: classification, types, sources, role in body. Mineral elements: types, requirements, sources, role in body. Overview of digestion and alimentary tract, digestive juices, secretions. An overview of absorption and metabolism of nutrients: carbohydrates, protein, lipids. Foundational overview of the field of public health care and public health paradigms. Brief introduction to public health, measures of disease occurrence, burden of disease and summary measures of population health, prevention and screening, major determinants of health, population level health promotion. History of public health care and introduction to the basic public health sciences, prevention of chronic and infectious diseases and injuries, future directions for public health, international health, ethics, health promotion and disease prevention. Brief and concise overview about some importance topics like community health promotion, public health practice,</p>		

	maternal & child health
<b>Books Recommended</b>	<ol style="list-style-type: none"> <li>1. Geissler, C. and Powers, H. 2010. Human nutrition. Churchill Livingstone, London.</li> <li>2. Awan, J.A. 2007. Elements of food and nutrition. Unitech Communications, Faisalabad- Pakistan.</li> <li>3. Bamji, M.S., Rao, N.P. and Reddy, V. 2004. Textbook of human nutrition. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.</li> <li>4. Eastwood, M. 2003. Principles of human nutrition. John Wiley &amp; Sons, Inc. New York.</li> <li>5. Garrow, J.S., James, W.P.T. and Ralph, A. 2000. Human nutrition and dietetics. Churchill Livingstone, London.</li> </ol>

<b>FST-101</b>	<b>Essentials of Food Science &amp;Technology</b>	<b>3(2-1)</b>
<b>Course Code</b>	<b>FST-103</b>	
<b>Course Title</b>	<b>Essentials of Food Science &amp;Technology</b>	
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To understand the role of food science &amp; technology towards ensuring food security</li> <li>• To acquaint knowledge about the food constituents, food classification and spoilage agents</li> <li>• To comprehend the role of various food processing and preservation methods in shelf-life extension and availability of food around the year</li> </ul>	
<b>Credit Hours</b>	<b>3(2-1)</b>	
<b>Theory</b>	Introduction: food science and technology, food processing and preservation; Food safety and security; Food sources and global food situation; Food constituents and their functions: water, carbohydrates, lipids, proteins, vitamins and minerals; Food classification based on perishability and pH; Spoilage agents in food: enzymes, microorganisms, insects, rodents, birds and physical factors; Principles of food preservation; Preparatory operations in food processing; Food preservation techniques – high temperature: pasteurization, sterilization, canning; low temperature – refrigeration, freezing; removal of moisture – drying, dehydration; use of chemical additives; fermentation techniques – alcoholic, acetic, lactic; Irradiation technology; food packaging and labelling.	
<b>Practical</b>	Bottling/canning of selected fruits and vegetables; Cold storage of fruits and vegetables; Freezing of fruits and vegetables; Dehydration of fruits and vegetables; Blanching of fruits and vegetables; Use of chemicals in preservation of food products; Preparation of fermented food products – vinegar, preparation; Evaluation of bottled, frozen and dehydrated products.	
<b>Books Recommended</b>	1. Awan, J.A. and S.U. Rehman. 2011. Food Preservation Manual. Unitech Communications, Faisalabad, Pakistan.	

	<p>2. 3. Awan, J.A. 2011. Food Science and Technology. Unitech Communications, Faisalabad, Pakistan.</p> <p>4. Potter, N.N. and J.H. Hotchkiss. 1995. Food Science, 5th ed. The AVI Pub. Co. Inc., Westport, Connecticut, USA.</p>
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<b>Biochem-101</b>	<b>Principles of Biochemistry</b>	<b>3(2-1)</b>
<b>Course Code</b>	<b>Biochem-101</b>	
<b>Course Title</b>	<b>Principles of Biochemistry</b>	
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To demonstrate knowledge and understanding of the molecular and genetic machinery of living cells</li> <li>• To know an biochemistry of macro-molecules and enzymes</li> </ul>	
<b>Credit Hours</b>	<b>3(2-1)</b>	
<b>Theory</b>	<p>A general introduction to the science of biochemistry. Ionization of water, weak acid and weak bases, pH, buffers, diffusion, osmosis and osmotic pressure. Enzymes: Classification, nomenclature, characteristics, coenzymes, cofactors and prosthetic groups. Mechanism of enzyme action. Enzyme inhibition. Carbohydrates: Classification, characteristics, oxidation of carbohydrates, glycolysis, kreb's cycle, electron transport chain, glycogenesis, gluconeogenesis, biological functions of carbohydrates. Lipids: composition and classification, structures of saturated and unsaturated fatty acids and their properties, characteristics of fats and oils, general metabolism of fats and oils. Proteins: Composition and classification, classification and structures of amino acids, peptides and levels of structural organization of proteins, physiological function and general metabolism of proteins. Nucleic acids: Chemical composition, structures of DNA and RNA. Functions of DNA and different types of RNA in the cell.</p>	
<b>Practical</b>	<p>Determination of pH value of biological fluids. Preparation of buffers of definite pH. Estimation of optical activity by polarimetry. Qualitative analysis of carbohydrates. Qualitative analysis of urine for normal and abnormal constituents – albumin, acetone bodies and sugar. Estimation of glucose in biological fluids. Determination of acid, saponification and iodine values of fats/oils. Estimation of lactose and casein in milk.</p>	
<b>Books Recommended</b>	<ol style="list-style-type: none"> <li>1. Ahmad, M. 2006. Essentials of medical biochemistry, Vol. I. Merit Publishers Lahore, Pakistan.</li> <li>2. Boyer, R.F. 2000. Modern experimental biochemistry, 3<sup>rd</sup> ed (LPE). Pearson Education, New Delhi, India.</li> <li>3. Champe, P.C., R.A. Harvey and D.R. Ferrier. 2008. Biochemistry: Lippincott's illustrated reviews, 4<sup>th</sup> ed. Lippincott Williams and Wilkins, U.S.A.</li> <li>4. Plummer, D.T. 2009. An introduction to practical biochemistry, 3<sup>rd</sup></li> </ol>	

	ed. Tata McGraw-Hill Education (Pvt.) Ltd., New Delhi, India. 5. Sawhney, C.K. and R. Singh. 2009. Introductory practical biochemistry. Norosa Pub. House, New Delhi, India. 6. Velson, D.L. and M.M. Cox. 2008. Lehninger principles of biochemistry, 5 <sup>th</sup> ed. Worth Publishers, New York, U.S.A.
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<b>GEC-121</b>	<b>Quantitative Reasoning (Mathematics)</b>	<b>3(3-0)</b>
<b>Course Code</b>	<b>GEC-121</b>	
<b>Course Title</b>	<b>Quantitative Reasoning (Mathematics)</b>	
	<ul style="list-style-type: none"> <li>To prepare the students, not majoring in mathematics, with the essential tools like algebra, data analysis and basic probability to apply the concept and the techniques in their respective disciplines</li> </ul>	
<b>Credit Hours</b>	<b>3(3-0)</b>	
<b>Theory</b>	Practical approaches to importance of whole numbers, Preliminaries: Basic arithmetic, fractions, exponential modelling; exponent and roots, percent, decimals, Real-number system, complex numbers, Presentation of data; introduction to sets, set operations, algebraic expression, rules of exponent, functions, types of functions & applications, understanding relation of variables; graphs of function, linear equation in one variable and its applications, linear inequalities with absolute value, applications of linear inequalities, Quadratic equation in one variable and its applications, solution of quadratic equations, nature of roots of quadratic equations, concept of profit, loss and compound interest; profit, loss, discount, taxation, percentage increase, decrease, percentage of change. Sequences and series: Arithmetic, geometric and harmonic progressions, Data Analysis tools: Methods for presenting data, Bar Graph, Histograms, Circle Graphs, , pie charts, scatter graph, line graph, measure of central tendency, measures of dispersion, standard deviation, Probability: factorial, permutation & combination, population, sample space, mutually exclusive event, dependent & independent event. Geometry: Lines and angles, polygons, quadrilateral, triangles, circles, applications of Pythagoras theorem, Fundamentals of trigonometry, trigonometric identities.	
<b>Books Recommended</b>	<ol style="list-style-type: none"> <li>Pre-calculus Mathematics for Calculus, 6th edition by James Stewart, Lothar Redlin and Saleem Watson published by Brooks/Cole Cengage Learning USA</li> <li>Mathematical thinking and reasoning 2008 by Aufmann, Lockwood, Nation &amp; Clegg published by Houghton Mifflin company USA.</li> <li>Swokowski EW, Fundamentals of Algebra and Trigonometry (1st edition), 1971, PWS-Kent Company, Boston.</li> </ol>	

<b>GEC-123</b>	<b>Overview of Natural sciences</b>	<b>3(3-0)</b>
<b>Course Code</b>	<b>GEC-123</b>	

<b>Course Title</b>	<b>Overview of Natural sciences</b>
<b>Credit Hours</b>	<b>3(3-0)</b>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To acquaint the students with elementary laws of nature and their scientific application to civic problems of society</li> <li>• Allow students to develop an understanding how natural systems interact to produce a dynamic system and how we use these models to predict future changes in climate globally.</li> <li>• Allow students to understand role of emerging technologies including nanotechnology and biotechnology.</li> </ul>
<b>Theory</b>	<p><b>Introduction of Science:</b></p> <p>Theory of Science and its types, Interaction of different sciences, scientific role in technological revolution in societies, ethical constraints, and future applications.</p> <p><b>Natural sciences:</b></p> <p>Introduction of Natural Sciences, Sub-branches and Scopes, Biological Sciences; sub-classes and scope. Introduction to molecular biology and history.</p> <p><b>Biological sciences:</b></p> <p>Photosynthesis and cellular respiration; Energy metabolism: aerobic and anaerobic forms of metabolism; The physiology of breathing; circulation: the anatomical components of circulatory systems, the heart and blood vessels function to maintain adequate perfusion of tissues; osmoregulation &amp; excretion nutrition &amp; digestion; gas exchange; immune system, The structure and function of DNA, RNA, genes and genome., infectious disease and human survival, infectious diseases and its types, Nutraceuticals; Exobiology; Endocrinology (Types of glands, Hormones types, Stress response (Fight and flight response, The resistance reaction, Exhaustion, Stress and disease); Nutrition, feeding, and digestion; and gut health</p> <p><b>Ecosystem Sustainability:</b></p> <p>Climate change; Greenhouse effect; Challenges and risks of climate change; ocean and winds and their role in regulating global climate; Climate constraints ecosystem; Carbon footprints and Carbon Emission Scenario, Energy forms and available resources of energy; Renewable and non-renewable sources</p> <p><b>Emerging perspectives:</b></p> <p>Future of science: Nanotechnology and its application in medicine, disease and vaccination history, changing interactions and new diseases, food and nutraceutical; Biotechnology and its applications; Nutri-genomics and</p>



	nutriome; Food group and its composition, thermodynamics and its applications,
<b>Books Recommended</b>	<ol style="list-style-type: none"> <li>1. Campbell Biology. Reece, J.B., Urry, L.A., Cain, M.L. and Wasserman, S.A., 9<sup>th</sup> Edition, Pearson/ Benjamin Cummings Publishers, USA. 2010.</li> <li>2. Biology' Campbell, N. A. 8<sup>th</sup> Edition, The Benjamin / Cummings Publishing Company Inc. New York. USA, 2008.</li> <li>3. Cells, Lewis, B., Cassimeris, L., Lingappa, V. R., Plopper, G. Jones and Bartlett Publishers. Canada, 2007.</li> <li>4. Biology. Campbell, N. A. 8<sup>th</sup>Ed. The Benjamin / Cummings Publishing Company Inc. New York. USA, 2008.</li> <li>5. William Textbook of Endocrinology. Salvatore, D., Davies, T. F., Schlumberger, M. J., Hay, I. D., Larsen, P. R., Melmed, S., and Kronenberg, H. M. (2011). 12<sup>th</sup> Edition, Philadelphia: Elsveir Saunders.</li> <li>6. Richard Feynman's Comments on Science (<a href="http://www.feynman.com/science/whatis-science/">http://www.feynman.com/science/whatis-science/</a>)</li> <li>7. Hawking,S, Mlodinow, L (2008). A Briefer History of Time. Bantam Books, - Chapter</li> <li>8. Nature of a Scientific Theory 3. Chalmers, A., 2015. What Is This Thing Called Science? 4th ed. Indianapolis: Hackett Publishing Company, Inc., pp.24-47.</li> <li>9. Carey, S., 2011. A Beginner's Guide To Scientific Method. 4th ed. Boston: Clark Baxter, pp.1-7, 29-45. 7</li> <li>10. Chalmers, A., 2015. What Is This Thing Called Science?. 4th ed. Indianapolis: Hackett Publishing Company, Inc., pp.77-99</li> <li>11. Ernst Mayr (1997) This is Biology: The Science of the Living World. Harvard University Press, Cambridge, Massachusetts: C h 1-4, Ch 6</li> <li>12. Dev, Sukhendu (2015) Unsolved problems in Biology – The state of current thinking. Progress in Biophysics and Molecular Biology, 117: 232-23</li> <li>13. Evidence for Natural Selection from the book, Science and Creationism: A View from the National Academy of Sciences: Second Edition.</li> </ol>

<b>GEC-125</b>	<b>Functionnl English</b>	<b>2(2-0)</b>
<b>Course Code</b>	<b>FEC-125</b>	
<b>Course Title</b>	<b>Functional English</b>	
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• Enhance language skills and develop critical thinking</li> <li>• Improving the comprehension skills</li> <li>• Improving the speaking abilities and vocabulary selection</li> </ul>	
<b>Credit Hours</b>	<b>2(2-0)</b>	
<b>Theory</b>	Basics of Grammar, Parts of speech and use of articles, Sentence structure, active and passive voice, Practice in unified sentence, Analysis of phrase, clause and sentence structure, Transitive and intransitive verbs, Punctuation and spelling. Comprehension: Answers to questions on a given text (Practice assignments)	

	<p>Discussion: General topics and every-day conversation (topics for discussion to be at the discretion of the teacher keeping in view the level of students)</p> <p>Listening: To be improved by showing documentaries/films carefully selected by subject teachers,</p> <p>Translation skills: Urdu to English</p> <p>Paragraph writing: Topics to be chosen at the discretion of the teacher</p> <p><i>Note: Extensive reading is required for vocabulary building</i></p>
<b>Books Recommended</b>	<p>a) Grammar</p> <ol style="list-style-type: none"> <li>1. Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 1. Third edition. Oxford University Press. 1997. ISBN 0194313492</li> <li>2. Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 2. Third edition. Oxford University Press. 1997. ISBN 0194313506</li> </ol> <p>b) Writing</p> <ol style="list-style-type: none"> <li>3. Writing. Intermediate by Marie-Christine Boutin, Suzanne Brinand and Francoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 0 19 435405 7 Pages 20-27 and 35-41.</li> </ol> <p>c) Reading/Comprehension</p> <ol style="list-style-type: none"> <li>4. Reading. Upper Intermediate. Brain Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1992. ISBN 0 19 453402 2.</li> </ol> <p>d) Speaking</p>

<b>GEC-127</b>	<b>Islamic Studies / Ethics</b>	<b>2(2-0)</b>
<b>Course Code</b>	<b>GEC-127</b>	
<b>Course Title</b>	<b>Islamic Studies/ Ethics</b>	
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To provide Basic information about Islamic Studies</li> <li>• To enhance understanding of the students regarding Islamic Civilization</li> <li>• To improve Students skill to perform prayers and other worships</li> <li>• To enhance the skill of the students for understanding of issues related to faith and religious life.</li> </ul>	
<b>Credit Hours</b>	<b>2 (2-0)</b>	
<b>Theory</b>	<p>Introduction to Quranic Studies</p> <ol style="list-style-type: none"> <li>1) Basic Concepts of Quran</li> <li>2) History of Quran</li> <li>3) Uloom-ul -Quran</li> </ol> <p>Study of Selected Text of Holly Quran</p>	

	<p>1). Surah Al-Baqra Related to Faith (Verse No-284-286)</p> <p>2). Surah Al-Hujrat Related to Adab Al-Nabi (Verse No-1-18)</p> <p>3). Surah Al-Mumanoon Related to Characteristics of faithful (Verse No-1-11)</p> <p>4). Surah al-Furqan Related to Social Ethics (Verse No.63-77)</p> <p>5). Surah Al-Inam Related to Ihkam (Verse No-152-154)</p> <p>Study of Selected Text of Holly Quran</p> <p>1). Surah Al-Ihzab Related to Adab al-Nabi (Verse No.6, 21, 40, 56, 57, 58.)</p> <p>2). Surah Al-Hashar (18,19,20) Related to thinking, Day of Judgment</p> <p>3). Surah Al-Saf Related to Tafakar,Tadabar (Verse No-1,14)</p> <p>Seerat of Holy Prophet (S.A.W) I</p> <p>1). Life of Muhammad Bin Abdullah ( Before Prophet Hood)</p> <p>2). Life of Holy Prophet (S.A.W) in Makkah</p> <p>3). Important Lessons Derived from the life of Holy Prophet in Makkah</p> <p>Seerat of Holy Prophet (S.A.W) II</p> <p>1). Life of Holy Prophet (S.A.W) in Madina</p> <p>2). Important Events of Life Holy Prophet in Madina</p> <p>3). Important Lessons Derived from the life of Holy Prophet in Madina</p> <p>Introduction to Sunnah</p> <p>1) Basic Concepts of Hadith</p> <p>2) History of Hadith</p> <p>3) Kinds of Hadith</p> <p>4) Uloom -ul-Hadith</p> <p>5) Sunnah &amp; Hadith</p> <p>6) Legal Position of Sunnah</p> <p>Islamic Economic System</p> <p>1) Basic Concepts of Islamic Economic System</p> <p>2) Means of Distribution of wealth in Islamic Economics</p> <p>3) Islamic Concept of Riba</p> <p>4) Islamic Ways of Trade &amp; Commerce</p> <p>Social System of Islam</p> <p>1) Basic Concepts of Social System of Islam</p> <p>2) Elements of Family</p> <p>3) Ethical Values of Islam</p>
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	<p>Islam &amp; Science</p> <ol style="list-style-type: none"> <li>1) Basic Concepts of Islam &amp; Science</li> <li>2) Contributions of Muslims in the Development of Science</li> <li>3) Quran &amp; Science</li> </ol>
<b>Books Recommended</b>	<p>Reference Books:</p> <ol style="list-style-type: none"> <li>1. Hameed ullah Muhammad, "Emergence of Islam" , IRI, Islamabad</li> <li>2) Hameed ullah Muhammad, "Muslim Conduct of State"</li> <li>3) Hameed ullah Muhammad, 'Introduction to Islam</li> <li>4) Dr. Muhammad Zia-ul-Haq, "Introduction to Al Sharia Al Islamia" Allama Iqbal Open University, Islamabad (2001)</li> </ol>

**2<sup>nd</sup> Semester**

Sr. No.	Course Code	Title of Course	Credit Hours
1.	HND-102	Human Physiology-1	3(2-1)
2.	HND-104	Elementary anatomy and histology	3(2-1)
3.	HND-106	Principles of medical microbiology	3(2-1)
4.	HND-108	Fundamentals of community Nutrition	2(2-0)
5.	GEC-222	Ideology & Constitution of Pakistan	2(2-0)
6.	GEC-224	Expository writing and Communication skills	2(2-0)
7.	GEC-226	Arts & Humanities	2(2-0)

**Total Credit Hours**

**17**

**HND-102                      Human Physiology-I                      3(2-1)**

<b>Course Code</b>	<b>HND-102</b>
<b>Course Title</b>	<b>Human Physiology-I</b>
<b>Credit Hours</b>	<b>3(2-1)</b>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To familiarize about the functions of different body organs</li> <li>• To understand risk parameters related to assessment and prognosis of different diseases</li> <li>• To discuss and familiarize with physiology of gastrointestinal tract and cardiovascular system</li> <li>• To acquaint knowledge about respiratory system and urinary system</li> </ul>
<b>Theory</b>	Introduction to human physiology, levels of organization in the body, homeostasis, homeostatic control systems. Cell physiology: an overview. Digestive system: oral cavity, salivary glands, teeth, tongue; oesophagus, pharynx, larynx, stomach, small intestine, large intestine, accessory glands associated with GIT (liver, gallbladder and pancreas); Urinary system: introduction, functions of kidney and nephron, Glomerular filtration, tubular reabsorption, tubular secretion, urine excretion and plasma clearance, fluid and acid base balance; Cardiovascular system: functions of heart and blood vessels, electrical activity of heart, mechanical events of heart, cardiac output and its control.
<b>Practical</b>	Blood grouping; Hb estimation; Counting of blood cells; complete blood count (CBC); Electrolyte estimation; Hydration test; Determination of coagulation time, blood pressure, pulse recording; Heart activity - electrocardiography; Test for saliva; Respiratory movement, maximum breathing capacity, pulmonary function test; Intestinal motility; Renal function tests and urine analysis.
<b>Books Recommended</b>	1. Gillian, P. and C.D. Richards. 2006. Human physiology: the basis of medicine, 3 <sup>rd</sup> ed. Oxford University Press, London. 2. Guyton A.C. and J.E. Hall. 2006. Textbook of medical

	<p>physiology, 11<sup>th</sup> ed. J.F. Kennedy Blvd., Philadelphia, U.S.A.</p> <p>3. Rahman, Z.U., B. Aslam, J.A. Khan and T. Khaliq. 2007. Manual of physiology-I, 2<sup>nd</sup> ed. MAS Computers, Faisalabad, Pakistan.</p> <p>4. Rahman, Z.U., B. Aslam, Khan, J.A. and T. Khaliq. 2007. Manual of physiology-II, 2<sup>nd</sup> ed. MAS Computers, Faisalabad, Pakistan.</p> <p>5. Tortora, G.J. 2008. Principles of anatomy and physiology, 12<sup>th</sup> ed. John Wiley &amp; Sons, Inc., New York, U.S.A.</p>
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<b>HND-104</b>		<b>Elementary anatomy and histology</b>	<b>3(2-1)</b>
<b>Course Code</b>	<b>HND-104</b>		
<b>Course Title</b>	<b>Elementary anatomy and histology</b>		
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To acquaint knowledge about structural components of body</li> <li>• To know about histology and blood composition for the identification of diseases</li> </ul>		
<b>Credit Hours</b>	<b>3(2-1)</b>		
<b>Theory</b>	<p>Introduction to anatomical and histological terminologies, definitions Introduction: grass anatomy, histology; Terminology: bones &amp; joints, muscles, cartilage, body structure, tissue, cell, organs; Digestive system: oral cavity, stomach, small &amp; large intestine; Urinary system/ excretory: kidneys, ureter, bladder, urethra; Cardiovascular system: heart and Pericardium, Arteries system, venous system/ Major arteries &amp; veins; Respiratory system: Upper respiratory- Pharynx, Larynx, Trachea sinuses; Lower respiratory- Bronchus, Lungs, Diaphragm; Reproduction system: Male-Testis, Spermatic cord, Penis, Prostate, Bulbourethral gland/ other glands; Female: Ovaries, Fallopian tubes, Uterus, Vagina, Vulva, Breast; Endocrinology: Pituitary, Thyroid, Parathyroid, Thymus, Adrenal, Renal, super renal; Lymphatic system: Lymph, Lymph vessel, lymph node; Nervous system: Brain, Spinal cord, Cranel nerves, Brachial plexus, Sciatic nerve; Sensory organs: Eyes, Ears, Taste buds, Smell, Touch.</p>		
<b>Practical</b>	<p>Anatomy of different systems like gastrointestinal tract especially small and large intestine, circulatory system, central nervous system, skeletal system, etc. through graphical, model representation and dissection of rats and rabbits; Four primary tissues of body - Epithelium tissues: Introduction, types, epithelial glands - endocrine &amp; exocrine, connective tissues: loose connective tissue, collagenous, elastic and reticular fiber; Te-cell of loose cartilage (fibroblast, fat cell, plasma cell, macrophages, mast cell); Blood: leukocytes, WBC, RBC &amp; Platelets; Cartilage and its types; Muscle and its types; Histology in: GIT, respiratory, urinary systems, breast, uterus. Microscopy and preparation of histological slides. Microscopic analysis of different cells and tissues like saliva, skin, blood, liver cells, etc.</p>		

<b>Books Recommended</b>	<ol style="list-style-type: none"> <li>1. Agur, M.R. and F.D. Arthur. 2009. Grant's Atlas of Anatomy. Lippincott Williams and Wilkins, New York, U.S.A.</li> <li>2. David, C. 2007. Anatomy of Hatha Yoga: A Manual for Students, Teachers and Practitioners. National Banarisdass Publishers (Pvt.) Ltd., New Delhi, India.</li> <li>3. Gerard, J. T. and T.N. Mark. 2009. Principles of Human Anatomy. John Wiley and Sons, Inc., New York, USA.</li> <li>4. Marsh, P. 1920. The Fundamentals of Human Anatomy. C.V. Mosby Publisher, St. Louis MO, USA.</li> </ol>
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<b>HND-106</b>	<b>Principles of medical microbiology</b>	<b>3(2-1)</b>
<b>Course Code</b>	<b>HND-106</b>	
<b>Course Title</b>	<b>Principles of Medical microbiology</b>	
<b>Credit Hours</b>	<b>3(2-1)</b>	
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To discuss the microorganism and taxonomy features</li> <li>• To discuss the basic microbial techniques and role of microbes in human diseases</li> <li>• To provide hands on training on laboratory techniques in the domain of microbiology</li> <li>• To highlight the host microbe interaction and controlling the microorganisms using various techniques</li> </ul>	
<b>Theory</b>	<p>Introduction to microbiology, scope, definition, branches and applied areas of microbiology; Historical development of microbiology; identification techniques in Medical Microbiology; Host-parasite interactions; Study of aetiology, epidemiology, pathogenesis, immunology; Basic concepts of epidemiology; Microbial virulence, factors responsible; Determinants of pathogenicity and molecular mechanisms of pathogenesis; Diversity of microbes; Differentiation between Prokaryotes and eukaryotes; An outline of the principles and applications bright field, dark field, phase contrast, fluorescent and electron microscope; Morphology, arrangement and detailed anatomy of bacterial cell; Ultra-structure of bacteria; Microbial growth and requirements, physicochemical requirements, pH, temperature, oxidation reduction potential, gaseous and nutritional requirements; Microbial multiplication and growth curves; General methods of studying microorganisms, cultivation, isolation, purification and characterization; Microbial culture systems, microbial preservation; Control of microorganisms by physical and chemical methods; Chemotherapeutic agents and antibiotics, modes of action of antibiotics on microorganisms, antibiotic resistance; A brief introduction to structure and propagation of fungi, protozoa, algae viruses and bacteriophages. Microbiology of food. Diseases communicable through food. A brief introduction to structure and</p>	

	propagation of fungi, protozoa, algae viruses and bacteriophages.
<b>Practical</b>	Introduction and Precautionary measures in Microbiology laboratory. Function and handling of laboratory equipment. Smear preparation and simple staining technique. Gram staining method, Capsule stain, Spore stain, Sterilization of glass wares by using hot air oven. Preparation and sterilization of culture media. Bacterial cultivation methods. Macroscopic examination of bacteria; Microscopic examination of bacteria; morphological characteristics. Safety in the microbiological laboratory; Containment and decontamination; Demonstration of laboratory equipment's, their basic functions and handling; Practical demonstration of Microscopy; Sterilization and disinfection; Physical agents including moist heat, dry heat, ionizing radiation, filtration, etc.; Chemical agents, antiseptics and disinfectants, evaluation of antimicrobial activity (phenol coefficient); Preparation and sterilization of bacteriological media; preparation and demonstration of various culture media; (basic, enriched, selective, differential, transport and storage media); Stains and staining, principles of staining procedures, simple (Loeffler's methylene blue) staining, differential (Gram's and acid fast), special (capsule, spores, etc.); Methods of bacterial cultivation and growth, Bacterial colonies
<b>Books Recommended</b>	<ol style="list-style-type: none"> <li>1. Tortora G. J., B.R. Funke and C.L. Case. Microbiology- An Introduction. 2004. 8<sup>th</sup> Ed. Pearson Edu. Inc., California, U.S.A</li> <li>2. Alcamo I. E. Fundamentals of Microbiology. 2001. Jones and Bartlett Pub., USA.</li> <li>3. Cappuccino J. G. and N. Sherman Microbiology: a laboratory manual. 2004. Pearson Education, USA.</li> <li>4. Talaro K. P. and A. Talaro. Foundation in Microbiology. 2002. McGraw Hill. N.York. Tortora, G.J., B.R. Funke and C.L. Case. 2004.</li> </ol>

<b>HND-108</b>	<b>Fundamentals of community nutrition</b>	<b>2(2-0)</b>
<b>Course Code</b>	<b>HND-108</b>	
<b>Course Title</b>	<b>Fundamentals of community nutrition</b>	
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To discuss the concepts of community and community development</li> <li>• To adequate lifestyles related to food consumption patterns.</li> <li>• To improve the quality of life and contribute to health promotion of the population in the community.</li> </ul>	
<b>Credit Hours</b>	<b>2(2-0)</b>	
<b>Theory</b>	Overview and key concepts of community, community development, importance & foundation of community nutrtnion, understanding role of epidemiological approaches to understand	



	<p>nutrition related health issues, Community nutritional problems, Methods of assessing nutritional status at individual &amp; community levels, Types and causes of malnutrition, assessment of food availability in community, necessary actions to improve food security, Nutrition situation analysis, Overview of national and international community nutrition programs, overview and comparative analysis of NNS report, Pakistan (2018 &amp; 2023), Analysis of program effectiveness and counteracting challenges, Planning intervention strategy (organization, resource mobilization training), Types of intervention programmes ( supplementation, fortification, school feeding programs, therapeutic feeding, kitchen gardens, Dietary assessment &amp; methodology; Study of factors influencing food habits, Nutritional status of Pakistani people, Community nutrition programs: key features, benefits, planning, implementation, evaluation, Case studies of successful community nutrition interventions, Relationship between food insecurity and poor nutritional status, designing and implementing community nutrition education programs, evaluating impact of nutrition promotion initiatives in different populations, culturally sensitive nutrition interventions and fortification programs, understanding community needs and formulation of policies at community &amp; national levels, Integrating technology &amp; innovation in addressing nutritional needs of different age groups i.e. children, elderly and pregnant &amp; lactating females, relationship of Community nutrition and dietetics profession.</p>
<p><b>Books Recommended</b></p>	<ol style="list-style-type: none"> <li>1. Singh J. 2008. Handbook of nutrition and dietetics. Lotus Press, Darya Ganj, New Delhi.</li> <li>2. Boyle, M.A. 2008. Community nutrition in action: an entrepreneurial approach. Thomson Learning Wadsworth, New York.</li> <li>3. Mann, J. and Truswell, A.T. 2007. Essentials of human nutrition, 3<sup>rd</sup> ed. Oxford University Press, Oxford.</li> <li>4. Whitney, E. and Rolfes, S.R. 2005. Understanding nutrition. Thomson Learning Inc., Belmont, U.S.A.</li> <li>5. Sardesai, V.M. 2003. Introduction to clinical nutrition. Marcel Dekker, New York.</li> <li>6. Thomas, B. 2001. Manual of dietetic practice. Blackwell Pub. Co., Oxford.</li> </ol>

<b>GEC-122</b>	<b>Ideology &amp; Constitution of Pakistan</b>	<b>2(2-0)</b>
<b>Course Code</b>	<b>GEC-122</b>	
<b>Course Title</b>	<b>Ideology &amp; Constitution of Pakistan</b>	
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• Develop vision of historical perspective, government,</li> </ul>	

	<p>politics, contemporary Pakistan, ideological background of Pakistan.</p> <ul style="list-style-type: none"> <li>• Study the process of governance, national development, issues arising in the modern age and posing challenges to Pakistan.</li> </ul>
<b>Credit Hours</b>	<b>2 (2-0)</b>
<b>Theory</b>	<p><b>1. Historical Perspective</b></p> <p>a. Ideological rationale with special reference to Sir Syed Ahmed Khan, Allama Muhammad Iqbal and Quaid-e-Azam Muhammad Ali Jinnah.</p> <p>b. Factors leading to Muslim separatism</p> <p>c. People and Land</p> <p>i. Indus Civilization</p> <p>ii. Muslim advent</p> <p>iii. Location and geo-physical features.</p> <p><b>1. Government and Politics in Pakistan</b> Political and constitutional phases e.g. a. 1947-58, b. 1958-71, c. 1971-77, d. 1977-88, e. 1988-99, f. 1999 onward</p> <p><b>3. Contemporary Pakistan</b></p> <p>a. Economic institutions and issues</p> <p>b. Society and social structure</p> <p>c. Ethnicity</p> <p>d. Foreign policy of Pakistan and challenges</p> <p>e. Futuristic outlook of Pakistan</p> <p><b>4. Food and Nutritional security</b></p>
<b>Books Recommended</b>	<p>1. Burki, Shahid Javed. State &amp; Society in Pakistan, The MacMillan Press Ltd 1980.</p> <p>2. Akbar, S. Zaidi. Issue in Pakistan's Economy. Karachi: Oxford University Press, 2000.</p> <p>3. S.M. Burke and Lawrence Ziring. Pakistan's Foreign policy: An Historical analysis. Karachi: Oxford University Press, 1993.</p> <p>4. Mehmood, Safdar. Pakistan Political Roots &amp; Development. Lahore, 1994.</p> <p>5. Sayeed, Khalid Bin. The Political System of Pakistan. Boston: Houghton Mifflin, 1967.</p> <p>6. Aziz, K.K. Party, Politics in Pakistan, Islamabad: National Commission on Historical and Cultural Research, 1976.</p> <p>7. Haq, Noor ul. Making of Pakistan: The Military Perspective. Islamabad: National Commission on Historical and Cultural Research, 1993.</p>

<b>GEC-124</b>	<b>Expository Writing&amp; communication Skills</b>	<b>2(2-0)</b>
<b>Course Code</b>	<b>GEC-124</b>	
<b>Course Title</b>	<b>Expository Writing&amp; communication Skills</b>	
<b>Credit Hours</b>	<b>2(2-0)</b>	
<b>Objectives</b>	<ul style="list-style-type: none"> <li>•</li> </ul>	
<b>Theory</b>	<p>Introduction to structure and significance of oral presentations, art of public speaking, oral content selection, critical reading skills, vocabulary building and translation writing, technical writing, translating cultural heritage through folktales, rehearsals of storytelling, Effective Communication process, Practice in writing coherent paragraph, essay writing, study skills, Skimming and scanning, intensive and extensive, and speed reading, summary and précis writing and comprehension. Academic skills, Letter/memo writing, minutes of meetings, use of library and internet. Presentation skills, Personality development (emphasis on content, style and pronunciation). Note: documentaries to be shown for discussion and review. Students will be assigned independent topics for practicing .How to plan your presentation. Preparing your presentation. How to deliver your presentation. How Engaging your audience. Question / Answer Technique. Use of visual aids. Use of non-verbal communication skills,</p>	
<b>Books Recommended</b>	<p>Adler, R.B. and G. Rodman. 2003. Understanding human communications, 3rd ed. Oxford Uni. Press, New York, U.S.A.</p> <p>2. Calvert, P. (Ed.). 1990. The communication's hand book: Techniques and technology. Maupin House, USA.</p> <p>3. Devito, J.A. 1997. Human communication: The basic course. Addison Wesley Longman, Inc., New York, U.S.A.</p> <p>4. Kossen, S. 1994. The human side of organization. Harper Collins College Pub., New York, U.S.A.</p> <p>5. McKerrow, R.E. and B.E. Gronbeck. 2000. Principles and types of speech communication. Longman Pub., New York, U.S.A.</p> <p>6. Roy, E. and S. Roy. 1993. Guide to basic writing. Prentice Hall, Englewood Cliffs, New York, U.S.A.</p>	

<b>GEC- 126</b>	<b>Arts and humanities</b>	<b>2(2-0)</b>
<b>Course Code</b>	<b>GEC-126</b>	
<b>Course Title</b>	<b>Arts and Humanities</b>	
<b>Credit Hours</b>	<b>2(2-0)</b>	
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• Introduce students to key theme in domain of philosophy, history and creative arts</li> </ul>	

	<ul style="list-style-type: none"> <li>To explore how we understand human experience and enable engagement with different culture and civilizations</li> </ul>
<b>Theory</b>	<p>Fables: Bang e Dara</p> <p><b>Wisdom and literature:</b> discussion and discursive philosophy, purpose of life, development of knowledge, role of experience, characteristics of literature (universality, artistry, intellectual value, suggestiveness, spiritual value, permanence and style), explore human thought, nature of reason, consciousness, cognition, philosophical theme of self -knowledge and self-sacrifice by comparing classical philosophical texts e.g. by Plato, study of cultures with perspective of four different themes i.e. place, power, literary classics and journeys, Philosophies of arts (realism, expressiveness, formalism, institutional theory, post modernism, Issues in literature (appearance, reality, personal identity, truth, freedom, evil, justice).</p> <p><b>Space Place &amp; experiences:</b> Functions and role of society, Historical monuments and socio-cultural, religious and political situations of the area where it stands, traditional decorative techniques including geometric patterns and naturalistic design in different civilizations,</p>
<b>Books Recommended</b>	<ol style="list-style-type: none"> <li>Kanhaiyā Lāl, <i>Tārīkh-i lāhaur</i> (Lāhaur: Būk ṭāk, 2006 [1884]), 127-128.</li> <li>Syed Muhammad Latif, <i>Lahore: Its Historical, Architectural Remains and Antiquities, with an Account of its Modern Institutions, Inhabitants, their Trade, Customs &amp;c.</i> (Lahore: New Imperial Press, 1892), 131-132.</li> <li>M. Baqir, <i>Lahore: Past and Present</i> (Delhi: Low price Publications, 1993 [1952]), 358- 359.</li> <li>Muḥammad ‘Abdullah Quraishī, “<i>Masājīd: ‘ahd-i ghaznavī se zamāna-yi ḥāl tak,</i>” in Muḥammad Ṭufail ed., <i>Nuqūsh lāhaur nambar: ahd-i ghaznavi se daur-i ḥāzir tak kī tārīkh, 1014 se 1961 tak</i>, Vol. 92 (Special issue 1962), 545-546. Lucy Peck, <i>Lahore: The Architectural Heritage</i> (Lahore: Ferozsons, 2015), 80-81.</li> </ol>

**3<sup>rd</sup> Semester**

Sr. No.	Course Code	Title of Course	Credit Hours
1.	HND-201	Human Physiology-II	3(2-1)
2.	HND-203	Physiology and biochemistry of macronutrients	3(3-0)
3.	HND-205	Assessment of Nutritional status	3(2-1)
4.	GEC -221	Bio-Statistics & Public health	3(3-0)
5.	GEC-223	Information, Computer and technologies ICT	3(2-1)
6.	GEC-225	Nutriton & community engagement	2(2-0)

**Total Credit Hours**

**18**

**HND-201                      Human physiology-II                      3(2-1)**

<b>Course Code</b>	<b>HND-201</b>
<b>Course Title</b>	<b>Human physiology-II</b>
<b>Credit Hours</b>	<b>3(2-1)</b>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To understand the functions of respiratory, endocrine, nervous, immune and reproductive systems</li> <li>• To acquaint knowledge about hormonal and neural interactions on metabolism</li> </ul>
<b>Theory</b>	Respiratory system: respiratory mechanics, gas transport and exchange mechanisms, control of respiration, respiratory capacities and volumes, non-respiratory functions of lungs; Immune system and lymphatic system: body defence system and regulation; Endocrinology and reproduction: reproductive physiology, role of hormones in spermatogenesis, menstrual cycles and pregnancy, energy balance and temperature regulation; Nervous system: principles of neuronal and hormonal communication systems, functional organization of nervous system, central, peripheral and autonomic nervous system, action potentials, types of neurotransmitters and their role in pathophysiological integration in body; Musculoskeletal system: principles of neuromuscular physiology.
<b>Practical</b>	Demonstration of the location of endocrine glands in laboratory animal; Adrenalectomy and the effect of adrenaline on metabolism in rats; Effect of adrenaline on metabolism; Nerve muscle preparation, effect of temperature on single muscle twitch, muscle and nerve irritability, neuromuscular fatigue, normal heart activity; Hormonal assay: digestive, growth & reproductive.
<b>Books Recommended</b>	1. Brar, R.S., H.S. Sandhu and Singh, A. 2002. Veterinary clinical diagnosis by laboratory methods. Kalyani Publishers Ludhiana, New Delhi, India.

	<ol style="list-style-type: none"> <li>2. Gillian, P. and C.D. Richards. 2006. Human physiology: the basis of medicine, 3<sup>rd</sup> ed. Oxford University Press, London.</li> <li>3. Guyton A.C. and J.E. Hall. 2006. Textbook of medical physiology, 11<sup>th</sup> ed. J.F. Kennedy Blvd., Philadelphia, USA.</li> <li>4. Rahman, Z.U., B. Aslam, J.A. Khan and T. Khaliq. 2007. Manual of physiology-I, 2<sup>nd</sup> ed. MAS Computers, Faisalabad, Pakistan.</li> <li>5. Tortora, G.J. 2008. Principles of anatomy and physiology, 12<sup>th</sup> ed. John Wiley &amp; Sons, Inc., New York, USA.</li> </ol>
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<b>HND-203</b>	<b>Physiology and biochemistry of macronutrients</b>	<b>3(3-0)</b>
<b>Course Code</b>	<b>HND-203</b>	
<b>Course Title</b>	<b>Physiology and biochemistry of macronutrients</b>	
<b>Credit Hours</b>	<b>3(3-0)</b>	
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To discuss the classification, structures, digestion, absorption and metabolisms of carbohydrates</li> <li>• To discuss the classification, structures, digestion, absorption and metabolisms of proteins</li> <li>• To discuss the classification, structures, digestion, absorption and metabolisms of lipids</li> <li>• To discuss the dietary requirements and deficiency disorders associated with macro-nutrients</li> </ul>	
<b>Theory</b>	<p>Introduction to biochemistry of proteins, structural features, characteristics, functions; Amino acids (biosynthesis and degradation); Food sources (on the basis of their functions in human body); Digestion and absorption; Metabolic fates of amino acids (deamination, transamination); Urea cycle; Ketogenic amino acids; Glucogenic amino acids; Protein metabolism in liver &amp; kidney diseases; Protein energy malnutrition; Nature of CHO; Structure of carbohydrates; Classification and functions of carbohydrates - Monosaccharaides, Disaccharides, Oligosaccharides, Polysaccharaides; Digestion and absorption of carbohydrates; Glycolitic pathway; Glycolysis, Glycogenesis, Glycogen catabolism; Tricarboxylic acid cycle and pentose phosphate pathway; Biosynthesis of carbohydrates; Gluconeogenesis; Regulation of carbohydrate metabolism pathways; CHO- metabolism in diabetes; Nature and classification of lipids - Fatty acids (saturated, unsaturated, polysaturated), glycerol, cholesterol, sterol; lipoprotein systems (blood lipids); Fats biosynthesis (lipids, phospholipids and sphingolipids); Lipid biosynthesis (behaviour l, sterol); Lipid oxidation; Essential fatty acids (sources &amp; health benefits); Adipose tissues; Digestion, absorption, metabolism and transportation of lipids; Oxidation of fatty acids (beta oxidation); Ketone bodies; Nutritional disorders of lipids</p>	

<b>Books Recommended</b>	<p>1. David L. N., Lehninger A. L. and Michael M. C. 2008. Lehninger Principles of Biochemistry. W. H. Freeman &amp; Company</p> <p>2. Wardlaw G. M. and Kessel M. W. 2002. Perspectives in Nutrition, McGraw-Hill.</p> <p>3. Davidson, S., R. Passmore, R and M.A. Eastwood. 1986. Human nutrition and dietetics. Churchill Livingstone, New York, U.S.A.</p> <p>4. Sarwar, M. and Zia-ul-Hasan. 2000. Nutrients metabolism in ruminants. University of Agriculture Press, Faisalabad, Pakistan</p>
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<b>HND-205</b>	<b>Assessment of Nutritional Status</b>	<b>3(2-1)</b>
<b>Course Code</b>	<b>HND-205</b>	
<b>Course Title</b>	<b>Assessment of Nutritional Status</b>	
<b>Credit Hours</b>	<b>3(2-1)</b>	
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To impart hands-on training in nutritional assessment techniques to diagnose health problems</li> <li>• To understand and apply dietary guidelines for standard nutrient intake</li> <li>• To select an appropriate method for measuring dietary needs of hospitalized patients.</li> </ul>	
<b>Theory</b>	<p>Principles &amp; objectives of nutritional assessment, Types of Nutritional assessment systems, Nutritional assessment methods: anthropometrics, biochemical, clinical, dietary. Bioelectrical impedance Analysis (BIA) in nutritional analysis, Challenges and limitations in dietary assessment, methods of determining diet history through food frequency questionnaire, determining the mean nutrient intake, calculating the population at risk, ranking individuals by food and nutrient intake, Nutrition assessment in hospitalized patients, Nutrition assessment in special populations i.e. geriatrics, pediatrics, pregnancy, athletes, Nutritional assessment in chronic diseases (Obesity, Diabetes, cardiovascular disease, cancer, burn patients), Nutrition Assessment and community health, Role of advanced technology in assessment tools, Interpreting nutritional assessment data, ethics in nutritional assessment, nutrition surveys, nutrition surveillance, nutrition screening.</p>	
<b>Practical</b>	<p>Practicing methods of nutritional assessment (ABCD of Nutritional assessment); Comparison of the data with references values for drawing conclusions. Report reading, etc.</p>	
<b>Books Recommended</b>	<p>1. Driskell, J.A. and Wolinsky, I. 2011. Nutritional Assessment of Athletes, 2<sup>nd</sup> ed. CRC Press, Taylor &amp; Francis Group, New York, USA.</p> <p>2. Gibson, R.S 2005. Principles of Nutrition Assessment. Oxford University Press Inc., New York, USA.</p>	

	<p>3. Lee, R.D. and Nieman, D.C. 2012. Nutritional Assessment, 6<sup>th</sup> ed. The McGraw-Hill Companies Inc., New York, USA.</p> <p>4. McGuire, M. and Beerman, K.A. 2011. Nutritional Sciences: From Fundamentals to Food. Cengage Learning, Belmont, CA, USA.</p>
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<b>GEC-221</b>	<b>Bio-Statistics &amp; Public Health</b>	<b>3(2-1)</b>
<b>Course Code</b>	<b>GEC-221</b>	
<b>Course Title</b>	<b>Bio-Statistics &amp; Public Health</b>	
<b>Credit Hours</b>	<b>3(2-1)</b>	
<b>Objectives</b>	<ul style="list-style-type: none"> <li>To impart hands-on training in application of statistics in nutritional sciences</li> <li>To understand and apply statistical techniques to evaluate the data and health status</li> </ul>	
<b>Theory</b>	<p>Definition and importance of Biostatistics, role of biostatistics in public health &amp; nutrition research, Descriptive &amp; inferential statistics, Use of descriptive statistics with practical application to health and nutrition datasets, visualization of health &amp; nutrition data through mean, median, mode, variance &amp; standard deviation, tabulation &amp; graphical presentation aof nutritional data base, Application of null and alternative hypothesis to health &amp; nutrition studies, Study of linear regression, multiple regression &amp; correlation analysis in relation with public health, studying different types of observational studies to analyze nutritional epidemiology, statistical considerations in an community health experimental study, Interpretation of anthropometric, biochemical &amp; dietary assessment of data using statistical tools, application of statistical tools and softwares for data analysis of nutrition database, ethical considerations in data analysis, avoidance of data manipulation for successful experimental study</p> <p><b>skewness and kenosis.</b> Sampling Probability and non-Probability Sampling, Sampling methods, random sampling, stratified random sampling, sampling distribution of mean, systematic sampling error, sampling distribution of mean and difference between two means. Interference Theory: Estimation and testing of hypothesis, Type–I and type-II error, Testing of hypothesis about mean and difference between two means using Z-test and t-test, Paired t-test, Test of association of attributes using X<sup>2</sup> (chi-square) Testing hypothesis about variance, Testing of hypotheses regarding population mean, Testing of hypotheses about the difference between population means. One-way ANOVA, Two-way ANOVA.</p>	
<b>Books Recommended</b>	<p>1. Introduction to Statistical Theory Part- I and Part-II by Sher Muhammad and Dr. Shahid Kamal (Latest Edition)</p> <p>2. Statistical Methods and Data Analysis by Dr. Faquir Muhammad</p>	



	<p>3. A. Concise Course in A. Level Statistic with world examples by J. Crashaw and J. Chambers (1994)</p> <p>4. Basic Statistics an Inferential Approach 2<sup>nd</sup> ed. (1986) Fran II. Dietrich-II and Thomas J. Keans</p> <p>5. Principles and Procedures of Statistics A Bio-material approach, 2<sup>nd</sup> ed., 1980 by R. G. D Steal and James H. Tarric</p> <p>6. Statistical Procedures for Agricultural Research 2<sup>nd</sup> ed. (1980) by K. A. Gomez and A. A. Gomez</p>
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<b>GEC-223</b>	<b>Information, Computer and Technologies (ICT)</b>	<b>3(3-0)</b>
<b>Course Code</b>	<b>GEC-223</b>	
<b>Course Title</b>	<b>Information, Computer and Technologies(ICT)</b>	
	<ul style="list-style-type: none"> <li>• Understand different terms associated with ICT</li> <li>• Define the basic terms associated with communications and networking and understanding different terms associated with the Internet and World Wide Web.</li> <li>• Learn the windows of opportunities for free lancing</li> <li>• Using different software for betterment of nutrition</li> </ul>	
<b>Credit Hours</b>	<b>3(3-0)</b>	
<b>Theory &amp; Practical</b>	<p>Overview of information technology, and its role in modern society, impacts of emerging technologies on communication, education, business &amp; healthcare, components of a computer system, Basic Definitions &amp; Concepts, Storage Devices, Programming and Application Software, Introduction to Programming, Implementation of programming languages, design principles &amp; user interface, basics of data modelling, database optimazation, internet protocols &amp; services, Email, Collaborative, Computing and Social Networking, Browsers and Search Engines, Types of network (LAN, WAN, MAN), Network &amp; architecture, Network security, bsics of cybersecurity, encryption and securing communication, Ethical and legal cnsiderations in ICT, professional code of conduct,</p> <p>E-Commerce (using freelancing activities e.g. Upwork, Fiver, Colab Tree, Amazon KDP), Different software used in the domain of nutrition e.g. Diet Organizer, Diet-5, etc. Hands-on practice on Cartewheel, Eatec Solutions by Agilysys, eTrition, Health-e Meal Planner, KidServe, MCS Edison Menus &amp; Inventory, Meal Magic Cloud, Meals Plus, a LINQ Solution, NetMenu, NUTRIKIDS, OneSource- Menu Planning and Nutrient Analysis</p>	
<b>Books Recommended</b>	<p>1. Introduction to Computers by Peter Norton, 6th International Edition (McGraw HILL) Using Information Technology: A Practical Introduction to Computer &amp; Communications by Williams Sawyer, 6th Edition (McGraw HILL) Computers,</p>	

	2. Communications & information: A user's introduction by Sarah E. Hutchinson, Stacey C. Swayer Fundamentals of Information Technology by Alexis Leon, Mathewsleon Leon Press.
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<b>GEC- 225</b>	<b>Civic/Nutrition &amp; Community Engagement</b>	<b>3(3- 0)</b>
<b>Course Code</b>	<b>GEC-225</b>	
<b>Course Title</b>	<b>Civics / Nutrition &amp; Community Engagement</b>	
<b>Credit Hours</b>	<b>3(3-0)</b>	
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To motivate student to gain peak performance in academics</li> <li>• To build attitude and non-professional competencies that will help them in professional life.</li> </ul>	
<b>Theory</b>	<p>Introduction &amp; historic perspective to civic responsibility in Nutrition, different models of civic responsibility, civic engagement &amp; sustainable development goals, nutrition advocacy &amp; public policies related to nutrition, community approaches to identify and address nutrition related challenges, Community needs assessment techniques, identifying vulnerable populations, understanding cultural influences and dietary habits, social determinants influencing nutritional status of communities, strategies for engaging diverse communities an promoting healthy practices, understanding social change behaviour, integrating cultural competence through education iniatives, developing culturally sensitive nutrition supplementation, engaging local organizations and stake holders to eradicate hidden hunger in different communities, understanding vulnerable population needs, empowering communities through evidence based nutritional practices, global citizenship and civic engagement, challenges and oppurtunities in rural civic engagement, international collaboration in nutrition initiatives to develop nutrition action plan with local partners, community resilience and disaster preparedness</p>	
<b>Books Recommended</b>	<ol style="list-style-type: none"> <li>1. Brain Tracy. Psychology of learning.</li> <li>2. Brain Tracy. Accelerated learning.</li> <li>3. Zig Zigler. Attitude is everything.</li> <li>4. Shive Khera. You can win.</li> <li>5. Larry Winget. Stop whining start living.</li> <li>6. Dr. W. Green. Getting Straight As.</li> <li>7. Dr. Stephen R. Covey. Highly effective habits.</li> <li>8. Jim Rohn. Cultivating Unshakable character.</li> <li>9. Dr. Stephen R. Covey. Principle cantered leadership.</li> <li>10. Study Skills by Riachard Yorky.</li> <li>11. The balance by Dr. Rayed Afzal</li> </ol>	

**4<sup>th</sup> Semester**

Sr. No.	Course Code	Title of Course	Credit Hours
1.	HND-202	General and Systemic Pathology	3(2-1)
2.	HND-204	Nutrition through the life cycle	3(3-0)
3.	HND-208	Physiology and biochemistry of micronutrients	3(2-1)
4.	FST-301	Food Analysis & Sensory Evaluation	3(1-2)
5.	GEC-220	Social Sciences for nutritional protection	2(2-0)
6.	GEC-222	Entrepreneurship development	3(3-0)

**Total Credit Hours****17****HND-202                      General and Systemic Pathology                      3(2-1)**

<b>Course Code</b>	<b>HND-202</b>
<b>Course Title</b>	<b>General and Systemic Pathology</b>
<b>Credit Hours</b>	<b>3(2-1)</b>
<b>Theory</b>	Health and disease; language at pathology; Basic concepts: cell injury, inflammation, growth disturbances, circulatory disturbances, wound healing and repair, neoplasia, fever, disturbance of mineral deposits and pigmentation, anaemia, leukaemia, diarrhoea, burn injury, infectious diseases, environmental and nutritional diseases. Ischemia, Hypoxia, Necrosis, Infarction, Hypertrophy, Hyperplasia, Metaplasia, Plasia, Anaplasia; Response of body to injury and infection; Acute Inflammation, Chronic inflammation, Immunity, Allergy, Hypersensitivity; Hypertension, Leukemia or Blood Cancer (Malignant Carcinoma, Sarcoma & Lymphomas); Diagnosis of Cancer in general, fate, survival and prognosis with tumours, Cardiovascular System: Pericarditis, endocarditic, myocarditis Heart failure, arteriosclerosis, atherosclerosis, Digestive System: General consideration, Diseases of oral cavity, pharynx and oesophagus, Dysphagia, parasitic diseases of oesophagus, Diseases of stomach, Specific, Ulcer (Peptic, Duodenal), developmental anomalies, Diseases of intestine (small, large), Liver and biliary system, Urinary System (General consideration, Renal failure, glomerulonephritis), Skeletal System (Bone formation, examination of skeleton), Developmental abnormalities, osteoporosis, Inflammatory bone diseases, arthritis, Neurodegenerative diseases, Muscular System: atrophy, Myelenopathies, Listeriosis, hemophilus infection, Myotonic syndrome, metabolic myopathies, Congenital and hereditary diseases, Viral disease, fungal and parasitic diseases
<b>Practical</b>	Selection, collection, preservation and dispatch of morbid material for laboratory examination. Demonstration of blood sampling. Basic concepts of anemia. Demonstration of routine urinalysis, fecal examination and skin scraping. Blood smears, staining and

	examination. Haematology report interpretation, basic concepts of contents and interpretation of pathology report (serum enzymes and other markers of disease). Study of Pathological Slides of various Pathological Conditions, Acute inflammation, chronic inflammation, chronic specific inflammation; Different types of Degeneration, Thrombosis, Embolism, Infarction, Necrosis, Gangrene, Hyperplasia, Metaplasia, Pigmentation, Calcification, CVC, Papilloma, Adenoma, Chondroma, Fibroma, Gross examination of lesions; Histopathological interpretation of different systemic diseases.
<b>Books Recommended</b>	<ol style="list-style-type: none"> <li>1. Carton, J., R. Daly, and P. Ramani. 2007. Clinical pathology, 1<sup>st</sup> ed. Oxford University Press, U.S.A.</li> <li>2. Kierszenbaum, A.L. and L. Tres. 2011. Histology and cell biology: introduction to pathology, 3<sup>rd</sup> ed. Mosby Inc., U.S.A.</li> <li>3. Kumar, V., A.K. Abbas, N. Fausto, and J.C. Aster. 2010. Robbins and Cotran pathologic basis of disease, 8<sup>th</sup> ed. Saunders Elsevier, U.S.A.</li> <li>4. McPhee, S.J. and W.F. Ganong. 2006. Pathophysiology of disease: an introduction to clinical medicine, 5<sup>th</sup> ed. McGraw-Hill, U.S.A.</li> <li>5. Kumar Cotran Robins, Basic Pathology, 6th Ed., W B Saunders Company, Philadelphia (1992)</li> <li>6. Walters and Israel, General Pathology, Churchill Livingstone, London (1998).</li> <li>7. Peter S Macfarlane, Robin Reid, Robin Collander, Pathology Illustrated, Churchill Livingstone, London (1998).</li> <li>8. Walter G B, General Pathology, Churchill Livingstone, New York, 1996.</li> </ol>

<b>HND-204</b>	<b>Nutrition through the Life Cycle</b>	<b>3(3-0)</b>
<b>Course Code</b>	<b>HND-204</b>	
<b>Course Title</b>	<b>Nutrition through the Life Cycle</b>	
<b>Credit Hours</b>	<b>3(3-0)</b>	
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To analyse the nutritional needs during conception, infancy, childhood, adolescence, male and female adults, pregnancy, lactation and during aging</li> <li>• To suggest dietary recommendations in special clinical conditions</li> </ul>	
<b>Theory</b>	<b>Preconception nutrition:</b> overview, reproductive physiology, nutrition related disruption in fertility, nutrition and contraceptives, other nutrition concerns, premenstrual and polycystic ovary syndrome, obesity and fertility, diabetes prior to pregnancy, disorders of metabolism. <b>Nutrition during pregnancy:</b> status of pregnancy outcomes, embryonic and Fetal growth & development, pregnancy weight gain, nutrition and outcome of the pregnancy,	

	<p>common health problems during pregnancy, nutrient needs and dietary guidelines during pregnancy. Nutrition and lactation: human milk composition, benefits of breast feeding, breast milk supply and demand, maternal diet during lactation, factors influencing breastfeeding initiation and duration, common breast feeding conditions, medical contradictions in breast feeding. Infant nutrition: assessing new born health, energy and nutrient needs, development of infant feeding skills, common nutritional problems and concerns, infants at risk. Toddlers and pre-schooler nutrition: normal growth and development, energy and nutrient needs, common nutritional problems, nutrition related conditions, food allergies and intolerances. <b>Child and pre-adolescent nutrition:</b> normal growth and development, energy and nutrient needs, common nutritional problems, prevention of nutrition related disorders, dietary recommendations. <b>Adolescent nutrition:</b> normal physical growth and development, health and eating related behavior, energy and nutrient requirements, overweight and obesity, eating disorders. <b>Adult nutrition:</b> physiological changes of adulthood, maintaining a healthy body, dietary recommendations, nutrient recommendations, nutrition intervention for risk reduction. <b>Geriatric nutrition:</b> physiological changes, nutritional risk factors, dietary recommendations and food safety, nutrient recommendations, nutrition in special clinical conditions.</p>
<p><b>Books Recommended</b></p>	<ol style="list-style-type: none"> <li>1. Brown, J. E., Isaacs, J. and Wooldridge, N. H. 2008. Nutrition through the life cycle, 3<sup>rd</sup> Ed. Thomas Learning Academic Resource Centre, USA</li> <li>2. Worthington. 2000. Nutrition throughout the life cycle. The McGraw-Hill Education, Maidenhead, Berkshire, U.K.</li> <li>3. Walter W. 1998. Nutritional Epidemiology. 2nd edition. Oxford University Press, USA.</li> <li>4. Judith S. and Edelstein S. 2011. Essentials of Life Cycle Nutrition. Jones and Bartlett Publishers, UK.</li> <li>5. Judith E. B. (editor). 2011. Nutrition Throughout the Life Cycle. 4th edition. Wadsworth, Cengag Learning, USA.</li> <li>6. Rolfes, S.R., K. Pinna and E. Whitney. 2015. Understanding Normal and Clinical Nutrition, 10th ed. Thomson and Wadsworth Publishers, USA.</li> </ol>

HND-208	Physiology and biochemistry of micronutrients	3(2-1)
Course Code	HND-208	
Course Title	Physiology and biochemistry of micronutrients	

<b>Credit Hours</b>	<b>3(2-1)</b>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To discuss the nutritional requirements of the vitamins and minerals</li> <li>• To understand the functional roles of vitamins and minerals in human nutrition with special reference to metabolism</li> <li>• To familiarize with the deficiency symptoms and health disorders associated with improper intake of vitamins and minerals</li> <li>• To analyse losses of micronutrients during food processing</li> </ul>
<b>Theory</b>	<p>Introduction to vitamins, importance and role in human nutrition; Categories of vitamins, fat and water soluble vitamins; Fat soluble vitamins, vitamin A, D, E and K; General properties, dietary sources, biochemical and physical functions and mechanisms in the body, their deficiency syndromes, recommended intake; Digestion, absorption, metabolism and storage for each vitamin; Water soluble vitamins, thiamine, riboflavin, niacin, biotin, vitamin B6, folate, vitamin B12, ascorbic acid; General properties, food sources, recommended daily allowances, FAO/WHO standards, deficiency disorders; Digestion, absorption, metabolism and storage of these vitamins separately; Toxicity caused by excess of vitamins; Losses of vitamin during food processing; Vitamin like compounds. Introduction to minerals, importance of minerals in normal nutrition; Macro-minerals, calcium, chloride, magnesium, phosphorus and potassium, sodium, sulphur, their dietary sources, digestion, absorption and storage for each mineral; Recommended daily allowances; Selected enzyme cofactors, deficiency symptoms and disorders; Micro-minerals, iron, zinc, copper, selenium etc. food sources, RDA, deficiency disorders; Digestion, absorption, metabolism and storage of these micro-minerals separately in detail; Toxicity or problems caused by excess of minerals; Minerals in processed foods; Minerals and hypertension, health related issues of minerals. Food processing and its impact on vitamins and minerals, improving techniques to reduce the losses using concepts of hurdle technology</p>
<b>Books Recommended</b>	<ol style="list-style-type: none"> <li>1. Gordon M. W. and Hampl J. S. 2007. Perspective in Nutrition, McGraw-Hill Publishing Company Limited, New York, USA.</li> <li>2. Sareen S. G., Jack L. S., and James L. G. 2009. Advanced Nutrition and Human Metabolism, 5<sup>th</sup> edition, Wadsworth Cengage Learning, USA.</li> <li>3. Lindsay A., Benoist B-de., Dary O. and Hurrell R. (editors). 2006. Guidelines on Food Fortification with Micronutrients. Copy writes, FAO / WHO</li> </ol>

**FST-301                      Food analysis and sensory evaluation                      3(1-2)**

<b>Course Code</b>	<b>FST-301</b>
<b>Course Title</b>	<b>Food analysis and sensory evaluation</b>
<b>Credit Hours</b>	<b>3(1-2)</b>
<b>Theory</b>	Food analysis: significance. Sampling: techniques, preparation, preservation. Physical properties and analysis of foods and food products: appearance, texture, specific gravity, refractive index, rheology. Chemical analysis: significance. Proximate analysis, acidity, pH, sugars, mineral elements, vitamins - significance, methods. Chromatography: paper, thin layer. Spectroscopy: atomic emission, atomic absorption. Sensory evaluation of foods: attributes, difference and preference tests, consumer acceptance. Sensory evaluation: Introduction: overview, physiological and psychological foundations. General requirements for sensory testing. Organization and evaluation of sensory evaluation program. Measurement: difference, discrimination testing, scaling, threshold methods, descriptive analysis. Effective texture evaluation. Color and flavor evaluation. Special problems related to sensory science. Consumer field tests and questionnaire design. Statistical procedures.
<b>Practical</b>	Lab safety requirements. Preparation and standardization of laboratory solutions. Sampling. Determination of specific gravity, refractive index, moisture, ash, crude protein, crude fat, crude fiber, NFE, pH and acidity. Estimation of vitamin C. Determination of mineral elements through flame photometer and atomic absorption spectrophotometer. Paper and thin layer chromatography. Identification of toxins by TLC. Sensory evaluation of foods. Taste, odor identification, trigeminal sensations, taste modifiers. Use of sequential testing in selecting judges. Training of panelists by difference tests such as triangle test, paired comparison test, duo-trio test. Color, threshold determination, just noticeable difference. R-Index rating and ranking. Category scaling, determining an ideal level of an ingredient. Magnitude estimation. Descriptive analysis of different foods. Consumer test and analysis.
<b>Books Recommended</b>	<ol style="list-style-type: none"> <li>1. AOAC. 2007. Official methods of analysis of AOAC. Association of Official Analytical Chemists, Arlington, USA.</li> <li>2. Awan, J.A. and Rehman, S.U. 2003. Food analysis manual. Unitech Communications, Faisalabad-Pakistan.</li> <li>3. Pomeranz, Y. and Meloan, C.E. 2000. Food analysis: theory and practice. CBS Publishers, New Delhi.</li> <li>4. Kemp, S.E., Hollywood, T and Hort, J. 2009. Sensory evaluation: a practical handbook. John Wiley &amp; Sons, Inc., New York.</li> <li>5. Lawless, H.T. and Haymann, H. 1998. Sensory evaluation of food: principles and practices. Chapman and Hall, New York.</li> </ol>

	6. Nielsen, S.S. 1994. Introduction to the chemical analysis of foods. Jones & Bartlett Publishers, London.
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<b>GEC-220</b>	<b>Social sciences for nutritional protection</b>	<b>3(3-0)</b>
<b>Course Code</b>	<b>GEC-220</b>	
<b>Course Title</b>	<b>Social sciences for nutritional protection</b>	
<b>Credit Hours</b>	<b>3(3-0)</b>	
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To acquaint knowledge about the role of social protection programs in poverty alleviation and overall welfare of the society</li> <li>• To understand the role of social protection programs in provision of financial support for scaling up nutrition</li> <li>• To identify the development partners and various social protection and scale up nutrition programs</li> </ul>	
<b>Theory</b>	<p>Introduction to sociology, Social change and rural development; Global challenges due to climatic crisis, legacies of colonialism and enslavement, Food society and environment; Food insecurity and vulnerability due to geographic and environmental factors, ; Food and social class differences; Behaviour change; Social construction and eating disorders; Economic opportunities among the poor; Nutrition and gender sensitive policies and strategies of social protection sector; Social assistance, income generation, risk reduction and risk management; Current social protection programs in the public and private sector, , Impact of social protection on nutrition outcomes, Food and nutrition in culturally diverse societies; Women empowerment and nutrition; Food choices and their determinants; Challenges to combat malnutrition; Nutrition-sensitive and nutrition-specific interventions; Community development projects; Medical social services projects; Role of social welfare/protection sector to scale-up nutrition; Impact of individual financial assistance programs; Backyard poultry farming and backyard kitchen gardening; Social protection strategies in Pakistan and South Asia; Social safety nets for vulnerable group; Role of various development partners, (such as NGOs, INGOs, Asian Development bank, World Bank, USAID, and DFID) in social protection and scaling up nutritional status.</p>	
<b>Books Recommended</b>	<ol style="list-style-type: none"> <li>1. FAO. 2015. Improving Nutrition Through Multisectoral Approaches. Food and Agriculture Organization of the United Nations, Rome Italy.</li> <li>2. FAO. 2015. Nutrition and Social Protection. Food and Agriculture Organization of the United Nations, Rome Italy.</li> <li>3. IFPRI. 2016. Global Nutrition Report 2016: From Promise to</li> </ol>	



	Impact: Ending Malnutrition by 2030. International Food Policy Research Institute, Washington, DC, USA. 4. World Bank, UNICEF, WFP, USAID, ADB and Government of Pakistan Reports
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<b>GEC-222</b>	<b>Entrepreneurship development</b>	<b>2(2-0)</b>
<b>Course Code</b>	<b>GEC-222</b>	
<b>Course Title</b>	<b>Entrepreneurship Development</b>	
<b>Credit Hours</b>	<b>2(2-0)</b>	
<b>Theory</b>	<p>Concept of entrepreneurship, essential attributes of an entrepreneur, women entrepreneurs, entrepreneurs, entrepreneurs and economic development. The concept of entrepreneurship, Natural talents. Dynamic of opportunity identification, process of selection of the right business, decision making steps and caution. Introduction: The opportunities in nutritional sciences, global nutrition market, challenges. Myths of Entrepreneurship, Practice of Entrepreneurship: From Job to Entrepreneur, Entrepreneurial Attitudes, Vision. New Venture. Start up. Entrepreneurship and Innovation: The innovation concepts, Importance of innovation for entrepreneurship, Sources of innovative opportunities, Mind-set, The innovation process, Risks involved in innovation. Characteristics of successful entrepreneur: Entrepreneurship Organization: Flight Plan, Self-Discipline, Team work. Entrepreneurship and SMEs: Defining SMEs, Scope of SMEs, Entrepreneurial, and managers of SME, Financial and marketing problems of SMEs. Entrepreneurial Marketing: Online advertising, Framework for developing entrepreneurial marketing, Devising entrepreneurial marketing plan, Entrepreneurial marketing strategies, Product quality and design. Sales. Entrepreneurship and Economic Development: Role of entrepreneur in the economic development generation of services, Employment creation and training, Ideas, knowledge and skill development, The Japanese experience. Case Studies of successful Entrepreneurs. Project assignment is mandatory for preparing business plan related to food and nutrition market</p>	
<b>Books Recommended</b>	<ol style="list-style-type: none"> <li>1. Deshpande, M. R. Entrepreneurship of small scale industries concept growth and management. Deep &amp; Deep publication, Rajouri, New Delhi. 2002.</li> <li>2. Gupta, C. P. Entrepreneurship Development in India. Sultan Chand and Sons, New Delhi. 2005.</li> <li>3. Abraham, M.M. Entrepreneurship Development &amp; Management, Prakash Publications, Changanacherry. 2000.</li> </ol>	



**5<sup>th</sup> Semester**

Sr. No.	Course Code	Title of Course	Credit Hours
1.	HND301	Nutritional Psychology	3(3-0)
2.	HND-303	Dietetics-I	3(2-1)
3.	HND-305	Nutritional Epidemiology & Intervention	3(2-1)
4.	HND-307	Meal Planning and nutritional significance	3(2-1)
5.	HNd-309	Functional & Nutraceutical Foods	3(3-0)
6.	HND-311	Nutrition education & counselling skills	3(2-1)
<b>Total Credit Hours</b>			<b>18</b>

**HND-301    Nutritional Psychology    3(3-0)**

<b>Course Code</b>	<b>HND-301</b>
<b>Course Title</b>	<b>Nutritional Psychology</b>
<b>Objectives</b>	<ul style="list-style-type: none"><li>• To understand psychology, its types and importance in nutrition</li><li>• To abreast the impact of psychological influences on appetite and attitude behaviour relationship</li><li>• To improve the behaviour and aptitude to health and diet</li></ul>
<b>Credit Hours</b>	<b>2(2-0)</b>
<b>Theory</b>	<p>Nutritional impact on mental health; overview, Gut brain axis and its connection, psychological factors linked with dietary choices, relationship of emotional eating during stress and mood disorders, role of nutrition in anxiety management, role of nutrition in sleep disorders, depression and dietary patterns, certain food addictions and psychological dependencies, psychological aspects restricted diet, impact of food marketing on psychological behaviours, cognitive therapy for binge eating, positive psychological strategies for treating food allergies, impact of environmental influence on food selection, resilience building strategies through nutrition, right selection of food: insights from psychology, role of psychology in dietary counselling, Eating disorders: diagnosis, assessment and treatment; Conceptual model of food choice; Psychological influences on appetite; integration of biological, social, cultural and psychological influences on food choice; psychology of food cravings, psychology of bulimia nervosa, cognitive decline in elderly; an psychological perspective, the relation of food intake with emotional instability ( happiness, grief, depression, stress, anger), recent advances about nutritional psychiatry</p> <p>Psychology: introduction, types, classification; Psychology and nutrition adherence; Attitude and eating patterns and the field of cognitive psychology; Perception, visualization and eating patterns, errors in perception process; Face perception; Understanding</p>

	behaviour: sensation, sense organs/special organs, attention and concentration, memory and its stages, methods for improvement, types and theories of thinking, cognition and levels of cognition, problem solving and decision making strategies, attitude behaviour relationship; Measurement issues, indirect effects of attitude on behaviour; The theory of reasoned action; Additional variables within the theory of planned behaviour; Personality and intelligence; Stress management.
<b>Books Recommended</b>	<ol style="list-style-type: none"> <li>1. Blackman, M.C. and C.A. Kvaska. 2011. Nutrition Psychology: Improving Dietary Adherence. Jones and Bartlett Learning Publishers, Ontario, Canada.</li> <li>2. Booth, D.A. 1994. The Psychology of Nutrition. Taylor &amp; Francis Inc., Bristol, PA, USA.</li> <li>3. Elmes, D.G., B.H. Kantowitz and H.L. Roediger. Research Methods in Psychology, 9<sup>th</sup> ed. Wadsworth Cengage Learning, Belmont, CA, USA.</li> <li>4. Jane O. 2010. The Psychology of Eating: From Healthy to Disorders Behavior, 2<sup>nd</sup> ed. Wiley Blackwell, John Wiley &amp; Sons Ltd., Chichester, West Sussex, UK.</li> </ol>

<b>HND-303</b>	<b>Dietetics-I</b>	<b>3(2-1)</b>
<b>Course Code</b>	<b>HND-303</b>	
<b>Course Title</b>	<b>Dietetics-I</b>	
<b>Credit Hours</b>	<b>3(2-1)</b>	
	<ul style="list-style-type: none"> <li>• To understand the discipline of dietetics and its role in human wellbeing</li> <li>• To familiarize with the foundations of healthy diets and their role in disease prevention and management</li> <li>• To acquaint hands-on training for calorie calculation and assess BMI and energy expenditures using food composition table and data bases</li> <li>• To comprehend the principles of diet therapy and therapeutic nutrition</li> <li>• To understand the role of dietary management in various health disorders related to upper and lower gastrointestinal tract</li> </ul>	
<b>Theory</b>	Dietetics: definitions, history, importance; dietician: role in food service and clinical practice, responsibilities in multidisciplinary team, code of ethics; Foundations of healthy diet: Dietary Reference Intakes, Recommended Dietary Allowance, Food Guide Pyramid and allied approaches, Dietary Guidelines, Exchange system and menu planning; Energy expenditure and basal metabolism; Body mass index; Role of diet in disease conditions; Diet therapy and its	

	<p>principles; Food selection and factors affecting its acceptance; Nutrient density; Alternative patterns of food consumption; Nutritional counselling in clinical practice. Critical diet assessment. Nutrition and diet clinics. Introduction to diet therapy; Principles of diet therapy and therapeutic nutrition; Therapeutic modifications of normal diets; Dietary management in various health disorders (objective, physiology, food choices, diet plans): Diet in the diseases of the upper gastrointestinal tract - mouth, dental disease, pharynx, esophagitis; hiatal hernia; gastritis; peptic ulcer; Diet in the diseases of the lower gastrointestinal tract - constipation, diarrhoea, mal-absorption syndrome, lactose Intolerance, celiac disease, inflammatory bowel disease, Crohn's disease, ulcerative colitis, irritable bowel syndrome, diverticular disease, gastric surgery, dumping syndrome, small bowel resections, short bowel syndromes, blind loop syndrome, ileostomy or colostomy</p>
<b>Practical</b>	<p>Interpretation of food guide pyramid, MyPyramid, My-plate, Eat-well Plate; Energy value of different foods: carbohydrates, fats, proteins; Calculating energy requirements; BMI in relation to obesity and overweight, energy and calorie requirements; Balanced diet and menu planning using exchange lists, food composition tables &amp; data bases; Food intake analysis: Dietary Recall, Food Frequency Questionnaires, Food Surveys. Steps in nutrition care; Types of diets: regular diet, clear liquid diet, full liquid diet, soft diet, bland diet; Dietary modification for texture, energy, nutrients and fluids; Planning of energy modified diets: high calorie diet, restricted calorie diet, high fiber diet, low residue diet, modified carbohydrates diet, moderate carbohydrate diet, modified fat diet, restricted fats diet; Planning and preparation of diets for various pathological conditions;</p>
<b>Books Recommended</b>	<ol style="list-style-type: none"> <li>1. Mahan, L.K., S. Escott-Stump and J.L. Raymond. 2012. Krause's Food, Nutrition &amp; Diet Therapy, 13th ed. Elsevier Saunders, St. Louis, Missouri, USA.</li> <li>2. Mudambi, S.R. and M.V. Rajagopal. 2007. Fundamentals of Foods, Nutrition &amp; Diet Therapy, 5th ed. New Age International Pvt. Ltd. Publishers, New Delhi.</li> <li>3. Punekar, M. and J. D'Souza. 2010. Handbook of Applied Nutrition, Dietotherapy and Diet Management. SBS Publishers &amp; Distributors Pvt. Ltd., New Delhi.</li> <li>4. Rawat, S. 2015. Applied Nutrition. Random Publication, New Delhi.</li> <li>5. Schlenker, E. and J.A. Gilbert. 2015. Williams' Essentials of Nutrition and Diet Therapy, 11th ed. Elsevier/Mosby Inc., Louis, Missouri.</li> </ol>

	6. Singh, J. 2008. Handbook of Nutrition and Dietetics. Lotus Press, India.
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<b>HND-305</b>	<b>Nutritional Epidemiology &amp; Intervention</b>	<b>3(2-1)</b>
<b>Course Code</b>	<b>HND-305</b>	
<b>Course Title</b>	<b>Nutritional Epidemiology &amp; Intervention</b>	
<b>Credit Hours</b>	<b>3(2-1)</b>	
<b>Theory</b>	Introduction to Nutritional epidemiology in public health, types of epidemiology, clinical, occupational, experimental, interrelation of factors. <b>Principles of epidemiology</b> and epidemiological methods, Designing and conducting nutritional surveys in populations, <b>Epidemiologic consideration</b> in disease process, different <b>ssampling methodology</b> for studyin epidemiology of vulnerable populations, data collection of infections, antibiotic resistance, integrating genomics in epidemiological studies, community intervention studies, Public health policies addressing high sugar intake (diabetic prevelance), epidemiological studies for reducing salt intake at population level, <b>Molecular epidemiology</b> : bio-markers of nutritional status etc.; <b>Applied epidemiology</b> : rationale, strategies and concepts of control and eradication of diseases, <b>Household surveys</b> : characteristics of household data, techniques, uses and limitations, using household surveys in epidemiological studies; <b>Individual surveys</b> : methods for assessment of present or recent data, measurement error in dietary assessment, data collection of infectious disease cases, predictive value, reliability; Hypothesis testing, statistical significance, (p values, confidence interval etc.) <b>Project Assignments</b> : Design a research project using one of the epidemiological methods to investigate the nutritional problem in local community and present it with suggested solutions.	
<b>Practical</b>	Designing of questionnaire for disease surveillance; Village search for disease, storage, analysis, interpretation of data; Analysis and interpretation of passive surveillance data of Medical/Veterinary hospitals; Hands on training of computer software for epidemiology.	
<b>Books Recommended</b>	1. Friedman G. D. Primer of Epidemiology. 1994. 4th Edi. McGraw-Hill Inc., Singapore. 2. Robert H. F. and Thomas A. S. 2009. Epidemiology for Public Health Practice. 4th edition. Jones and Bartlett Publishers. 3. Ann A. and George R. S. III. 2008. Essentials of Epidemiology in Public Health. 2nd edition. Jones and Bartlett Publishers.	

<b>HND-307</b>	<b>Meal planning and nutritional significance</b>	<b>3(2-1)</b>
<b>Course Code</b>	<b>HND-307</b>	

<b>Course Title</b>	<b>Meal planning and nutritional significance</b>
<b>Credit Hours</b>	<b>3(2-1)</b>
<b>Theory</b>	Importance and principles of meal planning for family and occasions; Importance of balanced meal for optimal health, nutrient dense meal planning, individualized meals plans for fulfilling nutritional needs, strategic meal planning for weight management, Nutritional value of meal and budgeting; Rules for good menu planning, Selection of foods i.e meat, poultry, cereals, fish, eggs, fruits and vegetables according to budget, nutritional significance for school lunch program, meal planning for special dietary needs i.e. allergies & sensitivities, creating budget friendly and nutritious meal plans, Meal management in hospital care system and development of ready to eat nutritious food products for emerging ailments e.g. AIDS, cancer, concept of immune-nutrition. Meal presentation skills: selection, use and care of table appointments; Study of different types of table settings, table manners and etiquettes.
<b>Practical</b>	Nutritional composition of food products available in the market, Survey and record keeping of market prices (retail & wholesale); Comparison of weight, volume and effect of cooking on colour, taste and texture of different foods; Planning, preparation and service of meals for different occasions at different income levels; Market visits for cost and quality and food marketing regulations. Producing diet plans and fact sheets. Using food to manage health: obesity, diabetes, cardiovascular diseases, bone disorders and liver diseases, and cancer. Model diet plan: use of calorie calculators, charts. Case studies.
<b>Books Recommended</b>	1. Whitney E. and Rolfes S. 2005. Understanding Nutrition, Wadsworth. 2. Wardlaw G. M. and Kessel M. W. 2002. Perspectives in Nutrition, McGraw-Hill. 3. Bogert D. J. 2001. Nutrition and Physical Fitness, W.B. Saunders Co. Philadelphia, London.

<b>HND-310</b>	<b>Functional and nutraceutical foods supplements</b>	<b>3(3-0)</b>
<b>Course Code</b>	<b>HND-310</b>	
<b>Course Title</b>	<b>Functional and nutraceutical food supplements</b>	
<b>Credit Hours</b>	<b>3(3-0)</b>	
<b>Theory</b>	An overview of dietary supplements and their market; Forms of food supplements; Basic concepts, role of nutrition therapy in pharmacotherapy. Pharmacologic aspects of food and drug interactions; Natural products and extracts; Medicinal plants as food supplements; Vitamins and mineral supplements; Essential fatty acids; Enzymes as supplements; Probiotics and prebiotics in Health;	

	<p>Fish oil supplements; Non-essential nutrients as dietary supplements; Caffeine in food and dietary supplements; Codex Alimentarius standards for food supplements; Safety of vitamins and minerals added to foods; Implications of mega doses; Global legislation on food supplements; DRAP Alternative Medicines and Health Products Enlistment Rules 2014, drug administration's routes. Drug mechanism e.g. pharmacodynamics; pharmacokinetics, absorption, distribution, metabolism, elimination. Factors that might alter the absorption and bioavailability of drugs. The effects of various drugs on action, metabolism and elimination of nutrients. Risk factors for drug-nutrient interaction: effects of food on drug therapy, drug absorption, drug distribution, drug metabolism and drug excretion; Effects of drugs on food and nutrition, nutrient absorption, metabolism and excretion; Effects of drugs on the nutritional status of patients e.g. taste, smell and type of intake; Gastrointestinal effects, appetite changes; Nutrient assessment of drug-nutrient interactions; Dietary counselling for the prevention of food drug interactions to aid client/patient with dietary side effects caused by nutrient-drug interactions.</p>
<b>Books Recommended</b>	<p>FAO (Food and Agriculture Organization of the United Nations). 2007. Report on functional foods. Food and Agriculture Organization of the United Nations, Rome, Italy.</p> <p>Shi, J., C.T. Ho and F. Shahidi. 2005. Asian functional foods. Marcel Dekker/CRC Press, New York, U.S.A.</p> <p>Shi, J., G. Mazza and M.L. Maguer. 2002. Functional foods: biochemical and processing aspects, Vol. 2. CRC Press, New York, U.S.A.</p> <p>Wildman, R.E.C. 2006. Handbook of nutraceuticals and functional foods, 2<sup>nd</sup> Ed. CRC Press, New York, U.S.A.</p>

<b>HND-206</b>	<b>Nutrition education and counselling skills</b>	<b>3(2-1)</b>
<b>Course Code</b>	<b>HND-206</b>	
<b>Course Title</b>	<b>Nutrition education and counselling skills</b>	
<b>Credit Hours</b>	<b>3(2-1)</b>	
<b>Theory</b>	<p>Defining nutrition education, history, need of nutrition education; Nutrition education programme, scope and challenges of educating people about eating well; Implications for competencies and skills for nutrition education; Biological influences, cultural and social preferences; Family and psychological factors; Expectancy-value theories of motivation, social and cognitive theory; Behaviour change as a process, phases of change; Addressing multiple and overlapping influences on behaviour; A logical model approach for planning a</p>	



	<p>framework of nutrition education; Understanding communication model, preparing/organizing oral presentations, delivering oral presentation, delivering nutrition education workshops, types of supporting visual aids, nutrition mass media communication campaigns, social marketing; Ethics in nutrition education, conflicts, participating process in community coalition; Non-government and public health organizations and their current programmes. Nutritional counselling; Programme designing for specific diseases like Anaemia, Neural tube defects, rickets, etc. Nutritional counselling and clinical practice, resources and dietary guidelines. Different tools to follow up study: group discussion and motivation in food selection and preparation. Diet counselling for reducing risk of diseases: cancer, obesity, diabetes, cardiovascular diseases and bone diseases. Counselling for the prevention of major disabilities: antioxidants, supplements and micronutrients. Counselling for functional and nutraceutical foods in relation to diseases. Counselling in outpatient wards in local hospitals. Simulation techniques for counselling in selected settings.</p>
<b>Practical</b>	<p>Nutritional counselling; Program designing for specific diseases like anemia, neural tube defects, rickets, etc.; Surveys and seminars in different educational institutions; Individual presentations by students on different nutrition topics; Visits of public places for nutrition awareness; Independent student projects.</p>
<b>Books Recommended</b>	<ol style="list-style-type: none"> <li>1. Walter W. 1998. Nutritional Epidemiology. 2nd edition, Oxford University Press, USA.</li> <li>2. Richard D. S. and Martin W. B. 2001. Nutrition and Health in Developing Countries (Nutrition and Health) Humana Press.</li> </ol>

**6<sup>th</sup> Semester**

<b>Sr. No.</b>	<b>Course Code</b>	<b>Title of Course</b>	<b>Credit Hours</b>
1.	FST-302	Food safety, Toxicology & Public health	3(3-0)
2.	HND-302	Dietetics-II	3(2-1)
3.	HND-304.	Infant and young child feeding	3(2-1)
4.	HND-306	Introductory Pharmacology and Pharmacognosy	3(2-1)
5.	HND-308	Drug Nutrient Interactions	2(2-0)
6.	HND-310	Food & drug laws	2(2-0)
7.	HND-312	Personal & Professional development	2(2-0)

**Total Credit Hours** **20**

**FST- 302                      Food Safety, Toxicology, and Public health                      3(3-0)**

<b>Course Code</b>	<b>FST- 301</b>
<b>Course Title</b>	<b>Food Safety, Toxicology, and Public health</b>
<b>Credit Hours</b>	<b>3(3-0)</b>
<b>Theory</b>	History and overview of food safety: introduction historical aspects, definitions, scope of the food safety. Foodborne infectious and microbial agents: types of infectious, foodborne infections versus intoxications, foodborne bacteria, viruses, protozoans, foodborne Toxic and physical Agents: basic food toxicology, microbial toxin, plant and animal toxin, agricultural chemicals, adulterants, food additives, packaging materials, toxicants induced during food processing and industrial waste. Food Safety: Principles of preventions. Risk assessment and hazard analysis of foods: risk analysis and food safety. The current food safety system: National food control strategy, traceability system. Contamination: types, sources, effects. Milk defects: off flavours, milk-borne diseases. Principles of chemical food safety, chemistry of food borne toxins, toxicants to food commodities, anti-nutritional properties of foods. Adulteration in milk: current status, control methods. HACCP for hygienic milk production. Milk hygiene: scope, importance. Hygienic milk production and handling practices. Preservation of milk: transportation, storage. Toxicology, principles, branches, dose-response mechanism, potency, margin of safety, biologic factors influencing toxicity. Toxicants in body: absorption, translocation, distribution, biotransformation, storage, excretion. Chemical carcinogenesis: initiation, promotion, progression, angiogenesis. Naturally occurring food toxins: plant and animal. Meat hygiene: meat sanitation scope, importance. Abattoirs: pre-requisites. Anti-mortem inspection: disease symptoms. Slaughtering and meat handling: hygienic practices and principles, rules for meat industry,

	red meat hygiene. Waste management. Quality control. Meat-borne diseases. Systems for food safety surveillance and risk prevention - HACCP and FSMS-ISO22000:2005.
<b>Books Recommended</b>	<ol style="list-style-type: none"> <li>1. Awan, J.A. and Anjum, F.M. 2010. Food toxicology. Unitech Communications, Faisalabad-Pakistan.</li> <li>2. Shibamoto, T and Bjeldanes, L. 2009. Introduction to food toxicology, 2 ed. ndAcademic Press, London, UK.</li> <li>3. CAC (Codex Alimentarius Commission). 2007. Codex Alimentarius Commission - Procedural manual. Joint FAO/WHO Food Standards Programme. FAO, Rome.</li> <li>4. ISO (International Standards Organization). 2005. Food safety management systems - requirements for an organization in the food chain. Case Postale, Geneva.</li> </ol>

<b>HND-302</b>	<b>Dietetics-II</b>	<b>3(2-1)</b>
<b>Course Code</b>	<b>HND-302</b>	
<b>Course Title</b>	<b>Dietetics-II</b>	
<b>Credit Hours</b>	<b>3(2-1)</b>	
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To understand the role of nutrition and dietetics in managing disease and preventing complications</li> <li>• To get hands-on training for the dietary modification of normal diets aligned with various health disorders</li> <li>• To comprehend the role of nutrition education and policies towards nutrition security</li> </ul>	
<b>Theory</b>	<p>Diet based regimen to improve the public health. Diet in the diseases of liver and accessory organs - hepatitis, hepatic steatosis, non-alcoholic hepatic steatosis, alcoholic liver disease, cirrhosis, hepatic encephalopathy; cholelithiasis, cholecystitis, cholangitis; Pancreatitis; Nutrition education and primary health care camp, diet supplementation for diseased patients, malabsorption and mineral deficiency, managing disease and avoiding complications through diet diversification, carbohydrate and fat modified diets, mineral-modified diets, fluid-modified diets, energy and protein-modified diets. Introduction to diet therapy, therapeutic diets and modifications, diet and drug interaction, nutrition and diet clinics, routine and hospital diet, diets in fevers and infections, obesity, leanness and underweight, diets in diseases of cardiovascular system, diets in relation to hepatic diseases, disorders of metabolism, diets in diabetes mellitus and dyslipidemia, diets in renal infections, diets and food allergy, diets in cancer and genetic disorders, malabsorption syndrome, diets in dental disease, diets in osteoporosis, diets in nutritional anemia's, preventing single and</p>	

	<p>cluster diseases, strategic actions and for promoting healthy diets. Dietary management in various health disorders (objective, physiology, food choices, diet plans): obesity, leanness and underweight; coronary heart disease: dyslipidemia, hypertension, ischemic heart disease, heart failure; fevers and infections; diabetes mellitus; diseases of respiratory system: cystic fibrosis, asthma; rheumatic diseases: rheumatoid arthritis, osteoarthritis &amp; gout; inborn errors of metabolism: Phenylketonuria, Maple syrup urine disease, galactosemia, glycogen storage disease; renal diseases; burn; surgical conditions; bacterial overgrowth; infections; AIDS; food allergy; protein energy malnutrition; micronutrient deficiencies; Role of diet in various infections along with concepts of food synergy and immune-nutrition along with few examples from nutraceutical and functional foods.</p>
<b>Practical</b>	<p>Nutrition in surgical conditions: pre-operative and post-operative diets; Enteral and parenteral feeding; Hospital visits and nutrition camps. Concept of balanced diet, analysis of food constituents, preparation of diets for disease condition, enriched and fortified menu, identifying diseases by conducting public survey, strategy to address health based maladies. Planning of modified diet: consistent carbohydrate diet, moderate carbohydrate diet; Modified proteins diet: high protein diet, restricted protein diet; Modified fats diet: restricted fats diet; Modified micronutrients diet; Controlled sodium, potassium and phosphorus diet; Dietary management in various health disorders; Hospital visits and nutrition camps.</p>
<b>Books Recommended</b>	<ol style="list-style-type: none"> <li>1. Rolfes, Pinna and Whitney. 2012. Understanding normal and clinical nutrition, 9<sup>th</sup> ed. Thomson and Wadsworth Publishers, U.S.A.</li> <li>2. Whitney, E. and S.R. Roltes. 2005. Understanding nutrition, 10<sup>th</sup> ed. Thomson and Wadsworth Publishers, U.S.A.</li> <li>3. Whitney, E.N., C.B. Cataldo, L.K. DeBruyne and S.R. Rolfes. 2001. Nutrition for health and health care. Thomson and Wadsworth Publishers, U.S.A.</li> <li>4. Cataldo, C.B., L.K. DeBrouyne and E.N. Whitney. 2003. Nutrition and diet therapy, 6<sup>th</sup> ed. Thomson and Wadsworth Publishers, U.S.A.</li> <li>5. Frank, G.C. 2008. Community nutrition applying epidemiology to contemporary practice, 2<sup>nd</sup> Ed. Jones and Bartlett Publishers Sudbury, Massachusetts, U.S.A</li> <li>6. Singh, J. 2008. Handbook of nutrition and dietetics. Lotus Press, India.</li> </ol>

<b>Course Code</b>	HND-304
<b>Course Title</b>	Infant and Young Child Feeding
<b>Credit Hours</b>	3(2-1)
<b>Objectives</b>	<ul style="list-style-type: none"> <li>To identify problems affecting infant and young child feeding and provide a framework of essential interventions</li> <li>To create an environment that will enable mothers, families and other caregivers to implement optimal feeding practices</li> </ul>
<b>Theory</b>	<p>Infant young child feeding: introduction, global strategy, importance of breastfeeding, local and international scenario, breastfeeding working; Breastfeeding practices: assessing a breastfeed, taking a feeding history, common breastfeeding difficulties, expressed breast milk, breastfeeding frequency guide by age, Factors Influencing Breastfeeding Initiation and Duration, Breast Milk Jaundice Syndrome, Breastfeeding counselling: listening and learning, building confidence and giving support, counselling for infant feeding decisions, counselling cards tools; Complementary feeding practices: importance, cup-feeding and hygienic preparation of food, replacement feeding in the first 6 months, foods to fill energy and micronutrients gap, quantity and frequency of feeding, feeding techniques, food demonstration. Infant allergies/Food intolerance and allergy, Hypersensitivities, Controversies in breastfeeding, Malnutrition, Reducing the burden of acute and prolonged childhood diarrhoea, Maternal depression and infant development. Breastfeeding related topics: growth charts, maternal illnesses and breast feeding, breast conditions, health care practices, International code of marketing of breast milk substitutes, checking understanding and arranging follow-up, feeding during illness and low-birth-weight babies; Feeding guidelines of various global agencies - WHO etc.; Complex challenges to implementing the global strategy for infant and young child feeding.</p>
<b>Practical</b>	<p>Breastfeeding counselling; Preparation of indigenous complementary foods; Therapeutic foods; Infant formulas for various needs; Growth monitoring: APGAR (Appearance, Pulse rate, Grimace, Activity and Respiration) score, Growth charts. Nutritional assessment, Dietary assessment in children, Calculations of energy needs of infants, Management of watery diarrhoea/vomiting, Preparation of F-75 and F-100, Visits of hospitals and day care centers.</p>
<b>Books Recommended</b>	<ol style="list-style-type: none"> <li>Behan, E. 2008. The baby Food Bible - A Complete Guide to Feeding Your Child from Infancy On, 1st ed. Random House Publishing Group, New York, USA.</li> <li>Dykes, F. and V.H. Moran. 2009. Infant and Young Child Feeding: Challenges to Implementing a Global Strategy. Wiley-Blackwell, John</li> </ol>

	<p>Wiley &amp; Sons Ltd., Chichester, West Sussex, UK.</p> <p>3. Samour, P.Q. and K. King. 2010. Pediatric Nutrition, 4th ed. Jones &amp; Bartlett Learning, Mississauga, Canada.</p> <p>4. WHO. 2003. Global Strategy for Infant and Young Child Feeding. World Health Organization, Geneva, Switzerland.</p> <p>5. WHO/UNICEF/GOP (World Health Organization/ United Nation's Children Fund/Government of Pakistan). 2008. Infant and young child feeding counselling: an integrated course. Nutrition Wing, Ministry of Health, Government of the Pakistan, Islamabad.</p>
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<b>HND-306</b>	<b>Introductory Pharmacology and Pharmacognosy</b>	<b>3(2-1)</b>
<b>Course Code</b>	<b>HND-306</b>	
<b>Course Title</b>	<b>Introductory Pharmacology and Pharmacognosy</b>	
<b>Credit Hours</b>	<b>3(2-1)</b>	
<b>Theory</b>	<p>Historical development and scope of Pharmacology and Pharmacognosy. Terminology, pharmaceuticals used in the health care process, life-saving drugs, medicines used to treat various disorders and their mode of action. Classification of drugs and their sources, Drugs acting on autonomic nervous system (ANS), Drugs acting on gastrointestinal tract, Autacoids and their antagonists, Drugs acting on respiratory system, Drugs acting on cardiovascular system, Drugs acting on genitourinary system, and Anti-anaemic drugs. Routes of drugs administration: Advantages and disadvantages of Enteral Routes, Advantages and disadvantages of Parenteral Routes and Advantages and disadvantages of Topical Routes. An introduction of traditional systems (Unani, Ayurvedic and Homoeopathic systems of medicine) with special reference to medicinal plants. Introduction to herbal pharmacopoeia and modern concepts about Pharmacognosy. Preparation of crude drugs for commercial market. Chemical and Therapeutic classification of crude drugs (Official &amp; Un-official drugs). Methods of Cultivation, Drying, Storage, Preservation and Packing. Evaluation of crude drugs i.e. Organoleptic, Microscopic, Physical, Chemical and Biological. Deterioration and Adulteration of crude drugs. Types of adulteration, inferiority, admixture, sophistication and substitution of crude drugs. Clinical use of herbs &amp; herbal medicine against Diabetes, heart diseases, Hepatitis, Respiratory diseases, Skin diseases, CNS disorders, Musculo-skeletal disorders, Renal disorders, Reproductive disorders, and G.I.T. disorders.</p>	
<b>Practical</b>	<p>Introduction of the entire and broken parts of the plant drugs (Macro and organoleptic characters). Microscopic examination of powders and sections of plant drugs. Evaluation of crude drugs i.e.</p>	

	Organoleptic, Microscopic, Physical, Chemical and Biological. Deterioration and Adulteration of crude drugs. Types of adulteration, inferiority, spoilage, admixture, sophistication and substitution of crude drugs. A Study Tour will be an integral part of the syllabus and will be arranged at the end of the session for collection of medicinal plants from the country.
<b>Books Recommended</b>	<ol style="list-style-type: none"> <li>1. Braun L, Cohen M. Herbs and Natural Supplements: An Evidence Based Guide. 3rd Ed. London: Elsevier Mosby; 2010.</li> <li>2. Khandelwal K. Practical Pharmacognosy. 8th Ed. Nirali Prakashan Publishers; 2008.</li> <li>3. Ross IA. Medicinal Plants of the World. 2nd Ed. Humana Press; 2003.</li> <li>4. Lesley Braun and Marc Cohen. Herbs and Natural Supplements: An evidence Based guide. 3rd Ed. London: Elsevier Mosby; 2010.</li> <li>5. Lockwood B. Nutraceuticals: A Guide for Healthcare Professionals. 2<sup>nd</sup> Ed. Pharmaceutical Press; 2007.</li> </ol>

**HND-308 Drug-Nutrient Interactions 2(2-0)**

<b>Course Code</b>	<b>HND-308</b>
<b>Course Title</b>	<b>Drug-Nutrient Interaction</b>
<b>Credit Hours</b>	<b>2(2-0)</b>
<b>Theory</b>	Basic definitions and concepts, role of nutrition therapy in pharmacotherapy. Pharmacologic aspects of food and drug interactions; a brief revision of drug administration's routes. Drug mechanism e.g. pharmacodynamics; pharmacokinetics, absorption, distribution, metabolism, elimination. Factors that might alter the absorption and bioavailability of drugs. The effects of various drugs on action, metabolism and elimination of nutrients. Risk factors for drug-nutrient interaction: effects of food on drug therapy, drug absorption, drug distribution, drug metabolism and drug excretion; Effects of drugs on food and nutrition, nutrient absorption, metabolism and excretion; Effects of drugs on the nutritional status of patients e.g. taste, smell and type of intake; Gastrointestinal effects, appetite changes; Nutrient assessment of drug-nutrient interactions; Dietary counselling for the prevention of food drug interactions to aid client/patient with dietary side effects caused by nutrient-drug interactions.
<b>Books Recommended</b>	<ol style="list-style-type: none"> <li>1. Mahan, L. K. and Escott-Stump S. 2008. Krause's Food &amp; Nutrition Therapy, Elsevier Saunders.</li> <li>2. Nelms M., Sucher K. 2010. Nutrition Therapy and Pathophysiology, Cengage Learning.</li> <li>3. McCabe, J Beverly, Frankel, H Eric. 2003. Handbook of Food-Drug Interactions, CRC press.</li> </ol>

	4. Boullata, J.I. and V.T. Armenti. 2010. Handbook of Drug-Nutrient Interactions, 2nd ed. Humana Press, New York, USA
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<b>HND-310</b>	<b>Food and Drug Laws</b>	<b>2(2-0)</b>
<b>Course Code</b>	<b>HND-310</b>	
<b>Course Title</b>	<b>Food and Drug Laws</b>	
<b>Credit Hours</b>	<b>2(2-0)</b>	
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To get know how about the existing food and drug laws prevailing in the country</li> <li>• To understand duties and authorities of food safety officers and drug inspectors</li> <li>• To familiarize with food and drug laws enforcement agencies in Pakistan</li> </ul>	
<b>Theory</b>	<p>Punjab Pure Food Rules 2011: legal terms and definitions from the food industry; Rules for food additives, categories, permissible limits; Food packaging: rules, criteria for packaging material, labelling requirements; Duties and responsibilities of public analysts and food safety officer; The Drug Regulatory Authority of Pakistan Act, 2012; DRAP Alternative Medicines and Health Products Enlistment Rules 2014; Halal food dietary laws. Consumer protections laws in Pakistan; The Punjab Consumer Protection Rules 2009; The Punjab Consumer Protection Act 2005; The Pakistan Hotels and Restaurants Act, 1976; The Punjab Food Authority Act 2011; The Pakistan Halal Authority Act 2015; Pakistan National Accreditation Council; Punjab Halal Development Agency; Pakistan Standards and Quality Control Authority (PSQCA); Role of electronic and print media in public awareness and empowerment.</p>	
<b>Books Recommended</b>	<ol style="list-style-type: none"> <li>1. GOP. 2005. The Punjab Consumer Protection Act 2005. Government of the Punjab, Lahore, Pakistan.</li> <li>2. GOP. 2011. Punjab Pure Food Rules 2011. Health Department, Government of the Punjab, Lahore, Pakistan.</li> <li>3. GOP. 2012. Drug Regulatory Authority of Pakistan Act, 2012 The Drug Regulatory Authority of Pakistan, Government of the Pakistan, Islamabad.</li> <li>4. GOP. 2015. Pakistan Halal Authority Act, 2015. Minister for Science and Technology, Government of the Pakistan, Islamabad.</li> <li>5. Independent topics for readings.</li> </ol>	

<b>HND-312</b>	<b>Personal &amp; Professional development</b>	<b>2(2-0)</b>
<b>Course Code</b>	<b>HND-312</b>	



<b>Course Title</b>	<b>Personal &amp; Professional development</b>
<b>Credit Hours</b>	<b>2(2-0)</b>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• Develop an understanding of professional strength, weaknesses, values and interests,</li> <li>• Identify personal goals and aspirations for both personal &amp; professional growth</li> <li>• Enhance collaboration and teamwork abilities</li> <li>• Develop empathy and interpersonal skills for effective professional relationships</li> </ul>
<b>Theory</b>	Importance of goal setting and self assessment approach, understanding of personal traits by self personality assessment test, building self confidence, understanding effective communication traits and body language, active listening techniques, principles of effective leadership, decision making traits with leadership styles and approaches, exploring career options, job search strategies and interview skills, resume writing and cover letters, professional code of conduct, balancing personal and professional values, understanding conflict resolution, negotiation skills in professional settings, peer and mentor feedback, success models, attitudes, change management, psychology of achievement, character building, time management, critical thinking, global models of personal development, peak performance, dynamic learning skills, self discipline, anger and stress management.
<b>Books Recommended</b>	<ol style="list-style-type: none"> <li>1. The habits of highly effective people, Stephen Covey, 1989.</li> <li>2. The power of now- A guide to spiritual enlightenment, Eckhart Tolle, 1997</li> <li>3. The art of self improvement; Ten timeless truths, Anna Katharina Schaffner, 2021</li> </ol>

**7<sup>th</sup> Semester**

Sr. No.	Course Code	Title of Course	Credit Hours
1.	HND-401	Public Health Nutrition	3(3-0)
2.	HND-403.	Nutritional practices in clinical care	3(2-1)
3.	HND-405	Research methods and Professional writing	3(3-0)
4.	HND-407	Principles of Nutritional Immunology	3(3-0)
5.	HND-409	Sports Nutrition	3(2-1)
6.	HND-411	Experimental Cooking & Product development	3(1-2)
<b>Total Credit Hours</b>			<b>18</b>

**HND-401                      Public health nutrition                      3(3-0)**

<b>Course Code</b>	<b>HND-401</b>
<b>Course Title</b>	<b>Public health nutrition</b>
<b>Credit Hours</b>	<b>3(3-0)</b>
<b>Theor</b>	History of medicine and birth of public health concept; Changing and foundations of public health nutrition, The importance of public health nutrition programs in preventing disease and promoting adult health; Professional conduct in Nutrition, Nutritional problems of public health, (global and local), low birth weight, Protein energy malnutrition, Xerophthalmia, Nutritional anemia; Iodine deficiency disorders, Beriberi and thiamine deficiency; Pellagra; Rickets and osteomalacia; Scurvy; Zinc deficiency; Dental caries and fluorosis; Nutritional neuropathies; Riboflavin deficiency; vitamin B6 deficiency; Minor nutritional disorders and clinical signs. Nutritional factors in selected diseases- Cardiovascular diseases, diabetes mellitus, obesity, cancer, hypertension, and liver diseases, Disease pattern in community and Social diversity, Health and productivity schemes: development of standards of health and productivity, surveillance and monitoring of disease; Food consumption, nutrient intake and the use of food composition tables: food consumption tables and nutrient databases, applying concept of health and disease emergency conditions; Concepts of control-disease control, disease elimination, disease eradication, monitoring and surveillance; concept of association and causation, food sources and sustainability, systems and applying concept of health and disease; Levels of prevention, modes of intervention; Disease pattern in community and Social diversity; Health and productivity schemes: development of standards of health and productivity, surveillance and monitoring of disease; importance of public health nutrition programs in preventing disease and promoting adult health;

<b>Books Recommended</b>	<p>1. Michael J. G., Barrie M. M., John N. K. and Lenore A. 2004. Public Health Nutrition. Wiley Blackwell</p> <p>2. Sari E. 2011. Nutrition in Public Health, A Handbook for Developing Programs and Services. 3rd edition. Jones and Bartlett Learning International, London, UK.</p> <p>3. Mark L. and Worsley T. (Editors). Public Health Nutrition, From Principles to Practice. Allen &amp; Unwin Book Publishers, Australia</p>
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<b>HND-403</b>	<b>Nutritional practices in clinical care</b>	<b>3(2-1)</b>
<b>Course Code</b>	<b>HND-403</b>	
<b>Course Title</b>	<b>Nutritional practices in clinical care</b>	
<b>Credit Hours</b>	<b>3(2-1)</b>	
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To understand and create a patient-centred nutrition care plan based on sound nutrition principles, scientific evidence and biomedical reasoning</li> <li>• To assess various physiological conditions and prepare diet plans accordingly</li> <li>• To acquaint hands-on training in the field of enteral and parenteral nutrition</li> </ul>	
<b>Theory</b>	<p>Importance of clinical care nutrition support; Nutritional screening and assessment; The therapeutic process, stress of the therapeutic encounter, focus of care, phases of the care process; Quality patient care and collaborative roles of nutritionists and nurses; Modified diets for various physiological needs; Enteral nutritional: composition, nutritional prescription (dose), strategies to optimize delivery and minimize risks, pediatric enteral feeding; Total parenteral nutrition; composition, intravenous nutritional prescription (dose) for specific conditions; Percutaneous endoscopic gastrostomy and radiologically inserted gastrostomy; Complications in enteral and parenteral nutrition; Patients needing special care e.g. surgery, burn patients focussing on their nutritional and recovery requirements. Nutritional therapy in diseases of infancy and childhood; Drug-nutrient interactions: drug effects on food and nutrients, food effects on drug absorption, food effects on drug; Dietary supplements.</p>	
<b>Practical</b>	<p>Nutritional assessment of patients: selection, nutritional requirements; Tube feeding: types, feeding equipment, preparation and application of enteral/naso-gastric diets, monitoring the tube-fed patient; Total parenteral nutrition: basic rules, techniques, prescription, preparation of total parenteral solution; Preparation of pre- and post-operative diets; Case studies and logbooks; Hospital visits.</p>	

<b>Books Recommended</b>	<ol style="list-style-type: none"> <li>1. Block, A.S., J. Maillet, W.H. Howell and M.F. Winkler. 2007. Issues and Choices in Clinical Nutrition Practice. Lippincott Williams &amp; Wilkins, Philadelphia, PA, USA.</li> <li>2. Katsilambros, N., C. Dimosthenopoulos, M.D. Kontogianni, E. Manglara and K.A. Poulia. 2010. Clinical Nutrition in Practice, 1st ed. Wiley-Blackwell, John Wiley &amp; Sons Ltd., Chichester, West Sussex, UK.</li> <li>3. Katz, D.L. 2008. Nutrition in Clinical Practice, 2nd ed. Lippincott Williams &amp; Wilkins, Philadelphia, PA, USA.</li> <li>4. Rolandelli, R.H., R. Bankhead, J. I. Boullate and C.W. Compher. 2005. Clinical Nutrition; Enteral and Tube Feeding. 4th ed. Elsevier Saunders Publishers, USA.</li> <li>5. Rolfes, S.R., K. Pinna and E. Whitney. 2015. Understanding Normal and Clinical Nutrition, 10th ed. Thomson and Wadsworth Publishers, USA.</li> </ol>
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<b>HND-405</b>	<b>Research methods and Professional writing</b>	<b>3(3-0)</b>
<b>Course Code</b>	<b>HND-405</b>	
<b>Course Title</b>	<b>Research methods and Professional writing</b>	
<b>Credit Hours</b>	<b>3(3-0)</b>	
<b>Theory</b>	<p>Research methods in nutrition: Introduction, objectives, types of research: basic and applied, quantitative and qualitative, clinical and diagnostic; Types of sampling: probability and non-probability; Collection of literature: printed and electronic sources, managing literature; Research designs: observational studies, cross-sectional, case-control, cohort (prospective, retrospective, time-series); Experimental studies: observational studies, clinical studies. Experimental data analysis: incidence/ prevalence rate; Research ethics. Methods of data collection; Work ethics, work behaviours I &amp; II, Writing professional and scientific documents: synopsis, research proposal, articles, references, internship report. Article writing. Blogs writing. Content writing (Web, SEO), Technical manuals. Training manuals. Broachers. Medical articles. Scientific articles. Bulletin. Feasibility reports. Research. Types of scientific presentations. Collection of literature: printed and electronic sources. Managing literature. Initiating write up. Writing scientific documents: synopsis, research proposal, articles, references, internship report. Oral presentations. Responsibility, Winning, Attitude. Problem solving and decision making. Workplace motivation, Analytical Thinking. Leadership, Interpersonal Skills. Conflict Management. Stress Management. Managerial Skills. HRM, Do More than expected, Interview skills.</p>	

<b>Books Recommended</b>	<ol style="list-style-type: none"> <li>1. Awan, J.A. 2015. Scientific Presentations. Unitech Communications, Faisalabad, Pakistan.</li> <li>2. Lovegrove, J.A., L. Hodson, S. Sharma and S.A. Lanham-New. 2015. Nutrition Research Methodologies. Wiley-Blackwell, John Wiley &amp; Sons Ltd., Chichester, West Sussex, UK.</li> <li>3. Lowe, M. 2007. Beginning Research: A Guide for Foundation Degree Students, 1st ed. Routedge Publications, New York, USA.</li> <li>4. Starks, T.P. 2006. Trends in Nutrition Research. Nova Science Publishers, Inc., New York, USA.</li> <li>5. Walliman, N. 2005. Your Research Project, A Step by Step Guide for The First-time Researcher, 2nd ed. Sage Publications, Thousand Oaks, CA, USA.</li> </ol> <p>Brain Tracy. Psychology of learning.</p> <ul style="list-style-type: none"> <li>• Brain Tracy. Accelerated learning.</li> <li>• Zig Zigler. Attitude is everything.</li> <li>• Shive Khera. You can win.</li> <li>• Larry Winget. Stop whining start living.</li> <li>• Dr. W. Green. Getting Straight As.</li> <li>• Dr. Stephen R. Covey. Highly effective habits.</li> <li>• Jim Rohn. Cultivating Unshakable character.</li> <li>• Dr. Stephen R. Covey. Principle cantered leadership.</li> <li>• Study Skills by Riachard Yorkey.</li> <li>• Psychology of Achievement. Dr. Dennis Wetley.</li> <li>• Winners. Jack Welch</li> </ul>
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<b>HND-407</b>	<b>Principles of Nutritional Immunology</b>	<b>3(3-0)</b>
<b>Course Code</b>	<b>HND-407</b>	
<b>Course Title</b>	<b>Principles of Nutritional Immunology</b>	
<b>Credit Hours</b>	<b>3(3-0)</b>	
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To discuss the immune systems and role of innate immune mechanism</li> <li>• To discuss the functionality of the immune system during infections</li> <li>• To provide hands on training on laboratory techniques in the domain of immunology</li> <li>• To study of aetiology, epidemiology, pathogenesis, immunology of diseases</li> </ul>	
<b>Theory</b>	<p>Cells and organs of the immune system, their differentiation and how they function to provide innate and adaptive immunity. Antigen presentation; antibody structure and function; generation of diversity; complement; T cell subsets; cell trafficking; cytokines and signalling are covered in detail. Evolution and comparative immunology are discussed later in the course. Immune system</p>	

	functions to protect from infection and maintain the health of the individual, immune dysfunction, loss of tolerance and autoimmunity. Natural reaction-non-specific defence mechanism. Basic theoretical aspects of immune response. Control of microorganisms by physical and chemical agents. Antimicrobial and other chemotherapeutics. Chemotherapeutic agents and antibiotics, modes of action of antibiotics on microorganisms, antibiotic resistance;
<b>Practical</b>	Demonstration of various serological tests. Preparation of antigen. Raising of hyper immune sera. Demonstration of Hypersensitivity test.
<b>Books Recommended</b>	<ol style="list-style-type: none"> <li>1. Immunology introductory textbook, revised second edition, Nandni Shetty, University College London Hospitals, London, UK</li> <li>2. Kuby Immunology by Thomas J. Kindt, Richard A. Goldsby, Barbara A.</li> </ol>

<b>HND-409</b>	<b>Sports Nutrition</b>	<b>3(2-1)</b>
<b>Course Code</b>	<b>HND-409</b>	
<b>Course Title</b>	<b>Sports Nutrition</b>	
<b>Credit Hours</b>	<b>3(2-1)</b>	
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To emphasize the importance of proper fuelling for physical activity, pre- and post-workout</li> <li>• To provide an overview about dietary supplements, how they are regulated and how to avoid use of contaminated dietary supplements</li> <li>• To highlight the risks associated with performance enhancing drugs including anabolic androgenic steroids</li> </ul>	
<b>Theory</b>	<p>The principles of fitness, motivation and conditioning; Nutrition for the athletes, stress management, preventing accidents, stretching, posture and aerobics; Vitamins and minerals supplementation for fitness; High and low intensity exercise, cross training, walking for weight control and case studies; Introduction to muscle contraction, fast and slow fibres, energy storage, fuels used for exercise; Energy balance, fluid balance, fuelling cycle: Pre-exercise, during exercise and during recovery; Athletes eating plan, calorie goals, calorie values, carbohydrate goals, protein goals, fat, vitamins and mineral goals; Competition nutrition; Loosing, gaining and making weight for athletes; Eating disorder and athletes; Sports drink and supplementation; National and international regulations for supplements; Risks associated with performance enhancing drugs; Metabolic Equivalent Task; My pyramid for sportsman. Application</p>	

	of biomechanics techniques in Sport Nutrition, need based muscles building, nutrition for ageing athlete, special needs; athlete with diabetes
<b>Practical</b>	Bioelectric impedance analysis; Sweat rate and hydration status calculation; Calculation of BMR and RMR; Diet planning for different sportsmen like body builders, athletes, swimmers, etc. Preparation of sports drinks and food products according to accelerated needs; Use of sports supplements. Visit of sports centers and fitness clubs.
<b>Books Recommended</b>	<ol style="list-style-type: none"> <li>1. Antonio, J., D. Kalman, J.R. Stout, M. Greenwood, D.S. Willoughby and G.G. Haff. 2008. Essentials of Sports Nutrition and Supplements. Humana Press, New York, USA.</li> <li>2. Driskell, J.A. 2007. Sports Nutrition Fats and Proteins. CRC Press, Taylor and Francis Group, Boca Raton, FL, USA.</li> <li>3. Fink, H.H., A.E. Mikesky and L.A. Burgoon 2011. Practical Applications in Sports Nutrition, 3rd ed. Jones &amp; Bartlett Learning Burlington, MA, USA.</li> <li>4. Lanham-New, S.A., S.J. Stear, S.M. Shirreffs and A.L. Collins. 2011. Sports and Exercise Nutrition. Wiley-Blackwell, John Wiley &amp; Sons Ltd., Chichester, West Sussex, UK.</li> <li>5. Maughan, R.J. 2000. Nutrition in Sport: The Encyclopedia of Sports Medicine. Wiley-Blackwell, John Wiley &amp; Sons Ltd., Chichester, West Sussex, UK.</li> </ol>

<b>HND-411</b>	<b>Experimental cooking &amp; Product development</b>	<b>3(2-1)</b>
<b>Course Code</b>	<b>HND-411</b>	
<b>Course Title</b>	<b>Experimental cooking &amp; Product development</b>	
<b>Credit Hours</b>	<b>3(2-1)</b>	
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• Aim to equip students with the knowledge and skills needed to explore innovative culinary techniques</li> <li>• To develop unique food products through planned experimentation in kitchen</li> </ul>	
<b>Theory</b>	<p>Concept of experimental cooking, chemical reactions in cooking, role of pH in culinary creations, exploring neglected conventional ingredients with some therapeutic applications, role of experimental foods in culinary art, identification of key ingredients and tools, the art of recipe documentation, scaling recipes for formulation, developing palate for innovation, sensory analysis and profiling, familiarity with advanced cooking methods, exploring the role of pH, temperature, cooking time, and different cooking methods on taste, flavor, color and texture of food, Milk cookery, Starch cookery, Sugar cookery &amp; crytallization, vegetabes &amp; fruits, egg cookery, hygienic practices in culinary innovation, labelling requirement for food products, developing a business</p>	

	plan, minimizing food waste in experimental kitchen,
<b>Practical</b>	Practice of subjective & objective methods of food evaluation, effect of time & temperature on food products, different food preparation methods, tenderizers, fats & oils, organoleptic evaluation of innovative food products,
<b>Books Recommended</b>	<ol style="list-style-type: none"> <li>1. Experimental food science, 3rd edition., Marjorie P. Penfield Ada Marie Campbell., 2012</li> <li>2. Experimental Foods: laboratory manual., Margaret McWilliams., 2016.</li> <li>3. Food futures: Experimental Food design., Gemm Warriner, Kate Sweetapple., 2020.</li> </ol>



**8<sup>th</sup> Semester**

<b>Sr. No.</b>	<b>Course Code</b>	<b>Title of Course</b>	<b>Credit Hours</b>
1.	HND-402	Project Management	3(0-3)
2.	HND-404	Internship + Project Report Writing	6(0-6)
3.	HND-406	Public Health & International Health policies	3(3-0)
4.	HND-408	Food issues and consumer behaviour	2(2-0)
5.	HND-410	Food service management	3(1-2)

**HND-402                      Internship/Research Project & Report Writing                      6(0-6)**

<b>Course Code</b>	<b>HND-402</b>
<b>Course Title</b>	<b>Internship/Research Project &amp; Report Writing</b>
<b>Credit Hours</b>	<b>6(0-6)</b>
<b>Practical</b>	Every student will undertake practical training in an approved food industry or research organization. The student will maintain a daily diary duly signed by the industrial/research supervisor. At the end of the internship, the student will submit a written report. He/she will be evaluated by a committee on the basis of his/her performance in the industry/research organization, final written report and oral presentation.
<b>Management</b>	The one group of internee will be supervised by one faculty member who will act as Internal Supervisor/Examiner and will be responsible for the performance of the internee in consultation with Internship Supervisor/Examiner (industries, hospitals, etc.). The marks distribution will be based on practical performance (assessment by External Examiner), report, and viva voce.

**HND-404                      Public Nutrition & internatioanl health policies                      3(3-0)**

<b>Course Code</b>	<b>HND-404</b>
<b>Course Title</b>	<b>Public Nutrition &amp; internatioanl health policies</b>
<b>Credit Hours</b>	<b>3(3-0)</b>
<b>Objective</b>	<ul style="list-style-type: none"> <li>• To familiarize with global &amp; local nutrition policies and programs in domain of public health nutrition</li> <li>• To promote appropriate diets &amp; healthy lifestyles and monitr nutrition situations</li> <li>• To prevent &amp; control specific micronutrient deficiencies through diet based approaches among vulnerable</li> </ul>

<b>Theory</b>	History & importance of nutrition intervention planning, evolution of international health policies, global health challenges & priorities, world declaration on nutrition, nutrition development partners, policy guidelines, community nutrition programs, national & international policies, role of WHO, UNICEF, WFP & global nutrition initiatives & partnerships, role of NGOs in nutrition assistance, addressing malnutrition in conflict zones, supplementary feeding programs, food fortification & diversification, school nutrition program, interventions & impacts, improving household food security, protecting consumers through improved food quality & safety, preventing and managing infectious diseases, promoting breast feeding, socioeconomically deprived and vulnerable population care plan, five years plan for nutritional improvement, SUN movement, one health concept, tawana program, trade policy and impact on food supply, accountability in nutrition policy implementation, global partnership for SDG achievement and targets
<b>Books</b>	<ol style="list-style-type: none"> <li>1. Global nutrition report 2016: from promise to impact., International Food policy research institute., 2016</li> <li>2. Global Food systems, diet and Nutrition., Jessica Fanzo Davis., 2021</li> <li>3. Global Nutrition policy review 2016-17., country progress., 2021</li> </ol>

<b>HND-408</b>	<b>Food issues &amp; consumer behaviour</b>	<b>2(2-0)</b>
<b>Course Code</b>	<b>HND-408</b>	
<b>Course Title</b>	<b>Food issues &amp; consumer behaviour</b>	
<b>Credit Hours</b>	<b>2(2-0)</b>	
<b>Objective</b>	<ul style="list-style-type: none"> <li>• To acquire knowledge about global food issues and nutrition security</li> <li>• To study impact of climatic change and other threats on food bioavailability</li> </ul>	
<b>Theory</b>	Millennium development goals to SDGs, world food situation & security challenges, impact of climatic change on food production, farm to fork; food supply chain dynamics, addressing food waste on global scale, global malnutrition patterns, NCDs prevalence trends and role of diet, food commodities & global market, role of multinational corporations in food trade, sustainable agriculture practices, psychological factors influencing food choices, influence of advertising on consumer behaviours, Food biotechnology and consumer perceptions, westernizations of diets, addressing global hunger challenges, role of NGOs in combating food insecurity, community based solutions to hunger, religion & cultural preferences for diet	

	selection, food policies and governance structures, global surveillance and food borne diseases, media literacy in evaluating nutrition information, digital health platform and consumer education, Cdex alimentarious and global food standards, worldwide food price fluctuations, consumption of per capita purchase power,
<b>Books</b>	<ol style="list-style-type: none"> <li>1. The global food crisis; governance challenges &amp; oppurtunities, Jennifer Clapp, Marc. J. Cohen, 2009</li> <li>2. The coming famine: The global food crisis and what we can do., Julin Cribb., 2010</li> <li>3. Global food insecurity,. Mohamed Behnassi., Sidney Draggan, Sanni Yaya., 2011.</li> </ol>

**HND-410                      Food service management                      3 (1-2)**

<b>Course Code</b>	<b>HND-410</b>
<b>Course Title</b>	<b>Food service Management</b>
<b>Credit Hours</b>	<b>3(1-2)</b>
<b>Objective</b>	<ul style="list-style-type: none"> <li>• To describe key milestones of food service industry</li> <li>• To relate current trends in food service operations &amp; evolution through business life cycle</li> <li>• To understand planning considerations vital for creating successful food service operation</li> </ul>
<b>Theory</b>	Introduction of food services, its management, compilation of management practices, current trends & innovations in food service, tools & techniques, essential approaches, food service industry, history, types of food service establishments, kitchen lyout and design, sustainable practicesin kitchen operations, segmentation and managerial impliations, menu planning and development, recipe standardization, food supply chain management, recruitment and staffing in food service, employee training and development, budgeting for food service operations, distribution channels, suppliers, equipment selection, forecasting storage management, product inventory management, Food allergen management, human resource management, customer services, eco friendly packing solutions, food safety, HACCP, GMP, crisis planning and preparedness, handling food borne illness outbreaks, plant based alternative protein offerings, international food service trends, cross cultural considerations in food management,

<b>Books</b>	<ol style="list-style-type: none"><li>1. Barron, C.W., T. Power &amp; D.R. Reynolds. 2012. Introduction to management in hospitality industry, 10th edition. John Wiley Sons Inc., Hoboken, New Jersey, USA.</li><li>2. Food service management: principles &amp; practices. June Payne-Palacio, Monica Theis, 2012</li><li>3. Food services management, principles and practices. Pearson Paperback. 2016.</li></ol>
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