Revised as per HEC New UEP 2023

SHAHEED BENAZIR BHUTTO WOMEN UNIVERSITY
PESHAWAR

APPROVED CURRICULUM
HUMAN NUTRITION AND DIETETICS
DEPARTMENT OF FOOD AND NUTRITION

SHAHEED BENAZIR BHUTTO WOMEN UNIVERSITY PESHAWAR

2nd MEETING OF BOARD OF STUDIES, 19th MEETING OF ACADEMIC COUNCIL. 49TH MEETING OF SYNDICATE. DEPARTMENT OF FOOD AND NUTRITION

SHAHEED BENAZIR BHUTTO WOMEN UNIVERSITY PESHAWAR

DEPARTMENT OF FOOD AND NUTRITION

Department Curriculum Committee

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2._____ (Dr. Rehana Masood, (Assistant Professor, Biochemistry)
3._____ (Dr. Aiman Umar, Assistant Professor)

Curriculum Revamp Committee

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Dr. Farhat Amin. Associate Professor
Department of Bioinformatics, SBBWU
(Convener)

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Dr. Samra Kiran (Member)
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Affiliation and Monitoring, SBBWU

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Controller of Examinations, SBBWU

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Dean Faculty of Sciences & Social Science,
SBBWU

SHAHEED BENAZIR BHUTTO WOMEN UNIVERSITY PESHAWAR

DEPARTMENT OF FOOD AND NUTRITION

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Introduction to Department of Food and Nutrition

The first ever department of its kind for women in Khyber Pakhtunkhwa offering full ledged program, competent to explore the field of Food and Nutrition widening their scope in areas of Food Industry, Nutritionist, Diet Therapist, Aerobic consultant, Food specialists, child-care experts and much more. Being an all women university, the main focus is on producing well-groomed, research-oriented skilled females in the field of nutrition, child and health care. The Undergraduate program of Food and Nutrition at the University is committed to the professional and personal growth of undergraduate students through the development of new scientific knowledge, critical thinking, problem–solving strategies, active learning, self-realization and participation in research discoveries. It is our mission to create a stimulating and personal growth that environment for our students. We strive to provide ample opportunities for professional and personal growth that will allow our graduates to excel in future endeavor, such as industrial work in food and nutrition.

Vision and Mission Statement of Department

Vision

To educate students and train them in research to meet local and national challenges through discovery of the ways in which foods and their components contribute to human health and the prevention of diseases through effective application of nutrition knowledge.

Mission statement of the Department

To provide quality education and learning experience for female students and to mold them into competent professionals in the field of Food sciences and Human nutrition.

To ensure a safe, healthy, and appealing food supply that supports the well-being and prosperity of people and the environment providing a comprehensive knowledge to improve human health via nutritional factors.

SHAHEED BENAZIR BHUTTO WOMEN UNIVERSITY PESHAWAR

BS 4 YEAR PROGRAM WITH MAJOR HUMAN NUTRITION & DIETETICS AS PER HEC New UEP 2023

STRUCTURE

Sr.	Categories	Credit Hours Min – Max
1.	General Education (Gen Edu) Requirements: Mandatory Courses of General Education.	30 – 30
2.	Major (Disciplinary) Requirements: Area of Study in Which the Degree is offered	*72 ≥
3.	Interdisciplinary/Allied Requirements (To Support Horizon of the Major)	**12 ≥
4.	Field Experience/Internship (Practical Work Experience related to a Student's Field of Study or Career interest)	03 – 03
5.	Capstone Project or Capstone Research Project	03 – 06
	Total	**120 – 144**

***The Credit Hours for the courses of Major Disciplines may vary but not less than 72 Credit Hours.**
****The Credit Hours for Interdisciplinary/Allied Courses may vary but not less than 12 Credit Hours.**

- Total number of Credit hours 134
- Duration 4 years
- Semester duration 16-18 weeks
- Semesters 8
- Course Load per Semester 15-18 Cr hr
- Number of courses per semester 4-6 (not more than 3 lab / practical courses)

SHAHEED BENAZIR BHUTTO WOMEN UNIVERSITY PESHAWAR

SCHEME OF STUDIES OF BS 4 YEAR PROGRAM WITH MAJOR HUMAN NUTRITION & DIETETICS

(SESSION 2023 & Onwards)

Semester	Category	Course Codes	Course Title	Lectures	Lab	Cr.Hrs
Semester 1	Art & Humanities	AH-301	Basics of Art	2	0	2
	Ideology and Constitution of Pakistan	PST-313	Ideology and Constitution of Pakistan	2	0	2
	Interdisciplinary/Allied	BCHM-302	Introductory Biochemistry	2	1	3
	Functional English	ENG-303	Functional English	3	0	3
	Major I	HND-311	Fundamentals of Human Nutrition	2	1	3
	Major II	FST-312	Essentials of Food science & Technology	2	1	3
			Total	**13**	**3**	**16**
Semester 2	Social Sciences	MS-307	Essential of management	2	0	2
	Expository Writing	ENG-304	Expository Writing	3	0	3
	Interdisciplinary/Allied	MB-301	Introduction to Microbiology	3	1	4
	Islamic Studies/Religious Education/Ethics	ISL-301	Islamic Studies/Religious Education/Ethics	2	0	2
	Major III	HND-313	Macronutrients in Human Nutrition	3	0	3
	Major IV	HND-314	Fundamentals of Human Physiology	2	1	3
			Total	**15**	**2**	**17**
Semester	**Category**	**Course Codes**	**Course Title**	**Lectures**	**Lab**	**Cr.Hrs**
Semester 3	Quantitative Reasoning (QR I)	MTH-401	Quantitative Reasoning QR I	3	**0**	**3**
	Application of Information and Communication Technologies.	CSC-308	Application of Information and Communication Technologies	2	1	3
	Natural Science	BIT- 414	Climate Change and Human Health	3	0	3
	Entrepreneurship	MS-309	Introduction to	2	0	2

			Entrepreneurship			
	Major V	HND-412	Advanced Human Physiology	2	1	3
	Major VI*	HND-415	Human Anatomy	2	1	3
			Total	**14**	**3**	**17**
Semester	**Category**	**Course Codes**	**Course Title**	**Lectures**	**Lab**	**Cr.Hrs**
Semester 4	Civic and Community Engagement	PSC-418	Civic and Community Engagement	2	**0**	**2**
	Quantitative Reasoning (QR II)	MTH-402	Quantitative Reasoning QR II	3	**0**	**3**
	Major VII	HND-411	Micronutrients in Human nutrition	3	0	3
	Major VIII	HND-416	Assessment of Nutritional status	2	1	3
	Major IX	HND-417	Nutrition through the life Cycle	3	0	3
	Major X	HND-418	General Pathology	2	1	3
			Total	**15**	**2**	**17**
Semester	**Category**	**Course Codes**	**Course Title**	**Lectures**	**Lab**	**Cr.Hrs**
Semester 5	Interdisciplinary/Allied Course	BCHM-513	Clinical Biochemistry	2	1	3
	Interdisciplinary/Allied Course	STAT-401	Biostatistics	3	0	3
	Major XI	HND-511	Fundamental of dietetics	2	1	3
	Major XII	HND-512	Nutrition and Psychology	3	0	3
	Major XIII	FST-414	Food safety and Quality management	3	0	3
	Major XIV	HND-521	Sports Nutrition	2	1	3
			Total	**15**	**3**	**18**
Semester	**Category**	**Course Codes**	**Course Title**	**Lectures**	**Lab**	**Cr.Hrs**
Semester 6	Major XV	FST-419	Food Analysis	1	2	3
	Major XVI	HND-516	Food and Drugs Law	2	0	2
	Major XVII	HND-517	Advanced Dietetics	2	1	3
	Major XVIII	HND-518	Functional foods and Nutraceuticals	3	0	3
	Major XIX	HND-519	Nutrition through social protection	2	0	2
	Major XX	FST-522	Infants and Young child feeding	3	0	3
			Total	**13**	**3**	**16**
Semester	**Category**	**Course Codes**	**Course Title**	**Lectures**	**Lab**	**Cr.Hrs**
Semester 7	Internship (Mandatory)	HND-698	Internship (Mandatory)	3	0	3
	Major XXI	HND-611	Dietetics in managing diseases	2	1	3
	Major XXII	HND-613	Research Methods in Nutrition	3	0	3
	Major XXIII	HND-629	Metabolism of Nutrients	3	0	3

	Major XXIV (Elective I)	HND-625	Nutrition in Emergencies	3	0	3
	Capstone Research Project OR Capstone Project + Optional Course	HND-699/	Capstone Research Project (Mandatory) or	3		3
			Optional Course for those who opted for Capstone Project	3 (optional course)		
				17	**1**	**18**
Semester	**Category**	**Course Codes**	**Course Title**	**Lectures**	**Lab**	**Cr.Hrs**
Semester 8	Major XXV (Elective II)	FST-623	Food Chemistry (Elective II)	3	0	3
	Major XXVI	HND-614	Nutritional practices in clinical care	2	1	3
	Major XXVII	HND-616	Food Service management	3	0	3
	Major XXVIII	FST-413	Food Microbiology	2	1	3
	Capstone Research Project OR Capstone Project + Optional Course	HND-699	Capstone Research Project	3	0	3
		HND-XXX	Optional Course for those who opted for Capstone Project	3 (optional course)		
			Total	**13**	**2**	**15**

*An optional subject for the students who opt only capstone project and having a CGPA less than 3 will select an optional subject from the list below.

Total credit hours: 134

Optional subject list

HND-621	Nutritional Immunology	3(3+0)
HND-622	Drug-Nutrient Interactions	3(3+0)
HND-624	Preventive Nutrition	3(3+0)
HND-625	Nutrition in Emergencies	3(3+0)
HND-626	Food Toxins & Allergens	3(3+0)
HND-627	Nutritional Deficiency Disorders	3(3+0)
HND-628	Food Supplements	3(3+0)
HND-629	Metabolism of Nutrients	3(3+0)
HND-630	Human Health and Climate Crisis	3(3+0)
HND-631	Nutrition Epidemiology	3(3+0)

HND-632	Plants based diet and nutrition	3(3+0)
FST-623	Food Chemistry	3(3+0)

SHAHEED BENAZIR BHUTTO WOMEN UNIVERSITY PESHAWAR

SCHEME OF STUDIES OF 1ST YEAR– BS 4 YEAR PROGRAM WITH MAJOR HUMAN NUTRITION & DIETETICS

SEMESTER – I

Course Title: Basics of Art	**Course Code: AD- 305**
Course Structure: Lectures: 1, Labs: 1	**Credit Hours:** 2(1,1)
Prerequisites: None	
Course Objective: • It is a manual course where art material techniques and its application and its forms will be taught This knowledge is imperative for an art and design student to gain technical know-howfor working in various art medium. • Students will further recognize and evaluate basic elements of design and Principal of design.Famous artists will be taught to the students for better visualization of paintings and art work.	
Course Outline: Introduction to Elements of Art, Line, Shape & Volume and Form types and itsuses, Value and Color, Space & Texture, Principles of Art, Balance & Contrast, Emphasis & Movement, Pattern & Rhythm, Unity/Variety, Mediums and Artists, Graphit Pencil, Charcoal , Pastels, Watercolors ,Oil Painting ,Acrylics, Pen and Ink.	
Recommended Books: Essential Textbook for Students of Art in Pakistan By Marjorie Husain ts of Art and Principles of Design. by Consultant: Gerald F. Brommer Art Is Fundamental: Teaching the Elements and Principles of Art in Elementary School by Eileen S. Prince	

Course Title: Ideology and Constitution of Pakistan	**Course Code: PST-313**
Course Structure: Lectures: 2	**Credit Hours: 2**

Prerequisites:

Course Objective: This course is designed to provide students with a fundamental exploration of the ideology and the constitution of Pakistan. The course focuses on the underlying principles, beliefs, and aspirations that have been instrumental in shaping the creation and development of Pakistan. Moreover, the course will enable students to understand the core provisions of the Constitution of the Islamic Republic of Pakistan concerning the fundamental rights and responsibilities of Pakistani citizens to enable them to function in a socially responsible manner.

Course Outline: 1. Introduction to the Ideology of Pakistan: Definition and significance of ideology. Historical context of the creation of Pakistan (with emphasis on socio-political religious, and cultural dynamics of British India between 1857 till 1947). Contributions of founding fathers of Pakistan in the freedom movement including but not limited to Allama Muhammad Iqbal, Muhammad Ali Jinnah etc.
Contributions of women and students in the freedom movement for separate homeland for Muslims ofBritish India. **2. Two-Nation Theory:** Evolution of the Two-Nation Theory (Urdu-Hindi controversy, Partition of Bengal Simla Deputation 1906, Allama lqbal's Presidential Address 1930, Congress Ministries 1937, Lahore Resolution 1940). Role of communalism and religious differences. **3. Introduction to the Constitution of Pakistan**. Definition and importance of a constitution. ldeological factors that shaped the Constitution(s) of Pakistan (Objectives Resolution 1949). Overview of constitutional developments in Pakistan. **4. Constitution and State Structure:** Structure of Government (executive, legislature, and judiciary). Distribution of powers between federal and provincial governments. 18th Amendment and its impact on federalism.**5. Fundamental Rights, Principles of Policy and Responsibilities:** Overview of fundamental rights guaranteed to citizens by the Constitution of Pakistan 1973 (Articles 8-28). Overview of Principles of Policy (Articles29-40). Responsibilities of the Pakistani citizens (Article 5). **6. Constitutional Amendments:** Procedures for amending the Constitution. Notable constitutional amendments and their implications.

Course Outcomes: By the end of this course, students will be able to:
1. Demonstrate enhanced knowledge of the basis of the ideology of Pakistan with special reference tothe contributions of the founding fathers of Pakistan.
2. Demonstrate fundamental knowledge about the Constitution of Pakistan 1973 and its evolution withspecial reference to state structure.
Explain about the guiding principles on rights and responsibilities of Pakistani citizens asenshrined in the Constitution of Pakistan 1973.

Recommended Books: Latest Edition of the Following Books.

1. "The ldea of Pakistan" by Stephen P. Cohen.
2. "ldeology of Pakistan" by Javed lqbal.
3. “The Struggle for Pakistan”by l.H. Qureshi.
4. "Pakistan the Fornmative Phase"by Khalid Bin Sayeed.
5. "Pakistan:Political Rots and Development"’ by Safdar Mahmood.
6. "ldeology of Pakistan' by Sharif-ul-Mujahid.
7. "The Struggle for Pakistan:A Muslim Homeland and Global Politics" by Ayesha Jalal.

8. "Jinnah, Pakistan and Islamic Identity: The Search for Saladin" by Akbar S. Ahmed.
9. "The Making of Pakistan: A Study in Nationalism" by K.K. Aziz.
10. "Pakistan: A New History" by lan Talbot.
11. "Pakistan in the Twentieth Century: A Political History" by Lawrence Ziring.
12. "The Constitution of Pakistan 1973".Original.
13. "Constitutional and Political Development of Pakistan"by Hamid Khan.
14. "The Parliament of Pakistan" by Mahboob Hussain.
15. "Constitutional Development in Pakistan" by G.W.Choudhury.

"Constitution-Making in Pakistan: The Dynamics of Political Order" by G.W. Choudhury.

Course Name: Introductory Biochemistry	**Course Code: BCHM-302**
Course Structure: Lectures: 2, Labs: 1	**Credit Hours: 2+1**
Prerequisites: None	
Course Objective: The course aims to • Course Objectives: • This course aims to provide students with fundamental knowledge of the • molecules of life, as well as their function in the context of a living cell.	
Course Outline: Introduction to biochemistry; water, Ph, buffers, and biochemical composition of cells; carbohydrates – structure and classification; proteins – overview with emphasis on their composition and structure, classification and function; lipids – structure, classification and biological significance; enzymes – properties, nomenclature, classification, and factors affecting enzyme activity including inhibitors and potentiators, basic kinetics, derivation of Km and Vmax; coenzymes and vitamins; nucleic acids – structure and function. **Practical:** Preparation of laboratory solutions and Ph determination; qualitative and quantitative tests for carbohydrates, proteins and lipids; enzyme assays and the effect of Ph, temperature and substrate concentration on enzyme activity.	
Course Outcomes: At the end of this course students will be able to identify and classify the various biomolecules. They will have deep understanding of the function of biomolecules.	
Recommended Books: Latest Edition of Following Books 1. Pollard, T. D., Earnshaw, W. C., Lippincott-Schwartz, J., & Johnson, G. (2022). *Cell biology E-book*. Elsevier Health Sciences. 2. Murphy, M., Srivastava, R., & Deans, K. (2023). *Clinical Biochemistry-E-Book: An Illustrated Colour Text*. Elsevier Health Sciences. 3. Shanmugam, S., Kumar, T. S., & Panneer Selvam, K. (2019). Laboratory handbook on biochemistry. PHI Learning Pvt. Ltd..	

4. Satyanarayana, U., & Chakrapani, U. (2020). Biochemistry, (Updated and Revised Edition)-E-Book. Elsevier India.
5. Lehninger principle of biochemistry by David L.Nelson and Michael M.Cox, 7th latest edition,ISBN-10:1-4641-2611-9,ISBN-13:978-14641-2611-6.
6. Biochemistry by Jeremy M. Berg , John L. Tymoczko; Lubert Stryer ,ISBN10:1429229365,ISBN-13:97814229229364, Berg, J. M.,Tymoczko,J. L., Lubert Stryer. 2010. Biochemistry. 7th Ed.
7. Lodish, H., Berk, A., Zipursky, S. L., Paul. M., Baltimore D, Darnell, J. 2012. Molecular Cell Biology.
8. Nelson, D. L., Cox, M. M. 2012. Lehninger Principles of Biochemistry. McMillan Worth Publishers, New York.

Course Title: Functional English	**Course Code: ENG-303**
Course Structure: Lectures: 3, Labs: 0	**Credit Hours: 3**
Prerequisites: None	

Course Objective:
This course will familiarize students with the essential language skills for effective communication in diverse real-world scenarios. It focuses on developing proficiency in English language and usage: wordchoices, grammar and sentence structure. In addition, the course will enable students to grasp subtle messages and tailor their communication effectively through the application of comprehension and analytical skills in listening and reading. Moreover, the course encompasses a range of practical communication aspects including professional writing, public speaking and everyday conversation ensuring that students are equipped for both academic and professional spheres.

Course Outline: 1. Foundations of Functional English Vocabulary Building (contextual usage,synonyms, antonyms, and idiomatic expressions) Communicative Grammar (subject-verb agreement,
verb tenses, fragments, run-ons, modifiers, articles, word classes etc) Word Formation (affixation, compounding, clipping, back formation etc) Sentence Structure (simple, compound, complex and compound-complex). **Comprehension and Analysis.3.** Understanding Purpose, audience and context a. (reading for meaning, descriptive texts versus narrative texts , argumentative texts versus persuasive texts) 3. Contextual Interpretation (tones, biases, stereotypes, assumptions, inferences etc) 4. Reading Strategies (skimming, scanning, SQ4R, critical reading) 5. Active Listening (overcoming listening barriers, focused listening). **Effective Communication** Principles of Communication(clarity, coherence, correctness and courteousness). Structuring Documents (introduction, body, conclusion and formatting). Inclusivity in Communication (gender-neutral language and cross-culturalcommunication). Public Speaking (Speech/presentation: extemporaneous and prepared, public announcements and overcoming stage fright) Presentation Skills: a. (the elements of an effective presentation,

using visual displays to present key facts, figures, charts, and graphs , steps to preparing an effective presentation, one-minute presentations and evaluate presentations, Informal Communication (small talk and networking),
Professional Writing (business e-mails, memos, reports, formal letters etc).

Course Outcomes: By the end of the course the students will be able to apply the enhanced English skills, comprehend a variety of literary and non-literary texts, and express effectively in spoken and written English in diverse social and cultural contexts.

Recommended Books: Latest Edition of Following Books

. Murphy, Raymond. Grammar in Use Intermediate Student's Book without Answers. CambridgeUniversity Press, 2018.
2. Kaufman, Lester, and Jane Straus. The Blue Book of Grammar and Punctuation. 2021.
3. Axelrod, Rise B., and Charles R. Cooper. The St. Martin's Guide to Writing [with AccessCode]. 2016.
4. 2. Johnson-Sheehan, Richard, and Charles Paine. Writing Today. Pearson, 2019.

https://www.hec.gov.pk/english/services/universities/RevisedCurricula/Documents/2011-2012/Education/English2_Sept13.pdf

Course Name: Fundamentals of Human Nutrition	**Course Code:** HND-311
Course Structure: Lectures 2, Lab 1	**Credit Hours: 3(2+1)**
Prerequisites: None	

Learning Outcomes:

To familiarize with the role of macro- and micro-nutrients in human nutrition
To understand the absorption, digestion and metabolism of nutrients in the humanTo abreast knowledge about the health disorders due to consumption of non- optimal quantities of the nutrients

Theory:

Introduction: food, nutrients, nutrition, malnutrition - global and local scenario, diet, balanced diet, food groups, foundations of healthy diet, meal planning; Water functions, regulation in body, dietary requirements, electrolytes and acid-base balance; Carbohydrates: types, role in body, dietary fiber, bulk and alternative sweeteners, recommended intake and energy value; Fats and oils: types, functions, recommendations concerning fat intake, fat substitutes; Proteins: amino acids, protein synthesis and degradation, classification, functions, quality of proteins, dietary requirements; Vitamins: classification, types, sources, role in body; Mineral elements: types, requirements, sources, role in body; Digestion: alimentary tract, digestive juices, secretions; Absorption and metabolism of nutrients: carbohydrates, protein, lipids; Nutrient and dietary deficiency disorders and special nutrient requirements.

Suggested Readings:

1. Schlenker, E. D., Gilbert, J. A., Schlenker, E., Gilbert, J., & Williams, S. R. (2023).

Williams' Essentials of Nutrition and Diet Therapy-E-Book. Elsevier Health Sciences.
2. Stipanuk, M. H., & Caudill, M. A. (2018). Biochemical, physiological, and molecular aspects of human nutrition-E-book. Elsevier health sciences.
3. Wildman, R. E. (2018). Advanced human nutrition. Jones & Bartlett Learning.
4. Awan, J.A. 2011. Elements of Food and Nutrition. Unitech Communications, Faisalabad, Pakistan.
5. Bamji, M.S., K. Krishnaswamy and G.N.V. Brahmam. 2009. Textbook of Human Nutrition, 3rd ed. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, India.
6. Geissler, C. and H. Powers. 2011. Human Nutrition, 12th ed. Churchill Livingstone, London, UK.

Course Name: Essentials of food science &technology	**Course Code:** HND-312
Course Structure: Lectures 2, Lab 1	**Credit Hours:** 3(2+1)
Prerequisites: None	

Learning Objectives:
To understand the role of food science & technology towards ensuring food security
To acquaint knowledge about the food constituents, food classification and spoilage agents
To comprehend the role of various food processing and preservation methods in shelf life extension and availability of food around the year.

Course Outline: 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 perish-ability 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 labeling.

Practical:
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 – vinegar, preparation; Evaluation of bottled, frozen and dehydrated products.

Suggested Readings:
1. Andrews, J., Jelley, N. A., & Jelley, N. (2022). Energy science: principles, technologies, and impacts. Oxford university press.
2. Whitaker, J. R. (2018). Principles of enzymology for the food sciences. Routledge.
press.

3. Hanan, J. J. (2017). Greenhouses: Advanced technology for protected horticulture. CRC
4. Awan, J.A. and S.U. Rehman. 2011. Food Preservation Manual. Unitech Communications, Faisalabad, Pakistan.
5. Awan, J.A. 2011. Food processing and Preservation. Unitech Communications, Faisalabad, Pakistan.
6. Awan, J.A. 2011. Food Science and Technology. Unitech Communications, Faisalabad.

SEMESTER – II

Course Title: Essential of Management	**Course Code:** MS-307
Course structure: Lectures: 2, Lab 0	**Credit Hours:2**
Prerequisites: None	

COURSE OBJECTIVES:

- The course aims to provide students with the basic managerial knowledge necessary for Business student. Upon successful completion of this course, students will be able to:
- Demonstrate theoretical knowledge in management course. Gain practical skills and personal attributes and competencies that is required for managerial position.
- Describe the four management functions of planning, organizing, leading, and controlling. Outline the historical evolution of management theories.
- Explain how decisions are made within an organization and how those decisions are communicated to the various stakeholders and can Relate the basic concepts of planning: the importance of planning, strategic planning, and the types of objectives and plans developed by organizations.
- Describe the control process including: the importance of control, tools for measuring organizational performance, and managerial actions and Understand analytical,

developmental, managerial and technical skills relate to Managing organizations

Course Outline: Introduction to Management-What is an Organization, The Management Process, Kinds of managers. Basic managerial roles and skills. **History and Evolution of Management-**The Organization Environment, a. Internal Environment & External Environment. **Planning and Decision Making -**Decision making and planning process- Organizational Goals and their kinds, Organizational plans and their kinds a. Strategic, Tactical Plans &. Operational Plans. **Strategic Management-** Strategic Management Process, Strategy Formulation, Strategy Implementation Strategy Evaluation Organizing. **Organization Structure-**a. Tall Vs Flat, Narrow Vs Wide, c. Centralized Vs Decentralized, Strategy and Organization Design, Corporate Level Strategy, Business Level Strategy & Organizational Functions. **Motivation and its theories-** Content Perspective of Motivation Maslow Hierarchy of Needs theory, ERG theory, Two Factor Theory, Process Perspective of Motivation Expectancy Theory, Equity Theory, Groups and Teams in Organization, Types of Groups and Teams group and Team Development Process. **Leadership and Power-** Leadership Styles.**Control**-Types, level & Process of control.

Course OutComes:

- Apply management theories to solve complex real-world business challenges and can Demonstrate effective leadership and interpersonal skills essential for managerial roles.
- Can be able to explain the historical evolution of management theories and theircontemporary relevance.
- Demonstrate competence in decision-making and effective communication withinorganizations.
- Analyze and implement strategic planning and diverse organizational structures.
- Utilize control processes and performance measurement tools to enhance organizationalefficiency.

Recommended Books:

- Ricky W. Griffin (2015). Introduction to Management. 8th Edition. Cengage Learning 20Channel Center Street Boston, USA
- John R. Schermerhorn. (2015). Introduction to Management by John Wiley & Sons;13th Edition International Student Version (April 14, 2015).
- Drucker, P. F. (2008). Management: Tasks, responsibilities, practices. HarperCollins.
- Kotter, J. P. (1996). Leading change. Harvard Business Review Press.
- Covey, S. R. (1989). The 7 habits of highly effective people. Free Press.

Collins, J. C. (2001). Good to great: Why some companies make the leap... and othersdon't. Harper Business.

Course Title: Expository Writing	**Course Code:** ENG-304
Course Structure: Lectures: 3, Labs: 0	**Credit Hours: 3**
Prerequisites: None	

Course Objective: This is a sequential undergraduate course aimed at refining basic writing skills in various contexts. Building upon its pre-requisite, Functional English Course, this course will enhance student's ability to produce clear, concise and coherent texts in English. This course will enable the students to produce well-structured essays and to refine their analytical skills.

Course Outline:

1. **Introduction to Expository Writing** Definition, Types, Characteristics (clarity, coherence & organization) **2. The Writing Process** Pre-writing Techniques (brainstorming, free-writing, mind-mapping, outlining), Drafting, Revising and Editing, Proof reading, Peer review and Feedback3. **Essay organization and Structure** Introduction, Thesis statement, Body paragraphs, Conclusion, Cohesion & Coherence **4. Different Types of Expository Writing** Description, Illustration, Classification, Cause and Effect, Process analysis, Comparative analysis 9. Writing for Different Purposes and Audiences Types of purposes (to inform, to analyze, to persuade, to entertain etc), Writing for Academic Audiences, Writing for Public Audiences, Different tones and styles Ethical Considerations Plagiarism and Originality, Citation and Referencing

Course Outcomes: By the end of the course, the students will be able to;

1. Understand the essentials of the writing process (pre-writing, drafting, editing, proof reading etc)
2. Demonstrate mastery of diverse expository types
3. Uphold ethical practices to maintain originality in expository writing

Recommended Books: Latest Edition of Following Books.

1. Axelrod, Rise B. and Charles Raymond Cooper. The Concise St. Martin's Guide to Writing. Bedford/ St. Martins, 2015.

2. Johnson-Sheehan, Richard, and Charles Paine. Writing Today. Pearson, 2019.

Murphy, Raymond. Grammar in Use Intermediate Student's Book without Answers. Cambridge University Press, 2018.

Course Title: Introduction to Microbiology	**Course Code:** MB-301
Course structure: Lectures: 3, Lab: 1	**Credit Hours:** 4(3+1)
Prerequisites: None	

COURSE OBJECTIVES:

1. To introduce students with Microorganism, scope of Microbiology and its applications in different fields.
2. To learn about the growth requirements of Microorganisms.
3. To introduce the techniques of isolation and preservation of Microorganisms.
4. To know about the techniques used to control the growth of microorganisms.

COURSE CONTENT:

Introduction to microbiology. Microorganisms and their respective place in the living world. Historical development of Microbiology and its scope. Microscopy: An outline of the principles and applications of light and electron microscope. Differentiation between pro- and eukaryotic cells. Morphology, arrangement and detailed anatomy of bacterial cell. Bacterial taxonomy and nomenclature, basis of classification of bacteria. Growth, nutrition (physical and nutritional requirement and nutritional types; sources of energy, C, N, H, O, S, P, H_2O, trace elements, growth factors). Asexual and sexual reproduction of microorganisms. General methods of studying microorganisms: Cultivation, isolation, purification, characterization and preservation. Control of microorganisms by physical and chemical methods. Chemotherapeutic agents and antibiotics. Modes of action of antibiotics on microorganisms. Basic properties of virus, fungi, protozoa and algae.

PRACTICAL

1. Laboratory safety: Containment and decontamination.
2. Preparation and sterilization of bacteriological media and glassware.

3. Inoculation techniques. Study of colony characteristics of microorganisms.
4. Standard plate count technique (SPC) and colony morphology (Colour, shape and size)

Principles of Staining Procedures & Microscopy: Simple staining, Gram's staining, Acid-fast staining, cell-wall staining, flagellar staining, capsule staining, spore staining and spirochaete staining.

6. Study of cell motility by hanging drop preparation.

Recommended Books

1. Pearson, R.D., Gillespie, S.H., 2009. Principles and Practice of Clinical Parasitology.1st Edition .Wiley, John & Sons.
2. Sun, T., 2012. Progress in Clinical Parasitology. Springer-Verlag New York, LLC
3. Zeibig, E., 2012. Clinical Parasitology: A Practical Approach. 2nd edition. Elsevier Health Sciences.

Course Title: Islamic Studies	**Course Code: ISL-301**
Course Structure: Lectures	**Credit Hours: 2**
Prerequisites: None	

Description This course is designed to provide students with a comprehensive overview of the fundamental aspect of Islam, its beliefs practices History and influence on society. It will further familiarize the students with a solid foundation in understanding Islam from an academic and cultural perspective. Through this course students will have and enhanced understating of Islam's multifaceted dimensions which will enable them to navigate complex discussions about Islam's Historical and contemporary role fostering empathy respect and informed dialogue.

Course outcomes: By the end of this course, Students will be able to :

1. Demonstrate enhanced knowledge of Islamic foundational beliefs, practices historical development spiritual values and ethical principles
2. Describe basic source of Islamic law and their application in daily life

Identify and discuss contemporary issue being faced by the Muslims world including socialchallenges, gender role and interfaith interactions.

Course outline:

Introduction to Islam: Definition of Islam and its core beliefs The Holy Qura'n (Introduction, Revelation and compilation, Hadith and Sunnah (Compilation Classificationand Significance) Key theological concepts and themes (Tawhid , Prophet hood Akhiraha etc, **Seerat of Holy Prophet (S.A.W)** Life and legacy of the Holy prophet **(S.A.W** Diverse role of the Holy Prophet (as and individual, educator, peace maker, leader etc**), Islamic History and civilization** World Before Islam Rashidun Caliphate and expansion of Islamic rule, Contribution of Muslim scientists and philosophers in shaping world civilization,

Islamic Jurisprudence: (Fiqh) Fundamental Sources of Islamic Jurisprudence Pillars of Islam and their significance Major Schools of Islamic Jurisprudence **,** Significance and principles of Ijtihad, **Family and Society in Islam** Status and rights of woman in Islamic Teachings, Marriage,Family, and gender roles in Muslim society, Family structure and values Muslim society, **I**slam &the

Modern World.

Suggested Instructional Materials

1. The five Pillars of Islam: A journey thought the Divene Acts of Worship by Muhammad Mustafa Al Azami
2. The Five Pillars of Islam: A Framework for Islamic Values and Character Building by Musharraif Hussain
3. Towards Understanding Islam By Abul A' la Mawdudi
4. Islami Nazria e Hayat by Khurshid Ahmad
5. An Introduction to Islamic theology by John Rearard
6. Islamic Civilization Foundations Belief and Principles by Abul A la Mawdudi
7. Women and Social Justices An Islamic Paradigm by Dr Anis Ahmad

Islam its Meaning and Message " By Khushid Ahmad

Course Name: Macronutrients in Human Nutrition	**Course Code:** HND-313
Course Structure: Lectures: 3, Lab 0	**Credit Hours:** 3+0

Prerequisites: None

Learning Outcomes:

To abreast knowledge about the normal nutrient metabolism in healthyhuman

To understand interactions between the intake, absorption, transport, processing, storage, catabolism and excretion of nutrients and the regulationof metabolic homeostasis in the intact organism

Theory:

Carbohydrates:nature,structures;Classificationandfunctionsofcarbohydrates:monosaccha r aides, disaccharides, oligosaccharides, polysaccharaides; Digestion and absorption ofcarbohydrates: glycolitic pathway, glycolysis, glycogenesis, glycogen catabolism, tricarboxylic acid cycle and pentose phosphate pathway; Biosynthesis of carbohydrates: gluconeogenesis; Regulation of carbohydrate metabolism pathways; CHO metabolism indiabetes; 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 and kidney diseases, Protein energy malnutrition; Lipids – nature, classification; Fatty acids: saturated, unsaturated, polysaturated, glycerol, cholesterol, sterol; Lipoprotein systems (blood lipids); Fats biosynthesis: lipids, phospholipids and sphingolipids;

Lipid biosynthesis: cholesterol, sterol; Lipid oxidation; Essential fatty acids: sources, health benefits; Adipose tissues; Digestion, absorption, metabolism and transportation of lipids; Oxidation of fatty acids (beta oxidation); Ketone bodies.

Suggested Readings:

1. Schlenker, E. D., Gilbert, J. A., Schlenker, E., Gilbert, J., & Williams, S. R. (2023). Williams' Essentials of Nutrition and Diet Therapy-E-Book. Elsevier Health Sciences.
2. Medeiros, D. M., & Wildman, R. E. (2022). Advanced human nutrition. Jones & Bartlett Learning.
3. Stipanuk, M. H., & Caudill, M. A. (2018). Biochemical, physiological, and molecular aspects of human nutrition-E-book. Elsevier health sciences.
4. Byrd-Bredbenner, C., G. Moe, D. Beshgetoor and J. Berning. 2015.
5. Wardlaw's Perspectives in Nutrition, 10th ed. McGraw-Hill Education, Columbus, OH, USA.
6. David L.N., A.L. Lehninger and M.M. Cox. 2013. Lehninger Principles ofBiochemistry, 6th ed. W.H. Freeman and Company, New York.
7. Gropper, S.S. and J.L. Smith JL. 2013. Advanced Nutrition and Human Metabolism, 6th ed. Cengage Learning, Belmont, CA, USA.

Course Name: Fundamentals of Human Physiology	**Course Code: HND-314**
Course Structure: 2 Lectures 1 Practical	**Credit Hours: 2 (2+1)**
Prerequisites: None	

Learning Outcomes:

To familiarize about the functions of different body organs

To understandrisk parameters related to assessment and prognosis of different diseases

Theory: Introduction to human physiology, organization level and cell physiology; Digestive system: oral cavity, salivary glands, teeth, tongue; esophagus, 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.

Practical: 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.

Suggested Readings:

1. Schleip, R., Findley, T. W., Chaitow, L., & Huijing, P. (Eds.). (2021). Fascia: the tensional network of the human body-e-book: the science and clinical applications in manual and movement therapy. Elsevier Health Sciences.
2. Fritz, S., & Fritz, L. A. (2020). Mosby's Fundamentals of Therapeutic Massage-E-Book: Mosby's Fundamentals of Therapeutic Massage-E-Book. Elsevier Health Sciences.
3. Coad, J., Pedley, K., & Dunstall, M. (2019). Anatomy and physiology for midwives e-book. Elsevier Health Sciences.
4. Stipanuk, M. H., & Caudill, M. A. (2018). Biochemical, physiological, and molecular aspects of human nutrition-E-book. Elsevier health sciences.
5. Tortora, G.J. 2008. Principles of Anatomy and Physiology, 12th ed. John Wiley & Sons, Inc.,New York, USA.
6. Rahman, Z.U., B. Aslam, Khan, J.A. and T. Khaliq. 2007. Manual of Physiology-II, 2nd ed.MAS Computers, Faisalabad, Pakistan.

SEMESTER – III

Course Title: Quantitative Reasoning-I	**Course Code:** MTH-401
Course Structure: Lectures: 3	**Credit Hours:** 3
Prerequisites:	

Course Objectives

- Quantitative reasoning (I) as in introductory-level undergraduate course that focuses on the fundamentals related to the quantitative concept and analysis.
- The course is designed to familiarize students with the basic concepts of mathematics and statistics and to develop students' ability to analyze and interpret quantitative information. Through a combination of theoretical concepts and practical exercises
- This course will also enable students cultivate their quantitative literacy and problem-solving skills while effectively expending their academic horizon and breadth of knowledge of their specific major/field of study.

Course Outline: 1. Numerical Literacy : Number system and basic arithmetic operation; Units and their conversion, dimension, area, parameter, and volume;Rates, ratio, proportion, and percentage; Types and sources of data; Measurement scales; Table and graphical presentation of data; Quantitative reasoning exercises using number knowledge; **2.Fundamental Mathematical Concept:** Basic of geometry (lines, angles, circles, polygons etc); Sets and their operations; Relations, functions, and their graphs;Exponent, factoring and simplifying algebraic expression; Algebraic and graphical solutions of linear and quadratic equations and inequalities;Quantitative reasoning exercises using fundamental mathematical concepts; **3. Fundamental Statistical Concepts:**Population and sample; Measure of central tendency, dispersion and data interpretation; Rules of counting (multiplicative, permutation, and combination);Basic probability theory; Introduction to random variables and their probability distribution;Quantitative reasoning exercises using fundamental statistical concept;

Course Outcomes: By the end of this course, student shall have:

- Fundamental numerical literacy to enable them work with numbers understand their meaning andpresent data accurately;
- Understanding of fundamental mathematical and statistical concept;

Basic ability to interpret data presented and various format including but not limited to tables, graphs, charts, and equations etc.

Recommended Books:

1. "Quantitative Reasoning: Tools for Todays Informs Citizen" by Bernard L. Madison. Lynn and Arthur Steen
2. "Quantitative Reasoning for the Information Age" by Bernard L. Madison. And David M. Bressoud.
3. "Fundamental of Mathematics" by Wade Ellis.
4. "Quantitative Reasoning: Thinking and Numbers" by Eric Zaslow.
5. "Thinking Clearly with Data: A Guide to Quantitative Reasoning and Analysis" by Ethan Bueno De Mesquita and Anthony Fowler.
6. "Using and Understanding Mathematics: A Quantitative Reasoning Approach" by Bennett, J. O., Briggs, W. L., & Badalamenti, A.
7. "Decreet Mathematics and Its Application" by Kenneth H. Rosen.
8. "Statistics for Technologies: A Course in Applied Statistics" by Chatfield, C.

"Statistics: Unlocking the Power of Data" by Robin H. Lock, Patti Farzer Lock, Kari Lock.

Course Title: Applications of Information and Communication Technologies	**Course Code: CSC-308**
Course Structure: Lectures: 2 Lab:1	**Credit Hours: 3**
Prerequisites: None	

Course Objective:

- This course is designed to provide students with an exploration of the practical applications of Information and Communication Technologies (ICT) and software tools in various domains.
- Students will gain hands-on experience with a range of software applications, learning how to leverage ICT to solve daily life problems, enhance productivity and innovate in different fields.
- Through individual and interactive exercises and discussions, students will develop proficiency in utilizing software for communication, creativity, and more.

Course Outline:

Introduction to Information and Communication Technologies: Components of Information and Communication Technologies (basics of hardware, software, ICT platforms, networks, local and cloud data storage etc.). Scope of Information and Communication Technologies (use of ICT in education, business, governance, healthcare, digital media and entertainment, etc.). Emerging technologies and future trends. **Basic ICT Productivity Tools:** Effective use of popular search engines (e.g., Google, Bing, etc.) to explore World Wide Web. Formal communication tools and etiquette (Gmail, Microsoft Outlook, etc.). Microsoft Office Suites (Word, Excel, PowerPoint).Google Workspace (Google Docs, Sheets, Slides).Dropbox (Cloud storage and file sharing), Google Drive (Cloud storage with Google Docs integration) and Microsoft OneDrive (Cloud storage with Microsoft Office integration). Evernote (Note-taking and organization applications) and OneNote (Microsoft's digital notebook for capturing and organizing ideas). Video conferencing (Google Meet, Microsoft Teams, Zoom, etc.). Social Media applications (Linkedln, Facebook, Instagram, etc.). **ICT in Education:** Working with learning management systems (Moodle, Canvas, Google Classrooms, etc.).Sources of online education courses (Coursera, edX, Udemy, Khan Academy, etc.).Interactive multimedia and virtual classrooms. **ICT in**

Health and Well-being: Health and fitness tracking devices and applications (Google Fit, Samsung Health, Apple Health, Xiaomi Mi Band, Runkccpcr, etc.).Telemedicine and online health consultations (OLADOC, Sehat Kahani, Marham, etc.).**ICT in Personal Finance and Shopping:** Online banking and financial management tools (JazzCash, Easypaisa, Zong PayMax, Il LINK and MNET, Keenu Wallet, etc.).E-commerce platforms (Daraz.pk, Telcnoart, Shophivc, etc.)Digital Citizenship and Online Etiquette. Digital identity and online reputation. Netiquette and respectful online communication. Cyberbullying and online harassment. **Ethical Considerations in Use of ICT Platforms and Tools:** Intellectual property and copyright issues. Ensuring originality in content creation by avoiding plagiarism and unauthorized use of in fornication sources. Content accuracy and integrity (ensuring that the content shared through ICT platforms is free from misinformation, fake news, and manipulation).

Practical Requirements

As part of the overall learning requirements, the course will include guided tutorials and exercises to ensure that students are proficient in commonly used software applications such as worcl processing software (e.g., Microsoft Word), presentation software (e.g., Microsoft PowerPoint), spreadsheet software (e.g., Microsoft Excel) among such other tools. Students may be assigned practical tasks that require them to create documents, presentations, and spreadsheets etc. Assigning tasks that involve creating, managing, and organizing files and folders on both local and cloud storage systems. Students will practice file naming conventions, creating directories, and using cloud storage solutions (e.g., Google Drive, OneDrive). The use of online learning management systems (LMS) where students can access course materials, submit assignments, participate in discussion forums, and take quizzes or tests. This will provide students with the practical experience with online platforms commonly used in education and the workplace.

Course Outcomes:

- By the end of this course, students will be able to Explain the fundamental concepts, components, and scope of Information and Communication Technologies (ICT).
- Identify uses of various ICT platforms and tools for different purposes.
- Apply ICT platforms and tools for different purposes to address basic needs in different domains of daily, academic, and professional life.

Understand the ethical and legal considerations in use of ICT platforms and tools.

Recommended Books: Latest Edition of the Following Books.

1. Morley and Parker Computing Essentials, 2023, McGraw Hill.
2. Evans, Martin, and Poatsy. Technology in Action,2021, Pearson.Vermaat, Shaffer, and Freund, Discovering Computers, 2017, Cengage Learning.
3. Grauer and Poatsy. Exploring Microsoft Office,2016, Pearson.
4. Series by Gaskin, Vargas, and McLellan, GO! with Microsoft Office,2013, Pearson.

Course Title: Climate Change and Human Health	**Course Code:** BIT-414
Course Structure: Lectures: 3, Labs: 0	**Credit Hours:** 3
Prerequisites: None	
Course Objective: The course "Impact of Climate Change on Human Health" provides a comprehensive exploration of the complex relationship between climate change and its impacts on human well-being. It covers various aspects of climate change, its drivers, and the direct and indirect ways it affects human health.	
Course Outline: Introduction to Climate Change, Causes and Impact of Rapid Climate Change, Climate Change and Public Health, Extreme Weather, Extreme Temperature and Human Health, Climate Change and Air Quality, Vector-Borne Diseases and Changing Patterns, water born diseases and changing pattern, mental health and climate change, Water security and Climate Change, Measures Against Climate Change, Adaptation and Mitigation Strategies, Case Studies and Group Discussions, Communication and Advocacy.	
Course Outcomes:	
Recommended Books: Latest Editions of the Following Books. 1. Butler, C. D. (2018). Climate change and global health. CABI. 2. McMichael, A. J., & Lindgren, E. (Eds.). (2011). Climate change and human health: Risksand responses. World Health Organization. 3. Patz, J. A., Gibbs, H. K., & Olson, S. H. (2008). Climate change and global health: Quantifying a growing ethical crisis. EcoHealth, 5(4), 397-405.	

Course Title: Introduction to Entrepreneurship	**Course Code:** MS-309
Course Structure: Lectures:2, Lab:0	**Credit Hours:** 2

Prerequisites:None

Course Objective:

This course is designed to promote entrepreneurial spirit and outlook among students, encouraging them to think critically, identify opportunities, and transform their ideas into successful ventures. It aims at imparting them with the requisite knowledge, skills, abilities, enabling them to seize theidentified opportunities for initiating ventures and successful navigating the challenges that come withstarting a business and managing it. The course covers topics relevant to entrepreneurship including setting up and initiation of business, market research, opportunity identification, business planning, financial literacy for managing finances and securing funding, marketing and sales, team building and innovation.

Course Outline:

Introduction to Entrepreneurship, Entrepreneurial Skills, . Opportunity Recognition and Idea Generation, Opportunity identification, evaluation and exploitation, Innovative idea generation techniques for entrepreneurial ventures, Marketing and Sales, Financial Literacy, Team Building for Startups & Regulatory Requirements to Establish Enterprises in Pakistan.

Course Outcomes: Upon successful completion of the course participants will:

- Have a basic understanding of the Islamic World and Muslim beliefs.
- Know the origins of the Islamic Banking and Finance.
- Appreciate the rationale behind the development of the Islamic finance industry.
- Be able to assess the nature and scope of the Islamic finance industry in relation to its conventional counterpart.
- Develop an appropriate level of understanding of the main principles of Islamic banking and finance.
- Acquire essential knowledge about the key Islamic financial contracts, as used by the industry.
- Know about Murabaha and Musharaka contracts, Ijara and Istisna'a financing methods, as well as Salam and Takaful insurance.
- Be familiarized with the Islamic financial infrastructure, international financial institutions, and regulatory bodies.

Recommended Books:

1. Barringer, B. R., & Ireland, R. D. (2012). Entrepreneurship: Successfully Launching New Ventures. Pearson.
2. Kuratko, Donald F. (2017). Entrepreneurship : Theory, Process, Practice (ed.10). United State of America: Cengage Learning.
3. Timmons, J. A., & Spinelli, S. (2003). New venture creation/entrepreneurship for the 21st century. Singapore City: McGraw-Hill.
4. Abrams, R. (2017). Entrepreneurship: A Real-World Approach (2nd ed., illustrated). Planning Shop.
5. Read, S., Sarasvathy, S., Dew, N., & Wiltbank, R. (2016). Effectual Entrepreneurship (2nd ed.). Routledge. https://doi.org/10.4324/9781315684826
6. Ries, E. . (2011).The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses.

Course Name: Advance Human Physiology	**Course Code: HND**-412
Course Structure: Lectures: 2 Lab:1	**Credit Hours:** 3(2+1)

Prerequisites: None

Learning Outcomes:

To understand the functions of respiratory, endocrine, nervous, immune and reproductive systems

To acquaint knowledge about hormonal and neural interactions on metabolism

Theory:

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 ofneuromuscular physiology.

Practical:

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.

Suggested Readings:

1. Brar, R.S., H.S. Sandhu and A. Singh. 2002. Veterinary Clinical Diagnosis byLaboratory Methods. Kalyani Publishers Ludhiana, New Delhi, India.
2. Gillian, P. and C.D. Richards. 2006. Human Physiology: The Basis of Medicine,3rd ed. Oxford University Press, London.
3. Guyton A.C. and J.E. Hall. 2006. Textbook of Medical Physiology, 11th ed. J.F. Kennedy Blvd., Philadelphia, USA.
4. Rahman, Z.U., B. Aslam, J.A. Khan and T. Khaliq. 2007. Manual of Physiology-I&II, 2nd ed. MAS Computers, Faisalabad, Pakistan.
5. Tortora, G.J. 2008. Principles of Anatomy and Physiology, 12th ed. John Wiley & Sons, Inc., New York, USA.

Course Name: Human Anatomy	**Course Code: HND-415**
Course Structure: Lectures:2, Lab:1	**Credit Hours: 2+1**
Prerequisites: None	

Learning Outcomes:

To acquaint knowledge about structural components of body

To know about histology and blood composition for the identification of diseases

Theory: Introduction: grass anatomy, histology; Terminology: bones & joints, muscles, cartilage, body structure, tissue, cell, organs; Digestive system: oral cavity, stomach, small & large intestine; Urinary system/ excretory: kidneys, ureter,

bladder, urethra; Cardio-vascular system: heart and Pericardium, Arteries system, venous system/ Major arteries & 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.

Practical:

Four primary tissues of body - Epithelium tissues: Introduction, types, epithelial glands - endocrine & 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 & Platelets; Cartilage and its types; Muscle and its types; Histology in: GIT, respiratory, urinary systems, breast, uterus. Microscopy and preparation of histological slides.

Suggested Readings:

1. Agur, M.R. and F.D. Arthur. 2009. Grant's Atlas of Anatomy. Lippincott Williams and Wilkins, New York, U.S.A.

2. David, C. 2007. Anatomy of Hatha Yoga: A Manual for Students, Teachers and Practitioners. National Banarisdass Publishers (Pvt.) Ltd., New Delhi, India.

3. Gerard, J. T. and T.N. Mark. 2009. Principles of Human Anatomy. John Wiley and Sons, Inc., New York, USA.

SEMESTER – IV

Course Title: Civics and Community Engagement.	**Course Code:** PSC-418
Course Structure: Lectures: 2	**Credit Hours:** 2
Prerequisites:	
Course Objective: This course is designed to provide students with fundamental knowledge about civics, citizenship, and community engagement. In this course, the students will learn about the essentials of civil society, government, civic responsibilities, inclusivity, and effective ways to participate in shaping the society which will help them apply theoretical knowledge to the real-world situations to make a positive impact on their communities.	
Course Outline: **1. Civics and Citizenship:** Concepts of civics, citizenship, and civic engagement, Foundations of modern society and citizenship, Types of citizenship: active, participatory, digital, etc.**2. State, Government and Civil Society:** Structure and functions of government in Pakistan. The relationship between democracy and civil society. Right to vote and the importance of political participation and representation.**3. Rights and Responsibilities**: Overview of fundamental rights and liberties of citizens under the Constitution of Pakistan 1973. Civic responsibilities and duties. Ethical considerations in civic engagement (accountability, non-violence, peaceful dialogue, civility, etc.) **4. Community Engagement:** ·Concept, nature, and characteristics of community. ·Community development and social cohesion. Approaches to effective community engagement. ·Case studies of successful community- driven initiatives.**5. Advocacy and Activism:** Public discourse and public opinion. Role of advocacy in addressing social issues. Social action movements. **6. Digital Citizenship and Technology:** The use of digital platforms for civic engagement Cyber ethics and responsible use of social media. Digital divides and disparities (access, usage, socioeconomic, geographic, etc.) and their impacts on citizenship.**7. Diversity,** Inclusion and Social Justice: Understanding diversity in society (ethnic, cultural, economic, political etc.). Youth, women and minorities' engagement in social development. Addressing social inequalities and injustices in Pakistan. Promoting inclusive citizenship and equal rights for societal harmony and peaceful co-existence.	
Course Outcomes: By the end of this course, students will be able to: 1. Demonstrate fundamental understanding of civics, government, citizenship and civil society 2. Understand the concept of community and recognize the significance of community engagement for individuals and groups. 3. Recognize the importance of diversiy and inclusivity for societal harmony and peaceful co-existence.	
Recommended Books: Latest Edition of the Following Books. 1. "Civics Today: Citizenship, Economics, & You" by McGraw-Hill Education.2 "Citizenship in Diverse Societies" by Will Kymlicka and Wayne Norman. 3."E Fngaaina V Youth in Civic Life" by James Youniss an Peter Levine.	

4. "Digital Citizenship in Action: Empowering Students to Engage in Online Com Kristen Mattson.
"Globalization and Citizenship: In the Pursuit of a Cosmopolitan Education" by Graham Pike and David Selby.
6. "Community Engagement: Principles, Strategies, and Practices" by Becky J. Feldpausch andSusan M. Omilian.
7. "Creating Social Change: A Blueprint for a Better World" by Matthew Clarke and Marie-Monique Steckel.

Course Title: Quantitative Reasoning II	**Course Code:** MTH-402
Course Structure: Lectures:3	**Credit Hours:** 3
Prerequisites:	

Specific Objectives of Course

Quantitative reasoning (II) is a sequential undergraduate course that focuses on logical reasoning supported with mathematical and statistical concepts and modelling/analysis technique to equip student with analytical skills and crtitical thinking abilities necessary to navigate the complexitiesof the modern world. The course is design to familiarize students with the quantitative concept and technique require to interpret and analyze numerical data to inculcate and ability in students the logical reasoning to construct and evaluate arguments, identify fallacies, and think systematically. Keeping the prerequisite course of quantitative reasoning I and its base, this course will enable students further their quantitative, logical and critical reasoning abilities to complement their specific major/field of study.

Course Outline:

1. Logic and Logical Critical Reasoning Introduction and Importance of logic; Inductive, deductive, and abductive approaches of reasoning; Prepositions, arguments (valid; invalid), logical connectives, truth tables and prepositional equivalences; Logical fallacies; Venn diagram; Predicates and quantifiers, Quantitative reasoning exercises using logical reasoning concepts and techniques;

2.Mathematical Modelling and Analysis, Introduction to deterministic models, Use of linear functions for modelling in real world situations; Modelling with system of linear equation and their solutions; Elementary introduction to derivatives and mathematical modelling; Linear and exponential growth and decay models; Quantitative reasoning exercises using mathematical modelling;

3. Statistical Modelling and Analysis: Introduction to probabilistic models; Bivariate analysis, scatter plots; Simple linear regression model and correlation analysis; Basics of estimation and confidence interval; Testing of hypothesis (Z-test; T-test); Statistical inference in decision making; Quantitative reasoning exercises and using statistical modelling.

Course Outcomes

By the end of this course, student shall have:

- Understanding of logic and logical reasoning;
- Understanding of basics quantitative modelling and analysis;
- Logical reasoning skills and abilities to apply them to solve quantitative problems and evaluate arguments;
- Ability to critically evaluate quantitative information to make evidence based decisions through appropriate computational tools:

Recommended Books:

1. "Using and Understanding: A Quantitative Reasoning Approach" by Bennett, J.O., Biggs, W. L., and Badalamenti, A.
2. "Discrete Mathematics and Its Applications" by Kenneth H. Rosen.
3. "Discrete Mathematics with Applications" by Susanna S. Epp.
4. "Applied Mathematics for Business, Economics, and Social Sciences" by Frank S. Budnick.
5. "Elementary Statistics: A Step by Step Approach" by Allan Bluman.
6. "Introductory Statistics" by Prem S. Mann.
7. "Applied Statistical Modelling" by Salvatore Babones. 8. "Barrons SAT" by Sharvonweiner Green, M. A and Lra K. Wolf.

Course Name: Micronutrients in HumanNutrition	**Course Code: HND-523**
Course Structure: Lectures:3, Lab:0	**Credit Hours:** 3(3+0)
Prerequisites: None	

Learning Outcomes:

To understand the functional roles of vitamins and minerals in humannutrition with special reference to metabolism

To familiarize with the deficiency symptoms and health disorders associatedwith improper intake of vitamins and minerals

To analyze losses of micronutrients during food processing

Theory:

Vitamins: nomenclature, history, development of the vitamins concept; Fat and water soluble vitamins: sources, chemistry, absorption, transport and storage, metabolism, function, deficiency, bioassay, interaction with other nutrients, recommended daily allowances and toxicities; Diagnosis, treatments and prevention of vitamin deficiencies in human; Stability of vitamins under different storage conditions; Vitamin like compounds; Losses of vitamin during food processing; Minerals: types, history and developments of the minerals concept; Criteria of essentiality of minerals and their classification; Minerals distribution in human body; Macro- and micro-minerals: dietary sources, absorption, metabolism, metabolic function, deficiency symptoms and disorders, recommended daily allowances, diagnosis, treatments and prevention of mineral deficiencies in human; Water and electrolytes.

Suggested Readings:

1. Allen, L. 2006. Guidelines on Food Fortification with Micronutrients. World Health Organization, Geneva, Switzerland.
2. Bender, D.A. 2009. Nutritional Biochemistry of Vitamins, 2th ed. Cambridge University Press, Cambridge, UK.
3. DiSilvestro, R.A. 2004. Handbook of Minerals as Nutritional Supplements.CRC Press, Taylor & Francis Group, Boca Raton, FL, USA.

Gropper, S.S. and Smith, J.K. 2012. Advanced Nutrition and Human Metabolism, 6th ed. Wadsworth Cengage Learning, Belmont, CA, USA

Course Name: Assessment of NutritionalStatus	**Course Code: HND-416**
Course Structure: Lectures:2 Lab:1	**Credit Hours:** 3(2+1)
Prerequisites: None	

Learning Outcomes:

To impart hands-on training in nutritional assessment techniques to diagnosehealth problems

To understand and apply dietary guidelines for standard nutrient intake Toselect an appropriate method for measuring dietary needs of hospitalized patients.

Theory:

Nutritional assessment systems: nutrition surveys, nutrition surveillance, nutrition screening. Nutritional assessment methods: Anthropomorphic, biochemical, clinical, dietary. Measuring food consumption at national level: food balance sheets, total diet consumption. Food consumption at the household levels: food account, household food records, household 24-hour food record. Measuring food consumption at individual levels: 24-hour recall, repeated 24-hour recall, weighed food records, diet history, food frequency questionnaire. Selecting an appropriate method: determining the mean nutrient intake, calculating the population at risk, ranking individuals by food and nutrient intake.

Practical:

Practicing methods of nutritional assessment (ABCD of Nutritional assessment);
Comparison of the data with references values for drawingconclusions.

Suggested Readings:

1. Driskell, J.A. and Wolinsky, I. 2011. Nutritional Assessment of Athletes, 2nd ed. CRC Press, Taylor & Francis Group, New York, USA.
2. Gibson, R.S 2005. Principles of Nutrition Assessment. Oxford University PressInc., New York, USA.
3. Lee, R.D. and Nieman, D.C. 2012. Nutritional Assessment, 6thed. The McGraw-Hill Companies Inc., New York, USA. McGuire, M. and Beerman, K.A. 2011. Nutritional Sciences: From Fundamentals to Food**.**Cengage Learning, Belmont, CA, USA.

Course Name: Nutrition Through the LifeCycle	**Course Code: HND-417**
Course Structure: Lectures:3 Lab:0	**Credit Hours:** 3(3+0)
Prerequisites: None	

Learning Outcomes:

To analyze the nutritional needs during conception, infancy, childhood,adolescence, male and female adults, pregnancy, lactation and during aging

To suggest dietary recommendations in special clinical conditions

Theory:

Preconception nutrition: 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. Nutrition during pregnancy: status of pregnancy outcomes, embryonic and fetal growth & development, pregnancy weight gain, nutrition and outcome of the pregnancy, 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-schooled nutrition: normal growth and development, energy and nutrient needs, common nutritional problems, nutrition related conditions, food allergies and intolerances. Child and pre-adolescent nutrition: normal growth and development, energy and nutrient needs, common nutritional problems, prevention of nutrition related disorders, dietary recommendations. Adolescent nutrition: normal physical growth and development, health and eating related behavior, energy and nutrient requirements, overweight and obesity, eating disorders. Adult nutrition: physiological changes of adulthood, maintaining a healthy body, dietary recommendations, nutrient recommendations, nutrition intervention for risk reduction. Geriatric nutrition: physiological changes, nutritional risk factors, dietary recommendations and food safety, nutrient recommendations, nutrition in special clinical conditions.

Suggested Readings

1. Brown, J.E. 2014. Nutrition through the Life Cycle, 5th ed. Cengage Learning, Belmont, CA, USA.
2. Rolfes, S.R., K. Pinna and E. Whitney. 2015. Understanding Normal and ClinicalNutrition, 10th ed. Thomson and Wadsworth Publishers, USA.
3. Shetty, P. 2002. Nutrition Through the Life Cycle. Leatherhead International Ltd. And Royal Society of Chemistry, Cambridge, U.K.
4. Worthington-Roberts, B.S. and S.R. Williams. 2000. Nutrition Throughoutthe Life Cycle. The McGraw-Hill Education, Maidenhead, Berkshire, U.K.

Course Name: General Pathology	**Course Code:HND-418**
Course Structure: lectures:2 Lab:1	**Credit Hours:** 3(2+1)
Prerequisites: None	

Learning Outcomes:

To understand the basic terminologies in different pathological states
To elaborate the cell injuries, necrosis, their types and practical applications ofpathology

Theory:

Scope of pathology and concept of diseases; Definition and terminology: Ischemia, Hypoxia, Necrosis, Infarction, Atrophy, Hypertrophy, Hyperplasia, Metaplasia, Plasia, Anaplasia; Response of body to injury and infection, growth disturbance, circulatory disturbances, wound healing and repair, neoplasia, fever, disturbance of mineral deposits and pigmentation, anaemia, diarrhoea, burn injury, infectious diseases, hypertension, acute & chronic inflammation, immunity, allergy, hypersensitivity, ulcer (peptic, duodenal), leukemia or blood cancer, environmental and nutritional diseases; Diagnosis and treatment of Cancer in general, fate, survival and prognosis with tumors.

Practical:

Selection, collection, preservation and dispatch of morbid material for laboratory examination; Study of pathological slides of various pathological conditions; Demonstration of blood sampling; Basic concepts of anemia; Demonstration of routine urinalysis, faecal examination and skin scraping; Blood smears, staining and examination; Hematology report interpretation, basic concepts of contents and interpretation of pathology report (serum enzymes and other markers of disease).

Suggested Readings:

1. Carton, J. 2012. Oxford Handbook of Clinical Pathology, 1st ed. OxfordUniversity Press, New York, U.S.A.
2. Kierszenbaum, A.L. and L. Tres. 2015. Histology and Cell Biology: Introductionto Pathology, 4th ed. Elsevier Sunders, Philadelphia, PA, USA.
3. Kumar, V., A.K. Abbas, N. Fausto, and J.C. Aster. 2015. Robbins and CotranPathologic Basis of Disease, 9th ed. Saunders Elsevier, USA.
4. McPhee, S.J. and W.F. Ganong. 2014. Pathophysiology of Disease: An Introduction to Clinical Medicine, 7th ed. McGraw-Hill Education, Bew York, USA.

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DETAILED COURSE OUTLINE OF BS 4 YEAR PROGRAM WITH MAJOR HUMAN NUTRITION AND DIETETICS

SEMESTER – V

Course Name: Clinical Biochemistry	**Course Code: BCHM-561**
Course Structure: Lectures: 2 Lab:1	**Credit Hours:** 3(2+1)
Prerequisites: None	

Learning Outcomes:

To understand the role and requirements of clinical laboratory and how chemicaland biochemical analysis are applied to the study of disease

To discuss the function, structure, laboratory investigation and diseases of thedifferent body systems

To correlate laboratory findings in clinical samples with various pathological processes.

Theory:

Clinical laboratory: organization and management, safety, good lab practices, quality control and assurance, reference range and normal values, laboratory data processing; Handling and processing of clinical samples; Effect of storage on composition of samples; Commonly used instruments in clinical laboratory: Microscope, Minilab apparatus, X-ray, ECG, MRI, ELISA reader, CT scan etc.; Symptomlogy and case histories of various diseases. Forensic science, Molecular basis of diagnosis.

Practical:

Blood sampling techniques; Complete blood picture (CBP) like Hb, PCV, ESR, TLC, DLC, bleeding time, clotting time, prothrombin time and blood groups; Pregnancy test; Liver function tests; Kidney function test; Cardiac enzymes; Lipid profile, total proteins, albumin and serum minerals; Urine analysis for bile pigments, protein, urea, pH, ketone bodies, sugars, creatinine, pus cells, RBCs and uric acid; Sero-diagnosis of infectious diseases; Visit to clinical laboratory/concerned organization.

Suggested Readings:

1. Ahmed, N. 2011. Clinical Biochemistry. Oxford University Press, Oxford, UK.
2. Bain, B.J., I. Bates, M.A. Laffan and S.M. Lewis. 2012. Practical Haematology, 11th ed. Churchill Livingstone, Elsevier Ltd., New York, USA.
3. Burtis, C., E. Ashwood and D. Burns. 2006. Tietz Text Book of Clinical Chemistry and Molecular Diagnostics, 4th ed. Elsevier Saunders Company, Philadelphia, USA.
4. Chawala, R. 2014. Practical Clinical Biochemistry: Methods and Interpretations, 4ed. Jaypee Brothers Medical Publishers (P) Ltd., New Delhi, India.
5. Devlin, T. M. 2005. Textbook of biochemistry with clinical correlations, 6th ed. Wiley-Liss, Inc., U.S.A.

Course Title: Biostatistics	**Course Code:** STAT-401
Course Structure: Lectures: 3, Labs: 0	**Credit Hours:** 3
Prerequisites: None	

Course Objective:
To provide knowledge of importance of and its application in Biological Sciences. Understanding of use of statistical techniques to summarize and analyze biological data

Course Outline:
Introduction to Biostatistics, scope. Types of data, variables; Categorical, numerical and censored data. Descriptive Statistics; Measure of central tendency; mean, median, mode. Measure of dispersion; Variance and standard deviation. Simple linear regression; model fitting. Correlation; correlation co-efficient, co-efficient of determination. Logistic regression. Logit transformations and their analysis, p values and its importance and role. Hypothesis testing.

Course Outcomes: After completing the course, the students will be able to

- Understand the applications of statistical tools in biological science.
- Demonstrate an understanding of the central concepts of statistical theory in Biological Sciences.
- Apply appropriate statistical techniques to biological data and analyze and communicate the results of statistical analysis effectively.

Recommended Books: Latest Edition of the Following Books.

1. Antonisamy, B. Premkumar, P. and Christopher, S. (2017). *Principles and Practice of Biostatistics*. 1st edition. Elsevier, India.
2. Daniel, W.W. (2010). *Biostatistics: A Foundation for the Health Sciences*. 6th edition. John Wiley, New York. NY, USA.
3. Sullivan, M.L. (2018). *Essentials of Biostatistics in Public Health*. 3rd edition. Jones and Bartlett Learning, Burlington, MA, USA.
4. Zar, J. (2000). *Biostatistical Analysis.* 5th Edition. John Wiley & Sons, New York, NY, USA.
5. Pagano, M., Gauvreau, K., & Mattie, H. (2022). *Principles of biostatistics*. CRC Press.
6. Gerstman, B. B. (2014). *Basic biostatistics*. Jones & Bartlett Learning, LLC.
7. Kaps, M., & Lamberson, W. R. (Eds.). (2017). *Biostatistics for animal science*. Cabi.

Course Name: Fundamentals of Dietetics	**Course Code: HND-511**
Course Structure: Lectures:2 Lab:1	**Credit Hours:** 3(2+1)
Prerequisites: None	

Learning Outcomes:

To understand the discipline of dietetics and its role in human wellbeing
To familiarize with the foundations of healthy diets and their role in diseaseprevention and management
To acquaint hands-on training for calorie calculation and menu planning usingfood composition table and data bases
To assess BMI and energy expenditures in relation to overweight andobesity

Theory:

Dietetics: definitions, history, importance; Dietitian: 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 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.

Practical:

Interpretation of food guide pyramid, MyPyramid, My plate, Eatwell 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 & data bases; Food intake analysis: Dietary Recall, Food Frequency Questionnaires, Food Surveys.

Suggested Readings:

1. Mahan, L.K., S. Escott-Stump and J.L. Raymond. 2012. Krause's Food, Nutrition & Diet Therapy, 13th ed. Elsevier Saunders, St. Louis, Missouri,USA.
2. Mudambi, S.R. and M.V. Rajagopal. 2007. Fundamentals of Foods, Nutrition & DietTherapy, 5th ed. New Age International Pvt. Ltd. Publishers, New Delhi.
3. Punekar, M. and J. D'Souza. 2010. Handbook of Applied Nutrition, Dietotherapy and Diet Management. SBS Publishers & Distributors Pvt. Ltd.,New Delhi.
4. Rawat, S. 2015. Applied Nutrition. Random Publication, New Delhi.

Course Name: Nutrition and Psychology	**Course Code: HND-512**
Course Structure: Lectures:3 Lab:0	**Credit Hours:** 3(3+0)
Prerequisites: None	

Learning Outcomes:

To understand psychology, its types and importance in nutrition

To abreast the impact of psychological influences on appetite and attitudebehavior relationship

Theory:

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; Eating disorders: diagnosis, assessment and treatment; Face perception; Conceptual model of food choice; Psychological influences on appetite; Process over the life course, integration of biological, social, cultural and psychological influences on food choice; Understanding 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 behavior relationship; Measurement issues, indirect effects of attitude on behavior; The theory of reasoned action; Additional variables within the theory of planned behavior; Personality and intelligence; Stress management.

Suggested Readings:

1. Blackman, M.C. and C.A. Kvaska. 2011. Nutrition Psychology: ImprovingDietary Adherence. Jones and Bartlett Learning Publishers, Ontario, Canada.
2. Booth, D.A. 1994. The Psychology of Nutrition. Taylor & Francis Inc., Bristol,PA, USA.
3. Elmes, D.G., B.H. Kantowitz and H.L. Roediger. Research Methods in Psychology, 9th ed. Wadsworth Cengage Learning, Belmont, CA, USA.
4. Jane O. 2010. The Psychology of Eating: From Healthy to Disorders Behavior,2nd ed. Wiley Blackwell, John Wiley & Sons Ltd., Chichester, West Sussex, UK.

Course Name: Food safety and quality management	**Course Code: FST-414**
Course Structure: Lectures:3 Lab:0	**Credit Hours: 3+0**
Prerequisites: None	

Learning Outcomes:

To understand principles lying under safety and quality of foods to ensuretheir safe production
To implement the food safety and quality management systems in a foodbusiness in a precise and systematic way

Theory:

Food safety, security and quality: definitions and importance; Different terminologies used in food safety & quality; Categories of hazards: Physical, chemical, biological. Good manufacturing practices; Good storage practices; Plant design layout; Global Food Safety Imitative; Global Food Safety Systems: HACCP, BRC, FSSC 22000, ISO 22000; Quality Management System (ISO 9001:2008);

Food safety laws in Pakistan—West Pakistan Pure Foods Ordinance 1960, Cantonments Pure Food Ordinance Act 1966, West Pakistan Pure Food Rules 1965,The Punjab Pure Food Rules 2007 & 2011.

Suggested Readings:

1. Ali, I. 2003. Food Quality Assurance: Principles and Practices. CRC Press,Taylor & Francis Group, Boca Raton, FL, USA.
2. David A.S. and F.S. Norah. 1998. Principles and Practices for the Safe Processing of Foods. Woodhead Publishing Limited, Cambridge, England.
3. Early, R. 1995. Guide to Quality Management Systems for the Food Industry.Springer Science + Business Media, LLC., New York, USA.
4. Motarjemi, Y and Lelieveld, H. 2014. Food Safety Management: A Practical Guide for the Food Industry. Academic Press, Elsevier Inc., San Diego, CA,USA.
5. Sun, D. 2012. Handbook of Food Safety Engineering. Wiley-Blackwell, JohnWiley & Sons Ltd., Chichester, West Sussex, UK.
6. Theuvsen, L., A. Spiller, M. Peupert and G. Jahn. 2007. Quality Management inFood Chains. Wageningen Academic Publishers, The Netherlands.

Course Name: Sports Nutrition	**Course Code: HND-521**
Course Structure: 2 Lectures 1 Practical	**Credit Hours:** 3(2+1)
Prerequisites: None	

Learning Outcomes:

To emphasize the importance of proper fueling for physical activity, pre-andpost-workout

To provide an overview about dietary supplements, how they are regulated andhow to avoid use of contaminated dietary supplements

To highlight the risks associated with performance enhancing drugs including anabolic androgenic steroids

Theory:

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.

Practical:

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.

Suggested Readings:

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.

Driskell, J.A. 2007. Sports Nutrition Fats and Proteins. CRC Press, Taylor and

1. Francis Group, Boca Raton, FL, USA.
2. Fink, H.H., A.E. Mikesky and L.A. Burgoon 2011. Practical Applications in SportsNutrition, 3rd ed. Jones & Bartlett Learning Burlington, MA, USA.
3. Lanham-New, S.A., S.J. Stear, S.M. Shirreffs and A.L. Collins. 2011. Sports and Exercise Nutrition. Wiley-Blackwell, John Wiley & Sons Ltd., Chichester, West Sussex, UK.
4. Maughan, R.J. 2000. Nutrition in Sport: The Encyclopedia of Sports Medicine. Wiley-Blackwell, John Wiley & Sons Ltd., Chichester, West Sussex, UK.

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SEMESTER – VI

Course Name: Food Analysis	**Course Code: FST-419**
Course Structure: Lecture :1 Lab:2	**Credit Hours:** 3(1+2)
Prerequisites: None	

Learning Outcomes:

To highlight the significance of food analysis in product development andoverall quality

To comprehend commonly employed types of analysis for productcharacterization

To prepare and standardize commonly used lab solutions

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: moisture, ash, proteins, lipids, carbohydrates, fiber, NFE, 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. Overview of the commonly employed statistical methods.

Practical :

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.

Suggested Readings:

1. AOAC. 2016. Official Methods of Analysis of AOAC International, 20th ed.Association of Official Analytical Chemists, Arlington, USA.
2. Awan, J.A. and S.U. Rehman. 2015. Food Analysis Manual. UnitechCommunications, Faisalabad, Pakistan.
3. Cruz, R.M.S., I. Khmelinskii and M. Vieira. 2014. Methods in Food Analysis.CRC Press. Taylor & Francis Group, Boca Raton, F.L, USA.
4. Pomeranz, Y. and C.E. Meloan. 2000. Food Analysis: Theory and Practice, 3rd ed. Chapman & Hall, New York, USA.

Winton, A. and K.B. Winton. 2006. Techniques of Food Analysis. AgrobiosPublishing Co., Jodhpur, India.

Course Name: Food and Drug Laws	**Course Code: FST-516**
Course Structure: Lectures: 2 Lab:0	**Credit Hours:** 2(2+0)
Prerequisites: None	

Learning Outcomes:

To get know how about the existing food and drug laws prevailing in thecountry
To understand duties and authorities of food safety officers and druginspectors
To familiarize with food and drug laws enforcement agencies in Pakistan

Theory

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, labeling 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 printmedia in public awareness and empowerment.

Suggested Readings:

1. GOP. 2005. The Punjab Consumer Protection Act 2005. Government of thePunjab, Lahore, Pakistan.
2. GOP. 2011. Punjab Pure Food Rules 2011. Health Department, Government ofthe Punjab, Lahore, Pakistan.
3. GOP. 2012. Drug Regulatory Authority of Pakistan Act, 2012 The *DrugRegulatory Authority of Pakistan,* Government of the Pakistan, Islamabad.
4. GOP. 2015. *Pakistan* Halal *Authority Act, 2015. M*inister for Science andTechnology, Government of the Pakistan, Islamabad.
5. Independent topics for readings.

Course Name: Advance Dietetics	**Course Code: HND-517**
Course Structure: Lectures:2 Lab:1	**Credit Hours:** 3(2+1)
Prerequisites: None	

Learning Outcomes:

To comprehend the principles of diet therapy and therapeutic nutrition

To understand the role of dietary management in various health disorders related toupper and lower gastrointestinal tract, hepatic, pancreas and coronary heart diseasesTo acquaint hands-on training for the dietary modification of normal diets aligned with various health disorders

To prepare pre- and post-operative diets

Theory:

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; 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.

Practical:

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 energymodified 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; Nutrition in surgical conditions: pre- operative and post-operative diets; Enteral and parenteral feeding; Hospital visits and nutrition camps.

Suggested Readings:

1. Mahan, L.K., S. Escott-Stump and J.L. Raymond. 2012. Krause's Food, Nutrition & Diet Therapy, 13th ed. Elsevier Saunders, St. Louis, Missouri,USA.
2. Mudambi, S.R. and M.V. Rajagopal. 2007. Fundamentals of Foods, Nutrition & DietTherapy, 5thed. New Age International Pvt. Ltd. Publishers, New Delhi.
3. Punekar, M. and J. D'Souza. 2010. Handbook of Applied Nutrition, Dietotherapy and Diet Management. SBS Publishers & Distributors Pvt. Ltd.,New Delhi.
4. Rawat, S. 2015. Applied Nutrition. Random Publication, New Delhi.
   Schlenker, E. and J.A. Gilbert. 2015. Williams' Essentials of Nutrition and Diet Therapy, 11th ed. Elsevier/Mosby Inc., Louis, Missouri.
6. Singh, J. 2008. Handbook of Nutrition and Dietetics. Lotus Press, India.

Course Name: Functional Foods and Nutraceuticals	**Course Code: HND-518**
Course Structure: Lectures: 3 Lab: 0	**Credit Hours:** 3(3-0)
Prerequisites: None	

Learning Outcomes:

To find out sources of functional foods &nutraceuticals and their impact onnutrition and health

To familiarize with the standards and regulations used globally regardingregulatory issues and usage of functional foods

To assess international trade and marketability of functional foods

Theory:

Functional foods and nutraceuticals: past, present, future and health claims; functional foods and their impact on nutrition and health obesity, diabetes, cardiovascular diseases, hypertension and cancer; Functional ingredients and bioactive molecules: Isoflavones, lycopene, polyphenols, dietary fiber, omega-3 & -6 fatty acids, conjugated linoleic acid, antioxidants, prebiotic and probiotic; Functional foods from different food groups: cereals, dairy, meat, fruits and vegetables; Regulatory systems governing the production and distribution of functional food - national and international; Standard and regulations of various agencies: FDA, EC,FAO/WHO, Health Canada; Guidelines for the assessment of functional foods; Marketing and regulatory issues; Conventional and emerging food processing technologies for functional food production; Toxicological and safety aspects of functional foods; Asian functional foods; Functional foods in international market and growth in Pakistan.

Suggested Readings:

1. FAO (Food and Agriculture Organization of the United Nations). 2007. Report onFunctional Foods. Food and Agriculture Organization of the United Nations,Rome, Italy.
2. Shi, J., C.T. Ho and F. Shahidi. 2005. Asian Functional Foods. Marcel Dekker/CRC Press, New York, U.S.A. Shi, J., G. Mazza and M.L. Maguer. 2002. Functional Foods: Biochemical and Processing Aspects, Vol. 2. CRC Press, Traylor & Francis Group, Boca Raton, New York, USA.
3. Wildman, R.E.C. 2006. Handbook of Nutraceuticals and Functional Foods, 2nd ed. CRC Press, Traylor & Francis Group, Boca Raton, New York, USA.

Course Name: Nutrition Through Social Protection	**Course Code: HND-519**
Course Structure: 2 Lectures	**Credit Hours:** 2(2-0)
Prerequisites: None	

Learning Outcomes:

To acquaint knowledge about the role of social protection programs in poverty alleviation and overall welfare of the society

To understand the role of social protection programs in provision of financial support for scaling up nutrition

To identify the development partners and various social protection and scale up nutrition programs

Theory:

Food insecurity and vulnerability; Food and social class differences; Food society and environment; Introduction to sociology of nutrition; Food and nutrition in culturally diverse societies; Social change and rural development; Women empowerment and nutrition; Food choices and their determinants; Behavior change; Social construction and eating disorders; Challenges to combat malnutrition; Nutrition-sensitive and nutrition-specific interventions; 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; 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.

Suggested Readings:

1. FAO. 2015. Improving Nutrition Through Multisectoral Approaches. Food and Agriculture Organization of the United Nations, Rome Italy.
2. FAO. 2015. Nutrition and Social Protection. Food and Agriculture Organization of the United Nations, Rome Italy.
3. IFPRI. 2016. Global Nutrition Report 2016: From Promise to 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

Course Name: Infant and Young Child Feeding	**Course Code: HND-522**
Course Structure: 2 Lectures 1 Practical	**Credit Hours:** 3(2+1)
Prerequisites: None	

Learning Outcomes

To identify problems affecting infant and young child feeding and provide aframework of essential interventions

To create an environment that will enable mothers, families and other caregiversto implement optimal feeding practices

Theory:

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 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; 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.

Practical:

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. Visits of hospitals and day care centers.

Suggested Readings:

1. 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.
2. Dykes, F. and V.H. Moran. 2009. Infant and Young Child Feeding: Challenges to Implementing a Global Strategy. Wiley-Blackwell, John Wiley & Sons Ltd., Chichester, West Sussex, UK.
3. Samour, P.Q. and K. King. 2010. Pediatric Nutrition, 4th ed. Jones & Bartlett Learning, Mississauga, Canada.

4. WHO. 2003. Global Strategy for Infant and Young Child Feeding. World HealthOrganization, Geneva, Switzerland.
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 thePakistan, Islamabad.

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SEMESTER – VII

Course Name: Internship (Mandatory)	**Course Code: HND**-698
Course Structure: 3 Cr. Hrs	**Credit Hours:** 3

Course Name: Dietetics in Managing Diseases	**Course Code: HND-611**
Course Structure: Lectures:2 Lab:1	**Credit Hours:** 3(2+1)
Prerequisites: None	

Learning Outcomes:

To understand the role of nutrition and dietetics in managing disease and preventing complications

To get hands-on training for the dietary modification of normal diets aligned with various health disorders

To comprehend the role of nutrition education and policies towards nutrition security

Theory:

Diet based regimen to improve the public health; Diet supplementation for diseased patients; Malabsorption and mineral deficiency; Health diets and lifestyles; Preventing diet related diseases; Nutritional implications of various diets; Managing disease and avoiding complications through diet diversification; 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 & 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; Policy principles for promotion of healthy diets; Incorporating nutrition objectives into development policies; Strategic actions and for promoting healthy diets; Drawing up of nutrition education programs; Role of specialist in dietetics and diseases.

Practical:

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.

Suggested Readings:

1. Mahan, L.K., S. Escott-Stump and J.L. Raymond. 2012. Krause's Food, Nutrition &Diet Therapy, 13th ed. Elsevier Saunders, St. Louis, Missouri, USA.
2. Mudambi, S.R. and M.V. Rajagopal. 2007. Fundamentals of Foods, Nutrition & DietTherapy, 5thed. New Age International Pvt. Ltd. Publishers, New Delhi.
3. Punekar, M. and J. D'Souza. 2010. Handbook of Applied Nutrition, Dietotherapy and Diet Management. SBS Publishers & Distributors Pvt. Ltd., New Delhi.
4. Rawat, S. 2015. Applied Nutrition. Random Publication, New Delhi.

Course Name: Research Methods in Nutrition	**Course Code: HND-613**
Course Structure: 3 Lectures	**Credit Hours:** 3(3+0)
Prerequisites: None	

Learning Outcomes:

To apply tools and skills required to understand published research

To identify the types of methods best suited for investigating different types of problems and questions

To get hands-on training of writing successful research proposals for thesis and projects

To abreast ethical consideration in research and publications

Theory:

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; Methods of data collection; Writing scientific documents: synopsis, research proposal, articles, references, internship report. 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.

Suggested Readings:

1. Awan, J.A. 2015. Scientific Presentations. Unitech Communications, Faisalabad, Pakistan.
2. Lovegrove, J.A., L. Hodson, S. Sharma and S.A. Lanham-New. 2015. Nutrition Research Methodologies. Wiley-Blackwell, John Wiley & Sons Ltd., Chichester, West Sussex, UK.
3. Lowe, M. 2007. Beginning Research: A Guide for Foundation Degree Students, 1st ed. Routedge Publications, New York, USA.
4. Starks, T.P. 2006. Trends in Nutrition Research. Nova Science Publishers, Inc., New York, USA.
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.

Course Name: METABOLISM OF NUTRIENTS	**Course Code: HND-**
Course Structure: 2 Lectures	**Credit Hours: 2**(2+0)
Prerequisites: None	

Learning Outcomes:

To understand the metabolic roles of carbohydrates, fats, proteins, vitamins and minerals

To generalize the way in which nutrients are processed through major metabolic fates in order to perform various energetic and structural functions in the body

To establish the role of enzymes and hormones in metabolism of nutrients.

Theory:

Metabolic pathways: objectives, chemical reactions, enzymes, co-enzymes and prosthetic groups, metabolic pathways; Role of ATP in metabolism: objectives, functions, phosphorylation of ADP to ATP; Digestion and absorption: gastrointestinal tract, digestion and absorption of carbohydrates, fats and proteins; Absorption of vitamins and minerals; Metabolism of carbohydrates and fats; Protein nutrition and metabolism; Nitrogen balance and protein requirements; Protein synthesis and metabolism of amino acids; Integration and control of metabolism: pattern of metabolic regulation, intracellular regulation of enzyme activity, responses to fast acting hormone by covalent modification of enzyme proteins, slow acting hormones, changes in enzymes synthesis.

Suggested Readings:

1. Bender, D.A. 2014. Introduction to Nutrition and Metabolism, 5th ed. CRC Press, Taylor & Francis, Boca Raton, FL, USA.
2. Davidson, S., R. Passmore, R and M.A. Eastwood. 1986. Human Nutrition and Dietetics. Churchill Livingstone, New York, U.S.A.
3. Gropper, S.S. and J.L. Smith. 2013. Advanced Nutrition and Human Metabolism, 6th ed. Wadsworth Cengage Learning, Belmont, CA, USA.
4. Kohlmeier, M. 2015. Nutrient Metabolism: Structures, Functions, and Genes, 2nd Ed. Academic Press, San Diego, CA, USA.
5. Lanham-New, S.A., I.A. Macdonald and H.M. Roche. 2011. Nutrition and Metabolism, 2nd ed. Blackwell Publishing, Jones & Wiley Sons Ltd., Chester, West Sussex, UK.
6. Whitney, E.N. and S.R. Rolfes. 2016. Understanding Nutrition, 14th ed. Cengage Learning, Belmont, CA, USA.

Course Name: Nutrition in Emergency	**Course Code: HND-625**
Course Structure: Lectures:3 Lab:0	**Credit Hours: 3**(3+0)
Prerequisites: None	

Learning Outcomes:

To understand the context in which emergencies occur and nutritional assessment of theindividuals and populations

To design and implement interventions for prevent and treatment of malnutrition

To familiarize with the role of national and international agencies in the management ofemergencies.

Theory:

Introduction and concepts: understanding malnutrition, micronutrient malnutrition, causes of malnutrition; Nutrition needs assessment and analysis: individual and population assessment,health assessment and the link with nutrition, food security assessment and the link with nutrition, nutrition information and surveillance systems; Interventions to prevent and treat malnutrition: general food distribution, supplementary feeding, therapeutic care, micronutrient interventions, health and livelihood interventions, infant and young child feeding, HIV and AIDS nutrition; Nutrition information, education and communication; Monitoring and evaluation, standards and accountability; Role of national and international agencies: UNHCR, WFP, NDMA (National disaster management authority), Civil defence; Hygiene and sanitation; Emergency foods.

Suggested Readings:

1. ENN (Emergency Nutrition Network). 2011. The harmonized training package (HTP): resource material for training on nutrition in emergencies, version 2. Nutrition Works, Emergency Nutrition Network, Global Nutrition Cluster. Oxford, U.K.
2. FAO. 2005. Protecting and Promoting Good Nutrition in Crisis and Recovery: Resource Guide. Food and Agriculture Organization of the United Nations, Rome, Italy.
3. SC (Save the Children Fund UK). 2004. Emergency nutrition assessment: guidelines for field workers. Save the Children, Westport, U.K.
4. WHO (World Health Organization). 2000. The management of nutrition in major emergencies. World Health Organization, Geneva, Switzerland.

Course Name: Capstone Research project	**Course Code: HND**-699
Course Structure: 3 Cr. hrs. Research	**Credit Hours:** 3

Course Name: Capstone project	**Course Code: HND**-697
Course Structure: 3 Cr. hrs. project	**Credit Hours:** 3

SHAHEED BENAZIR BHUTTO WOMEN UNIVERSITY PESHAWAR

DETAILED COURSE OUTLINE OF BS 4 YEAR PROGRAM WITH MAJOR HUMAN NUTRITION AND DIETETICS

SEMESTER – VIII

Course Name: Food Chemistry	**Course Code: FST-623**
Course Structure: Lectures:3 Lab:0	**Credit Hours: 3**(3+0)
Prerequisites: None	

Learning Outcomes:

To acquire knowledge and skills for understanding the main physical, chemical and functionalproperties of food

To understand and be able to control the major chemical and biochemical reactions that influencefood quality with emphasis on food industry applications

To acquaint information about different food components and interactions among them tomodulate the specific quality attributes of food systems

Theory:

Cellular basis of foods; Water: properties, types, water activity and its effect on shelf life of food; Carbohydrates: roles of in food structure, color, flavor and texture; Lipids: roles in food structure, color, flavor and texture, rancidity, emulsifiers; Proteins: roles in food structure, color, flavor and texture; Enzymes: enzymatic & non-enzymatic browning reactions, influences on color, flavor and texture; Technologies in minerals and vitamins fortification of foods, stability of vitamins; Food colors: natural & artificial colors, pigments; Flavors: characteristics, taste, odor and astringency, off-flavor, aromatic compounds, Chemistry involved in ripening processes of fruits and vegetables; Food additives.

Suggested Readings:

1. Belitz, H.D, W. Groschm and P. Schieberle. 2009. Food Chemistry. Springer Verlag,Germany.
2. Coultate, T. 2009. Food: The Chemistry of Its Components. The Royal Society ofChemistry, Thomas Graham House, Science Park, UK.
3. Damodaran, S., K. Parkin and O.R. Fennema. 2007. Fennema's Food Chemistry, 4th ed. CRC Press, Taylor & Francis Group, Boca Raton, FL, USA.
4. DeMan, J.M. 2007. Principles of Food Chemistry. Springer Verlag, Germany.
5. Velisek, J. 2014. The Chemistry of Food. John Wiley & Sons Inc., New York, USA.

Course Name: Nutritional practices inclinical care	**Course Code: HND-614**
Course Structure: Lectures:2 Lab:1	**Credit Hours:** 3(2+1)
Prerequisites: None	

Learning Outcomes:

To assess various physiological conditions and prepare diet plans accordingly
To acquaint hands-on training in the field of enteral and parental nutrition.

Theory:

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; 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.

Practical:

Nutritional assessment of patients: selection, nutritional requirements; Tubefeeding: 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-operativediets; Case studies and logbooks; Hospital visits.

Suggested Readings:

1. Block, A.S., J. Maillet, W.H. Howell and M.F. Winkler. 2007. Issues and Choices in Clinical Nutrition Practice. Lippincott Williams & Wilkins, Philadelphia, PA, USA.

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 & Sons Ltd., Chichester, West Sussex, UK.

3. Katz, D.L. 2008. Nutrition in Clinical Practice, 2nd ed. Lippincott Williams & Wilkins,Philadelphia, PA, USA.

4. Rolandelli, R.H., R. Bankhead, J. I. Boullate and C.W. Compher. 2005. ClinicalNutrition; Enteral and Tube Feeding. 4th ed. ElasvierSauders Publishers, USA.

Course Name: Food Service Management	**Course Code: HND-616**
Course Structure: Lectures:3 Lab:0	**Credit Hours:** 3(3+0)
Prerequisites: None	

Learning Outcomes:

To describe the key milestones of food service industry

To relate the current trends in food service operations and evolution through the businesslife cycle

To explain the art underlying menu development and method for recipe standardizationTo understand the planning considerations vital for creating a successful food service operation

Theory:

Food service management: introduction; position, manage and leverage a successful food service operation; The compilation of management practices: tools and techniques, essential approaches. Food service industry: history, segmentation and managerial implication, menu planning and development, recipe standardization, costing and analysis, food supply chain management, distribution channels, supplier selection, purchasing, equipment selection, forecasting, storage management, product inventory management, human resource management, customer services, marketing. Food safety: GMP, HACCP.

Suggested Readings :

1. Barron, C.W., T. Power and D.R. Reynolds. 2012. Introduction to Management in the Hospitality Industry, 10th ed. John Wiley Sons Inc., Hoboken, New Jersey, USA.
2. Reynolds, D.R. 2014. Foodservice Management Fundamentals. John Wiley Sons Inc.,Hoboken, New Jersey, USA.
3. Reynolds, D.R. and K.W. McClusky. 2014. Study Guide to Accompany Food service Management Fundamentals. John Wiley Sons Inc., Hoboken, New Jersey, USA.

Course Name: Food Microbiology	**Course Code: FST-611**
Course Structure: Lectures:2 Lab:1	**Credit Hours:** 3(2+1)
Prerequisites: None	

Learning Outcomes:

To identify various types of microorganisms on the basis of morphological,cultural and physiological characteristics

To grasp knowledge about the microbial contamination of foods and factorsaffecting the growth of microorganisms

To familiarize students about food borne infections, intoxications and role ofprobiotics in our daily life

Theory:

Food microbiology: introduction and scope; Important microbial genera in foods: bacteria, mold, yeast and yeast like fungi, viruses general, morphological, culturaland physiological characteristics; Factors affecting the growth and survival of microorganisms in food: intrinsic, extrinsic and implicit; Contamination and spoilage of perishable, semi perishable and stable foods: sources, transmission, microorganisms; Food microbiology and public health: food-borne infections: intoxications; Microbiological risk assessment; Microbiology in food sanitation: food sanitizers and pathogen reduction a case study; Food fermentation; Probiotics in human health.

Practical:

Isolation, identification and characterization of microorganisms: morphology, biochemical; Enumeration of microorganisms in food and water samples (total count, viable count, MPN); Examination of foods for pathogenic organisms (Escherichia coli, Coliform, Salmonella and Listeriamonocytogenes); Preparation of fermented and probiotic enriched food products.

Suggested Readings:

1. Adams, M.R. and M.O. Moss. 2006. Food Microbiology. The Royal Society of Chemistry, Cambridge, UK.
2. Adams, M.R., M.O. Moss and P. McClure. 2016. Food Microbiology, 4th ed. Royal Society of Chemistry, Cambridge, UK.
3. Brown, M. and M. Stringer. 2002. Microbiological risk assessment in food processing. Woodhead Publishing Ltd. Cambridge, UK. Frazier, W.C., D.C. Westhoff and K.N. Vanitha. 2013. Food Microbiology, 5th ed. McGraw-Hill Book Co., New York, USA.
4. Montville, T.J., K.R. Mathews and K.E. Kniel. 2012. Food microbiology: an introduction, 3rd ed. ASM Press, Washington DC, USA.
5. Ray, B. and A. Bhunia. 2013. Fundamentals of Food microbiology, 5th ed. CRC Press, Taylor & Francis Group, Boca Raton, FL, USA.

Course Name: Capstone Research project	**Course Code: HND**-699
Course Structure: 3 Cr. hrs. Research	**Credit Hours: 3**

Course Name: Capstone project	**Course Code: HND**-697

Course Structure: 3 Cr. Hrs Elective Course	**Credit Hours: 3**

Optional Course for those who opted for Capstone Project