UNIVERSITY OF THE PUNJAB

NOTIFICATION

It is hereby notified that the Syndicate at its meeting held on 15.11.2021 approved the recommendations of the Academic Council made at its meeting dated 25.08.2021 regarding grant of permission to start BS Nutrition and Dietetics (4 Years) program (Regular/Replica) alongwith approval of its Syllabi at the Department of Public Health w.e.f. from Academic Session 2021. Subject to the availability of resources/ infrastruction and fulfillment of Students/Teachers Ratio.

The Syllabus of BS Nutrition and Dietetics is Attached vide Annexure- 'A'.

Sd/-
Muhammad Rauf Nawaz
Registrar

Admin. Block,
Quaid-i-Azam Campus,
Lahore.
No. D/111/Acad.

Dated: 10.01/2022.

Copy of the above is forwarded to the following for information and necessary action: -

1. Dean, Faculty of Health Sciences.
2. Director, Social & Cultural Studies
3. Director, QEC
4. Controller of Examinations
5. Director, IT
6. Secretary to the Vice-Chancellor
7. PS to PVC
8. PS to Registrar
9. Assistant Syllabus

Assistant Registrar (Academic)
for Registrar

CURRICULUM

OF

NUTRITION AND DIETETICS

For

BS 4-Year Program

Program Title: BS (Hons.) Nutrition and Dietetics

Department: Department of Public Health

Faculty: Faculty of Behavioral and Social Sciences

1. Institute Mission

Our mission at the Institute of Social & Cultural Studies (ISCS) is to help our students and community by staying true to the ontological and epistemological traditions of our discipline. In an open and interactive environment, we encourage our students and faculty to pursue the shared resolve to understand ourselves as human beings, our interdependence on each other and the trends of cooperation and conflict that influence our mutual existence. As educators and social scientists, we endeavor to imbue our students with a sense of 'self' that is innately connected to the 'collective'. It is our hope and belief that our pedagogical style will promote peace and compassion through learning. We intend to create indigenous sociological knowledge and apply professional research skills to influence social policies for desirable social change in our own cultural domain. This has the aim of improving our social and cultural environment and raising the quality of life in Pakistan.

2. Introduction of the Institute

The Institute of Social and Cultural Studies (ISCS) is a student-centered and research-oriented institution. It offers a range of high-quality educational programs at undergraduate, graduate, and postgraduate levels. Currently the Institute offers PhD in Sociology and Public Health, M. Phil in Sociology, Education Policy & Development and Public Health. The Institute also offers Masters Programs in Sociology, Population Sciences, Development Studies, Criminology & Security Studies and BS in Sociology. The ISCS is dedicated to the discovery, sharing and application of knowledge to aid in the due progress of our society, and the nation. The core value of the ISCS remains the pursuit of useful knowledge for improving human life.

The objective of education and research is to promote social justice and harmony in human societies, especially in the complex emerging global social system. The aim is to entrust our students with the knowledge and skills necessary to participate in building equitable and humane social institutions in Pakistan. We intend to create indigenous

sociological knowledge and apply professional research skills to influence social policies for desirable social change in our own cultural domain. This has the aim of improving our social and cultural environment and raising the quality of life in Pakistan.

3. Program Introduction

The BS nutrition and dietetics is an undergraduate degree program that is designed to produce qualified nutritionists/professionals who are able to make meaningful contribution in enhancing understanding about nutritional issues of Pakistan. This program will be a blend of theoretical and practical knowledge to equip students with current data in this field. This is achieved through providing high quality education and training to our students. Like most of the developing countries, Pakistani population suffering from a variety of nutritional deficiency disorders ranging from protein-calorie malnutrition to specific micro-nutrients in certain areas of the country. These nutrient deficiencies are propagated by multiple factors like dietary insufficiencies of micronutrients, poor maternal & child health, high burden of morbidity, low levels of micronutrients in the soil, bioavailability issues and have resulted in growth retardation, mental development and various types of physical disabilities. Increasing rate of chronic and acute malnutrition in the country is primarily attributed to poverty, high illiteracy among the mothers, food & nutritional insecurity and lack of cutting edge research to devise local solutions to curb this situation.

A large number of infectious diseases such as respiratory and intestinal infections remain responsible for up to 50% of deaths of children under five. Beside micronutrient deficiencies, the incidences of cardiovascular diseases, diabetes, cancer, obesity, hypertension and kidney & liver problems are increasing day by day due to unsafe and poor quality diets. Consequently, malnutrition reduces the GDP by 2-3% that is quite high as compared to the impact of economic crises (2%) and failures in power sector (2%). Likewise, malnourished children are at risk of losing more than 10% of their lifetime earnings potential. Overcoming malnutrition not only improves productivity but also reduces disease burden and enhances individual & national growth and wellbeing. The present situation demands serious joint efforts with strong political commitment to strengthen the nutritional education, devise proactive interventions for vulnerable population groups such as pregnant and lactating women, young children, elderly and

disabled individuals based on indigenous solutions. The long-term and sustainable approach is to prevent and cure diseases with diet management. Realizing the importance of human nutrition in daily life and emergencies like earthquake, drought, famine and manmade disasters, the department of public health under the umbrella of faculty of health sciences at University of the Punjab, Lahore are going to start a multidisciplinary and inter-institutional 4-years degree program B.S. Nutrition and Dietetics. It is a multidisciplinary program comprising of 137 credit hours to be completed in eight semesters. Apart from compulsory and basic courses, this program consists of major and minor courses, including internship and research thesis. Initially, this BS (Hons) Program will be offered at the Institute of Social and Cultural Studies and will move to Faculty of Health Sciences when Department of public Health moves to faculty of Health Sciences.

4. Program Objectives

The objective of this degree program to create undergraduates in nutrition and dietetics to provide them with wide-ranging theoretical, practical, and methodological competencies for planning, development and practices to improve human health and well-being through effective application of practical nutrition knowledge in the field of nutrition that would enable them to:

1. demonstrate advanced knowledge and understanding of scientific, evidence-based approaches to the study of nutrition and dietetics;
2. develop manpower in the field of Nutrition and Dietetics with professional aptitude & practical skills
3. serve the nation's health at all stages of life through academically diverse educational and research environment by providing high-quality nutrition education and skills
4. discover, disseminate and apply knowledge to promote improved food choices, nutritional status and well-being of the people
5. create reality-based awareness in community to decrease burden of chronic nutritional diseases
6. serve the community through participation in nutrition related activities and increasing the awareness at the national and international levels

7. produce skilled manpower to cater the needs of Hospitals and clinical setups by providing excellence in professional learning, guidance and practical clinical skills focusing on Nutrition assessment, disease diagnosis and nutritional planning

5. Market Need / Rationale of the Program

This degree program will enable the students to professionally excel in the public health field through meeting today's market requirements. They will do transformation of human health status through better nutrition and physical activity. The students after graduation will be able to demonstrate their expertise in multiple fields which include:

i. Dietitians in the hospitals providing medical nutrition therapy and nutritional counseling to the indoor and outdoor patients
ii. Nutritionists, providing nutritional counseling to the healthy segment of the population regarding lifestyle changes and development of healthy eating patterns
iii. Community nutritionists working with different national and international organizations imparting nutrition education and awareness regarding healthy eating habits in the rural areas for the prevention of nutritional diseases and promotion of health
iv. Dietitian practitioners at personal / private clinic(s)
v. Consultants in the field of nutrition & dietetics for public & private sector organizations dealing in food & nutrition supplements
vi. Nutritionists in food & drug industries especially dealing in therapeutic foods and supplements
vii. Nutrition supervisors in basic health units in different districts of Punjab
viii. Nutrition officers in the nutrition wing of the Health Department.
ix. Researchers in research organizations like NIH to conduct research in nutrition & dietetics with special reference to health outcome of healthy individuals & patients

Nutritionists & dietitians in teaching organizations like universities & colleges Admission

a) Scope

i. Public Sector:

- Public Health Departments
- School Health & Nutrition Programs
- Research and Teaching Institutes
- International Organizations: UNICEF, UNDP, WHO, FAO, World Bank
- Non-Governmental Organizations
- Community Development Program
- Motivational speaker

ii. Private Sector:

- Multinational Companies
- Independent Private Practice
- Food Industries
- Pharmaceuticals Industry
- Hospitality industry
- Consultant for Private Companies and Hospitals
- Airlines and Railways Services
- Catering Services
- Health Care Centers

iii. Foreign Countries:

- Public health departments in Middle East, Europe etc.
- Independent Private Practice as registered dietitians

6. Admission Eligibility Criteria

• Years of Study Completed	12 Years
• Study Program/Subject	BS (Hons) Nutrition and Dietetics
• Percentage/CGPA	As per university rules and regulations
• Entry Test (If applicable) with Minimum requirement	No Entry Test (Open Merit) N/A
• Any Other (if applicable)	F. Sc. or equivalent or 50%

7. Duration of Degree Program

Minimum 4 Years/ 8 semesters/ 137 credit hours

8. Assessment Criteria

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 mark

9. Categorization of course as per HEC Recommendation and Difference

Semesters	Category (Credit Hours)				
	Core/ Compulsory	**Basic/Foundation Course**	**Major Elective**	**Minor Electives**	**General/Other**
1	• English-I (Functional English) • Pakistan Studies	• Fundamentals of Human Nutrition • Human Anatomy and Histology			• Mathematics OR Essentials of Biology • Introductory Biochemistry
2	• English-II (Communication Skills) • Islamic Studies/Ethics	• Food Microbiology • Macronutrients in Human Nutrition • Human Physiology-I			• Sociology of Health Illness
3	• English-III (Technical Writing & Presentation Skills)	• Micronutrients in Human Nutrition • Human Physiology-II			• General Pathology • Food Safety and Quality Management • Fundamentals of public Health
4	• Computer Science and Information Technology • Bio-statistics	• Nutrition through the Lifecycle • Nutrition through Social Protection	• Dietetics I • Public Health Nutrition		
5			• Dietetics II • Nutritional Practices		

			in Clinical Care • Nutritional Education and Awareness • Sports Nutrition • Meal Planning and Management • Nutrition and Psychology		
6			• Nutritional intervention planning • Proteomics and Nutrigenomics • Functional Foods and Nutraceuticals • Dietetics-III		• Biotechnology in Nutrition and Dietetics • Clinical Biochemistry
7		• Infant and Young Child Feeding	• Research Methods in Nutrition • Food and Drug Laws • Global Food Issues	• Nutritional Immunology • Preventive Nutrition • Drug-Nutrient Interactions • Food Chemistry • Nutrition in Emergencies	
8			• Thesis • Internship/ Project • Recent Advances in clinical nutrition •	• Food Toxins and Allergens • Nutritional Deficiencies Disorder • Food supplements • Metabolism of Nutrients • Nutrition	

				Epidemiology	
HEC Guidelines		YES			
Difference (HEC) & PU		Books Readings and course objectives have been revised. So it is different than HEC curriculum. Nevertheless, all the subjects offered as according to HEC Curriculum.			

- Total numbers of Credit hours 137
- Duration 4 years
- Semester duration 16-18 weeks
- Semesters 08
- Course Load per Semester 17-18 Credit Hours
- Number of courses per semester 4-6

10. Curriculum Difference

The designed course of BS(Hons.) Nutrition and Dietetics have total 137 credit hours as per the requirement of HEC curriculum. Majority of the courses are taken from HEC Scheme of Studies for BS(Hons.) Nutrition and Dietetics, however, the sequence of the courses is changed. Following eight courses are changed and/ or modified.

Sr. No.	HEC Curriculum	Punjab University Curriculum
Semester I		
1.	Human Anatomy	Human Anatomy and Histology
Semester II		
2.	Fundamentals of Sociology	Sociology of Health and Illness
Semester III		
3.	Essential of Food Sciences and Technology	Biotechnology in Nutrition and Dietetics
Semester VII		
4.	Introductory Molecular Genetics	Proteomics & Nutrigenomics
5.	Assessment of Nutritional Status	Fundamentals of Public Health
6.	Nutrition Policies and Program	Recent Advances in Clinical Nutrition
Semester VIII		
7.	Food Service Management	Nutritional Intervention Planning
8.	Food Analysis	Research Thesis

Scheme of Studies for BS (Hons) Nutrition and Dietetics

Sr. No.	Course Code	Title of Course	Course Type	Pre-requisite	Credit Hours
Semester-I					
1.	BSND 101	Fundamentals of Human Nutrition	Basic/ Foundation		3(3-0)
2.	BSND 102	Human Anatomy and Histology	Basic/ Foundation		3(2-1)
3.	BSND 103	Mathematics OR Essentials of Biology	General		3(3-0)
4.	BSND 104	English-I	Core/ Compulsory		3(3-0)
5.	BSND 105	Introductory Biochemistry	General		3(2-1)
6.	BSND 106	Pakistan Studies	Core/ Compulsory		2(2-0)
					17
Semester-II					
1.	BSND 107	Macronutrients in Human Nutrition	Basic/ Foundation		3(3-0)
2.	BSND 108	English-II	Core/ Compulsory		3(3-0)
3.	BSND 109	Islamic Studies/Ethics	Core/ Compulsory		2(2-0)
4.	BSND 110	Food Microbiology	Basic/ Foundation		3(2-1)
5.	BSND 111	Human Physiology-I	Basic/ Foundation		3(2-1)
6.	BSND 112	Sociology of Health and Illness	General		3(3-0)

					17
Semester-III					
1.	BSND 201	Micronutrients in Human Nutrition	Basic/ Foundation		3(3-0)
2.	BSND 202	Human Physiology-II	Basic/ Foundation		3(2-1)
3.	BSND 203	English-III	Core/ Compulsory		3(3-0)
4.	BSND 204	Fundamentals of Public Health	General		3(2-1)
5.	BSND 205	General Pathology	General		3(2-1)
6.	BSND 206	Food Safety and Quality Management	General		2(2-0)
					17
Semester-IV					
1.	BSND 207	Bio-Statistics	Core/ Compulsory		3(2-1)
2.	BSND 208	Computer Science and Information Technology	Core/ Compulsory		3(2-1)
3.	BSND 209	Public Health Nutrition	Major Elective		3(2-1)
4.	BSND 210	Nutrition Through the Life Cycle	Basic/ Foundation		3(3-0)
5.	BSND 211	Nutrition Through Social Protection	Basic/ Foundation		2(2-0)
6.	BSND 212	Dietetics-I	Major Elective		3(2-1)
					17
Semester-V					
1.	BSND 301	Dietetics-II	Major		3(2-1)

			Elective		
2.	BSND 302	Nutrition and Psychology	Major Elective		3(3-0)
3.	BSND 303	Nutritional Education and Awareness	Major Elective		3(2-1)
4.	BSND 304	Meal Planning and Management	Major Elective		3(2-1)
5.	BSND 305	Sports Nutrition	Major Elective		3(2-1)
6.	BSND 306	Nutritional Practices in Clinical Care	Major Elective		3(2-1)
					18
Semester-VI					
1.	BSND 307	Nutritional Intervention Planning	Major Elective		3(0-3)
2.	BSND 308	Dietetics-III	Major Elective		3(2-1)
3.	BSND 309	Functional Foods and Nutraceuticals	Major Elective		3(3-0)
4.	BSND 310	Biotechnology in nutrition and dietetics	General		2(2-0)
5.	BSND 311	Proteomics and Nutrigenomics	Major Elective		3(2-1)
6.	BSND 312	Clinical Biochemistry	General		3(2-1)
					17
Semester VII					
1.	BSND 401	Infant & Young Child Feeding	Basic/ Foundation		3(2-1)
2.	BSND 402	Global Food Issues	Major Elective		3(3-0)

3.	BSND 403	Research Methods in Nutrition	Major Elective		3(3-0)
4.	BSND 404	Food and Drug Laws	Major Elective		3(3-0)
Elective Courses (2 courses equal to 5 credit hours)					
5.	BSND 405	Nutritional Immunology/	Minor Elective		3(3-0)
6.	BSND 406	Preventive Nutrition	Minor Elective		3(3-0)
7.	BSND 407	Nutrition in Emergencies	Minor Elective		3(3-0)
8.	BSND 408	Drug-Nutrient Interactions	Minor Elective		2(2-0)
9.	BSND 409	Food Chemistry	Minor Elective		2(2-0)
					17
Semester-VIII					
1.	BSND 410	Research Thesis	Major Elective		6(0-6)
2.	BSND 411	Internship/ Project	Major Elective		3(3-0)
3.	BSND 412	Recent advances in clinical nutrition	Major Elective		3(3-0)
Elective Courses (2 courses equal to 5 credit hours)					
4.	BSND 413	Food Toxins & Allergens	Minor Elective		3(3-0)
5.	BSND 414	Nutritional Deficiency Disorders	Minor Elective		3(3-0)
6.	BSND 415	Food Supplements	Minor Elective		2(2-0)

7.	BSND 416	Metabolism of Nutrients	Minor Elective		2(2-0)
8.	BSND 417	Nutrition Epidemiology	Minor Elective		2(2-0)
					17
Total Credit Hours					**137**

11. Research Thesis/ Project and Internship

a. Thesis/ Project: 6 Credit hours

b. Internship: 3 Credit hours

12. Award of Degree

The degree will be awarded as per University of the Punjab rules and regulations. The student has to complete 137 credit hours, thesis, and internship to qualify for the degree.

13. Faculty Strength

Degree	Area/Specialization	Total
PhD	Public health Nutrition, Sociology of Health and Illness, Anatomy, Physiology, Pathology, Biochemistry, Dietetics, Microbiology, Immunology	**10**
M. Phil	Community Health, Nutrition Research, Macro biology	**5**
Total		**15**

14. Present Student Teacher Ratio in Department

Not Applicable

15. NOC from Professional Councils (If Applicable)

Not Applicable

Detail of courses semester-wise

FIRST SEMESTER

Course No.	Title of Course	Credit Hours
BSND 101	Fundamentals of Human Nutrition	3(3-0)
BSND 102	Human Anatomy	3(2-1)
BSND 103	Mathematics OR Essentials of Biology	3(3-0)
BSND 104	English-I	3(3-0)
BSND 105	Introductory Biochemistry	3(2-1)
BSND 106	Pakistan Studies	2(2-0)
		17

BSND 101: FUNDAMENTALS OF HUMAN NUTRITION

Course Objectives

After completion of this course, students shall be able to:

1. Familiarize with the role of macro- and micro-nutrients in human nutrition
2. Understand the absorption, digestion and metabolism of nutrients in the human
3. Abreast knowledge about the health disorders due to consumption of non-optimal quantities of the nutrients.

Content- Theory

1. **Introduction**

- Food, nutrients and nutrition
- Malnutrition - global and local scenario,
- Diet, balanced diet, food groups,
- Foundations of healthy diet, meal planning

2. **Water**

- Functions,
- Regulation in body, dietary requirements,
- Electrolytes and acid base balance

3. **Carbohydrates**

- Types,
- Role in body,
- Dietary fiber, bulk and alternative sweeteners,
- Recommended intake and energy value

4. **Fats and oils**

- Types and functions
- Recommendations concerning fat intake
- Fat substitutes

5. **Proteins**

- Amino acids,
- Protein synthesis and degradation,
- Classification and functions,

- Quality of proteins,
- Dietary requirements

6. Vitamins

- Classification and types
- Sources
- Role in body

7. Mineral elements

- Types,
- Requirements,
- Sources, role in body

8. Digestion

- Alimentary tract,
- Digestive juices,
- Secretions

9. Absorption and metabolism of nutrients

- Carbohydrates
- Protein lipids

10. Nutrient and Dietary Deficiency

- Disorders
- Special nutrient requirements

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings:

1. Awan, J.A. (2011). Elements of Food and Nutrition. Unitech Communications, Faisalabad, Pakistan.
2. Bamji, M.S., Krishnaswamy, K. & Brahmam, G.N.V. (2009). Textbook of Human Nutrition. (3rd ed.). Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, India.
3. Eastwood, M. (2003). Principles of Human Nutrition. (2nd ed.). John Wiley & Sons, Inc., New York, USA.
4. Geissler, C. & Powers, H. (2011). Human Nutrition. (12th ed.). Churchill Livingstone, London, UK.

BSND 102: HUMAN ANATOMY AND HISTOLOGY

Course Objectives

After completion of this course, students shall be able to:

1. Acquaint knowledge about structural components of body
2. Know about histology and blood composition for the identification of diseases

Content - Theory

1. **Introduction**

- Grass anatomy,
- Histology

2. **Terminology**

- Bones & joints, muscles, cartilage,
- Body structure, tissue, cell, organs

3. **Digestive system**

- Oral cavity,
- Stomach,
- Small & large intestine

4. **Urinary system/ excretory**

- Kidneys,
- Ureter,
- Bladder,
- Urethra

5. **Cardio-vascular system**

- Heart and Pericardium,
- Arteries system, venous system
- Major arteries & veins;

6. **Respiratory system**

- Upper respiratory- Pharynx, Larynx, Trachea sinuses;
- Lower respiratory- Bronchus, Lungs, Diaphragm;

7. **Reproduction system:**

- Male-Testis, Spermatic cord, Penis, Prostate, Bulbourethral gland/ other glands

- Female- Ovaries, Fallopian tubes, Uterus, Vagina, Vulva, Breast

8. Endocrinology

- Pituitary,
- Thyroid, Parathyroid,
- Thymus
- Adrenal, Renal, super renal

9. Lymphatic system

- Lymph,
- Lymph vessel,
- Lymph node;

10. Nervous system

- Brain,
- Spinal cord,
- Cranel nerves,
- Brachial plexus,
- Sciatic nerve;

11. Sensory organs

- Eyes,
- Ears,
- Taste buds,
- Smell,
- Touch.

12. Histology

- Microscopy & Histochemistry
- Cell biology
- Epithelia
- Connective Tissue
- Cartilage & Bone
- Blood
- Muscle

- Nervous system
- Circulatory System
- Lymphatic system
- Endocrine Organs
- Digestive tract – Oral Cavity
- Digestive tract – Oral Cavity, Esophagus
- Digestive tract – Esophagus, Stomach
- Digestive tract – Stomach, Intestines
- Digestive tract – Intestines, Liver, etc..
- Skin (Integument)
- Reproductive System – Male
- Reproductive System – Female

Content- Practical

1. Four primary tissues of body
2. Epithelium tissues: Introduction, types, epithelial glands - endocrine & exocrine,
3. connective tissues: loose connective tissue, collagenous, elastic and reticular fiber;
4. Te-cell of loose cartilage (fibroblast, fat cell, plasma cell, macrophages, mast cell);
5. Blood: leukocytes, WBC, RBC & Platelets;
6. Cartilage and its types; Muscle and its types;
7. Histology in: GIT, respiratory, urinary systems, breast, uterus.
8. Microscopy and preparation of histological slides.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings:

1. Agur, A. M., & Dalley, A. F. (2009). Grant's atlas of anatomy. Lippincott Williams & Wilkins.
2. David, C. (2007). Anatomy of Hatha Yoga: A Manual for Students, Teachers and Practitioners. National Banarisdass Publishers (Pvt.) Ltd., New Delhi, India.
3. Tortora, G. J., & Petti, K. (2002). Principles of human anatomy. John Wiley & Sons.

BSND 103: ESSENTIALS OF BIOLOGY

Course Objectives

After completion of this course, students shall be able to:

1. Understand fundamentals of botany and zoology with special reference to their role in food and nutrition
2. Study plant morphological characteristics and various animal classes through the dissection of representative plants and animals

Content- Theory

1. **Botany**

- Morphology and anatomy of leaf, stem and roots in monocots and dicots;
- Flowers and inflorescence, their parts and types;
- Plant systematic, different system of classification and rules of nomenclature;
- Branches of ecology, their aims and application;
- Plant communities;
- Vegetation sampling methods;
- Ecosystem, its types and components;
- Food chain and food web;
- Pollution its types and impact on plants;
- Metabolic pathways,
- Light and dark reactions of photosynthesis;
- Importance of photosynthesis to plant productivity;
- Respiration, respiratory substrates;
- Plant water relation, absorption and translocation of water and minerals;
- Functional role of minerals elements in plants;
- Growth, role of hormones in plants growth and development;
- Ethno botany and economic importance of plants.

2. **Zoology**

- Diversity of life;
- World resources,
- Classification of animals,

- Scope of Zoology;
- Community structure and diversity;
- Terrestrial and aquatic ecosystem;
- Ecological problems;
- Human population growth;
- Pollution; resource depletion;
- Approaches to animal behavior;
- Proximate and ultimate causes;
- Anthropomorphism;
- Development of behavior;
- Learning and control of behavior;
- Communication;
- Social behavior;
- Evolutionary mechanism;
- Population size, Genetic drift, Gene flow, Mutations, and balanced polymorphism;
- Species and speciation;
- Molecular evolution;
- Mosaic evolution; Protection, Support and Movement in animals;
- Modes of communication;
- Endocrine systems and chemical messengers; Circulation, Immunity and gas exchange, Nutrition and Digestion;
- Temperature and body fluid regulations,
- Reproduction and development in animals.

Content- Practical

1. Study of the morphology of selected ten monocot and plant species;
2. Identification and technical description of common flowering plants belonging to ten families;
3. Extraction of chlorophyll from the leaves and study of absorption spectra using spectrophotometer;

4. Field observation and report writing on animals and their behavior in terrestrial and aquatic ecosystems;
5. Study of insect cuticle, fish scales, amphibian skin, feathers and mammalian skin;
6. Study of heart, principal arteries and veins in a representative vertebrates (dissection of representative amphibian/fish/mammal).

Teaching-Learning Strategies:

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Campbell, N.A. (2002). Biology. (6th ed.). Benjamin/Cumming Publishing Company, Inc., USA.
2. Evert, R.F. & Eichhorn, S.E. (2006). Esau's Plant Anatomy: Meristems, Cells, and Tissues of Plant Body. (3rd ed.).Their Structure, Function and Development. John Wiley & Sons, New Jersey, USA.
3. Hickman, C.P., Roberts, L.S. & Larson, A. (2008). Integrated Principles of Zoology. (13th ed.). McGraw-Hill, USA.
4. Kent, G.C. & Miller, S. (2008). Anatomy of Vertebrates. McGraw-Hill, USA.
5. Mauseth, J.D. (1998). An Introduction to Plant Biology: Multimedia Enhanced. Jones and Bartlett Publishers, UK.
6. Pechenik, J.A. (2006). Biology of Invertebrates. (4th ed.). McGraw-Hill, USA.
7. Taiz, L. & Zeiger, E. (2010). Plant Physiology. (5th ed.). Sinauer Associates Inc., Sunderland, Massachusetts, USA.

BSND 103: MATHEMATICS

Course Objectives

After completion of this course, students shall be able to:

1. Prepare the students, not majoring in mathematics, with the essential tools of algebra
2. Apply the concepts and the techniques in their respective disciplines.

Content (MATHEMATICS I-ALGEBRA)

1. **Preliminaries**

- Real-number system, complex numbers,
- Introduction to sets, set operations, functions, types of functions.

2. **Matrices**

- Introduction to matrices,
- Types, matrix inverse, determinants,
- System of linear equations,
- Cramer's rule.

3. **Quadratic Equations**

- Solution of quadratic equations,
- Qualitative analysis of roots of a quadratic equations,
- Equations reducible to quadratic equations,
- Cube roots of unity,
- Relation between roots and coefficients of quadratic equations.

4. **Sequences and Series**

- Arithmetic progression,
- Geometric progression,
- Harmonic progression.

5. **Binomial Theorem**

- Introduction to mathematical induction
- Binomial theorem with rational and irrational indices.

6. **Trigonometry**

- Fundamentals of trigonometry,
- Trigonometric identities.

Recommended Readings:

1. Dolciani, M.P., Wooton, W., Beckenback, E.F. & Sharron, S. (1978). Algebra 2 and Trigonometry, Houghton & Mifflin, Boston
2. Kaufmann, J.E. (1987). College Algebra and Trigonometry, PWS-Kent Company, Boston
3. Swokowski, E.W. (1986). Fundamentals of Algebra and Trigonometry (6th ed.). PWS-Kent Company, Boston

Course Objectives (MATHEMATICS II (CALCULUS)

After completion of this course, students shall be able to:

- Prepare the students, not majoring in mathematics, with the essential tools of calculus
- Apply the concepts and the techniques in their respective disciplines.

Course Outline

1. **Preliminaries**

- Real-number line,
- Functions and their graphs,
- Solution of equations involving absolute values,
- Inequalities.

2. **Limits and Continuity**

- Limit of a function,
- Left-hand and right-hand limits,
- Continuity, continuous functions.

3. **Derivatives and their Applications**

- Differentiable functions,
- Differentiation of polynomial, rational and transcendental functions,
- Derivatives.

4. **Integration and Definite Integrals**

- Techniques of evaluating indefinite integrals,
- integration by substitution,
- integration by parts,
- Change of variables in indefinite integrals.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Anton, H., Bevens, I. & Davis, S. (2005). Calculus: A New Horizon (8th ed.). John Wiley, New York.
2. Stewart, J. (1995). Calculus (3rd ed.). Brooks/Cole (suggested text)
3. Swokowski, E.W. (1983). Calculus and Analytic Geometry, PWS-Kent Company, Boston
4. Thomas, G.B. & Finney, A.R. (2005). Calculus (11th ed.). Addison-Wesley, Reading, Ma, USA

BSND 104: English I (Functional English)

Course Objectives

Upon completing this course students will be able to:

1. Enhance language skills
2. Develop critical thinking

Content

1. **Basics of Grammar**

- Parts of speech and use of articles
- Sentence structure, active and passive voice
- Practice in unified sentence
- Analysis of phrase, clause and sentence structure
- Transitive and intransitive verbs Punctuation and spelling

2. **Comprehension:**

- Answers to questions on a given text

3. **Discussion**

- General topics and every-day conversation (topics for discussion to be at the discretion of the teacher keeping in view the level of students)

4. **Listening**

- To be improved by showing documentaries/films carefully selected by subject teachers

5. **Translation skills**

- Urdu to English Paragraph writing: Topics to be chosen at the discretion of the teacher

6. **Presentation skills**

Note: Extensive reading is required for vocabulary building

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

Grammar

1. Thomson, A.J. & Martinet, A.V. (1997). Practical English Grammar Exercises 1. (3rd ed.). Oxford University Press. ISBN 0194313492
2. Thomson, A.J. & Martinet, A.V. (1997). Practical English Grammar Exercises 2. (3rd ed.). Oxford University Press. ISBN 0194313506

Writing

1. Marie-Christine, B., Suzanne, B. & Francoise, G. (1993). Writing. Intermediate (4^{th} ed.). Oxford Supplementary Skills. ISBN 0 19 435405 7 Pages 20-27 and 35-41.

Reading/Comprehension

1. Tomlinson, B. & Ellis, R. (1992). Reading. Upper Intermediate. Third Impression. Oxford Supplementary Skills. ISBN 0 19 453402 2.

BSND 105: INTRODUCTORY BIOCHEMISTRY

Course Objectives

After completing this course students will be able to:

1. Acquaint knowledge about the nomenclature, structures and properties of chemical constituents
2. Understand about the energy yielding cycle like glycolysis, Kerbs cycle, β-oxidation etc.

Content -Theory

1. **Introduction**

- Scope and importance of biochemistry;
- Brief introduction of prokaryotic and eukaryotic cells

2. **Bio-macromolecules**

- Composition and organization;

3. **Energy**

- Principles of bioenergetics

4. **Water**

- Properties of water,
- Acid/base properties,
- Dissociation of water and ph value,
- Ph buffering capacity,
- Transportation mechanisms across bio-membranes and osmosis,

5. **Proteins**

- Amino acids - structure, nomenclature, classification,
- Primary structure of proteins - peptide bond, sequencing, synthesis,
- Secondary structure, - α-helices, β-sheets,
- Three dimensional structure of proteins, methods for protein structural determination
- - X-ray, NMR and homology modeling,
- Tertiary and quaternary structures of proteins, protein denaturation,
- Methods for purifying and studying proteins;

6. **Enzymes**

- Functions
- Mode of action, specificity and inhibition,
- Classification and nomenclature,
- Factors affecting enzymes activity

7. Introduction to carbohydrates (Glycobiology)

- Biosynthesis, metabolism, glycolysis, Kerbs cycle,
- Mitochondrial electron transport chain and ATP synthesis

8. Lipids

- Introduction
- Lipogenesis, lipids and lipoproteins in relation to lipid storage diseases,
- Sterol and steroids
- Overview of nucleic acids.

Content- Practical

1. Model visualization of prokaryotic and eukaryotic cells;
2. Solution preparation;
3. Preparation of different buffers and their pH adjustment;
4. Activity of different enzymes like amylase in saliva;
5. Enzyme purification;
6. DNA extraction;
7. Gel electrophoresis;
8. Determination of amino acid profile using HPLC/Amino acid analyzer;
9. Energy estimation through Bomb Calorimeter.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Ahmad, M. (2000). Essentials of Medical Biochemistry. (7th ed.). Ilmi Book House, Urdu Bazar, Lahore.
2. Nelson, D.L. & Cox, M.M. (2013). Lehninger Principles of Biochemistry. (6th ed.). W.H. Freeman & Co Ltd., New York, USA.
3. Rodwell, V.W., Bender, D.A., Botham, K.M., Kennelly, P.J. & Weil, P.A. (2012). Harper's Illustrated Biochemistry. (30th ed.). The McGraw-Hill Education, New York, USA.

BSND 106: PAKISTAN STUDIES

Course Objectives

1. Develop vision of historical perspective, government, politics, contemporary Pakistan, ideological background of Pakistan.
2. Analyze the process of governance, national development, issues arising in the modern age and posing challenges to Pakistan.

Course Content

1. **Historical Perspective**

- Ideological rationale with special reference to Sir Syed Ahmed Khan, Allama Muhammad Iqbal and Quaid-e-Azam Muhammad Ali Jinnah.
- Factors leading to Muslim separatism
- People and Land
- Indus Civilization
- Muslim advent
- Location and geo-physical features.

2. **Government and Politics in Pakistan**

- Political and constitutional phases: a. 1947-58
- 1958-71
- 1971-77
- 1977-88
- 1988-99
- 1999 onward

3. **Contemporary Pakistan**

- Economic institutions and issues
- Society and social structure
- Ethnicity
- Foreign policy of Pakistan and challenges
- Futuristic outlook of Pakistan

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Burki, S. J. (1980). State & Society in Pakistan, The MacMillan Press Ltd.
2. Zaidi, S. A. (2000). Issue in Pakistan's Economy. Karachi: Oxford University Press.
3. Burke, S. M., & Ziring, L. (1990). *Pakistan's foreign policy: An historical analysis*. Oxford University Press, USA.
4. Mahmood, S. (2000). *Pakistan: Political roots and development, 1947-1999*. Oxford University Press.
5. Wilcox, W. A. (1972). The Emergence of Bangladesh, Washington: American Enterprise, Institute of Public Policy Research.
6. Mehmood, S. (n.d.). Pakistan Kayyun Toota. Lahore: Idara-e-Saqafat-eIslamia, Club Road.
7. Tahir, A. (1988). Ethno-national Movements of Pakistan. *Institute of Policy Studies, Islamabad, 19S8*.
8. Ziring, L. (1980). *Enigma of Political Development.* Kent England: WmDawson & sons Ltd.
9. Zahid, A. (1980). *History & Culture of Sindh.* Karachi: Royal Book Company.
10. M. Rafique Afzal. (1980). *Political Parties in Pakistan,* Vol. I, II & III. Islamabad: National Institute of Historical and cultural Research.
11. ul Haq, N. (1993). *Making of Pakistan, the Military Perspective* (No. 81). National Institute of Historical & Cultural Research.

SECOND SEMESTER

Course No.	Title of Course	Credit Hours
BSND 107	Macronutrients in Human Nutrition	3(3-0)
BSND 108	English-II	3(3-0)
BSND 109	Islamic Studies/Ethics	2(2-0)
BSND 110	Food Microbiology	3(2-1)
BSND 111	Human Physiology-I	3(2-1)
BSND 112	Sociology of Health and Illness	3(3-0)
		17

BSND 107: MACRONUTRIENTS IN HUMAN NUTRITION

Course Objectives

After completion of this course, students shall be able to:

1. Abreast knowledge about the normal nutrient metabolism in healthy human
2. Understand interactions between the intake, absorption, transport, processing, storage, catabolism and excretion of nutrients and the regulation of metabolic homeostasis in the intact organism

Content Theory

1. **Carbohydrates:**

- Nature,
- Structures

2. **Classification and functions of carbohydrates:**

- Monosaccharaides,
- Disaccharides,
- Oligosaccharides,
- Polysaccharaides

3. **Digestion and absorption of carbohydrates:**

- Glycolitic pathway,
- Glycolysis,
- Glycogenesis,
- Glycogen catabolism,
- Tricarboxylic acid cycle and pentose phosphate pathway

4. **Biosynthesis of carbohydrates:**

- Gluconeogenesis;
- Regulation of carbohydrate metabolism pathways;
- Cho metabolism in diabetes;

5. **Proteins:**

- Structural features,
- Characteristics,

- Functions;

6. Amino acids:

- Biosynthesis and degradation,
- Food sources (on the basis of their functions in human body);
- Digestion and absorption;

7. 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.

8. Fatty acids:

- Saturated,
- Unsaturated,
- Polysaturated,
- Glycerol,
- Cholesterol,
- Sterol;
- Lipoprotein systems (blood lipids);

9. Fats biosynthesis:

- Lipids,
- Phospholipids and sphingolipids;

10. Lipid biosynthesis:

- Cholesterol,
- Sterol;
- Lipid oxidation;

11. Essential fatty acids:

- Sources,
- Health benefits;
- Adipose tissues;
- Digestion,
- Absorption,
- Metabolism and transportation of lipids;
- Oxidation of fatty acids (beta oxidation);
- Ketone bodies.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Berdanier, C.D. & Zempleni, J. (2009). Advances Nutrition: Macronutrients, micronutrients and Metabolism. CRC Press, Taylor & Francis Group, Boca Raton, FL, USA.
2. Byrd-Bredbenner, C., Moe, G., Beshgetoor, D. & Berning, J. (2015). Wardlaw's Perspectives in Nutrition. (10th ed.) McGraw-Hill Education, Columbus, OH, USA.
3. David, L.N., Lehninger, A.L. & Cox, M.M. (2013). Lehninger Principles of Biochemistry. (6th ed.). W.H. Freeman and Company, New York.
4. Gropper, S.S. & Smith J.L. (2013). Advanced Nutrition and Human Metabolism. (6th ed.). Cengage Learning, Belmont, CA, USA.

BSND 108: ENGLISH II (COMMUNICATION SKILLS)

Course Objectives

After completion of this course, students shall be able to:

1. Enable to meet their real life communication needs.

Course Content

1. **Paragraph writing**

- Practice in writing a good,
- Unified and coherent paragraph

2. **Essay writing**

- Introduction

3. **CV and job application**

- Translation skills Urdu to English

4. **Study skills**

- Skimming and scanning,
- Intensive and extensive, and speed reading,
- Summary and précis writing and comprehension.

5. **Academic skills**

- Letter/memo writing,
- Minutes of meetings,
- Use of library and internet

6. **Presentation skills**

- Personality development (emphasis on content, style and pronunciation)

Note: documentaries to be shown for discussion and review

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

Grammar

1. Thomson, A.J. & Martinet, A.V. (1986). Practical English Grammar Exercises 2. (3rd ed). Oxford University Press. ISBN 0 19 431350 6.

Writing

1. Marie-Christine, B., Suzanne, B. & Francoise, G. (1993). Writing. Intermediate (4th ed.). Oxford Supplementary Skills. ISBN 0 19 435405 7 Pages 20-27 and 35-41.
2. Nolasco, R. (1992). Writing. Upper-Intermediate Oxford Supplementary Skills. Fourth Impression. ISBN 0 19 435406 5

Reading

1. Tomlinson, B. & Ellis, R. (1992). Reading. Upper Intermediate. Third Impression. Oxford Supplementary Skills. ISBN 0 19 453402 2.
2. Langan, J. (n.d). Reading and Study Skills.
3. Yorky, R. (n.d). Study Skills.

BSND 109: ISLAMIC STUDIES/ETHICS

Course Objectives

This course is aimed to:

1. Provide Basic information about Islamic Studies
2. Enhance understanding of the students regarding Islamic Civilization
3. Improve Students skill to perform prayers and other worships
4. Enhance the skill of the students for understanding of issues related to faith and religious life.

Course Content

1. **Introduction to Quranic studies**

- Basic concepts of Quran
- History of Quran
- Uloom-ul -Quran

2. **Study of selected text of Holy Quran**

- Surah al-Baqra. Verses related to faith (verse no-284-286)
- Surah al-Hujrat. Verses related to adab al-nabi (verse no-1-18)
- Surah al-Mumanoon. Verses related to characteristics of faithful (verse no-1 11)
- Surah al-Furqan. Verses related to social ethics (verse no.63-77) 5)
- Surah al-Inam. Verses related to Ihkam (verse no-152-154)

3. **Study of selected text of holly Quran**

- Surah al-Ihzab. Verses related to Adab al-Nabi (verse no.6,21,40,56-58).
- Surah al-Hashar. Verses related to thinking, day of judgment, (verse no. 1820).
- Surah al-Saf. Verses related to Tafakar,Tadabar (verse no.1,14)

4. **Seerat of Holy Prophet (SAWW) i**

- Life of Muhammad bin Abdullah (before prophet hood)
- Life of holy prophet (SAWW) in Makkah
- Important lessons derived from the life of holy prophet in Makkah

5. **Seerat of holy prophet (SAWW) ii**

- Life of holy prophet (SAWW) in Madina
- Important events of life holy prophet in Madina

- Important lessons derived from the life of Holy Prophet in Madina

6. Introduction to Sunnah

- Basic concepts of hadith
- History of hadith
- Kinds of hadith
- Uloom –ul-hadith
- Sunnah & hadith
- Legal position of Sunnah

7. Selected study from text of hadith

- **Introduction to Islamic law & jurisprudence**

a) Basic concepts of Islamic law & jurisprudence
b) History & importance of Islamic law & jurisprudence
c) Sources of Islamic law & jurisprudence
d) Nature of differences in Islamic law
e) Islam and sectarianism

- **Islamic culture & civilization**

a) Basic concepts of Islamic culture & civilization
b) Historical development of Islamic culture & civilization
c) Characteristics of Islamic culture & civilization
d) Islamic culture & civilization and contemporary issues

8. Islam & science

- Basic concepts of Islam & science
- Contributions of Muslims in the development of science
- Quran & science

9. Islamic economic system

- Basic concepts of Islamic economic system
- Means of distribution of wealth in Islamic economics
- Islamic concept of riba
- Islamic ways of trade & commerce

10. Political system of Islam

- Basic concepts of Islamic political system
- Islamic concept of sovereignty
- Basic institutions of government in Islam

11. Islamic history

- Period of Khlaft-e-rashida
- Period of Ummayyads
- Period of Abbasids

12. Social system of Islam

- Basic concepts of social system of Islam
- Elements of family
- Ethical values of Islam

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Books

1. Muhammad, H.U. "Emergence of Islam", IRI, Islamabad
2. Muhammad, H.U. "Muslim Conduct of State"
3. Muhammad, H. U. 'Introduction to Islam
4. Hassan, H.H. "An Introduction to the Study of Islamic Law" leaf Publication Islamabad, Pakistan.
5. Hasan, A. (1993). "Principles of Islamic Jurisprudence" Islamic Research Institute, International Islamic University, Islamabad

6. Waliullah, M. (1982). “Muslim Jurisprudence and the Quranic Law of Crimes” Islamic Book Service

7. Bhatia, H.S. (1989). “Studies in Islamic Law, Religion and Society” Deep & Deep Publications New Delhi

8. Ul-haq, M. Z. (2001). “Introduction to Al Sharia Al Islamia”. Allama Iqbal Open University, Islamabad

BSND 110: FOOD MICROBIOLOGY

Course Objectives

After completion of this course, students shall be able to:

1. Identify various types of microorganisms on the basis of morphological, cultural and physiological characteristics
2. Grasp knowledge about the microbial contamination of foods and factors affecting the growth of microorganisms
3. Familiarize students about food borne infections, intoxications and role of probiotics in our daily life

Content- Theory

1. **Food microbiology:**

- Introduction and scope;
- Important microbial genera in foods:
- Bacteria,
- Mold,
- Yeast and yeast like fungi,
- Viruses general,
- Morphological,
- Cultural and physiological characteristics;

2. **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;

3. **Food microbiology and public health:**

- Food-borne infections: intoxications;
- Microbiological risk assessment;

4. **Microbiology in food sanitation:**

- Food sanitizers and pathogen reduction a case study;
- Food fermentation;
- Probiotics in human health.

Content- Practical

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

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Adams, M.R. & Moss, M.O. (2006). Food Microbiology. The Royal Society of Chemistry, Cambridge, UK.
2. Adams, M.R., Moss, M.O. & McClure, P. (2016). Food Microbiology. (4th ed.). Royal Society of Chemistry, Cambridge, UK.
3. Brown, M. & Stringer, M. (2002). Microbiological risk assessment in food processing. Wood head Publishing Ltd. Cambridge, UK.
4. Frazier, W.C., Westhoff, D.C. & Vanitha, K.N. (2013). Food Microbiology, (5th ed.) McGraw-Hill Book Co., New York, USA.

5. Montville, T.J., Mathews, K.R. & Kniel, K.E. (2012). Food microbiology: an introduction (3rd ed.)ASM Press, Washington DC, USA.

6. Ray, B. & Bhunia, A. (2013). Fundamentals of Food microbiology, (5th ed.) CRC Press, Taylor & Francis Group, Boca Raton, FL, USA.

BSND 111: HUMAN PHYSIOLOGY–I

Course Objectives

After completion of this course, students shall be able to:

1. Familiarize about the functions of different body organs
2. Understand risk parameters related to assessment and prognosis of different diseases

Content- Theory

1. **Introduction:**

- Introduction to human physiology,
- Organization level and cell physiology;

2. **Digestive system:**

- Oral cavity,
- Salivary glands,
- Teeth,
- Tongue;
- Oesophagus,
- Pharynx,
- Larynx,
- Stomach,
- Small intestine,
- Large intestine,
- Accessory glands associated with git (liver, gallbladder and pancreas);

3. **Urinary system:**

- Introduction,
- Functions of kidney and nephron,
- Glomerular filtration,
- Tubular reabsorption,
- Tubular secretion,
- Urine excretion and plasma clearance,
- Fluid and acid base balance;

4. **Cardiovascular system:**

- Functions of heart and blood vessels,
- Electrical activity of heart,
- Mechanical events of heart,
- Cardiac output and its control.

Content- Practical

1. Blood grouping; Hb estimation; Counting of blood cells; complete blood count (CBC); Electrolyte estimation; Hydration test; Determination of coagulation time, blood pressure, pulse recording;
2. Heart activity – electrocardiography; Test for saliva;
3. Respiratory movement, maximum breathing capacity,
4. pulmonary function test; Intestinal motility;
5. Renal function tests and urine analysis.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Gillian, P. & Richards, C.D. (2006). Human Physiology: The Basis of Medicine, (3rd ed.) Oxford University Press, London.
2. Guyton, A.C. & Hall, J.E. (2006). Textbook of Medical Physiology, (11th ed.) J.F. Kennedy Blvd., Philadelphia, USA.
3. Rahman, Z.U., Aslam, B., Khan, J.A. & Khaliq, T. (2007). Manual of Physiology-I (2nd ed.) MAS Computers, Faisalabad, Pakistan.
4. Rahman, Z.U., Aslam, B., Khan, J.A. & Khaliq, T. (2007). Manual of Physiology-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.

BSND 112: Sociology of Health & Diseases

Course Objectives

After studying this course, students should be able to:

1. Discuss the social contexts of wellness and illness
2. Explain the patient's perspective on the experience of illness including meaning making and interaction with care providers
3. Examine the social-historical transformation of the medical system in the U.S., including the changing role of physicians and other health care providers
4. Interpret visual and written depictions of indicators and trends in population health over time
5. Identify the socio-cultural aspects of health and illness, particularly as relating to the definitions of health, illness behavior and social epidemiology
6. Investigate the social causes of disease and illness related to disparities due to social stratification and unequal access
7. Describe the historical role of women in the medical system as patients, practitioners and health care providers
8. Differentiate the current ethical issues and debates about new medical technologies and their impact on doctor-patient relationships and on access to health care

Course Content

1. **Introduction**

- Evolution of Health & Healing,
- Body, Mind, Illness and Environment

2. **Theories, research and debates of medical sociology.**
3. **Social, environmental and occupational factors in health and illness;**

- The meaning of health and illness from the patient's perspective;
- The historical transformation of the health professions and the health work force;

4. **The social and cultural factors surrounding the creation and labeling of diseases;**

- Disparities in health, access to healthcare, and the quality of healthcare received;

5. **Organizational and ethical issues in medicine including rising costs and medical technology; and health care reform.**

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Reading

1. Bird, C. E., Conrad, P. & Fremont, A.E. (2000). "Medical Sociology at the Millennium." Pp. 1-10 in *Handbook of Medical Sociology,* (5th ed*)* edited by Bird, C.E., Conrad, P. & Fremont, A. Upper Saddle River, NJ: Prentice-Hall.
2. Link, B., & Phelan, J. (2010). "Social Conditions as Fundamental Causes of Health Inequalities." Pp. 3-17 in *Handbook of Medical Sociology,* (6th ed) edited by Bird, C.E., Conrad, P, Fremont, A.M. & Timmermans, S. Nashville: Vanderbilt University Press
3. Shim, J. (2005). "Constructing 'Race' Across the Science-Lay Divide: Racial Formation in the Epidemiology and Experience of Cardiovascular Disease." *Social Studies of Science* 35: 405-436.
4. Farooq,S. Medical Sociology. Azeem Academy Karachi

THIRD SEMESTER

Course No.	Title of Course	Credit Hours
BSND 201	Micronutrients in Human Nutrition	3(3-0)
BSND 202	Human Physiology-II	3(2-1)
BSND 203	English-III	3(3-0)
BSND 204	Fundamentals of Public health	3(3-0)
BSND 205	General Pathology	3(2-1)
BSND 206	Food Safety and Quality Management	2(2-0)
		17

BSND 201: MICRONUTRIENTS IN HUMAN NUTRITION

Course Objectives

1. Understand the functional roles of vitamins and minerals in human nutrition with special reference to metabolism
2. Familiarize with the deficiency symptoms and health disorders associated with improper intake of vitamins and minerals
3. Analyze losses of micronutrients during food processing

Content-Theory

1. **Vitamins:**

- Nomenclature,
- History,
- Development of the vitamins concept;

2. **Fat and water soluble vitamins:**

- Sources,
- Chemistry,
- Absorption,
- Transport and storage,
- Metabolism,
- Function,
- Deficiency,
- Bioassay,
- Interaction with other nutrients,
- Recommended daily allowances and toxicities;

3. **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;

4. **Minerals:**

- Types,

- History and developments of the minerals concept;
- Criteria of essentiality of minerals and their classification;
- Minerals distribution in human body;

5. 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.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended 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, (2nd 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.

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

BSND 202: HUMAN PHYSIOLOGY–II

Course Objectives

After completion of this course, students shall be able to:

1. Understand the functions of respiratory, endocrine, nervous, immune and reproductive systems
2. Acquaint knowledge about hormonal and neural interactions on metabolism

Content-Theory

1. **Respiratory system:**

- Respiratory mechanics,
- Gas transport and exchange mechanisms,
- Control of respiration,
- Respiratory capacities and volumes,
- Non respiratory functions of lungs;

2. **Immune system and lymphatic system:**

- Body defense system and regulation;

3. **Endocrinology and reproduction:**

- Reproductive physiology,
- Role of hormones in spermatogenesis,
- Menstrual cycles and pregnancy,
- Energy balance and temperature regulation;

4. **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;

5. **Musculoskeletal system:**

- Principles of neuromuscular physiology.

Content-Practical

1. Demonstration of the location of endocrine glands in laboratory animal;
2. Adrenalectomy and the effect of adrenaline on metabolism in rats;
3. Effect of adrenaline on metabolism;
4. Nerve muscle preparation,
5. Effect of temperature on single muscle twitch, muscle and nerve irritability,
6. Neuromuscular fatigue,
7. Normal heart activity;
8. Hormonal assay:
9. Digestive, growth & reproductive.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Brar, R.S., Sandhu, H.S. & Singh, A. (2002). Veterinary Clinical Diagnosis by Laboratory Methods. Kalyani Publishers Ludhiana, New Delhi, India.
2. Gillian, P. & Richards, C.D. (2006). Human Physiology: The Basis of Medicine, (3rd ed.) Oxford University Press, London.
3. Guyton, A.C. & Hall, J.E. (2006). Textbook of Medical Physiology, (11th ed.) J.F. Kennedy Blvd., Philadelphia, USA.
4. Rahman, Z.U., Aslam, B., Khan, J.A. & Khaliq, T. (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.

BSND 203: ENGLISH III (TECHNICAL WRITING AND PRESENTATION SKILLS)

Course Objectives

The objectives of this course are to:

1. Enhance language skills
2. Develop critical thinking

Course Contents

1. **Essay writing**

- Descriptive, narrative, discursive, argumentative

2. **Academic writing**

- How to write a proposal for research paper/term paper
- How to write a research paper/term paper (emphasis on style, content, language, form, clarity, consistency)

3. **Technical Report writing**
4. **Progress report writing**
5. **Presentation skills**

Note: Extensive reading is required for vocabulary building

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Books

1. White, R. (1992). Writing. Advanced Oxford Supplementary Skills. Third Impression. ISBN 0 19 435407 3.
2. Langan, J. (2004). College Writing Skills. McGraw-Hill Higher Education.
3. Patterns of College Writing (4th edition) by Laurie G. Kirszner and Stephen R. Mandell. St. Martin's Press.
4. Neulib, J., Cain, K. S., Ruffus, S. & Scharton, M. (Eds). The Mercury Reader. A Custom Publication. Compiled by norther Illinois University.

BSND 204: FUNDAMENTALS OF PUBLIC HEALTH

Course objectives

After completion of this course the student will be able to:

1. Define and understand concept of health
2. Identify determinants of health
3. Enumerate the indicators of health
4. Understand the concept of disease causation
5. Understand iceberg of disease phenomenon
6. Understand the levels of prevention
7. Cover basic definitions and historical background of public health

Course Content

1. **Introduction of Health**

- Concept of health
- Dimensions of health
- Definition of health
- Health spectrum
- Determinants of health
- Responsibility of health
- Indicators of health

2. **Concept of disease**
3. **Concept of causation**
4. **Levels of prevention**
5. **Historical background of public health**

- Evolution of public health
- Definitions of common public health terms

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Schneider, M. J. (2016). *Introduction to public health*. Jones & Bartlett Publishers.
2. Turnock, B. (2012). *Public health*. Jones & Bartlett Publishers.
3. Keleher, H., & MacDougall, C. (2015). *Understanding health* (No. Ed. 4). Oxford University Press.
4. Ashton, J., & Seymour, H. (1988). *The new public health* (Vol. 1). Milton Keynes: Open University Press.
5. Baum, F. (2016). *The new public health* (No. Ed. 4). Oxford University Press.
6. Basch, P.F. Textbook of international health, (2nd Ed.) New York, NY: Oxford University Press.
7. Brownson, R.C., Baker, B.A., Leet, T. L., & Gillespie, K. N. (2003). Evidence-based public health. New York, NY: Oxford University Press.
8. Detels, R., McEwen, J., Beaglehole, R., & Tanaka, H., (eds.). (2002). Oxford textbook of public health: the practice of public health, (4th ed.) Oxford: Oxford University Press.

BSND 205: GENERAL PATHOLOGY

Course Objectives

After completion of this course, students shall be able to:

1. Understand the basic terminologies in different pathological states
2. Elaborate the cell injuries, necrosis, their types and practical applications of pathology

Content Theory

1. **Introduction**

- Scope of pathology and concept of diseases;

2. **Definition and terminology:**

- Ischemia,
- Hypoxia,
- Necrosis,
- Infarction,
- Atrophy,
- Hypertrophy,
- Hyperplasia,
- Metaplasia,
- Plasia,
- Anaplasia;

3. **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;

4. Diagnosis and treatment of Cancer in general

- Fate, survival and prognosis with tumors.

Content-Practical

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

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

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

BSND 206: FOOD SAFETY AND QUALITY MANAGEMENT

Course Objectives

Upon completion of this course students should be able to:

1. Understand principles lying under safety and quality of foods to ensure their safe production
2. Implement the food safety and quality management systems in a food business in a precise and systematic way

Content Theory

1. **Food safety, security and quality:**

- Definitions and importance;
- Different terminologies used in food safety & quality;

2. **Categories of hazards**:

- Physical, chemical, biological.
- Good manufacturing practices;
- Good storage practices;
- Plant design layout;
- Global Food Safety Imitative;

3. **Global Food Safety Systems:**

- HACCP, BRC, FSSC 22000, ISO 22000;
- Quality Management System (ISO 9001:2008);

4. **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.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Ali, I. (2003). Food Quality Assurance: Principles and Practices. CRC Press, Taylor & Francis Group, Boca Raton, FL, USA.
2. David, A.S. & Norah, F.S. (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. & 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, John Wiley & Sons Ltd., Chichester, West Sussex, UK.
6. Theuvsen, L., Spiller, A. Peupert, M. & Jahn, G. (2007). Quality Management in Food Chains. Wageningen Academic Publishers, The Netherlands.

SEMESTER FOUR

Course No.	Title of Course	Credit Hours
BSND 207	Bio-Statistics	3(2-1)
BSND 208	Computer Science and Information Technology	3(2-1)
BSND 209	Public health nutrition	3(2-1)
BSND 210	Nutrition Through the Life Cycle	3(3-0)
BSND 211	Nutrition Through Social Protection	2(2-0)
BSND 212	Dietetics I	3(2-1)
		17

BSND 207: BIO-STATISTICS

Course Objectives

Upon completion of this course, student will be able to:

1. Select and apply appropriate statistical tests to analyze common biological and health data.
2. Recognize and give examples of different types of data arising in public health and clinical studies.
3. Produce appropriate statistical graphs and descriptive statistics.
4. Interpret the statistical output from common statistical tests.
5. Calculate standard normal scores and resulting probabilities.
6. Select an appropriate test for comparing two populations on a continuous measure.
7. Choose an appropriate method for comparing proportions between two groups.
8. Design methodology for research and could draw inferences from any type of research data.

Course Content (Bio-statistics 1)

1. **Introduction**

- Definition
- Importance of Statistics in nutrition and dietetics

2. **Data**

- Different types of data and variables
- Classification and Tabulation of data,
- Frequency distribution,
- Stem-and-Leaf diagram,
- Graphical representation of data Histogram,
- Frequency polygon,
- Frequency curve.

3. **Measure of Central tendency,**

- Definition
- Arithmetic mean,
- Geometric mean,

- Harmonic mean,
- Median Quantiles
- Mode in grouped and un-grouped data.

4. Measure of Dispersion

- Definition
- Range,
- Quartile deviation,
- Mean deviation,
- Standard deviation
- Variance,
- Coefficient of variation.

Content-Practical

1. Frequency distribution
2. Stem-and-leaf diagram
3. Various types of graphs
4. Mean,
5. Geometric mean harmonic mean,
6. Median,
7. Quartiles deviation,
8. Mean deviation.
9. Standard deviation,
10. Variance,
11. Coefficient of variation,
12. Skewness and kenosis

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Chernick, M. R. & Friis, R. H. (2003). Introductory Biostatistics for the Health Sciences: Modern Applications Including Bootstrap (Wiley Series in Probability and Statistics) Hardcover.
2. Muhammad, S. & Kamal, S. Introduction to Statistical Theory Part- I, (latest Ed.).
3. Muhammad, F. Statistical Methods and Data Analysis.
4. Crashaw, J. & Chambers, J. (1994). A. Concise Course in A. Level Statistic with world examples.
5. Fran, II, Dietrich-II. & Keans, T. J. (1986). Basic Statistics an Inferential Approach (2^{nd} ed)

Course Content (bio-statistics 2)

1. **Sampling**

- Sampling Probability
- Non-Probability Sampling,

2. **Sampling types**

- Simple random sampling
- stratified random sampling
- Systematic sampling error,

3. **Sampling distribution of mean and difference between two means.**
4. **Interference Theory**

- Estimation and testing of hypothesis,
- Type—I and type-II error,
- Testing of hypothesis about mean and difference between two means using Z-test and t-test, Paired t-test,
- Test of association of attributes using X2 (chi-square) Testing hypothesis about variance

Content Practical

- Sampling random sampling

- Stratified random sampling.
- Sampling distribution of mean
- Testing of hypotheses regarding population mean
- Testing of hypotheses about the difference between population means
- Chi-square test
- Testing of Correlation Coefficient
- Fitting of simple linear regression
- One-way ANOVA
- Two-way ANOVA

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Muhammad, S. & Kamal, S. Introduction to Statistical Theory Part-II. (latest Ed).
2. Muhammad, F. Statistical Methods and Data Analysis.
3. Steal, R.G.D. & Tarric, J.H. (1980). Principles and Procedures of Statistics A Bio-material approach, (2nd Ed).
4. Gomez, K.A. & Gomez, A.A. (1980). Statistical Procedures for Agricultural Research (2nd Ed).

BSND 208: COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

Course Objectives

After completing this course, a student will be able to:

1. Understand different terms associated with ICT
2. Identify various components of a computer system
3. Identify the various categories of software and their usage
4. Define the basic terms associated with communications and networking
5. Understand different terms associated with the Internet and World Wide Web.
6. Use various web tools including Web Browsers, E-mail clients and search utilities.
7. Use text processing, spreadsheets and presentation tools
8. Understand the enabling/pervasive features of ICT

Course Content

1. **Introduction**

- Basic Definitions and Concepts

2. **Hardware**:

- Computer Systems & Components
- Storage Devices,
- Number Systems

3. **Software:**

- Operating Systems,
- Programming and Application Software

4. **Introduction to Programming,**

- Databases and Information Systems
- Networks
- Data Communication

5. **The Internet,**

- Browsers and Search Engines
- Email, Collaborative Computing and Social Networking
- E-Commerce

6. **IT Security and other issues**

7. **Project Week Review Week**

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended readings

1. Norton, P. & McGraw-Hill. Introduction to Computers, (6th International Ed).
2. Sawyer, W. & McGraw-Hill. Using Information Technology: A Practical Introduction to Computer & Communications (6^{th} Ed).
3. Sawyer, S.C. & Sarah, E. Computers, Communications & information: A user's introduction.
4. Alexis, L. Mathews, L. & Press, L. Fundamentals of Information Technology

BSND 209: PUBLIC HEALTH NUTRITION

Course Objectives

After studying this course students will be able to:

1. To figure out global and local scenario of public health nutrition
2. To understand the core concepts and assessment methods at the population level
3. To acquaint hands-on training for development of policies related to nutrition and possible gaps in the matrix of nutrition policies
4. To impart hands-on training in nutritional assessment techniques to diagnose health problems
5. To understand and apply dietary guidelines for standard nutrient intake
6. To select an appropriate method for measuring dietary needs of hospitalized patients.

Course-Theory

1. **Public health nutrition**

- Overview, concepts, determinants, foundations;

2. **Disease burden and its control;**
3. **Health promotion and disease prevention;**

- Modes of intervention,

4. **Monitoring and surveillance**;

- Safety and health at work place;
- Public health nutrition: assessment and programs
- Nutritional surveillance and growth monitoring;

5. **Public health policies and strategies;**

- Marketing nutrition programs in public;
- Public health nutrition: a field of practice
- Public health nutritionist
- Competencies, duties, responsibilities, ethics.

5. **Nutritional assessment systems**

- Nutrition surveys,
- Nutrition surveillance,
- Nutrition screening.

6. **Nutritional assessment methods**:

- Anthropometrics,
- Biochemical,
- Clinical, dietary.

7. **Measuring food consumption at national level**:

- Food balance sheets,
- Total diet consumptions.

8. **Food consumption at the household levels:**

- Food account,
- Household food records,
- Household 24-hour food record.

9. **Measuring food consumption at individual levels**:

- 24-hour recall,
- Repeated 24-hour recall,
- Weighed food records,
- Diet history,
- Food frequency questionnaire.

10. **Selecting an appropriate method**:

- Determining the mean nutrient intake,
- Calculating the population at risk,

Course Practical

1. Food and nutrition surveys for monitoring of public health;
2. Community need assessment;
3. Planning, implementation and monitoring nutrition intervention program based on the need assessment of the community;
4. Marketing nutrition programs in the public;
5. Visit of various public health departments.
6. Practicing methods of nutritional assessment (ABCD of Nutritional assessment);
7. Comparison of the data with references values for drawing conclusions.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Edelstein, S. (2011). Nutrition in Public Health: A Handbook for Developing Programs and Services, (3rd ed). Jones & Bartlett Learning, Sudbury, M.A, USA.
2. Gibney, M.J., Margette, B.M. & Kearney, J.M. (2004). Public Health Nutrition. Blackwell Science Ltd. Oxford, UK.
3. Lawrence, M. & Worsley, T. (2007). Public Health Nutrition: From Principles to Practice. Allen & Unwin Book Publishers, Australia.
4. McKenzie, J.F. & Pinger, R. R. (2015). An Introduction to Community & Public Health. (8th ed). Jones & Bartlett Learning, LLC Burlington, MA, USA.
5. Spark, A. (2007). Nutrition in Public Health: Principles, Policies and Practice. CRC Press, Taylor & Francis, Boca Raton, FL, USA.
6. Driskell, J.A. & Wolinsky, I. (2011). Nutritional Assessment of Athletes, (2nd ed). CRC Press, Taylor & Francis Group, New York, USA.
7. Gibson, R.S (2005). Principles of Nutrition Assessment. Oxford University Press Inc., New York, USA.
8. Lee, R.D. & Nieman, D.C. (2012). Nutritional Assessment, (6th ed). The McGraw-Hill Companies Inc., New York, USA.
9. McGuire, M. & Beerman, K.A. (2011). Nutritional Sciences: From Fundamentals to Food**.** Cengage Learning, Belmont, CA, USA

BSND 210: NUTRITION THROUGH THE LIFE CYCLE

Course Objectives

Upon completion of this course students should be able to**:**

1. Analyze the nutritional needs during conception, infancy, childhood, adolescence, male and female adults, pregnancy, lactation and during aging
2. Suggest dietary recommendations in special clinical conditions

Content-Theory

1. **Introduction**

- Preconception nutrition: overview,
- Reproductive physiology,
- Nutrition related disruption in fertility,
- Nutrition and contraceptives and other nutrition concerns,
- Premenstrual and polycystic ovary syndrome,
- Obesity and fertility,
- Diabetes prior to pregnancy,
- Disorders of metabolism.

2. **Nutrition during Pregnancy**:

- Status of pregnancy outcomes,
- Embryonic and fetal growth & development,
- Pregnancy weight gain,
- Nutrition and outcome of the pregnancy,
- Health problems during pregnancy,
- Nutrient needs and dietary guidelines during pregnancy.

3. **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.

4. **Infant Nutrition:**

- Assessing new born health, and energy and nutrient needs,
- Development of infant feeding skills,
- Common nutritional problems and concerns,
- Infants at risk.

5. **Toddlers and preschooler Nutrition**:

- Normal growth and development,
- Energy and nutrient needs,
- Common nutritional problems,
- Nutrition related conditions, food allergies and intolerances.

6. **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
- Adult nutrition.
- Geriatric nutrition

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Brown, J.E. (2014) Nutrition through the Life Cycle, (5th ed). Cengage Learning, Belmont, CA, USA.
2. Rolfes, S.R. Pinna, K. & Whitney, E. (2015). Understanding Normal and Clinical Nutrition, (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. & Williams, S.R. **(**2000). Nutrition Throughout the Life Cycle. The McGraw-Hill Education, Maidenhead, Berkshire, U.K.

BSND 211: NUTRITION THROUGH SOCIAL PROTECTION

Course Objectives

Upon completion of this course students should be able to:

1. Acquaint knowledge about the role of social protection programs in poverty alleviation and overall welfare of the society
2. Understand the role of social protection programs in provision of financial support for scaling up nutrition
3. Identify the development partners and various social protection and scale up nutrition programs

Content-Theory

1. **Food insecurity and vulnerability**

- Food and social class difference
- Food society and environment

2. **Introduction to sociology of nutrition**

- Food and nutrition in culturally diverse societies
- Social change and rural development
- Women empowerment and nutrition;

3. **Food choices and their determinants**;

- Behavior change;
- Social construction and eating disorders;

4. **Challenges to combat malnutrition**

- Nutrition-sensitive and nutrition-specific interventions;
- Economic opportunities among the poor;

5. **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;

6. **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;

7. **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.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended 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
4. Malnutrition by (2030). International Food Policy Research Institute, Washington, DC, USA.
5. World Bank, UNICEF, WFP, USAID, ADB and Government of Pakistan Reports

BSND 212: DIETETICS-I

Course Objectives

Upon completion of this course students should be able to:

1. Understand the discipline of dietetics and its role in human wellbeing
2. Familiarize with the foundations of healthy diets and their role in disease prevention and management
3. Acquaint hands-on training for calorie calculation and menu planning using food composition table and data bases
4. Assess BMI and energy expenditures in relation to overweight and obesity

Content-Theory

1. **Introduction**

- Dietetics definitions, Its history and importance;
- Dietitian: role in food service and clinical practice,
- responsibilities in multidisciplinary team, code of ethics

2. **Foundations of healthy diet:**

- Dietary Reference Intakes,
- Recommended Dietary Allowance,
- Food Guide Pyramid and allied approaches,
- Dietary Guidelines,
- Exchange system and menu planning;

3. **Energy expenditure and basal metabolism;**
4. **Body mass index**
5. **Role of diet in disease conditions;**
6. **Diet therapy and its principles;**
7. **Food selection and factors affecting its acceptance;**
8. **Nutrient density;**
9. **Alternative patterns of food consumption;**
10. **Nutritional counselling in clinical practice.**

- Critical diet assessment.
- Nutrition and diet clinics.

Content-Practical:

1. **Interpretation of food guide pyramid,**

- MyPyramid,
- Myplate,
- Eatwell Plate

2. **Energy value of different foods**

- carbohydrates,
- fats
- proteins

3. **Calculating energy requirements**;

- BMI in relation to obesity and overweight,

4. **Energy and calorie requirements**;

- Balanced diet and menu planning using exchange lists,
- food composition tables & data bases

5. **Food intake analysis**:

- Dietary Recall,
- Food Frequency Questionnaires,
- Food Surveys

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Mahan, L.K., Escott-Stump, S., Raymond, J.L. (2012). Krause's Food, Nutrition & Diet Therapy, (13th ed). Elsevier Saunders, St. Louis, Missouri, USA.

2. Mudambi, S. R. (2007). *Fundamentals of foods, nutrition and diet therapy*. (5th ed). New Age International.

3. Punekar and D'Souza M.J (2010). Handbook of Applied Nutrition, Dietotherapy & Diet Management. SBS Publishers & Distributors Pvt. Ltd., New Delhi.

4. Rawat and applied Nutrition. Random Publication (2015), New Delhi.

5. Schlenker, E. & Gilbert, J.A (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.

SEMESTER FIVE

Course No.	Title of Course	Credit Hours
BSND 301	Dietetics-II	3(2-1)
BSND 302	Nutrition and Psychology	3(3-0)
BSND 303	Nutritional Education and Awareness	3(2-1)
BSND 304	Meal Planning and Management	3(2-1)
BSND 305	Sports nutrition	3(2-1)
BSND 305	Nutritional Practices in Clinical Care	3(2-1)
		18

BSND 301: DEITETICS II

Course Objectives

Upon completion of this course students should be able to:

1. Comprehend the principles of diet therapy and therapeutic nutrition
2. Understand the role of dietary management in various health disorders related to upper and lower gastrointestinal tract, hepatic, pancreas and coronary heart diseases
3. Acquaint hands-on training for the dietary modification of normal diets aligned with various health disorders
4. Suggest pre- and post-operative diets

Content-Theory

1. **Introduction to diet therapy**

- Principles of diet therapy and therapeutic nutrition;
- Therapeutic modifications of normal diets;

2. **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; cholecystitis, cholangitis; Pancreatitis**;**

3. **Nutrition education and primary health care camp**

Content-Practical

1. **Steps in nutrition care;**
2. **Types of diets:**

- Regular diet, clear liquid diet, full liquid diet, soft diet, bland diet

3. **Dietary modification for texture, energy, nutrients and fluids;**

- Planning of energy modified diets: high calorie diet, restricted calorie diet,

High fiber diet, low residue diet, modified carbohydrates diet, moderate Carbohydrate diet, modified fat diet, restricted fats diet

4. **Planning and preparation of diets for various pathological conditions**;

- Nutrition in surgical conditions:
- Pre-operative and post-operative diets;
- Enteral and parenteral feeding;

5. **Hospital visits and nutrition camps.**

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended 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 & Diet Therapy, 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. Schlenker, E. and J.A. Gilbert. 2015. Williams' Essentials of Nutrition and Diet Therapy, 11th ed. Elsevier/Mosby Inc., Louis, Missouri.
5. Singh, J. 2008. Handbook of Nutrition and Dietetics. Lotus Press, India

BSND 302: NUTRITION AND PSYCHOLOGY

Course Objectives

Upon completion of this course students should be able to:

1. To understand psychology, its types and importance in nutrition
2. To abreast the impact of psychological influences on appetite and attitude behavior relationship

Content-Theory

1. **Introduction**

- Psychology and its types,
- classification;

2. **Psychology and nutrition adherence**

- Attitude and eating patterns
- the field of cognitive psychology;
- Perception, visualization and eating patterns, errors in perception process

3. **Eating disorders**

- diagnosis, assessment and treatment;

4. **Face perception**
5. **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

6. **Understanding behavior:**

- 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;

7. **Measurement issues, indirect effects of attitude on behavior;**
8. **The theory of reasoned action;**
9. **Additional variables within the theory of planned behavior;**
10. **Personality and intelligence**
11. **Stress management.**

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Blackman, M., & Kvaska, C. (2010). *Nutrition psychology: improving dietary adherence*. Jones & Bartlett Publishers.
2. Booth, D.A. (1994). The Psychology of Nutrition. Taylor & Francis Inc., Bristol, PA, USA.
3. Elmes, D.G., Kantowitz, B.H. & Roediger, H.L. 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.

BSND 303: NUTRITIONAL EDUCATION AND AWARENESS

Course Objectives

Upon completion of this course, students should be able to:

1. Learn the techniques of creating awareness about health issues in masses
2. Acquire information about different modes of communication and their effective use
3. Understand the ethical responsibilities for dissemination of knowledge

Content-Theory

1. **Introduction**

- Nutrition education and history, need, competencies and skills,
- Framework, training needs

2. **Nutrition education programs:**
3. **scope and challenges of educating people about eating well;**
4. **Biological influences, cultural and social preferences;**
5. **Education and communication strategies for different groups and settings;**

- Evaluation of nutrition education programs;

6. **Family and psychological factors**;

- Expectancy-value theories of motivation,
- social and cognitive theory;
- Behavior change as a process, phases of change;

7. **Addressing multiple and overlapping influences on behavior**;
8. **A logical model approach for planning a framework of nutrition education**

- Understanding communication model,
- preparing/organizing oral presentations,
- delivering oral presentation,
- delivering nutrition education workshops,

9. **Types of supporting visual aids**,
10. **Nutrition mass media communication campaigns**,
11. **Social marketing**;

- Ethics in nutrition education,
- conflicts,

- participating process in community coalition;
- Non-government and public health organizations and their current programs.

Content- Practical

1. Nutritional counselling;
2. Program designing for specific diseases like anemia, neural tube defects, rickets, etc.
3. Surveys and seminars in different educational institutions;
4. Individual presentations by students on different nutrition topics;
5. Visits of public places for nutrition awareness;
6. Independent student projects.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Contento, I.R. (2007). Nutrition Education: Linking Research, Theory and Practice. Jones & Bartlett Publishers, Ontario, Canada.
2. FAO. (1997). Nutrition Education for the Public: Discussion Papers of the FAO Expert Consultation. Food and Agriculture Organization of the United Nations, Rome, Italy.
3. Semba, A.D. & Bloem, M.W. (2008). Nutrition and Health in Developing Countries, (2nd ed). Humana Press, New York, USA.
4. Walter, W. (2013). Nutritional Epidemiology, (3rd ed). Oxford University Press, New York, USA.

BSND 304: MEAL PLANNING AND MANAGEMENT

Course Objectives

Upon completion of this course, students should be able to:

- Understand the importance of meal planning and its role in everyday life
- Apply the principles of meal planning in the planning of balanced and appropriate meals keeping in mind the nutritional requirements, family budget and food requirements choices of different age groups
- Identify market trends and conditions while purchasing food keeping in mind food costs and quality

Content-Theory

1. **Introduction**

- Importance and principles of meal planning for family and occasions;
- Nutritional value of meal;

2. **Family meal budgeting**

- Rules for good menu planning
- Menu planning for families
- Selection of various foods in relation to season and market conditions

3. **Composition and storage of food**
4. **Selection, use and care of table appointments**

- Study of different types of table settings,
- table manners and etiquettes

5. **Kitchen safety and settings**

- Basics of food hygiene and sanitation
- Food labeling
- Menus for schools, geriatric and healthcare centers.

Content-Practical

1. **Survey and record keeping of market prices (retail & wholesale)**

- Types of foods available in the market from different food groups. *e.g.* retail cuts of meat and types of milk;

2. **Comparison of weight, volume and effect of cooking on color, taste and texture of different foods**

- Planning, preparation and service of meals for different occasions at different income levels

3. **Understanding food labels**

- Market visits for cost and quality and food marketing regulations.
- Food service visits (Restaurants, School, Colleges, Hospitals).

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Brown, A. (2015). Understanding Food Principles & Preparation, (5th ed). Cengage Learning, Belmont, CA, USA.
2. McWilliams, M. (2012). Fundamentals of Meal Management, (5th ed). Dorling Kindersley India Pvt. Ltd., New Delhi, India.
3. Narvaez-Soriano, S. (2004). A Guide to Meal Management and Table Services. Rex Book Store, Manilla, Philippine.
4. Sethi, M. (2008). Institutional Food Management. New Age International Pvt. Ltd. New Delhi, India.

BSND 305: SPORTS NUTRITION

Course Objectives

Upon completion of this course, students should be able to:

1. To emphasize the importance of proper fueling for physical activity, pre- and post-workout
2. To provide an overview about dietary supplements, how they are regulated and how to avoid use of contaminated dietary supplements
3. To highlight the risks associated with performance enhancing drugs including anabolic androgenic steroids

Content-Theory

1. **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;

2. **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;
- 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

3. **Risks associated with performance enhancing drugs**;

- Metabolic Equivalent Task;
- My pyramid for sportsman.

Content-Practical

1. **Bioelectric impedance analysis**

- Sweat rate and hydration status calculation;
- Calculation of BMR and RMR;

2. **Diet planning for different sportsmen like body builders, athletes, swimmers**, **etc**.
3. **Preparation of sports drinks and food products according to accelerated needs**

- Use of sports supplements.

4. **Visit of sports centers and fitness clubs.**

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Antonio, J., Kalman, D. J., Stout, R., Greenwood, M., Willoughby, D.S. & Haff, G.G. (2008). Essentials of Sports Nutrition and Supplements. Humana Press, New York, USA.
2. Driskell, J.A. (2007). Sports Nutrition Fats and Proteins. CRC Press, Taylor and Francis Group, Boca Raton, FL, USA.
3. Fink, H.H., Mikesky, A.E. & Burgoon , L.A. (2011). Practical Applications in Sports Nutrition, (3rd ed). Jones & Bartlett Learning Burlington, MA, USA.
4. Lanham-New, S.A., Stear, S.J., Shirreffs, S.M. & Collins, A.L. (2011). Sports and Exercise Nutrition. Wiley-Blackwell, John Wiley & Sons Ltd., Chichester, West Sussex, UK.

5. Maughan, R.J. (2000). Nutrition in Sport: The Encyclopedia of Sports Medicine. Wiley-Blackwell, John Wiley & Sons Ltd., Chichester, West Sussex, UK.

BSND 306: NUTRITIONAL PRACTICES IN CLINICAL CARE

Course Objectives

Upon completion of this course, students should be able to:

1. Understand and create a patient-centered nutrition care plan based on sound nutrition principles, scientific evidence and biomedical reasoning
2. Assess various physiological conditions and prepare diet plans accordingly
3. Acquaint hands-on training in the field of enteral and parenteral nutrition

Content-theory

1. **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;

2. **Enteral nutritional:**

- Composition,
- Nutritional prescription (dose),
- Strategies to optimize delivery and minimize risks,
- Pediatric enteral feeding;

3. **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

4. **Drug-nutrient interactions:**

- Drug effects on food and nutrients,
- Food effects on drug absorption,

- Food effects on drug;
- Dietary supplements.

Content-Practical

1. **Nutritional assessment of patients:**

- Selection,
- Nutritional requirements;

2. **Tube feeding:**

- Types,
- Feeding equipment,
- Preparation and application of enteral/nasogastric diets,
- Monitoring the tube-fed patient;

3. **Total parenteral nutrition:**

- Basic rules,
- Techniques,
- Prescription,

4. **Preparation of total parenteral solution;**

- Preparation of pre- and post-operative diets;
- Case studies and logbooks;
- Hospital visits.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Block, A.S., Maillet, J., Howell, W.H & Winkler, M.F. (2007). Issues and Choices in Clinical Nutrition Practice. Lippincott Williams & Wilkins, Philadelphia, PA, USA.
2. Katsilambros, N., Dimosthenopoulos, C., Kontogianni, M.D., Manglara, E. & Poulia, K.A. (2010). Clinical Nutrition in Practice. 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., Bankhead, R., Boullate, J. I. & Compher, C.W. (2005). Clinical Nutrition; Enteral and Tube Feeding. (4th ed.) Elasvier Sauders Publishers, USA.
5. Rolfes, S.R., Pinna, K. & Whitney, E. (2015). Understanding Normal and Clinical Nutrition, (10th ed.) Thomson and Wadsworth Publishers, USA.

SEMESTER SIX

Course No.	Title of Course	Credit Hours
BSND 307	Nutritional Intervention Planning	3(0-3)
BSND 308	Dietetics-III	3(2-1)
BSND 309	Functional foods and Nutraceuticals	3(3-0)
BSND 310	Biotechnology in nutrition and dietetics	2(2-0)
BSND 311	Proteomics and Nutrigenomics	3(2-1)
BSND 312	Clinical Biochemistry	3(2-1)
		17

BSND 307: NUTRITIONAL INTERVENTION PLANNING

Course Objectives

Upon completion of this course, students should be able to:

1. Familiarize with global and local nutrition policies and programs in the domain of public health nutrition
2. Prevent and control specific micronutrient deficiencies through diet based approaches among the vulnerable
3. Promote appropriate diets and healthy lifestyles and access, analyze and monitor nutrition situations
4. Understand basis of epidemiological concepts and their application.
5. Conduct community assessment, policy development and implement in novel situations
6. Evaluate and critically analyze already implemented interventions

Content-Theory

1. **Introduction:**

- History and importance of nutrition intervention planning;
- World declaration on nutrition;
- Nutrition development partners;
- Policy guidelines;

2. **Community nutrition programs:**

- National and international,
- Supplementary feeding programs;
- Food fortification,
- Supplementation and diet diversification;

3. **School feeding programs:**

- Interventions and impacts;
- Improving household food security
- Protecting consumers through improved food quality and safety;
- Preventing and managing infectious diseases;
- Promoting breast feeding;

- Caring for socioeconomically deprived and vulnerable;
- Preventing and controlling specific micronutrient deficiencies;
- Promoting appropriate diets and healthy lifestyle;
- Improving health care;
- Five years plan for Pakistan (nutrition);

4. Nutrition intervention:

- Counselling for change;
- Sun movement;
- One health concept;

5. National nutrition programs:

- Food & nutrition program,
- Tawana pakistan,
- School health program;
- Developing effective food and *nutrition policies* and programs.

6. Epidemiological Tools

- Types of Epidemiological studies
- Types of Epidemiological studies

7. Introduction of Community Problems

- WHO tools for Community Nutrition Plans
- WHO tools for Community Nutrition Plans Monitoring
- Introduction of Conducting Community Assessment
- Components of Community Assessment

8. Nutritional and Health Indicators

- Community Assessment Surveys locally done (e.g. MICS Punjab)
- Community Assessment Surveys locally done (e.g. MICS Punjab)
- Summarizing the Results of locally done surveys
- Practical application of the findings of community assessment
- Community Assessment Surveys locally done (e.g. NNS, 2018)
- Community Assessment Surveys locally done (e.g. NNS, 2018)
- Comparison of different Assessment Surveys done

9. **Nutrition Care Process**

- Nutrition Intervention Planning (for individuals)
- Nutrition Intervention Planning (for Communities)
- Health Care Planning Process (I)
- Health Care Planning Process (II)
- Planning Cycle
- Defining the working group
- Through- out the life cycle Approach

10. **Introduction of locally planned interventions**

- Locally planned Interventions and their analysis
- Comparison of locally planned interventions
- Planning the implementation Strategy
- Executing the implementation Strategy
- Evaluation and Monitoring

Content-Practical

1. **SMART Analysis**

- Data Analysis and its interpretation

2. **Specific Nutrient deficiency condition and relevant intervention**

- Vitamin A
- Iron
- Folic Acid

3. **Implications of NCDs on the health and socio-economic status of the communities**
4. **Differentiate between nutrition specific vs nutrition sensitive interventions**
5. **Plan intervention targeting under-nutrition**

- Women
- Children

6. **Steps required to implement nutrition-based intervention**
7. **Measuring Anthropometry in pediatric population in emergency set up according to WHO guidelines**

- Interpretation of the anthropometric parameters

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Assignment Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Edelstein, S. (2011). Nutrition in Public Health: A Handbook for Developing Programs and Services, 3rd ed. Jones & Bartlett Learning, Sudbury, M.A, USA.
2. IFPRI. (2016). Taking Actions: Progress and Challenges in Implementing Nutrition Policies and Programs. International Food Policy Research Institute, Washington, DC, USA.
3. Nnakwe, N.E. (2009). Community Nutrition: Planning Health Promotion and Disease Prevention. Jones and Bartlett Learning International, London, UK.
4. Semba, R.D. & Bloem, M.W. (2008). Nutrition and Health in Developing Countries, (2nd ed.) Humana Press, New York, USA.
5. Spark, A. (2007). Nutrition in Public Health: Principles, Policies and Practice. CRC Press, Taylor & Francis Group, Boca Raton, FL, USA.
6. Awan, J.A. & Anjum, F.M. (2010). Food Toxicology. Unitech Communications, Faisalabad, Pakistan.
7. Coutts, J. & Fielder, R. (2009). Management of Food Allergens. John Wiley & Sons Ltd., Chichester, West Sussex, UK.
8. Jedrychowski, L. & Wichers, H.J. (2009). Chemical and Biological Properties of Food Allergens. CRC Press, Taylor & Francis Group, Boca Raton, FL, USA.

9. Metcalfe, D., Sampson, H.A., Simon, R.A. & Lack, G. (2014). Food Allergy: Adverse Reaction to Foods and Food Additives, (5th ed). Wiley-Blackwell, John Wiley & Sons Ltd., Chichester, West Sussex, UK.
10. Shibamoto, T. & Bjeldanes, L. (2009). Introduction to Food Toxicology, (2nd ed.). Academic Press, London

BSND 308: DIETETICS-III

Course Objectives

Upon completion of this course, students will be able to:

1. Understand the role of nutrition and dietetics in managing disease and preventing complications
2. Get hands-on training for the dietary modification of normal diets aligned with various health disorders
3. Comprehend the role of nutrition education and policies towards nutrition security

Content-Theory

1. **Diet based regimen to improve the public health;**

- Diet supplementation for diseased patients;
- Malabsorption and mineral deficiency;

2. **Health diets and lifestyles;**

- Preventing diet related diseases;
- Nutritional implications of various diets;
- Managing disease and avoiding complications through diet diversification;

3. **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;

4. **Diseases of respiratory system:**

- Cystic fibrosis,
- Asthma;

5. **Rheumatic diseases:**

- Rheumatoid arthritis,
- Osteoarthritis & gout;

6. **Inborn errors of metabolism:**

- Phenylketonuria,
- Maple syrup urine disease,
- Galactosemia,
- glycogen storage disease
- Renal diseases;
- Burn
- Surgical conditions;
- Bacterial overgrowth;

7. **Infections;**

- AIDS;
- Food allergy

8. **Protein energy malnutrition;**

- Micronutrient deficiencies;

9. **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.

Content-Practical

1. **Planning of modified diet:**

- Consistent carbohydrate diet,
- Moderate carbohydrate diet;

2. **Modified proteins diet:**

- High protein diet,
- Restricted protein diet;

3. **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.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

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

BSND 309: FUNCTIONAL FOODS AND NUTRACEUTICALS

Course Objectives

Upon completion of this course, students will be able to:

1. Find out sources of functional foods & nutraceuticals and their impact on nutrition and health
2. Familiarize with the standards and regulations used globally regarding regulatory issues and usage of functional foods
3. Assess international trade and marketability of functional foods.

Content-Theory

1. **Functional foods and nutraceuticals:**
2. **past, present, future and health claims**;
3. **functional foods and their impact on nutrition and health obesity, diabetes, cardiovascular diseases, hypertension and cancer**;
4. **Functional ingredients and bioactive molecules**:

- Iso flavones, lycopene, polyphenols,
- fiber, omega-3 & -6 fatty acids, conjugated linoleic acid, antioxidants, prebiotic and probiotic

5. **Functional foods from different food group**s

- Cereals, dairy, meat, fruits and vegetables;

6. **Regulatory systems governing the production and distribution of functional food -national and international**;
7. **Standard and regulations of various agencies**:

- FDA, EC, FAO/WHO, Health Canada;

8. **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

9. **Asian functional foods**

- Functional foods in international market and growth in Pakistan.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

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

BSND 310: BIOTECHNOLOGY IN NUTRITION AND DIETETICS

Course Objectives

After attending this course and completion of an appropriate amount of independent study, students will be able to;

1. Know about biotechnology, its important areas in food and nutrition. And how the major components of food and functional foods can be produced using microorganisms?
2. Understand Food bio-preservatives and the importance of fermentation and starter cultures?
3. Know about Genetically modified foods, plants and microbes, how they can be produced and what their role in food and nutrition is.

Theory Content

1. **Introduction to food biotechnology**

- History of Food Biotechnology
- Needs for food biotechnology

2. **Fermented food and their diversity**

- Food fermentation, benefits
- Fermented foods of sub-continent
- Starter cultures and fermentation
- General criteria for starter cultures

3. **Food Bio-preservation**

- Bacteriocins as food preservative
- Niacin as bacteriocin and mode of action
- Single cell oils (SCO), History of SCO production
- SCO, Oligeneous microbes and their criteria

4. **SCO, Safety and applications**

- Microbial exopolysaccharides
- Importance of Microbial EPS
- Single cell proteins, production and applications

5. **Food flavors and role of biotechnology in production**

- Natural vs synthetic flavors
- Food applications of algae
- Nutritional value of edible fungi -- Spirulina
- Production and processing of edible fungi
- Nutritive and non-nutritive Sweeteners
- Low calorie sweeteners and their production

6. Metabolic Engineering, Introduction

- Aims of metabolic engineering
- Steps of metabolic engineering
- Metabolic Engineering and LAB
- ME of LAB for dairy products
- Functional foods and biotechnology
- Genetically modified foods / microbes

Content-Practical

1. Intro to prebiotics and probiotics, their criteria and applications
2. Lactobacilli and their selective media for growth
3. Intro to beta galactosidase and transgalactosylation
4. Bioconversion of lactose using beta-galactosidase to produce prebiotic galacto-oligosaccharides and discussion for factors affecting
5. Galacto-oligosaccharides quantification using thin layer chromatography and discussion
6. Lactose intolerance and concept of lactose free functional dairy products
7. Production of dairy products (milk, yogurt) with reduced lactose and improved GOS

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Shetty K., Paliyath G., Pommeto, Levin, R. E. (2006). Food Biotechnology. (2nd ed). Taylor and Francis Group, LLC.
2. Stahl, U., Donalies, U. E. B., & Nevoigt, E. (2008). Food Biotechnology. Advances in Biochemical Engineering /Biotechnology. Springer-Verlag Berlin Heiderberg.

BSND 311: PROTEOMICS AND NUTRI-GENOMICS

Course Objectives

At the end of this course and following completion of an appropriate amount of independent study, a student will be able to:

1. Understand proteomics and Nutrigenomics,
2. Assess the importance and role in management of chronic diseases.

Course Content

1. **Introduction to Nutritional genomics**

- DNA composition, structure and functions
- Genes, genetic code and its importance

2. **Central dogma, Transcription**

- Central dogma, Post-transcriptional modifications
- Central dogma, t RNA, structure and functions
- Central dogma, Translation mechanism
- Central dogma, Post-translational modifications

3. **Protein structure and functions**

- Protein-protein interaction
- Protein production process through microorganisms
- Protein purification strategies

4. **Nutritional genomics**

- Metabolomics
- Transcriptomic
- Application of proteomics
- Application of proteomics

5. **Transcription factors**

- Nuclear receptors
- Classifications of nuclear receptors
- Mode of actions of nuclear receptors

6. **Gene Regulation**

- Carbohydrates and gene regulation

- Lipids and gene regulations
- PUFA and gene regulations
- Vitamins and gene regulations
- Antioxidants and gene regulations
- Functional peptides and gene expression
- Specific nutraceuticals and gene expression

7. Role of nutrients in prevention/management of chronic diseases

Content-Practical

1. Genomic DNA extraction

- DNA Quantification through gel electrophoresis or nano drop

2. PCR Primer designing and practice

- PCR introduction, applications and mechanism
- PCR hands on performance
- PCR product and gel electrophoresis

3. Recombinant proteins

4. Introduction to NCBI & BLAST

- Hands on practice on BLAST in NCBI

5. Demonstration of genetic analyzer

6. Protein purification – any one technique

7. Enzyme activity β-galactosidase activity

- Effect of cations on enzyme activity

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended readings:

1. MineY, Kazuo M & Fereidoon S.(2009). Nutrigenomics and Proteomics in Health and Disease: Food factors and gene interactions. John Willey & Sons. New Jersey, USA
2. Regina B-F & Joost H-G. (2006). Nutritional Genomics: Impact on health and disease. WileyVCH, Germany
3. Nawin C.M. (2010). Introduction to Proteomics: Principles and Applications. John Willey & Sons. New Jersey, USA.

BSND 312: CLINICAL BIOCHEMISTRY

Course Objectives

Upon completion of this course, students will be able to:

1. To understand the role and requirements of clinical laboratory and how chemical and biochemical analysis are applied to the study of disease
2. To discuss the function, structure, laboratory investigation and diseases of the different body systems
3. To correlate laboratory findings in clinical samples with various pathological processes

Content-Theory

1. **Clinical laboratory:**

- Organization and management,
- Safety, good lab practices,
- Quality control and assurance,
- Reference range and normal values,

2. **Laboratory data processing**;
3. **Handling and processing of clinical samples;**

- Effect of storage on composition of samples;

4. **Commonly used instruments in clinical laboratory**:

- Microscope, Minilab apparatus,
- X-ray, ECG, MRI, ELISA reader,
- CT scan etc.

5. **Symptomlogy and case histories of various diseases**

- Forensic science, Molecular basis of diagnosis.

Content-Practical:

1. **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;

2. **Cardiac enzymes;**

- Lipid profile, total proteins, albumin and serum minerals;

3. **Urine analysis for bile pigments, protein, urea, pH, ketone bodies, sugars, creatinine, pus cells, RBCs and uric acid;**
4. **Sero-diagnosis of infectious diseases**;
5. **Visit to clinical laboratory/concerned organization.**

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Ahmed, N. (2011). Clinical Biochemistry. Oxford University Press, Oxford, UK.
2. Bain, B.J., Bates, I., Laffan, M.A. & Lewis, S.M. (2012). Practical Haematology, (11th ed.) Churchill Livingstone, Elsevier Ltd., New York, USA.
3. Burtis, C., Ashwood, E. & Burns, D. (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, (4th ed.). 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.

SEMESTER SEVEN

Course No.	Title of Course	Credit Hours
BSND 401	Dietetics-III	3(2-1)
BSND 402	Global Food Issues	3(3-0)
BSND 403	Research Methods in Nutrition	3(3-0)
BSND 404	Nutritional Practices in Clinical Care	3(2-1)
Elective Courses (2 courses equal to 5 credit hours)		
BSND 405	Nutritional Immunology	3(3-0)
BSND 406	Drug-Nutrient Interactions	2(2-0)
BSND 407	Food Chemistry	2(2-0)
BSND 408	Preventive Nutrition	3(3-0)
BSND 409	Nutrition in Emergencies	3(3-0)

BSND 401: INFANT AND YOUNG CHILD FEEDING

Course Objectives

Upon completion of this course, students will be able to:

1. Identify problems affecting infant and young child feeding and provide a framework of essential interventions
2. Create an environment that will enable mothers, families and other caregivers to implement optimal feeding practices

Content-Theory

1. **Infant young child feeding**

- Global strategy,
- Importance of breastfeeding,
- Local and international scenario,

2. **Breastfeeding working**

- Breastfeeding practices:
- Assessing a breastfeed, taking a feeding history,
- Common breastfeeding difficulties,
- Expressed breast milk;

3. **Breastfeeding counselling**:

- Listening and learning,
- Building confidence and giving support,
- Counselling for infant feeding decisions,
- Counselling cards tools

4. **Complementary feeding practices**

- 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,

5. **Feeding techniques,**

- Food demonstration;

6. **Breastfeeding related topics**

- Growth charts

- Maternal illnesses
- Breast feeding, breast conditions, health care practices,

7. **International code of marketing of breast milk substitutes,**

- Checking understanding and arranging follow-up,
- Feeding during illness and low-birth weight babies

8. **Feeding guidelines of various global agencies – WHO etc.**
9. **Complex challenges to implementing the global strategy for infant and young child feeding.**

Content-Practical

1. Breastfeeding counseling
2. Preparation of indigenous complementary foods;
3. Therapeutic foods;
4. Infant formulas for various needs;
5. Growth monitoring:
6. APGAR (Appearance, Pulse rate, Grimace, Activity and Respiration) score,
7. Growth charts
8. Visits of hospitals and day care centers.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Behan, E. (2008). The baby Food Bible – A Complete Guide to Feeding Your Child from Infancy On. Random House Publishing Group, New York, USA.

2. Dykes, F. & Moran , V.H. (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. & King, K. (2010). Pediatric Nutrition, (4th ed.) Jones & Bartlett Learning, Mississauga, Canada.
4. WHO. (2003). Global Strategy for Infant and Young Child Feeding. World Health Organization, 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 the Pakistan, Islamabad.

BSND 402: GLOBAL FOOD ISSUES

Course Objectives

After completing this course students will be able to:

1. Acquaint knowledge about global food issues having impact on food and nutrition security
2. Understand the role of global organizations in food production, consumption and trade
3. Study the impact of climate change and other threats on global food availability

Content-Theory

1. **Introduction**

- World food situation;
- Food and nutrition security;

2. **The green revolution:**

- Worldwide post-harvest losses;

3. **Global malnutrition:**

- Protein energy malnutrition and hidden hunger;
- Overweight & obesity;
- Worldwide food price fluctuations;
- Importance of per capita earning, consumption and purchase power;
- Irrational food consumption behaviour;
- Contribution of cereals, legumes, roots, tubers and animal products;
- World food policy;
- Wto's trade regulations;
- Food bioterrorism

4. **International food laws:**

- European and American;
- Potentials of modern biotechnology to combat food insecurity;
- Genetically modified foods.
- Organic, Kosher and Halal Foods;
- Millennium development goals to sustainable development goals.
- Global Trends.

- Climate change.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Barbosa-Canovas, G., Mortimer, A., Lineback, D., Spices, W., Buckle, K. & Colonna, P. (2009). Global Issues in Food Science and Technology. Academic Press, Elsevier Inc., Burlington, MA, USA.
2. Barrientos, S. & Dolan, C. (2006). Ethical Sourcing in the Global Food System. Earthscan, New York, USA.
3. Hajra, M.A. (2013). Global Food Security: Emerging Issues and Economic Implications. Nova Science Publishers, New York, USA.
5. Oosterveer, P. (2007). Global Governance of Food Production and Consumption: Issues & challenges. Edward Elgar Publishing Inc., Massachusetts, USA.
6. Phoenix, L.E. & Walter, L. (2009). Critical Food Issues: Problems and State of the Art Solutions Worldwide, Vol. I & 2. ABC-CLIO, LLC, Santa Barbara, California, USA.

BSND 403: RESEARCH METHODS IN NUTRITION

Course Objectives

After completing this course, students should be able to:

1. Apply tools and skills required to understand published research
2. Identify the types of methods best suited for investigating different types of problems and questions
3. Get hands-on training of writing successful research proposals for thesis and projects
4. To abreast ethical consideration in research and publications

Content-Theory

1. **Introduction, objectives, types of research:**

- Basic and applied,
- Quantitative and qualitative,
- Clinical and diagnostic;

2. **Types of sampling:**

- Probability and non-probability;

3. **Collection of literature:**

- Printed and electronic sources,
- Managing literature;
- Methods of data collection;

4. **Writing scientific documents:**

- Synopsis,
- Research proposal,
- Articles,
- References,
- Internship report.

5. **Research designs:**

- observational studies,
- cross-sectional,
- case-control,

- cohort (prospective, retrospective, time-series);

6. **Experimental studies:**

- Observational studies,
- Clinical studies.

7. **Experimental data analysis:**

- Incidence/ prevalence rate
- Research ethics.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 mark

Recommended Readings:

1. Awan, J.A. (2015). Scientific Presentations. Unitech Communications, Faisalabad, Pakistan.
2. Lovegrove, J.A., Hodson, L., Sharma, S. & Lanham-New, S.A. (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.

BSND 404: FOOD AND DRUG LAWS

Course Objectives

Upon completion of this course, students shall be able to:

1. Get know how about the existing food and drug laws prevailing in the country
2. Understand duties and authorities of food safety officers and drug inspectors
3. Familiarize with food and drug laws enforcement agencies in Pakistan

Course-Theory

1. **Punjab Pure Food Rules 2011**

- legal terms and definitions from the food industry;
- Rules for food additives, categories, permissible limits;
- Food packaging: rules, criteria for packaging material, labelling requirements;
- Duties and responsibilities of public analysts and food safety officer;

2. **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;

3. **The Punjab Consumer Protection Act 2005;**
4. **The Pakistan Hotels and Restaurants Act, 1976;**
5. **The Punjab Food Authority Act 2011;**
6. **The Pakistan Halal Authority Act 2015;**

- Pakistan National Accreditation Council; Punjab Halal Development Agency;
- Pakistan Standards and Quality Control Authority (PSQCA); Role of electronic and print media in public awareness and empowerment.

Content-Practical

1. **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;

2. Planning of energy modified diet:

- High calorie diet, restricted calorie diet, high fiber diet, low residue diet, modified carbohydrates diet, moderate carbohydrate diet, modified fat diet, restricted fats diet;

3. Planning and preparation of diets for various pathological conditions;

- Nutrition in surgical conditions: preoperative and post-operative diets;
- Enteral and parenteral feeding;

4. Hospital visits and nutrition camps.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Mahan, L.K., Escott-Stump, S. & Raymond, J.L. (2012). Krause's Food, Nutrition & Diet Therapy, (13th ed.) Elsevier Saunders, St. Louis, Missouri, USA.
2. Mudambi, S.R. & Rajagopal, M.V. (2007). Fundamentals of Foods, Nutrition & Diet Therapy, (5th ed.) New Age International Pvt. Ltd. Publishers, New Delhi.
3. Punekar, M. & D'Souza, J. (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.
5. Schlenker, E. & Gilbert, J.A., (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.

BSND 405: NUTRITIONAL IMMUNOLOGY

Course Objectives

After studying this course, students hall be able to:

1. To understand relationship between nutrition and immunity
2. To evaluate, summarize and apply current research in the field of nutrition
3. To determine and assess factors impacting nutritional and immunological status
4. To grasp knowledge about the interactions among the nutrients and immune responses

Content-Theory

1. **Nutritional immunology:**

- Overview,
- principles;
- Immune system;
- Psychoneuroimmunology;

2. **Effective detoxification protocols:**

- anti-inflammatory,
- immune boosting,
- alkalinizing,
- detoxification;

3. **Mechanisms of immune dysfunction in autoimmune conditions and cancer;**
4. **Gerson therapy;**
5. **Harmful effects of vaccinations and antibiotics and nutritional support;**

- Supplementation requirements to treat immune dysfunctions,
- Colds,
- Flus,
- Pandemics.
- Opportunistic infections.

6. **Genetic and immunity;**

- Functional foods and Immunology;
- Immune boosters;

- Food Allergies;
- Cognitive function of nutrients;
- Immunization and its impacts.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Calder, P.C., Field, C.J. & Gill, H.S. (2002). Nutrition and Immune Function. CABI Publishing, New York, USA.
2. Gershwin, M.E., German, J.B. & Keen, C.L. (2000). Nutrition and Immunology Principles and Practice. Humana Press, New York, USA.
3. Gershwin, M. E., Nestel, P. & Keen, C.L. (2004). Handbook of Nutrition and Immunology. Humana Press, New York, USA.
4. Schat, K.A., Kaspers, B. & Kaiser, P. (2014). Avian Immunology, (2nd ed.) Academic Press, San Diego, CA, USA.

BSND 406: PREVENTIVE NUTRITION

Course Objectives

After completing this course, students shall be able to:

1. Acquaint knowledge about the preventive nutrition with special reference to historical perspective, public health benefits, ethnic and socioeconomic issues and its role throughout the life cycle
2. Understand the role of dietary components in the prevention and management of various health disorders

Content-Theory

1. **Preventive nutrition:**

- A historical perspective,
- Public health benefits,
- Ethnic and socioeconomic issues,
- Nutrition in the age of polypharmacy,
- Preventive nutrition throughout the life cycle;

2. **Cancer prevention:**

- Upper GIT cancer,
- Prostate cancer,
- Dietary supplements and cancer risks,
- Soy and cancer prevention,
- Micronutrients as intermediate biomarkers in chemotherapy;

3. **Cardiovascular disease prevention:**

- Omega-3 fatty acids from fish and plants,
- Cardiovascular effects of trans fatty acids,
- Antioxidants and b-vitamins and atherosclerosis,

4. **Prevention and nutritional management**

- TLC dietary patterns,
- AHA dietary patterns,
- DASH dietary patterns,
- Weight reduction,

- Increased dietary fiber,
- Omega-3 fatty acids,
- Soy proteins,
- Fruits and vegetables as antioxidant role,
- Reduce dietary cholesterol;

5. Diabetes and obesity:

- Role of nutrition in pathophysiology,
- Prevention and treatment,
- Adipokines,
- Nutrition and obesity,
- Obesity and insulin resistance in childhood and adolescence,
- Obesity and chronic disease,
- Meal replacement products and fat substitutes,
- Prevention and treatment (dietary changes, calories restricted diet and other dietary regimens,
- Exercise,
- Behavioural modification);

6. Growth, Immunity and Infection:

- Role of long chain fatty acids,
- polyunsaturated fatty acids and autoimmune diseases;

7. Prevention and treatment for hypertension:

- weight reduction,
- Adaptation of DASH diet,
- Nutrition education for behavioural modification;

8. Bone density:

- Osteoarthritis
- Role of nutrition and dietary supplements
- Calcium requirement during treatment of osteoporosis,
- Prevention and treatment
- Adequate calcium intake,

- Adequate vitamin d intake,
- Avoidance of excess phosphorous,
- Lifestyle dietary modifications, exercise;

9. Role of dietary fiber in preventing diseases (colon cancer, diabetes, constipation, diverticular disease, obesity, cardiovascular diseases)

- Health claims for foods and dietary supplements;
- Micronutrient and immunity in older people.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Bendich, A. & Deckelbaum, R.J. (2001). Primary and Secondary Preventive Nutrition. Springer Science+Business Media, New York, USA.
2. Bendich, A. & Deckelbaum, R.J. (2010). Preventive Nutrition: The Comprehensive Guide for Health Professional, (4th ed.) Humana Press, New York, USA.
3. Coulston, A.M. & Boushey, C.J. (2008). Nutrition in the Prevention and Treatment of Diseases, (2nd ed.) Academic Press, Elsevier Inc., San Diego, CA, USA.
4. Gerber, J.M. (2007). Handbook of Preventive and Therapeutic Nutrition. Aspen Publications, Silver Spring, MD, USA.
5. Thomson, C. (1996). Preventive and Therapeutic Nutrition Handbook. Chapman & Hall, UK.

BSND 407: NUTRITION IN EMERGENCY

Course Objectives

After studying this course, student should be able to:

1. Understand the context in which emergencies occur and nutritional assessment of the individuals and populations
2. Design and implement interventions for prevent and treatment of malnutrition
3. Familiarize with the role of national and international agencies in the management of emergencies

Content Theory

1. **Introduction and concepts:**

- Understanding malnutrition,
- Micronutrient malnutrition,
- Causes of malnutrition;

2. **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;

3. **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;

4. **Nutrition information**

- Education and communication;
- Monitoring and evaluation,

- Standards and accountability;

5. Role of national and international agencies:

- UNHCR, WFP, NDMA (National disaster management authority),
- Civil defence;
- Hygiene and sanitation;
- Emergency foods.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended 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.

BSND 408: DRUG-NUTRIENT INTERACTIONS

Course Objectives

After studying this course, student should be able to:

1. Raise the awareness of potential drug-nutrient interactions and influence on clinical outcomes
2. Understand complex underlying mechanisms responsible for drug-nutrient interactions
3. Identify factors that can promote drug-nutrient interactions and contribute to nutrition and/or therapeutic failure
4. Integrate knowledge of pharmacology, nutrient-nutrient and drug-nutrient interactions into the nutrition care process.

Content-Theory

1. **Basic definitions and concepts:**

- Role of nutrition therapy in pharmacotherapy;
- Pharmacologic aspects of food and drug interactions;
- Routes of drug administration; Pharmacodynamics;
- Pharmacokinetics,
- Absorption,
- Distribution,
- Metabolism,
- Elimination;

2. **Effects of food on drug therapy**,

- Drug absorption,
- Drug distribution,

3. **Drug metabolism and drug excretion;**

- Effects of drugs on food and nutrition,
- Nutrient absorption,
- Metabolism and excretion;
- Effects of drugs on the nutritional status of patients e.g. Taste, smell and type of intake;

4. **Enteral feeding:**

- Drug/nutrient interaction;
- Gastrointestinal effects,
- Appetite changes;
- Nutrient assessment of drug-nutrient interactions;
- Dietary counselling for the prevention of food drug interactions.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Boullata, J.I. & Armenti, V.T. (2010). Handbook of Drug-Nutrient Interactions, (2nd ed.) Humana Press, New York, USA.
2. Mahan, L.K. & Escott-Stump, S. (2007). Krause's Food & Nutrition Therapy. Elsevier – Health Sciences Division. Philadelphia, USA.
3. McCabe-Sellers, B., Frankel, E.H. & Wolfe, J.J. (2003). Handbook of Food Drug Interactions, CRC Press, Taylor & Francis Group, Boca Raton, FL., USA.
4. Nelms, M.N. & Sucher, K.P. (2016). Nutrition Therapy and Pathophysiology, (3rd Ed.) Cengage Learning, Belmont, CA, USA.

BSND 409: FOOD CHEMISTRY

Course Objectives

After studying this course, student should be able to:

1. Acquire knowledge and skills for understanding the main physical, chemical and functional properties of food
2. Understand and be able to control the major chemical and biochemical reactions that influence food quality with emphasis on food industry applications
3. Acquaint information about different food components and interactions among them to modulate the specific quality attributes of food systems

Content-Theory

1. **Cellular basis of foods' Water:**

- Properties,
- Types,
- Water activity and its effect on shelf life of food;

2. **Carbohydrates:**

- Roles of in food structure,
- Color,
- Flavor and texture;

3. **Lipids:**

- Roles in food structure,
- Color,
- Flavor and texture,
- Rancidity,
- Emulsifiers;

4. **Proteins:**

- Roles in food structure,
- Color,
- Flavor and texture;

5. **Enzymes:**

- Enzymatic & non-enzymatic browning reactions,
- Influences on color,
- Flavor and texture;

6. Technologies in minerals and vitamins fortification of foods,

- Stability of vitamins;

7. Food colors:

- Natural & artificial colors,
- Pigments;

8. Flavors:

- Characteristics,
- Taste,
- Odor and astringency,
- Off-flavor,
- Aromatic compounds,
- Chemistry involved in ripening processes of fruits and vegetables;
- Food additives.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Belitz, H.D., Groschm, W. & Schieberle, P. (2009). Food Chemistry. Springer Verlag, Germany.

2. Coultate, T. (2009). Food: The Chemistry of Its Components. The Royal Society of Chemistry, Thomas Graham House, Science Park, UK.
3. Damodaran, S., Parkin, K. & Fennema, O.R. (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.

SEMESTER EIGHT

Course No.	Title of Course	Credit Hours
BSND 410	Research thesis	6(0-6)
BSND 411	Internship/ Project	3(3-0)
BSND 412	Recent advances in clinical nutrition	3(3-0)
Elective Courses (2 Courses equal to 5 credit hours)		
BSND 413	Food Toxins & Allergens	3(3-0)
BSND 412	Nutritional Deficiency Disorders	3(3-0)
BSND 415	Food Supplements	2(2-0)
BSND 416	Metabolism of Nutrients	2(2-0)
BSND 417	Nutrition Epidemiology	2(2-0)
		17

BSND 412: RECENT ADVANCES IN CLINICAL NUTRITION

Course Objectives

At the end of this course and following completion of an appropriate amount of independent study, a student will be able to;

1. Understand the role of macronutrients and micronutrients in normal physiological pathways.
2. Identify and explain the role of specific nutrients in the metabolic pathways and in relation to major diseases.
3. Identifying alternate feeding routes, their relation with the nutritional biochemistry and their application in a clinical setting.
4. Design enteral and parenteral feeding regimens.

Content-Theory

1. **Advanced study of principles of nutrition in relation to health and disease;**

- The interrelationships of nutrition with biochemical,
- Physiological and anatomical changes associated with acute,
- Chronic, and terminal illness,
- Surgery, and trauma are explored;

2. **Formulation of medical nutrition therapy through advanced nutritional management techniques plans using the Nutrition Care Process framework by determining nutrition diagnoses;**
3. **Macro/micronutrient and fluid/electrolyte needs;**
4. **Routes of feeding, and implementation plans;**

- Clinical cases are used to address metabolic
- Nutrition status and patient applications,
- Topics including diabetes,
- Nutrition support;

5. **Enteral and parenteral nutrition;**

- Surgery and critical care,
- Burns,

- Immunology,
- Cancer,
- Pulmonary,
- Gastrointestinal,
- Liver and renal diseases.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Mahan, L. K. & Escott-Stump, S. (2008). Krause's Food & Nutrition Therapy, Elsevier Saunders
2. Nelms, M. & Sucher, K. (2010). Nutrition Therapy and Pathophysiology, Cengage Learning.
3. Vishwanath, M. S. (2011). Introduction to Clinical Nutrition. (3rd edition). Marcel Dekker, Inc. NY, USA

BSND 413: FOOD TOXINS & ALLERGENS

Course Objectives

After studying this course, students should be able to:

1. Acquire an in-depth understanding of toxicology related to food and health
2. Understand various types of toxins from plant, animal and plant origins as well induced by extraneous chemicals
3. Familiarize with food allergens, their health implications and management

Content-Theory

1. **Toxicology:**

- Introduction,
- Dose-response,
- Absorption,
- Translocation,
- Storage, excretion;

2. **Natural toxins of plant origin:**

- Goitrogens,
- Cyanogenic glycosides,
- Favism,
- Lathyrogens,
- Lecitins (hemagglutinins),
- Mutagens in natural plant,
- Caffeine,
- Flavonoids and some others;

3. **Natural toxins of animal origin:**

- Animal liver,
- Marine animals;

4. **Toxicity by extraneous chemicals:**

- Agricultural chemicals,
- Food processing, packaging, additives, adulterants;
- Toxicity from water;

5. **Microbial toxins:**

- Mycotoxins
- Molds,
- Mushrooms;
- Bacterial food intoxication;
- Bacterial food infection;

6. **Food allergies**

- Introduction,
- Incidence of food allergy,
- Food allergens of protein families,
- Animal origin and plant origin;
- Adverse allergic reaction,
- Diagnosis,
- Prevention,
- Legislation and labelling,
- Allergen management,
- Food intolerances,
- Emergency treatment of food-induced allergic reactions.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Boyle, M.A. (2016). Personal Nutrition. Wadsworth Cengage Learning, Belmont, CA, USA.
2. Gropper, S.S., & Smith, J. L. (2013). Advanced Nutrition and Human Metabolism. 6th ed. Cengage Learning, Belmont, CA, USA.
3. Rolfes, S.R., Pinna, K. & Whitney, E. (2015). Understanding Normal and Clinical Nutrition, (10th ed). Thomson and Wadsworth Publishers, USA.
4. WHO. (2004). Vitamin and Mineral Requirements in Human Nutrition. World Health Organization, Geneva, Switzerland.

BSND 414: NUTRITIONAL DEFICIENCY DISORDERS

Course Objectives

After studying this course, student should be able to:

1. Analyze existing global scenario of protein energy malnutrition and hidden hunger
2. Understand the causes & consequences of common micronutrient deficiencies and the scale of the problem
3. Discuss food based approached for the management of nutritional deficiency disorders

Content-Theory

1. **Introduction and general concepts;**
2. **Protein-energy malnutrition and hidden hunger:**

- Types,
- Causative factors,
- Clinical symptoms,
- Management;

3. **Vitamin related deficiency disorders:**

- Nyctolopia (night blindness)
- Xerophthalmia and kerotomalacia;
- Rickets,
- Osteomalacia,
- Osteoporosis;
- Scurvy;
- Beriberi;
- Pallegra,
- Biotin Deficiency;
- Ariboflavinosis;
- Vitamin K deficiency;
- Hypocobalaminemia;
- Paraesthesia;

4. **Minerals related deficiency disorders:**

- Nutritional anemia;
- Goiter;
- Zinc, potassium and magnesium deficiency disorders.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Boyle, M.A. (2016). Personal Nutrition. Wadsworth Cengage Learning, Belmont, CA, USA.
2. Gropper, S.S., & Smith, J. L. (2013). Advanced Nutrition and Human Metabolism. 6th ed. Cengage Learning, Belmont, CA, USA.
3. Rolfes, S.R., Pinna, K. & Whitney, E. (2015). Understanding Normal and Clinical Nutrition, (10th ed). Thomson and Wadsworth Publishers, USA.
4. WHO. (2004). Vitamin and Mineral Requirements in Human Nutrition. World Health Organization, Geneva, Switzerland.

BSND 415: FOOD SUPPLEMENTS

Course Objectives

After studying this course, student should be able to:

1. Identify the current trends in the use of dietary supplement and analysis of their global market
2. Demonstrate the impact of dietary supplements on health and disease prevention
3. Discuss safety issues and global legislations on food supplements

Content-Theory

1. Introduction

- An overview of dietary supplements and their market;
- Forms of food supplements;
- Vitamins and mineral supplements;
- Essential fatty acids;
- Enzymes as supplements;

2.Natural products and extracts;

- Probiotics and prebiotics in Health;
- Fish oil supplements;

3.Non-essential nutrients as dietary supplements

- Caffeine in food and dietary supplements;

4. Medicinal plants as food supplements;

- Codex Alimentarius standards for food supplements;
- Safety of vitamins and minerals added to foods;
- Implications of mega doses;

5. Global legislation on food supplements;

- DRAP Alternative Medicines and Health Products Enlistment Rules 2014.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Caballero, B. (2009). Guide to Nutritional Supplements. Elsevier Ltd., Oxford, UK.
2. Ottaway, P.B. (2008). Food Fortification and Supplementation: Technological, Safety and Regulatory Aspects. Woodhead Publishing Limited, Cambridge, England.
3. Pray, L., Yaktine, A.L. & Pankevich, D. (2014). Caffeine in Food and Dietary Supplements. The National Academes Press, Washington, DC, USA.
4. Ransley, J.K., Donnelly, J.K. & Read, N.W. (2001) Food and Nutritional Supplements: Their Role in Health and Disease. Springer-Verlag Berlin Heidelberg, Germany.
5. Webb, G.P. (2011). Dietary Supplements and Functional Foods, (2nd ed.). Blackwell Publishing Ltd., Oxford, UK.

BSND 412: METABOLISM OF NUTRIENTS

Course Objectives

After studying this course, student should be able to:

1. Understand the metabolic roles of carbohydrates, fats, proteins, vitamins and minerals
2. Generalize the way in which nutrients are processed through major metabolic fates in order to perform various energetic and structural functions in the body
3. Establish the role of enzymes and hormones in metabolism of nutrients

Content-Theory

1. **Metabolic pathways:**

- Objectives
- Chemical reactions
- Enzymes,
- Co-enzymes and prosthetic groups,
- Metabolic pathways;

2. **Role of ATP in metabolism:**

- Objectives,
- Functions,
- Phosphorylation of ADP to ATP;

3. **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;

4. **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.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Bender, D.A. (2014). Introduction to Nutrition and Metabolism, (5th ed.) CRC Press, Taylor & Francis, Boca Raton, FL, USA.
2. Davidson, S., Passmore, R. R. & Eastwood, M.A. (1986). Human Nutrition and Dietetics. Churchill Livingstone, New York, U.S.A.
3. Gropper, S.S. & Smith, J.L. (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., Macdonald, I.A. & Roche, H.M. (2011). Nutrition and Metabolism, (2nd ed). Blackwell Publishing, Jones & Wiley Sons Ltd., Chester, West Sussex, UK.
6. Whitney, E.N. & Rolfes, S.R. (2016). Understanding Nutrition, (14th ed). Cengage Learning, Belmont, CA, USA.

BSND 417: NUTRITION EPIDEMIOLOGY

Course Objectives

After completing this course, students should be able to:

1. Learn the methodology and applications of nutritional epidemiology
2. Apply various epidemiological study designs for research in the domain
3. Study collection and handling of data related to socio-demographic profile and dietary intake of the community.

Content-Theory

1. **Principles of nutritional epidemiology:**

- Objective of nutritional epidemiological research,
- Interpretation,
- Systematic reviews,
- Role of meta-analysis;

2. **Nutritional epidemiological studies:**

- Classification, uses in research,
- Selection of right study;
- Socio-demographic and psycho-social variables;

3. **Sampling, study size and power of study:**

- Types of sampling,
- Variability,
- Sample size,
- Power of studies;

4. **Food consumption, nutrient intake and the use of food composition tables:**

- Food consumption tables and nutrient databases,
- Calculation on nutrient intake from data on food intake and composition of foods,
- Food groups and food scores;

5. **Household surveys:**

- Characteristics of household data,
- Techniques, uses and limitations,
- Using household surveys in epidemiological studies;

6. **Individual surveys:**

- Methods for assessment of present or recent data,
- Measurement error in dietary assessment,
- Energy adjustment,
- Effects of measurement error on validity,
- Adjustment of intake in the distant past,
- Problems of retrospective assessment in population sub-groups;

7. **Validation of dietary assessment:**

- The context of validation,
- Validation techniques,
- Factors affecting the design of validation studies,
- Statistical techniques and interpretation.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Readings

1. Frank, G.C. (2008). Community Nutrition: Applying Epidemiology to Contemporary Practice, (2nd ed.) Jones and Bartlett Publishers Inc., Sudbury, MA, USA.
2. Margetts, B.M. & Nelson, M. Design Concepts in Nutritional Epidemiology, (2nd Ed.) Oxford University Press, New York, USA.
3. Rothman, K.J., Greenland, S. & Lash, T.L. (2008). Modern Epidemiology, (3rd ed.) Lippincott & Wilkins, Philadelphia, PA, USA.
4. Spark, A. (2007). Nutrition in Public Health: Principles, Policies and Practice. CRC Press, Taylor & Francis, Boca Raton, FL, USA.

5. Walter, W. (2013).Nutritional Epidemiology, (3rd ed). Oxford University Press, New York, USA.

ASSESSMENT EVALUATION AND EXAMINATIONS:

Sr. No.	Elements	Weightage
1.	Mid-term Assessment	**35%**
2.	Sessional Marks on Presentation, Attendance, Assignments and Participation	**25%**
3.	Final-term Assessment	**40%**

A semester comprises of 16-20 weeks. There is midterm examination after 8 weeks of study and final examination after 16 weeks of study. Promotion to the next semester will be based on results of both semesters and decision to be taken at the end of the semester. If a student fails in a course, he/she will be provided two chances to pass a course by registering for the course again in the same semester of the subsequent years. If a student fails to pass the course after availing these two chances, he/she will be dropped from the rolls of the program.

GRADING SYSTEM:

PERCENT MARKS	LETTER GRADE	GRADE POINTS
85 & Above	A	4.00
80-84	A-	3.70
75-79	B+	3.30
70-74	B	3.00
65-69	B-	2.70
61-64	C+	2.30
58-60	C	2.00
55-57	C-	1.70
50-54	D	1.00
Below 50	F	0.00

THESIS WRITING

Students have to write a 10,000 words public health thesis of any topic of 'Occupational Health, Safety Promotion and Risk Management' and submit it to their designated supervisor before final term examination otherwise student will not be allowed to appear in final term examination (8th semester). This will carry 6 credit hours as prescribed by HEC for SPOH. The conduct and assessment of the thesis will be as per Punjab University rules/policies