DETAIL OF COURSES
SEMESTER-WISE

FIRST SEMESTER

Course No.	Title of Course	Credit Hours
HND	Fundamentals of Human Nutrition	3(3-0) FC
FST	Essentials of Food Science & Technology	3(2-1) FC
Bio/ Math	Mathematics OR Essentials of Biology	3(3-0) GC 3(2-1) GC
Eng	English-I	3(3-0) CC
Biochem	Introductory Biochemistry	3(2-1) GC
SSH	Pakistan Studies	2(2-0) CC
		17 (15-2)

HND FUNDAMENTALS OF HUMAN NUTRITION 3(3-0)

Learning Outcomes:

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

Theory:

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

Suggested Readings:

1. Awan, J.A. 2011. Elements of Food and Nutrition. Unitech Communications, Faisalabad, Pakistan.
2. Bamji, M.S., K. Krishnaswamy and G.N.V. Brahmam. 2009. Textbook of Human Nutrition, 3rd ed. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, India.

3. Eastwood, M. 2003. Principles of Human Nutrition, 2nd ed. John Wiley & Sons, Inc., New York, USA.
4. Geissler, C. and H. Powers. 2011. Human Nutrition, 12th ed. Churchill Livingstone, London, UK.

FST ESSENTIALS OF FOOD SCIENCE &TECHNOLOGY 3(2-1)

Learning Outcomes:

- To understand the role of food science & technology towards ensuring food security
- To acquaint knowledge about the food constituents, food classification and spoilage agents
- To comprehend the role of various food processing and preservation methods in shelflife extension and availability of food around the year

Theory:

Introduction: food science and technology, food processing and preservation; Food safety and security; Food sources and global food situation; Food constituents and their functions: water, carbohydrates, lipids, proteins, vitamins and minerals; Food classification based on perishability and pH; Spoilage agents in food: enzymes, microorganisms, insects, rodents, birds and physical factors; Principles of food preservation; Preparatory operations in food processing; Food preservation techniques - high temperature: pasteurization, sterilization, canning; low temperature – refrigeration, freezing; removal of moisture – drying, dehydration; use of chemical additives; fermentation techniques – alcoholic, acetic, lactic; Irradiation technology; food packaging and labelling.

Practical:

Bottling/canning of selected fruits and vegetables; Cold storage of fruits and vegetables; Freezing of fruits and vegetables; Dehydration of fruits and vegetables; Blanching of fruits and vegetables; Use of chemicals in preservation of food products; Preparation of fermented food products – vinegar, preparation; Evaluation of bottled, frozen and dehydrated products.

Suggested Readings:

1. Awan, J.A. and S.U. Rehman. 2011. Food Preservation Manual. Unitech Communications, Faisalabad, Pakistan.
2. Awan, J.A. 2011. Food processing and Preservation. Unitech Communications, Faisalabad, Pakistan.
3. Awan, J.A. 2011. Food Science and Technology. Unitech Communications, Faisalabad, Pakistan.
4. Potter, N.N. and J.H. Hotchkiss. 1995. Food Science, 5thed. The AVI Pub. Co. Inc., Westport, Connecticut, USA.

BIO ESSENTIALS OF BIOLOGY 3(2-1)

Learning Outcomes:

- To understand fundamentals of botany and zoology with special reference to their role in food and nutrition
- To study plant morphological characteristics and various animal classes through the dissection of representative plants and animals

Theory:

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.

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.

Practical:

Study of the morphology of selected ten monocot and plant species; Identification and technical description of common flowering plants belonging to ten families; Extraction of chlorophyll from the leaves and study of absorption spectra using spectrophotometer; Field observation and report writing on animals and their behavior in terrestrial and aquatic ecosystems; Study of insect cuticle, fish scales, amphibian skin, feathers and mammalian skin; Study of heart, principal arteries and veins in a representative vertebrates (dissection of representative amphibian/fish/mammal).

Suggested Readings:

1. Campbell, N.A. 2002. Biology, 6th ed. Benjamin/Cumming Publishing Company, Inc., USA.

2. Evert, R.F. and S.E. Eichhorn. 2006. Esau's Plant Anatomy: Meristems, Cells, and Tissues of Plant Body: Their Structure, Function and Development, 3rd Ed. John Wiley & Sons, New Jersey, USA.
3. Hickman, C.P., L.S. Roberts and A. Larson. 2008. Integrated Principles of Zoology, 13th ed. McGraw-Hill, USA.
4. Kent, G.C. and S. Miller. 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. and Zeiger, E. 2010. Plant Physiology, 5th ed. Sinauer Associates Inc., Sunderland, Massachusetts, USA.

MATH MATHEMATICS 3(3-0)

1. MATHEMATICS I (ALGEBRA)

Prerequisite(s): Mathematics at secondary level
Credit Hours: 3 + 0

Specific Objectives of the Course:

To prepare the students, not majoring in mathematics, with the essential tools of algebra to apply the concepts and the techniques in their respective disciplines.

Course Outline:

Preliminaries: Real-number system, complex numbers, introduction to sets, set operations, functions, types of functions. *Matrices:* Introduction to matrices, types, matrix inverse, determinants, system of linear equations, Cramer's rule.

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.

Sequences and Series: Arithmetic progression, geometric progression, harmonic progression. *Binomial Theorem:* Introduction to mathematical induction, binomial theorem with rational and irrational indices. *Trigonometry:* Fundamentals of trigonometry, trigonometric identities.

Recommended Books:

1. Dolciani MP, Wooton W, Beckenback EF, Sharron S, *Algebra 2 and Trigonometry*, 1978, Houghton & Mifflin, Boston (suggested text)
2. Kaufmann JE, College *Algebra and Trigonometry*, 1987, PWS-Kent Company, Boston
3. Swokowski EW, *Fundamentals of Algebra and Trigonometry* (6th edition), 1986, PWS-Kent Company, Boston

2. MATHEMATICS II (CALCULUS)

Prerequisite(s): Mathematics I (Algebra)
Credit Hours: 3 + 0

Specific Objectives of the Course:
To prepare the students, not majoring in mathematics, with the essential tools of calculus to apply the concepts and the techniques in their respective disciplines.

Course Outline:
Preliminaries: Real-number line, functions and their graphs, solution of equations involving absolute values, inequalities. *Limits and Continuity:* Limit of a function, left-hand and right-hand limits, continuity, continuous functions.

Derivatives and their Applications: Differentiable functions, differentiation of polynomial, rational and transcendental functions, derivatives.

Integration and Definite Integrals: Techniques of evaluating indefinite integrals, integration by substitution, integration by parts, change of variables in indefinite integrals.

Recommended Books:

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

English I (Functional English) **Credit Hrs. 3(3-0)**

Objectives:
Enhance language skills and develop critical thinking.

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

Comprehension:
Answers to questions on a given text

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)

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

Translation skills

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

Presentation skills:

Introduction

Note: Extensive reading is required for vocabulary building

Recommended Books:

1. **Functional English**

a) Grammar
   1. Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 1. Third edition. Oxford University Press. 1997. ISBN 0194313492
   2. Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 2. Third edition. Oxford University Press. 1997. ISBN 0194313506

b) Writing
   1. Writing. Intermediate by Marie-Christine Boutin, Suzanne Brinand and Francoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 0 19 435405 7 Pages 20-27 and 35-41.

c) Reading/Comprehension
   1. Reading. Upper Intermediate. Brain Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1992. ISBN 0 19 453402 2.

d) Speaking

BIOCHEM INTRODUCTORY BIOCHEMISTRY 3(2-1)

Learning Outcomes:

- To acquaint knowledge about the nomenclature, structures and properties of chemical constituents
- To grasp the knowledge about the energy yielding cycle like glycolysis, Kerbs cycle, β-oxidation etc.

Theory:

Introduction, scope and importance of biochemistry; Brief introduction of prokaryotic and eukaryotic cells; Bio-macromolecules: composition and

organization; Energy and Principles of bioenergetics; Water: Properties of water, acid/base properties, dissociation of water and pH value, pH buffering capacity, transportation mechanisms across bio-membranes and osmosis, 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; Enzymes: functions, mode of action, specificity and inhibition, classification and nomenclature, factors affecting enzymes activity; Introduction to carbohydrates (Glycobiology): biosynthesis, metabolism, glycolysis, Kerbs cycle, Mitochondrial electron transport chain and ATP synthesis; Lipids: introduction, lipogenesis, lipids and lipoproteins in relation to lipid storage diseases, sterol and steroids; Overview of nucleic acids.

Practical:

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

Suggested Readings:

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

SSH PAKISTAN STUDIES (Compulsory) — Credit hours 2 (2-0)

Introduction/Objectives

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

Course Outline:

1. **Historical Perspective**
   a. Ideological rationale with special reference to Sir Syed Ahmed Khan, Allama Muhammad Iqbal and Quaid-e-Azam Muhammad Ali Jinnah.
   b. Factors leading to Muslim separatism
   c. People and Land
      i. Indus Civilization

ii. Muslim advent
iii. Location and geo-physical features.

2. **Government and Politics in Pakistan**
   Political and constitutional phases:
   a. 1947-58
   b. 1958-71
   c. 1971-77
   d. 1977-88
   e. 1988-99
   f. 1999 onward

3. **Contemporary Pakistan**
   a. Economic institutions and issues
   b. Society and social structure
   c. Ethnicity
   d. Foreign policy of Pakistan and challenges
   e. Futuristic outlook of Pakistan

Recommended Books:

1. Burki, Shahid Javed. *State & Society in Pakistan,* The MacMillan Press Ltd 1980.
2. Akbar, S. Zaidi. *Issue in Pakistan's Economy.* Karachi: Oxford University Press, 2000.
3. S.M. Burke and Lawrence Ziring. Pakistan's Foreign policy: An Historical analysis. Karachi: Oxford University Press, 1993.
4. Mehmood, Safdar. *Pakistan Political Roots & Development.* Lahore, 1994.
5. Wilcox, Wayne. *The Emergence of Bangladesh,* Washington: American Enterprise, Institute of Public Policy Research, 1972.
6. Mehmood, Safdar. *Pakistan Kayyun Toota,* Lahore: Idara-e-Saqafat-e-Islamia, Club Road, nd.
7. Amin, Tahir. *Ethno - National Movement in Pakistan,* Islamabad: Institute of Policy Studies, Islamabad.
8. Ziring, Lawrence. *Enigma of Political Development.* Kent England: WmDawson & sons Ltd, 1980.
9. Zahid, Ansar. *History & Culture of Sindh.* Karachi: Royal Book Company, 1980.
10. Afzal, M. Rafique. *Political Parties in Pakistan,* Vol. I, II & III. Islamabad: National Institute of Historical and cultural Research, 1998.
11. Sayeed, Khalid Bin. *The Political System of Pakistan.* Boston: Houghton Mifflin, 1967.
12. Aziz, K.K. *Party, Politics in Pakistan,* Islamabad: National Commission on Historical and Cultural Research, 1976.
13. Muhammad Waseem, Pakistan Under Martial Law, Lahore: Vanguard, 1987.
14. Haq, Noor ul. *Making of Pakistan: The Military Perspective.* Islamabad: National Commission on Historical and Cultural Research, 1993.