



SCHEME OF STUDIES

FOR

**DOCTOR OF HUMAN NUTRITION AND DIETETICS (DHND)
(5-YEARS DEGREE PROGRAM)
AS PER HEC RECOMMENDATION
(OLD SCHEME)**

SESSIONS:

2014-2015

2015-2016

2016-2017

ONLY

DEPARTMENT OF MEDICAL NUTRITION & DIETETICS

SARGODHA MEDICAL COLLEGE CAMPUS

FACULTY OF MEDICAL & HEALTH SCIENCES

UNIVERSITY OF SARGODHA, PAKISTAN

DOCTOR OF HUMAN NUTRITION AND DIETETICS (DHND)

1ST YEAR

Biochemistry-I	200 marks
Physiology-I	200 marks
Anatomy-I	200 marks
Human Nutrition & Dietetics-I	200 marks
English	100 marks
Introduction to Computer	100 marks
	1000 marks

2ND YEAR

Biochemistry-II	200 marks
Physiology-II	200 marks
Anatomy-II	200 marks
Human Nutrition & Dietetics-II	200 marks
Pak. Studies	100 marks
Islamic Studies	100 marks
	1000 marks

3RD YEAR

Pathology	200 marks
Behavioral Sciences	100 marks
Food Microbiology & Immunology	200 marks
Food Analysis	100 marks
Food Science & its Applications-I	200 marks
	800 marks

4TH YEAR

Food Science & its Applications-II	200 marks
Community Nutrition, Biostatistics & Research Methodology	100 marks
Functional Foods & Nutraceuticals	200 marks
Contemporary Nutrition	100 marks
	600 marks

5TH YEAR

Clinical Nutrition & Diet Therapy	200 marks
Nutrition in Emergency & Sports	100 marks
Food Safety & Quality Management	100 marks
Nutrition in Medicine	200 Marks
Pharmacology	100 marks
Report Writing	Qualifying
	700 marks

GRAND TOTAL **4,100 marks**

Note:

1. The detailed curricula along with course outlines to be followed, is attached as annexure and is also available in the concerned department.
2. The evaluation / paper pattern will be as divided already by the Faculty Board of FMHS and at present is applicable for other degree program now under this Faculty.

PAPER PATTERNS & MARKS DISTRIBUTION

PAPER PATTERNS:

I TOTAL MARKS = 100 (having Theory Section only)

II TOTAL MARKS = 200 (having Theory + Practical & G. Viva)

I- TOTAL MARKS = 100 (having Theory only)

THEORY (100 marks)	
Question	Marks for each Questions
Question 01: MCQs (20 stems with 04 possible options only 01 correct)	01x20 = 20
Question 02: SEQs (08 stems Requiring short answer of all)	08x05 = 40
Question 03-05: LEQs (Requiring detailed answer of any 02 Qs)	02x15 = 30
Total Marks	90
INTERNAL ASSESSMENT (10 MARKS)	
Internal assessment Theory part	10
Total Marks	10
Grand Total Marks	100

II- TOTAL MARKS = 200 (having both Theory and Practical & General Viva)

WRITTEN /THEORY (100 marks)	
Question	Marks for each Questions
Question 01: MCQs (20 stems with 04 possible options only 01 correct)	01x20 = 20
Question 02: SEQs (08 stems Requiring short answer of all)	08x05 = 40
Question 03-05: LEQs (Requiring detailed answer of any 02 Qs)	02x15 = 30
Total Marks	90
PRACTICAL (40 marks)	
Marks for Internal	20
Marks for External	20
Total Marks	40
G.VIVA (50 marks)	
Marks for Internal	25
Marks for External	25
Total Marks	50
INTERNAL ASSESSMENT (20 MARKS)	
Internal assessment Theory part	10
Internal assessment Practical part	10
Total Marks	20
Grand Total Marks	200

CREDIT ACCUMULATION AND TRANSFER SYSTEM (CAT)

1ST YEAR

Sr. #	Subject Title	Contact Hours		
		Total	Theory	Practical
1	Anatomy I	300	200	100
2	Physiology I	300	200	100
3	Biochemistry I	300	200	100
4	Human Nutrition & Dietetics-I	300	200	100
5	English	100	100	N/A
6	Introduction to Computers	100	100	N/A
	TOTAL	1400		

2ND YEAR

Sr. #	Subject Title	Contact Hours		
		Total	Theory	Practical
1	Anatomy II	300	200	100
2	Physiology II	300	200	100
3	Biochemistry II	300	200	100
4	Human Nutrition & Dietetics-II	300	200	100
5	Islamic Studies	100	100	N/A
6	Pakistan Studies	100	100	N/A
	TOTAL	1400		

3RD YEAR

Sr.#	Subject Title	Contact Hours		
		Total	Theory	Practical
1	Pathology	300	200	100
2	Food Microbiology & Immunology	300	200	100
3	Food Science & its Applications-I	300	200	100
4	Food Analysis	100	100	N/A
5	Behavioral Sciences	100	100	N/A
	Total	1100		

4TH YEAR

Sr. #	Subject Title	Contact Hours		
		Total	Theory	Practical
1	Food Science & its Applications-II	400	300	100
2	Functional Foods & Nutraceuticals	400	300	100
3	Contemporary Nutrition	300	300	N/A
4	Community Nutrition, Biostatistics & Research Methodology	200	200	N/A
	TOTAL	1300		

5TH YEAR

Sr.#	Subject Title	Contact Hours		
		Total	Theory	Practical
1	Clinical Nutrition & Diet Therapy	400	300	100
2	Nutrition in Medicine	400	300	100
3	Food Safety & Quality Management	200	200	N/A
4	Nutrition in Emergency & Sports	200	200	N/A
5	Pharmacology	200	200	N/A
	Total	1400		
	Report Writing (In Final Year)	300		

BREAK DOWN OF HOURS OF CLINICAL PRACTICE

Year	Ward/Clinic	Hours	Period
4 th Year	Hospital/Laboratory Rotation	300	03 Months
5 th Year	Hospital / Laboratory Rotation	600	06 Months
	G. TOTAL	900	

1ST YEAR

Biochemistry-I	200 marks
Physiology-I	200 marks
Anatomy-I	200 marks
Human Nutrition & Dietetics-I	200 marks
English	100 marks
Introduction to Computer	100 marks

1. ANATOMY-I

Detailed Course Outline

Cell Biology: General Anatomy: Terms related to position and movements, The skin and subcutaneous tissues, Layers of skin, Integuments of skin, Glands associated with hair follicle, Microscopic picture of skin. Bones And Cartilages: Osteology, Functions of Bones, Classification of bones, Parts of developing long bones, Blood supply of bones, Lymphatic vessels & nerve supply, Rule of direction of nutrient foramen, Gross structure of long bone, Surface markings, Cartilage, Development of bone and cartilage and Microscopic picture of cartilage and bone. The Muscle: Introduction, Histological Classification, Functions of muscles in general, Type of skeletal muscles, Parts of skeletal muscle and their action and Nomenclature and Microscopic picture of muscle. Structures Related To Muscles & Bones: Tendons, Aponeurosis, Fasciae, Synovial bursae, Tendon Synovial sheaths, Raphaes, Ligaments, Condyle, Epicondyle, Ridge, Tuberosity, Tubercle, Foramen, Canal, Groove, Process and Spur. The Joints: Introduction, Functional classifications, Structural classification, Structures comprising a Synovial joint, Movements of joints, Blood supply of Synovial joints, their nerve supply and lymphatic drainage and Factors responsible for joint stability and Development of joints. Cardiovascular System: Definition, Division of circulatory system into pulmonary & systemic, Classification of blood vessels and their microscopic picture and Heart and its histology and Function of the Heart and Anastomosis. Nervous System: Definition, Outline of cellular architecture, Classification of nervous system, Parts of the central nervous system, Microscopic picture of cerebrum, cerebellum, spinal cord, Functional components of a nerve, Typical spinal nerve and Microscopic picture of nerve and Introduction of autonomic nervous system and Anatomy of neuromuscular junction. Upper Limb-Osteology: Detailed description of all bones of upper limb and shoulder girdle along their musculature and ligamentous attachments. Myology: Muscles connecting upper limb to the axial skeletal, Muscles around shoulder joint, Walls and contents of axilla, Muscles in brachial region, Muscles of forearm, Muscles of hand, Retinacula and Palmar aponeurosis and Flexor tendon dorsal digital expansion. Neurology: Course, distribution and functions of all nerves of upper limb and Brachial plexus. Angiology (Circulation): Course and distribution of all arteries and veins of upper limb, Lymphatic drainage of the upper limb and Axillary lymph node and Cubital fossa. Arthrology: Acromioclavicular and sternoclavicular joints, Shoulder joint, Elbow joint, Wrist joint, Radioulnar joints, Inter carpal joints, Joints MCP and IP and Surface Anatomy of upper limb, and Surface marking of upper limb. Demonstrations: Demonstration on Shoulder joint, attached muscles and articulating surfaces, Demonstration on Elbow joint, Demonstration on Wrist joint, Demonstration on Radioulnar joint, Demonstration on MCP and IP joints, Demonstration on acromioclavicular joint, Demonstration on sternoclavicular joint and Demonstration on Brachial plexus and Demonstration on Structure of bones. Thorax--Structures Of The Thoracic Wall: Dorsal spine (Vertebrae), Sternum, Costal Cartilages & Ribs, Intercostal Muscles, Intercostal Nerves, Diaphragm, Blood supply of thoracic wall and Lymphatic drainage of thoracic wall and Joints of thorax. Thoracic Cavity: Mediastinum, Pleura, Trachea, Lungs, Bronchopulmonary segments, Pericardium, Heart – Its blood supply, venous drainage & nerve supply, Large veins of thorax, superior and inferior vena cava., pulmonary veins brachiocephalic veins and Large Arteries – Aorta & its branches. Lower Limb-Osteology: Detailed description of all bones of lower limb and pelvis along their musculature and ligamentous attachments. Myology: Muscles of gluteal region, Muscles around hip joint, Muscles of thigh (anteriorly,

posteriorly, laterally and medially) and Muscles of lower leg and foot. Neurology: Course, distribution, supply of all nerves of lower limb and gluteal region and Lumbosacral plexus. Angiology: Course and distribution of all arteries, veins and lymphatic drainage of lower limb. Arthrology: Pelvis, Hip joint, Knee joint, Ankle joint, Joints of the foot, Surface Anatomy of lower limb and Surface marking of lower limb. General Histology: Cell, Epithelium, Connective tissue, Bone, Muscles tissue, Nervous tissues, Blood vessels, Skin and appendages and Lymphatic organs. General Embryology: Male and female reproductive organs, Cell division and Gametogenesis, Fertilization, cleavage, blastocyst formation and implantation of the embryo. Stages of early embryonic development in second and third week of intrauterine life, Foetal membrane (amniotic cavity, yolk sac, allantois, umbilical cord and Placenta) and Developmental defects

Practical

During study of Gross Anatomy, emphasis should be given on applied aspect, radiological anatomy, surface anatomy and cross-sectional anatomy of the region covered in the respective year.

Recommended Text Books

1. Gray's Anatomy by Prof. Susan Standring 39th Ed.,
2. Elsevier, Clinical Anatomy for, Medical Students by Richard S.Snell,
3. Clinically Oriented Anatomy by Keith Moore,
4. Clinical Anatomy by R.J. Last, Latest Ed,
5. Cunningham's Manual of Practical Anatomy by G.J. Romanes, 15th Ed., Vol-I, II and III,
6. The Developing Human. Clinically Oriented Embryology by Keith L. Moore, 6th Ed, Wheater's Functional Histology by Young and Heath,
7. Latest Ed, Medical Histology by Prof. Laiq Hussain, Neuroanatomy by Richard S.Snell.

2. BIOCHEMISTRY-I

Detailed Course Outline

Cell: Introduction to Biochemistry, Cell: (Biochemical Aspects), Cell Membrane Structure, Membrane Proteins, Receptors & Signal Molecules. Body Fluids: Structure and properties of Water, Weak Acids & Bases, Concept of pH & pK, Buffers, their mechanism of action, Body buffers. Biomolecules: Amino Acids, Peptides & Proteins: Amino acids: Classification, Acid-Base Properties, Functions & Significance, Protein Structure, Primary, Secondary & Super secondary. &, Structural Motifs, Tertiary & Quaternary Structures of Proteins, Protein Domains, Classification of Proteins, Fibrous proteins (collagens and elastins) & Globular proteins. Enzymes: Introduction, Classification & Properties of Enzymes, Coenzymes, Isozymes & Proenzymes, Regulation & Inhibition of Enzyme activity & enzymes inhibitors, Clinical Diagnostic Enzymology. Carbohydrates: Definition, Classification, Biochemical Functions & Significance of Carbohydrates, Structure & Properties of Monosaccharides & Oligosaccharides, Structure & Properties of Polysaccharides, Bacterial cell Wall, Heteropolysaccharides, GAGS. Lipids: Classification of Lipids, Fatty Acids: Chemistry, Classification occurrence & Functions, Structure & Properties of Triacylglycerols and Complex Lipids, Classification & Functions of Eicosanoids, Cholesterol: Chemistry, Functions & Clinical Significance, Bile acids/salts. Nucleic Acids: Structure, Functions & Biochemical Role of Nucleotides. Structure & Functions of DNA, Structure & Functions of RNA. Minerals & Trace Elements: Sources, RDA, Biochemical Functions & Clinical Significance of Calcium & Phosphorus, Sources, RDA, Biochemical Functions & Clinical Significance of Ca, Na, K, Cl, Mg, S, &P, Biochemical Functions & Clinical Significance of Fe, Cu, Zn, Mn, Mb, Se, Co, I,F etc. Vitamins: Sources, RDA & Biochemical Functions & Clinical Significance of Fat Soluble Vitamins, Sources, RDA & Biochemical Functions & Clinical Significance of Water Soluble, Vitamins. Nutrition: Dietary Importance of Carbohydrates, Lipids & Proteins and other dietary Ingredients. Balanced Diet. Diet in specialized conditions. Molecular Biology: Nitrogenous basis, Nucleosides and Nucleotides, Structure & Role of Nucleotide. Tissue Biochemistry: Extracellular Matrix, Collagen, Elastin and Extracellular Matrix Components, Biochemistry of Proteoglycans, Bone & Teeth, Muscle & Cytoskeleton

Practical Training

Section 1: Introduction to Biochemistry

1. Working SOPs for a Biochemistry Practical Laboratory
2. Introduction to Laboratory Equipments and Techniques
3. Preparation of solution (Normal, Molar Equivalent solution etc).

Section 2: Physical Biochemistry

4. Surface Tension
5. Process of adsorption
6. Buffer Action
7. Practical application of Henderson-Hasselbalch's equation

Section 3: Carbohydrate

8. Molisch's Test & Iodine Test
9. Benedict's Test & Barfoed's Test
10. Selivanoff's Test & Phenylhydrazine Test
11. Sucrose Hydrolysis
12. Starch Hydrolysis
13. Schematic Identification of an unknown carbohydrate

Section 4: Proteins

14. Biuret Test, Heat Coagulation Test & Salt Saturation Test
15. Ninhydrin Test, Xanthoproteic Test & Millon-Nasse's Test
16. Aldehyde Test, Sakaguchi's Test & Lead Sulphide Test
17. Determination of Isoelectric pH of casein Protein.
18. Schematic Identification of unknown protein

Section 5: Lipids

19. Emulsification of natural fat & Solubility of soap
20. Acrolein Test & Test for Cholesterol
21. Iodine & Peroxide value calculation
22. Saponification value calculation

Section 6: Biochemical analysis of different body fluid

23. Sample Collection & Physical Evaluation of Urine
24. Analysis of Normal Urine
25. Analysis of Abnormal Urine

Recommended Books

1. Harper's Biochemistry by Robbert K. Murray, Daryl K. Granner, Peter A. Mayes, Victor W. Rodwel (Latest Edition).
2. Lippincott's Illustrated Review of Biochemistry by Pamela C. Champe and Richard A. Harvey (Latest Edition).
3. Practical Clinical Biochemistry by Varley (Latest Edition).
4. Textbook of Biochemistry by Devlin (Latest Edition).
5. Textbook of Medical Biochemistry by M.A. Hashmi (Latest Edition).
6. Biochemistry by Stryer (Latest Edition).

3. PHYSIOLOGY-I

Detail Course Outline

Basic And Cell Physiology: Functional organization of human body, Homeostasis, Control systems in the body, Cell membrane and its functions, Cell organelles and their functions and Genes: control and function. Nerve And Muscle: Structure and function of neuron, Physiological properties of nerve fibers, Physiology of action potential, Conduction of nerve impulse, Nerve degeneration and regeneration. Synapses, Physiological structure of muscle, Skeletal muscle contraction, Skeletal, smooth and cardiac muscle contraction, Neuromuscular junction and transmission, Excitation contraction coupling, Structure and function of motor unit. *Clinical Module*: Perform nerve conduction

studies and explain their clinical importance, Myopathies and neuropathies, Peripheral nerve injuries. Cardiovascular System: Heart and circulation, Function of cardiac muscle, Cardiac pacemaker and cardiac muscle contraction, Cardiac cycle, ECG: recording and interpretation. Common arrhythmias and its mechanism of development, Types of blood vessels and their function, Haemodynamics of blood flow (local control systemic circulation its regulation and control). Peripheral resistance its regulation and effect on circulation, Arterial pulse, Blood pressure and its regulation, Cardiac output and its control, Heart sounds and murmurs Importance in circulation and control of venous return., Coronary circulation, Splanchnic, pulmonary and cerebral circulation , Triple response and cutaneous circulation, Foetal circulation and circulatory changes at birth. *Clinical Module:* Clinical significance of cardiac cycle, correlation of ECG and heart sounds to cardiac cycle, Clinical significance of cardiac cycle, interpretation of ischemia and arrhythmias, Effects of hypertension, Clinical significance of heart sounds, Effects of ischemia, Shock. Respiratory System: Function of respiratory tract, Respiratory and non-respiratory function of the lungs, Mechanics of breathing, Production & function of surfactant and compliance of lungs, Protective reflexes, Lung volumes and capacities including dead space, Diffusion of gases across the alveolar membrane, Relationship between ventilation and perfusion. Mechanism of transport of oxygen and carbon dioxide in blood, Nervous and chemical regulation of respiration, Abnormal breathing, Hypoxia, its causes and effects, Cyanosis, its causes and effects. *Clinical Module:* Clinical importance of lung function tests, Causes of abnormal ventilation and perfusion, Effects on pneumothorax, pleural effusion, and pneumonia, Respiratory failure, Artificial respiration and uses & effects of O₂ therapy, Clinical significance of hypoxia, cyanosis, and dyspnoea. Blood: Composition and general functions of blood, Plasma proteins their production and function, Erythropoiesis and red blood cell function, Structure, function, production and different types of haemoglobin, Iron absorption storage and metabolism, Blood indices, Function, production and type of white blood cells, Function and production of platelets, Clotting mechanism of blood, Blood groups and their role in blood transfusion, Complications of blood transfusion with reference to ABO & RH incompatibility, Components of reticuloendothelial systems, gross and microscopic structure including tonsil, lymph node and spleen, Development and function of reticuloendothelial system. *Clinical Module:* Anemia and its different types, Blood indices in various disorders, Clotting disorders, Blood grouping and cross matching, Immunity. Skin And Body Temperature Regulation

Physiology Practical's

Hematology

1. Use of the microscope
2. Determination of haemoglobin
3. Determination of erythrocyte sedimentation rate
4. Determining packed cell volume
5. Measuring bleeding and clotting time
6. RBC count
7. Red cell indices
8. WBC count
9. Leukocyte count
10. Prothrombin and thrombin time

Respiratory System

1. Clinical examination of chest
2. Pulmonary volume, their capacities and clinical interpretation
3. Stethography

Cardiovascular System

Cardiopulmonary resuscitation (to be coordinated with the department of medicine), Examination of arterial pulse, ECG recording and interpretation, Arterial blood pressure, Effects of exercise and posture on blood pressure, Apex beat and normal heart sounds

Recommended Text Books

1. Textbook of Physiology by Guyton and Hall, Latest Ed.

2. Review of Medical Physiology by William F. Ganong, Latest Ed.
3. Physiology by Berne and Levy, Latest Ed.
4. Human Physiology: The Basis of Medicine by Gillian Pocock, Christopher D. Richards
5. Physiological Basis of Medical Practice by John B. West and Taylor, 12th Ed.

4. HUMAN NUTRITION AND DIETETICS-I

Food, nutrients, diet, balanced diet, food groups, food guide pyramid, meal planning. Eating food: smell, taste, satiety. Water: functions, sources, regulation in body, dietary requirements, content in food. Carbohydrates: types, role in body, dietary fiber, sweeteners, dietary requirements, content in food. Fats and oils: types, functions, dietary requirements, content in food, fat substitutes. Proteins: amino acids, protein synthesis, classification, functions, quality of proteins, dietary requirements, content in foods. Vitamins: classification, role in body, content in food. Mineral elements: types, requirements, sources, functions. Digestion: alimentary tract, digestive juices, secretions. Absorption and metabolism of nutrients: carbohydrates, protein, lipids. Nutrient and dietary deficiency disorders: malnutrition, obesity, coronary diseases, diabetes, lactose and gluten intolerance, dental caries – symptoms, causes, prevention.

Dietetics: Introduction, Definition, diet therapy, nutrition care process, modified and functional foods, glycemic index, special feeding practices. Diet designing: nutritional requirements, exchange diets, eating disorders. Diets for specific ailments: obesity, overweight, cardiovascular diseases, diabetes, stomach and liver diseases.

Practical

Use of laboratory equipments. Estimation of moisture, fat, protein, carbohydrates, fiber and ash in food samples. Determination of soluble solids, total solids, pH, acidity, total sugars, specific gravity, refractive index and peroxide value.

Recommended Books

1. Geissler, C. and Powers, H. 2010. Human nutrition. Churchill Livingstone, London, UK.
2. Awan, J.A. 2007. Elements of food and nutrition. Unitech Communications, Faisalabad- Pakistan.
3. Bamji, M.S., Rao, N.P. and Reddy, V. 2004. Textbook of human nutrition. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, India.
4. Eastwood, M. 2003. Principles of human nutrition. John Wiley & Sons, Inc., New York, USA.
5. Garrow, J.S., James, W.P.T. and Ralph, A. 2000. Human nutrition and dietetics. Churchill Livingstone, London, UK.

5. ENGLISH

Detailed Course Outline

Comprehension: Answers to questions on a given text. Translation skills: Urdu to English
Paragraph writing: Topics to be chosen at the discretion of the teacher. Paragraph writing: Practice in writing a good, unified and coherent paragraph. Essay writing: Introduction . CV and job application: Translation skills, Urdu to English. Study skills: Skimming and scanning, intensive and extensive, and speed reading, summary and précis writing and comprehension. Academic skills: Letter/memo writing, minutes of meetings, use of library and internet, 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). Technical Report writing. Progress report writing

Recommended Text Books:

Functional English:

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

Writing

3. Writing. Intermediate by Marie-Christine Boutin, Suzanne Brinand and Francoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 0 19 435405 7 Pages 20-27 and 35-41 45-53.

Reading/Comprehension

4. Reading. Upper Intermediate. Brian Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1992. ISBN 0 19 453402 2.
5. Writing. Upper-Intermediate by Rob Nolasco. Oxford Supplementary Skills. Fourth Impression 1992. ISBN 0 19 435406 5 (particularly good for writing memos, introduction to presentations, descriptive and argumentative writing).
6. Reading. Advanced. Brian Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1991. ISBN 0 19 453403 0.
7. Reading and Study Skills by John Langan

6. INTRODUCTION TO COMPUTER

Course Description:

This is an introductory course on Information and Communication Technologies. Topics include ICT terminologies, hardware and software components, the internet and World Wide Web, and ICT based applications.

Detailed Course Out Line

Basic Definitions & Concepts, Hardware: Computer Systems & Components, Storage Devices, Number Systems, Software: Operating Systems, Programming and Application Software, Introduction to Programming, Databases and Information Systems, Networks, Data Communication, The Internet, Browsers and Search Engines, The Internet: Email, Collaborative Computing and Social Networking, The Internet: E-Commerce, IT Security and other issues

Recommended Text Books

1. Introduction to Computers by Peter Norton, 6th International Edition (McGraw HILL)
2. Using Information Technology: A Practical Introduction to Computer & Communications by Williams Sawyer, 6th Edition (McGraw HILL)
3. Computers, Communications & information: A user's introduction by Sarah E. Hutchinson, Stacey C. Swayer
4. Fundamentals of Information Technology by Alexis Leon, Mathewsleon Leon press

2ND YEAR

Biochemistry-II	200 marks
Physiology-II	200 marks
Anatomy-II	200 marks
Human Nutrition & Dietetics-II	200 marks
Pak. Studies	100 marks
Islamic Studies	100 marks

1. ANATOMY-II

Detailed Course Out Line

Embryology: Special: Musculoskeletal system, cardiovascular system, CNS, The Head And Neck: The Neck: Muscles around the neck, Triangles of the neck, Main arteries of the neck, Main veins of the neck, Cervical part of sympathetic trunk, cervical plexus, cervical spine (Vertebrae), Joint of neck. The Face: Sensory nerves of the face, Bones of the face, Muscles of the face, Facial nerve, Muscles of mastication, Mandible, Hyoid bone, Temporomandibular joint, Brief description of orbit and nasal cavity. The Skull: Bones of skull, Anterior cranial fossa, Middle cranial fossa, Posterior cranial fossa, Base of skull and Structures passing through foramina. Neuro Anatomy: Central Nervous System: Disposition, Parts and Functions, Brain stem (Pons, Medulla, and Mid Brain), Cerebrum, Cerebellum, Thalamus, Hypothalamus, Internal Capsule, Blood Supply of Brain, Stroke and its types, Ventricles of Brain, CSF circulation and Hydrocephalus, Meninges of Brain, Neural pathways (Neural Tracts), Pyramidal and Extra pyramidal System (Ascending and Descending tracts), Functional significance of Spinal cord level, Cranial Nerves with special emphasis upon IV, V, VII, XI, XII (their course, distribution, and palsies), Autonomic nervous system, its components and Nerve receptors. Spinal Cord: Gross appearance, Structure of spinal cord, Grey and white matter (brief description), Meninges of spinal cord, Blood supply of spinal cord and Autonomic Nervous system. Abdomen-Abdominal Wall: Structures of anterior abdominal wall: superficial and deep muscles, Structure of rectus sheath, Structures of Posterior abdominal wall, Lumbar spine (vertebrae), Brief description of viscera. Pelvis: Brief description of anterior, posterior and lateral walls of the pelvis, Inferior pelvic wall or pelvic floor muscles, Sacrum, Brief description of perineum and Nerves of perineum.

Practical

During study, emphasis should be given on applied aspect, radiological anatomy, surface anatomy and cross-sectional anatomy of the region covered in the respective semester /year

Recommended Text Books:

1. Gray's Anatomy by Prof. Susan Standring 39th Ed., Elsevier.
2. Clinical Anatomy for Medical Students by Richard S.Snell.
3. Clinically Oriented Anatomy by Keith Moore.
4. Clinical Anatomy by R.J. Last, Latest Ed.
5. Cunningham's Manual of Practical Anatomy by G.J. Romanes, 15th Ed., Vol-I, II and III.
6. The Developing Human. Clinically Oriented Embryology by Keith L. Moore, 6th Ed.
7. Wheater's Functional Histology by Young and Heath, Latest Ed.
8. Medical Histology by Prof. Laiq Hussain.
9. Neuroanatomy by Richard S.Snell

2. BIOCHEMISTRY-II

Bioenergetics: Introduction to Bioenergetics, Biological Oxidations and Electron Transport Chain and Oxidative Phosphorylation. Metabolism Of Carbohydrates: Digestion & Absorption of Carbohydrates, Glycolysis & its Regulation, Citric Acid Cycle, Metabolism of Glycogen, Gluconeogenesis and regulation of blood glucose and Pentose Phosphate Pathway & its Significance. Metabolism Of Lipids: Digestion & Absorption of Lipids, Metabolism & Clinical Significance of Lipoproteins, Fatty acid oxidation biosynthesis and metabolism of Triacylglycerols, Metabolism & clinical Significance of

Cholesterol and Metabolism of Eicosanoids. Metabolism Of Proteins & Amino Acids: Digestion of Proteins & Absorption of Amino Acids, Transamination & Deamination of Amino Acids and urea cycle and Specialized products formed from Amino Acids. Molecular Biology: Structural Organization of Chromosome and Genes. Replication, Transcription in Prokaryotes & Eukaryotes, Translation: (Genetic Code) in Prokaryotes & Eukaryotes, Translation Inhibition by Antibiotics, Regulation of Gene Expression and Recombinant DNA Technology & Polymerase Chain Reaction, Blotting Techniques. Hormones: Classification & Mechanism of Action of Hormones, Signal Transduction, Second Messengers and Receptors, Hypothalamic & Pituitary Hormones, Steroid Hormones: Glucocorticoids and Mineralocorticoids, Insulin & Glucagon and Disease related to hormones abnormalities

List Of Practical's

Section 1: Techniques of Instruments in Clinical Biochemistry with examples

1. Visible Spectrophotometry
2. Flame photometry
3. UV & IR spectrophotometry
4. Atomic Absorption spectrophotometry
5. pH Metry
6. Chromatography and determination of Amino Acids in Urine by pape chromatography

Section 2: Clinical quantatives analysis in Biochemistry

1. Sample Collection Blood, Faces and body fluids
2. Serum Glucose Estimation
3. Glucose tolerance Test (GTT)
4. Serum Cholesterol estimation (Total, HDL and HDL cholesterol)
5. Serum Bilirubin Estimation (Total, Direct and Indirect bilirubins)
6. Serum Amylase Estimation
7. Serum AST Estimation
8. Serum ALT Estimation
9. Serum ALP Estimation
10. Serum Creatine Kinase(CK) Estimation
11. Serum Ascorbic acid Estimation
12. Serum LDH Estimation
13. Serum Proteins Estimation (Total, Albumin & Globulin)
14. Serum Total lipids Estimation
15. Serum calcium Estimation (total, ionized & unionized)
16. Serum Uric acid Estimation
17. Serum Magnesium Estimation
18. Serum Urea Estimation
19. Serum Creatinine Estimation

Recommended Text Books:

1. Harper's Biochemistry by Robbert K. Murray, Daryl K. Granner, Peter A. Mayes, Victor W. Rodwel (Latest Edition).
2. Lippincott's Illustrated Review of Biochemistry by Pamela C. Champe and Richard A. Harvey (Latest Edition).
3. Practical Clinical Biochemistry by Varley (Latest Edition).
4. Textbook of Biochemistry by Devlin (Latest Edition).
5. Textbook of Medical Biochemistry by M.A. Hashmi (Latest Edition).
6. Biochemistry by Stryer (Latest Edition).by Stryer, Lubert, Latest Ed

3. PHYSIOLOGY-II

Detailed Course Outline

Nervous System: General organization of the nervous system, Classification of nerve fibers, Properties of synaptic transmission, Function of neurotransmitters and neuropeptides, Type and function of sensory receptors, Function of the spinal cord and ascending tracts, Reflex action and reflexes, Muscle spindle and muscle tone, Mechanism of touch, temperature and pain., Functions of the cerebral cortex, Difference between the sensory and motor cortex and their functions, Motor pathways including pyramidal and extrapyramidal, Basal Ganglia and its functions, Cerebellum and its function, Control of posture and equilibrium, Physiology of sleep, Physiology of memory, Mechanism and control of speech, Function of the thalamus, Function of the hypothalamus and limbic system, Production of CSF, Mechanism of temperature regulation and Function of the autonomic nervous system and the physiological changes of aging. *Clinical Module:* Significance of dermatomes, Injuries of the spinal cord, Hemiplegia and paraplegia, Parkinsonism, Effects of cerebellar dysfunction.

Reproduction: Function of the male reproductive system, Spermatogenesis, Mechanism of erection and ejaculation, Production and function of testosterone and Physiological changes during male puberty, Function of the female reproductive system, Production and function of oestrogen, and progesterone, Menstrual cycle, Physiological changes during female puberty and menopause, Pregnancy and the physiological changes taking place in the mother, Function of the placenta, Parturition and lactation and Neonatal physiology. *Clinical Module:* Male infertility, Female infertility, Contraception, Basis for pregnancy tests.

Gastrointestinal Tract: General function of gastrointestinal tract, Enteric nervous system, control of gastrointestinal motility and secretion, Mastication, Swallowing: mechanism and control, Function, motility and secretions of stomach, Function, motility and secretions of small intestine, Function, motility and secretions of large intestine, Function of GIT hormones, Mechanism of vomiting and its control pathway, Defecation and its control pathway, Functions of liver, Functions of gallbladder and bile in digestion and Endocrine & exocrine pancreas and functions of pancreas in digestion. *Clinical Module:* Dysphagia, Physiological basis of acid peptic disease, Causes of vomiting, Diarrhea and constipation in clinical settings, Jaundice and liver function tests in clinical settings.

Endocrinology: Classification of endocrine glands, Mechanism of action, feedback and control of hormonal secretion, Functions of the hypothalamus, Hormones secreted by the anterior and posterior pituitary and their mechanism of action and function.. Function of the thyroid gland, Function of the parathyroid gland, Calcium metabolism and its regulation, Secretion and function of calcitonin, Hormones secreted by the adrenal cortex and medulla, and their function and mechanism of action, Endocrine functions of the pancreas, Control of blood sugar. Hormones secreted by the gastrointestinal system and their function, Function of the thymus and The endocrine functions of the kidney and Physiology of growth. *Clinical Module:* Acromegaly, gigantism and dwarfism, Effects of panhypopituitarism, Diabetes insipidus, Thyrotoxicosis and myxoedema, Pheochromocytoma, Cushing's disease, Adrenogenital syndrome, Diabetes mellitus and hypoglycemia.

Body Fluids And Kidney: Components and quantitative measurements of body fluids, Fluid compartments, tissue and lymph fluid, Structure of the kidney and nephron, General function of the kidney, GFR and its regulation, Formation of urine including filtration, re-absorption and secretion, Plasma clearance., Mechanism of concentration and dilution of urine, Water and electrolyte balance with reference to the kidney, Role of the kidney in blood pressure regulation, Hormonal functions of the kidney, Acidification of urine and its importance, Acid base balance with reference to the kidney and Micturition and its control. *Clinical Module:* Renal function tests and their clinical importance, Fluid excess and depletion, Renal failure and dialysis, Metabolic acidosis and alkalosis, Abnormalities of micturition, Medical Physics

Physiology Practicals

Nervous System

1. Examination of superficial and deep reflexes.
2. Brief examination of the motor and sensory system.
3. Examination of the cranial nerves.

Special Senses

1. Measurement of the field of vision.
2. Measurement of light reflex.
3. Ophthalmoscopy.
4. Colour vision.
5. Hearing tests.
6. Testing taste and smell.

Pregnancy tests

Recommended Text Books

1. Textbook of Physiology by Guyton and Hall, Latest Ed.
2. Review of Medical Physiology by William F. Ganong, Latest Ed.
3. Physiology by Berne and Levy, Latest Ed.
4. Human Physiology: The Basis of Medicine by Gillian Pocock, Christopher D. Richards
5. Physiological Basis of Medical Practice by John B. West and Taylor, 12th Ed

4. HUMAN NUTRITION AND DIETETICS-II

Theory

Role of various nutrients for maintains growth, production, reproduction and health. Various abnormalities related to poor nutrition. Role of different hormones and enzymes in relation to utilization of various nutrients. Remedial approach through diet for various metabolic problems. Diet based regimen to improve the public health, diet supplementation for diseased patients. Malabsorbtion and mineral deficiency. Managing disease and avoiding complications through diet diversification. Carbohydrates, proteins and fat modified diets. Mineral modified diet for cardiovascular disorders. Fluid modified diets against the disorders of kidney and urinary tract, energy and protein modified diets for acute stress and wasting syndrome. Role of diet in various infections. Meal management in emerging Pathogens. AIDS, cancer, concept of immunonutition.

Practical

Planning a normal diet, texture modified diets, clear fluid diet, full fluid diet, soft diet, semi solid diet. Energy modified diets. High calorie diet. Restricted calorie diet, high fiber diet. Modified carbohydrate diet. Modified protein diet. Modified fat diet. Modified micronutrients deit.

Books Recommended

1. Davidson, S., R. Passmore, R and M.A. Eastwood. 1986. Human nutrition and dietetics. Churchill Livingstone, New York, USA.
2. Tull, A. 1997. Food and nutrition. Oxford University Press, London.
3. Catalado, C.B., L.K. DeBrouyne and E.N. Whitney. 2003. Nutrition and diet therapy. 6th ed. Thomson and Wordsworth Publisher, USA.
4. Frank, G.C. 2008. Community nutrition applying epidemiology to contemporary practice, 2nd ed. Jones and Bartlett Publishers Sudbury, Massachusetts, USA.

5. PAKISTAN STUDIES

Ideology Of Pakistan: Definition and elucidation. Historical aspect. Ideology of Pakistan in the light of speeches and sayings of Allama Iqbal and Quaide-Azam. Pakistan Movement: Basis for the creation of Pakistan. Historical developments: 1857-1947. Political Developments In Pakistan Since 1947. Land And People Of Pakistan: Geography, Society., Culture., Natural resources., Health and education with reference to characteristics trends and problems.

Recommended Books (Pakistan Studies)

1. Ideological Orientations of Pakistan by Sharif Al Mujahid.
2. Struggle for Pakistan by I.H. Qureshi.
3. The Making of Pakistan by Richard Symond

6. ISLAMIC STUDIES

Fundamental Beliefs And Practices Of Islam: Tauheed (Unity of Allah), Risalat (Finality of the Prophet-hood). Akhirat (Day of Judgement).,Salat, Soum, Zakat, Hajj and Jihad. Need Of Religion And Its Role In Human Life. Morality In Islam: Concept of morality, Concept of morality and Faith. Islamic principles and methods of character building., Moral values in Islam. Rights Of The Individual In Islam. Quran As A Guide For The Modern Society And Scientific Development. Holy Prophet (Peace Be Upon Him) And His Life. Islamic Concept Of State. Islam And Society: Role of man and women in society, Rights of women children in Islam. Concept of woman's freedom in Islam., Hukook-ul-Ibad. Importance Of Rizk-E-Hilal. Contribution Of Islamic Scholars In Science And Medicine.

Recommended Books (Islamic Studies)

1. Introduction to Islam by Dr. Hamidullah.
2. Islam: Its meaning and message by Khurshid Ahmad

3. اسلام یک نظر میں مولانا صدرا الدین اصلاحی

4. قرآن اور تفسیر سیرت ڈاکٹر میر ولی الدین

3RD YEAR

Pathology	200 marks
Behavioral Sciences	100 marks
Food Microbiology & Immunology	200 marks
Food Analysis	100 marks
Food Science & its Applications-I	200 marks

1. PATHOLOGY

Objectives:

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

- The basic terminologies in different pathological states
- Cell injuries, necrosis and their types
- Practical applications of pathology
- The basic knowledge of different human body systems and their disease
- Disease management of different systems of human body

Theory:

Scope of pathology and concept of diseases; Definition and terminology: Ischemia, Hypoxia, Necrosis, Infarction, Atrophy, Hypertrophy, Hyperplasia, Metaplasia, Plasia, Anaplasia; Response of body to injury and infection; Acute Inflammation, Chronic inflammation, Immunity, Allergy, Hypersensitivity; Specific, Ulcer (Peptic, Duodenal), Hypertension, Leukemia or Blood Cancer (Malignant Carcinoma, Sarcoma & Lymphomas); Diagnosis and treatment of Cancer in general, fate, survival and prognosis with tumors. Introduction to systemic pathology, General terms, Respiratory System: Atelectasis, emphysema, pneumonia, Developmental anomalies of heart Different types of pneumonia Pneumonic Meningitis, CCPP, CBPP, Pleuritis, Canine distemper and other respiratory disorders, Cardiovascular System: Pericarditis, endocarditis, myocarditis Heart failure, arteriosclerosis, atherosclerosis, Medial sclerosis, Digestive System: General consideration, Diseases of oral cavity, pharynx and oesophagus, Dysphagia, parasitic diseases of oesophagus, Diseases of stomach, developmental anomalies, Diseases of intestine (small, large) Liver and biliary system, Urinary System: General consideration, Renal failure, glomerulonephritis, Skeletal System: Bone formation, examination of skeleton, Developmental abnormalities, osteoporosis, Inflammatory bone diseases, arthritis, Male Reproductive System: General consideration, surgical conditions of prepuce, Metabolic bone disease, Balanoposthitis, orchitis, Female Reproductive System: Developmental abnormalities, metritis, endometritis, Developmental abnormalities, Pyometra, abortion, still birth and brucellosis, Haemopoietic System: Red blood cell disorder, anemia, its types, White blood cell disorders, different diseases Gaseous lymphadenitis and other lymph node associated disease, Neurodegenerative diseases, Muscular System: General reaction of muscles, atrophy, hypertrophy, Myelopathies, inflammations, Listeriosis, hemophilus infection, Myotonic syndrome, metabolic myopathies, Viral infections, Parasitic infections, Endocrine System: Mechanism of endocrine diseases, Disorders of pituitary and adrenal, Disorders of thyroid and pancreas, Milk fever, postparturient hemoglobinuria, Skin and Appendages: General consideration, Dermatohistopathology, Perifolliculitis, folliculitis, furunculosis, Congenital and hereditary diseases, Viral disease, fungal and parasitic diseases

Practical Training/ Lab Work

To study the microscope, To study the calcification, To study the osteogenic sarcoma, To study the granulation tissue, To study the chronic inflammation (cholecystitis), To study the acute inflammation (appendicitis), To study Fibroedema, To study the carcinoma of breast, To study the actinomycosis, To study the culture media, To study the gram staining, To study the Z-N staining, To study the giant cell tumor, Examination of urine

Recommended Books:

1. Kumar Cotran Robins, Basic Pathology, 6th Ed., W B Saunders Company, Philadelphia (1992)
2. Walters and Israel, General Pathology, Churchill Livingstone, London (1998).
3. Peter S Macfarlane, Robin Reid, Robin Collander, Pathology Illustrated, Churchill Livingstone, London (1998).
4. Walter G B, General Pathology, Churchill Livingstone, New York, 1996.
5. Underwood J. C. E. 2009. General and Systemic Pathology. Churchill Publisher

2. BEHAVIORAL SCIENCES

Introduction: Behavioral Sciences and their importance in health, Bio-Psycho-Social Model of Healthcare, Desirable attitudes, Correlation of brain, mind and Behavioural Sciences, Roles of a doctor. Understanding Behaviour: Sensation, sense organs / special organs, Perception and factors affecting it, Attention and concentration, Memory and its stages, types and methods to improve it, Types and theories of thinking, Cognition and levels of cognition, Problem solving and decision making strategies, Communication Its types, modes and factors affecting it Non-verbal cues and Characteristics of a good communicator. Personality And Intelligence: Stages and characteristics of psychological growth and development, Personality and development theories of personality Factors affecting personality development, Assessment of personality Influence of personality in determining reactions during health, disease, hospitalization, stress, etc, Intelligence and its types Relevance of IQ and EQ Methods of enhancing EQ and effectively using IQ Factors affecting intelligence and their assessment. Stress Management: Definition and classification of stress and stressors, Relationship of stress and stressors with illness, Stress and health, Anxiety, Coping skills, Psychological defence mechanisms, Conflict and frustration, Adjustment and maladjustment, Patient anxiety / stress, Psychological theories of pain perception and patients' experience of pain Treatment adherence and compliance, Psychological techniques including hypnosis. Doctor – Patient Relationship: Concept of boundaries and psychological reactions in doctor – patient relationship (such as transference and counter transference). Pain, Sleep And Consciousness: Concept of pain, Physiology of pain, psychosocial assessment and management of chronic /intractable atypical facial pain, Stages of sleep, Physiology of consciousness, Attend states of consciousness, Psychological influence on sleep and consciousness, Non-pharmacological methods of inducing sleep, Changes in consciousness. Communication Skills: Principles of effective communication, Active listening, Art of questioning, Good and bad listener, Counseling: steps, scope, indication and contraindications, Dealing with real life crisis and conflict situations in health settings, A practical method of communication between the doctor and patient about disease, drugs, prognosis etc. Interviewing: Collecting data on psychosocial factors in Medicine / Surgery / Reproductive Health / Paediatrics and other general health conditions, Types of interview and Skills of interviewing. Health Psychology: Importance of psychological consideration in clinical management of patients, Psychological therapies, Key concepts in child's social and cognitive development, Psychological changes during adolescence and old age and their clinical management, Impact of illness on a patient's psychological well being including the ability to cope and understand the association between psychological stress and physical well being, Role of doctor in patient reassurance and allaying anxiety and fear. Social And Community Perspective: Inequalities of healthcare and the relationship of social class, Ethnicity, culture and racism, How disease pattern and medical care vary by culture and ethnicity?, Gender and Healthcare and Influence of health and illness on behavior. Application Of Behavioural Principles In Health And Disease: Mentally / emotionally handicapped, physically handicapped, chronically ill, Homebound and medically compromised.

Recommended Text Books

1. A Handbook of Behavioural Sciences for Medical and Dental Students By: Mowadat H Rana, Sohail Ali and Mansoor Mustafa, , University of Health Sciences Lahore
2. Medicine in Society ; Behavioural Sciences for Medical Students, By: Christopher Dowrick, Arnold Publisher

3. Behavioural Sciences in Clinical Medicine By: Wolf & Stewart
4. Developmental Psychology for Healthcare Professions By: Katherine A Billingham

3. FOOD MICROBIOLOGY & IMMUNOLOGY

Theory

Microbiology: introduction, historical background, branches. Significance of microorganisms in food, water and environment. Microorganisms: cell structure, prokaryotes, eukaryotes. Characteristics of microorganisms: bacteria, yeasts, moulds, viruses. Growth requirements: cultural, physical, chemical, macro- and micro-nutrients. Culture media: types, applications. Microbial metabolism. Bacterial multiplication: growth curve, continuous culture. Microbial genetics: conjugation, transduction, transformation.

Practical

Safety in microbiological laboratory. Basic functions and handling of laboratory equipments. Use of microscope. Sterilization and disinfection of glassware. Preparation of culture media. Staining of microorganisms and their structures. Bacterial cultivation, growth measurement. Characteristics of bacterial colonies. Bacterial and fungal morphology. Micrometry.

Books Recommended

1. Tortora, G.J., Funke, B.R. and Case, C.L. 2009. Microbiology: an introduction. The Benjamin/Cummings Pub. Co, Redwood City, California, USA.
2. Frazier, W.C. and Westhoff, D.C. 2008. Food microbiology. McGraw Hill Book Co, New York, USA.
3. Awan, J.A. and Rahman, S.U. 2005. Microbiology manual. Unitech Communications, Faisalabad, Pakistan.
4. Banwart, G.J. 2004. Basic food microbiology, 2nd ed. CBS Publishers and Distributors, New Delhi, India.

4. FOOD ANALYSIS

Theory

Food analysis: significance. Sampling: techniques, preparation, preservation. Physical properties and analysis of foods and food products: appearance, texture, specific gravity, refractive index, theology. Chemical analysis: significance. Proximate analysis, acidity, pH, sugars, mineral elements, vitamins – significance, methods. Chromatography: paper, thin layer. Spectroscopy: atomic emission, atomic absorption. Sensory evaluation of foods: attributes, difference and preference tests, consumer acceptance. Analytical data: evaluation, interpretation, statistical applications.

Methods of sensory evaluation, physiological and psychological foundations. General requirements for sensory testing. Organization, and evaluation of sensory testing. Measurement: difference, discrimination testing, scaling, threshold methods, descriptive analysis. Texture, Color and flavor evaluation. Special problems related to sensory science. Consumer field tests and questionnaire design. Statistical procedures in sensory evaluation.

Books Recommended

1. AOAC. 2007. Official methods of analysis of AOAC. Association of Official Analytical Chemists, Arlington, USA.
1. Winton, A. and Winton, K.B. 2006. Techniques of food analysis. Agrobios Publishing Co., Jodhpur, India.
2. Awan, J.A. and Rehman, S.U. 2003. Food analysis manual. Unitech Communications, Faisalabad, Pakistan.
3. Pomeranz, Y. and Meloan, C.E. 2000. Food analysis: theory and practice. CBS Publishers, New Delhi.
4. Kemp, S.E., Hollywood, T and Hort, J. 2009. Sensory evaluation: a practical handbook. John Wiley & Sons Inc., New York, USA.
5. Chambers, E. and Wolf, M.B. 2005. Sensory testing methods. American Society for Testing

and Materials, West Conshohocken, Pennsylvania, USA.

6. Carpenter, R.P., Hasdell, T.A. and Lyon, D.H. (Eds). 2000. Guidelines for sensory analysis in food product development and quality control. Aspen Publishers, Inc., Gaithersburg, Maryland, USA.

5. FOOD SCIENCE & ITS APPLICATION-I

Theory

Preparation of foods for food processing: introduction, properties of raw materials, storage and transportation of raw materials. Preparatory operations: cleaning, sorting, grading, size reduction, blanching, sulphiting. Heat processing: methods – thermisation, pasteurization, HTST, commercial sterilization, UHT. Canning: unit operations. Retort operation: equipment. Effect of heat processing: nutrients, microorganisms. Low temperature preservation: refrigeration: methods and equipments. Cold storage: requirements, insulation, air circulation, humidity, refrigeration load, controlled atmospheric storage. Principles of low temperature preservation: refrigeration, cold storage, freezing, refrigeration plants, monitoring and control. Cold storage: requirements, insulation, air circulation, humidity, controlled atmospheric storage, racking systems, calculation of refrigeration load. Freezing and frozen storage: methods, types, slow and quick freezing, freezing point, freezing curve, rate, changes during freezing, damages during intermittent thawing. Defects in frozen foods: freeze burn, drip loss. Evaporation and dehydration: evaporation – concentration and condensation, principles, equipments, applications. Drying – principles, equipments, types of driers, Dehydration: applications, dehydrated products – vegetables, fruits and milk. Use of chemical additives: contaminants, adulterants, additives. Food additives: classification, criteria for selection, GRAS additives, permissible limits, food safety, E-numbers. Preservation by fermentation technology: principles, objectives, types - alcoholic, acetic and lactic fermentations. Fermented foods: bread, wine, vinegar, yoghurt, sausages, pickles. Food irradiation: principles, applications, equipments, safety aspect, effect on food properties, detection methods.

Postharvest technology: introduction, production, losses, causes, trade. Fruit ripening: changes during ripening, recommended conditions, commercial practices, water loss, respiration activity. Harvesting and handling methods. Maturity assessment of different fruits and vegetables. Ripening process: respiration, climacteric and non-climacteric patterns, pectic substances, ripening conditions. Postharvest physiology of fruits and vegetables. Postharvest treatments: coatings, curing, vapor heat treatment, hot water treatment, degreening. Storage: refrigerated, CA, hypobaric, MAS. Packaging: types, design, modified atmospheric packaging, recycling. Cold chain: packing house operations, transportation. Safety and quality of fruits and vegetables. Postharvest technology of cereals: harvesting, threshing, drying, storage and handling. New developments in postharvest technology.

Practical

Bottling/canning of selected fruits, vegetables. Cold storage of fruits and vegetables. Freezing of fruits and vegetables. Dehydration of fruits and vegetables. Use of chemicals in preservation of food products. Production of vinegar, yoghurt and pickles. Evaluation of bottled, frozen and dehydrated products. Visit to food industries.

Determining harvest maturity of different fruits and vegetables. Grading and sorting. Applications of different postharvest techniques. Changes in physical and chemical quality parameters of fruits during storage weight loss, acidity, TSS, vitamin C degradation, firmness, color changes. Effect of packaging materials on stored fruits and vegetables. Effect of different chemicals - anti-sprouting, anti-ripening.

Books Recommended

1. Fellow, P.J. 2005. Food processing technology: principles and practices, 2nd ed. CRC Press, Taylor & Francis Group, Boca Raton, Florida.
2. Brennan, JG. 2006. Food processing handbook. Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, Germany.
3. Rahman, M.S. 2007. Handbook of food preservation. CRC Press, Taylor & Francis Group, Boca Raton, Florida, USA.

4. Awan, J.A. and Rehman, S.U. 2009. Food preservation manual. Unitech Communications, Faisalabad, Pakistan.
5. Chakraverty, A., Mujumdar, A.S., Raghavan, G.S.V., Ramaswamy, H.S. 2003. Handbook of postharvest technology: cereals, fruits, vegetables, tea, and spices, Marcel Dekker, Inc., New York, USA.
6. Thompson, A.K. 2003. Fruit and vegetables harvesting, handling and storage. Blackwell Science Pub., Cambridge, UK.
7. Wim, J. (ed.) 2002. Fruit and vegetable processing: Improving quality. Woodhead Publishing Ltd., Abington, Cambridge, UK

4TH YEAR

Food Science & its Applications-II	200 marks
Community Nutrition, Biostatistics & Research Methodology	100 marks
Functional Foods & Nutraceuticals	200 marks
Contemporary Nutrition	100 marks

1. FOOD SCIENCE & ITS APPLICATION-II

Theory

Milk: Production, importance, standards, composition, properties, Factors influencing raw milk quality. Milk handling: manual and machine milking, farm cooling, collection, reception, analyses at different levels, transportation. Milk Chemistry: major constituents, their properties and chemistry. Milk processing: standardization, homogenization, pasteurization, UHT, packaging, storage, distribution. Effect of storage and heat processing on milk quality. Milk adulteration: adulterants, objectives, health effects. Wholesomeness of milk: standards of raw and processed milk. Milk Microbiology.

Cereal grains: importance, production, structure, composition, nutrition: Grain grades and grading. Storage: methods, types, role of temperature and moisture, safe storage methods. Dry milling process: cleaning, tempering, conditioning. Grinding process: types of grinding machines. Sieving process: principles, types of sifters. Flour treatment and quality assessment. Rheology of doughs and batters. Maize - wet milling: production of starch, oil, protein. Rice: Drying, milling, parboiling. Processing of rice and oats. Malting and brewing. Production of breakfast cereals and snack foods. Feed and industrial uses of cereals.

Poultry industry in Pakistan. Factors affecting poultry quality: breed, age, sex, genotype, rearing conditions and practices. Bird selection: weight, quality. Primary poultry processing: live-bird supply, stunning, slaughtering, scalding, plucking, evisceration, giblet harvesting, whole-carcass and cuts packaging. Portioning and deboning operations. Preservation: freezing, canning, drying, chemical treatments, irradiation. Packaging: materials, selection. Quality assurance: parameters, drug and feed residues. Eggs: identification, grading, composition, quality characteristics, handling, storage. Egg processing: drying, freezing - whole, white, yolk. Functional properties and applications in food processing. Quality control during processing. Fish and shell fish: overview, commercially important, biochemistry, microbiology, handling, transportation. Fish preservation: freezing, canning, salt curing, smoking, drying. Processing of miscellaneous products. Quality control and factory sanitation of sea foods.

Beverages: classification, beverage industry in Pakistan. Beverage ingredients: Water: sources, purification – need, methods. Sweeteners - sugars, artificial sweeteners. Additives: colors, flavors, preservatives, acidulants, stabilizers and carbon dioxide. Carbonated beverages: syrup room operations, carbonation, filling, capping, bottle washing. Fruit based beverages: to study difference in fruit pulps, fresh juices, ready to serve juice, juice concentrate, nectar, cordial, squash, syrup, barley water, powder drinks, energy drinks, traditional beverages, synthetic, low calorie, fruit flavored juices. Fermented beverages: use and role of tea and coffee. Bottled water: manufacture, quality control procedures, plant sanitation.

Oils and fats: importance, sources, production, uses. Characteristics of oils and fats: physical, chemical. Oil bearing materials: pre-treatment, storage. Extraction methods: rendering, expression, solvent extraction. Processing: degumming, refining, bleaching, deodorization, fractionation, winterization, hydrogenation, interesterification, esterification, emulsification, stabilization. Spoilage: oxidative and hydrolytic rancidity – chemistry, prevention - use of antioxidants. Manufacture of frying oils, margarine, mayonnaise. Byproducts of fats and oils industry and their uses.

Meat animals: Status in Pakistan, factors influencing growth and development. Slaughtering process: pre-slaughtering care and handling of meat animals, stunning methods, bleeding methods – modern, Islamic, Kosher, Jhatka, others. Meat carcass: dressing, post-mortem changes, carcass evaluation.

Factors affecting quality of meat. Preservation of beef and lamb: chilling, freezing, canning, dehydration, curing, salting, smoking, irradiation. Properties of meat: physical, chemical, and microbiological. Nutritive value of raw and processed meat. Quality assurance and safety in meat industries.

Practical

Milk collection and cooling practices. Milk sampling methods. Physical and chemical analyses of raw milk. Clot on boiling, Alcohol precipitation test. Tests for adulterants. Standardization, homogenization, pasteurization and UHT processes. Visit to milk processing plants.

Grading of grains. Milling of cereal grain through different mills. Tests for flour quality assessment. Visit to wheat, maize and rice processing industries.

Slaughtering and dressing of poultry. Poultry cuts. Tests for freshness of poultry and eggs. Grading of poultry meat and eggs. Preparation and preservation of poultry and egg products. Visit to poultry and egg processing plants. Standards for freshness of fish. Quality evaluation of processed fish. Fish and shell fish freezing, canning, salting and smoking. Determination of fish composition. Visit of fish farm/fisheries.

Formulation and preparation of carbonated and non-carbonated beverages. Preparation and preservation of fruit pulps and juices, sensory evaluation of different instant and powdered mixes/drinks, fermented, still, carbonated and non-carbonated beverages. Storage study of such prepared products under different conditions through taking laboratory tests (physical, chemical, sensory and microbiological examination) during whole storage life. Using different techniques to prepare juice concentrates. Use of low caloric sweeteners for the development of diet beverages. Manufacture of syrups, squashes, traditional beverages, synthetic and powder beverages. Chemical analysis of beverages. Visit to beverage plants.

Extraction of oils and fats. Determination of physical and chemical constants: color, cold test, melting point, smoke point, specific gravity, solid fat index, refractive index, acid value, peroxide value, iodine value, saponification value. Visit to oil and fat industries.

Identification of meat cuts. Tests for freshness of meat. Meat grading and quality testing. Preservation of meat: freezing, canning, dehydration, smoking, curing. Preparation of meat products. Visit to abattoir and meat processing plants.

Books Recommended

1. Alfa Laval/Tetra Pak. 1995. Dairy processing handbook. Tetra Pak Processing System, S 221 86, Lund, Sweden.
2. Britz, T.J. and Robinson, R.K. 2008. Advanced Dairy Science and Technology. Blackwell Publishing Ltd. Garsington Road, Oxford, UK.
3. MHFW. 2005. Manual of Methods of Food Analysis (Milk and Milk Products). Lab Manual. Ministry of Health and Family Welfare, Govt. of India, India.
4. Tamime AY and Barry AL. 2001. Mechanisation and automation in dairy technology. CRC Press, Boca Raton, Florida.
5. Delcour, J.A. and Hosney, R.C. 2010. Principles of cereal science and technology. American Association of Cereal Chemists Inc, St. Paul, Minnesota, USA.
6. Khetarpaul, N, Grewal, R.B., and Jood, S. 2005. Bakery Science and cereal technology. Daya Publishing, Dehli, India.
7. AACC. 2000. Approved methods of American Association of Cereal Chemists. American Association of Cereal Chemists Inc, St. Paul, Minnesota.
8. Mead, G.C. 2004. Poultry meat processing and quality. Woodhead Publishing Ltd., Abington, Cambridge, UK.
9. Sim, J.S., Nakai, S. and Guenter, W. 2000. Egg nutrition and biotechnology. CABI Publishing, New York, USA.

2. COMMUNITY NUTRITION, BIOSTATISTICS & RESEARCH

METHODOLOGY

Theory

Community nutrition: foundation and status in Pakistani masses. Community nutrition programs: key features, benefits, planning, implementation, evaluation. Factors affecting: social, environmental. Nutritional status assessment” anthropometric, dietary, biochemical, clinical measurements. Nutritional requirements and recommendations: Pre-school children, school children, adolescence, adults, pregnant and lactating women, geriatrics. Community nutrition and dietetics profession. Diet treatments for various disorders. Diet therapy. Diet designing. Diet for specific ailments: obesity, overweight, cardiovascular diseases, diabetes, stomach and liver diseases. Introduction to statistics; Types of data, Frequency distribution for continuous and discrete data; Visual representation of data, stem and leaf display, box and whisker plots; Measures of location and variability. Definitions and law of probability; Simple correlation and regression analysis; Elementary ideas of sampling, distribution of means and proportions; Test of significance of means, proportion, difference between means and proportion with their confidence intervals. Experimental design; The statistical packages.

Steps in the design of a nutritional epidemiological study, Testing , piloting of a nutritional epidemiological study, Questionnaire design . Evaluation, Sources of variation in the dietary intake, Methodological studies on dietary questionnaires. Validation studies. Prospective and Case Control studies on Nutrition and Health, Obesity morbidity and Mortality, Diet and cardiovascular disease, Diet and Hypertension. Diet Score. Cross Sectional Studies, Dietary Assessment in Cross-Sectional Studies, Anthropometry, Nutritional Anthropometric Assessment . Filed recommended Measurements, Biochemical Indicators of nutrient intake, Laboratory procedures. Quality assurance, Research Directions in Nutritional Epidemiology. Characteristics and types of research. Problem identification, research ethics, standardized measurement and sampling techniques. Research proposal/project. Discussion of research: interpretation, logics, evidence of imagination, drawing, conclusion and recommendation. Research thesis, reports and articles for publication. Use of computer for programs, software applicable to nutritional data.

Books Recommended

1. Singh J. 2008. Handbook of nutrition and dietetics. Lotus Press, Darya Ganj, New Delhi, India.
2. Boyle, M.A. 2008. Community nutrition in action: an entrepreneurial approach. Thomson Learning Wadsworth, New York, USA.
3. Mann, J. and Truswell, A.T. 2007. Essentials of human nutrition. 3rd ed. Oxford University Press, Oxford, England.
4. Whitney, E. and Rolfes, S.R. 2005. Understanding nutrition. Thomson Learning Inc., Belmont, USA.
5. Zar, J.H. Biostatistical Analysis. 2003. 4th Edition, Pearson Education. Prentice Hall International Limited. London, UK.
6. Choudhry, M.R. Modern Statistics. 2001. Polymer Publications, Urdu Bazaar, Lahore.
7. Steel, R.G.D. Torrie, J.H. and Dickey, D.A. Principles and Procedures of Statistics. A Biometrical Approach. 1997. 3rd Edition. WCB Mc. GrawHill, New York, USA.
8. Taylor, S. 2009. Advances in food and nutrition research. 1st Ed. Academic press, USA.
9. Williman, N. 2005. Your research project. 2nd Ed. Vistall Publisher, India.
10. Anjali, S. 2007. Therapeutic nutrition. Aavishkar Publishers and Distributors, Jaipu, India.
11. Nix, S. 2008. Williams Basic nutrition and diet Therapy. Elsevier Publishers, New Dehli, India.

3. FUNCTIONAL FOODS & NUTRACEUTICALS

Theory

Functional foods and nutraceutical: Past, Present and future. Functional foods and their impact on nutrition and health obesity, diabetes, cardiovascular diseases, hypertension and cancer; functional ingredients and bioactive molecules; isoflavons, lycopenes, polyphenol, dietary fiber, omega 3 fatty

acids, conjugated linoleic acids, antioxidants, probiotics and prebiotics; functional food from different food groups; cereals, dairy, meat, fruits and vegetables; regulatory systems governing the production and distribution of functional foods-national and international; standards and regulations FDA, EC, FAO/WHO, Health Canada, guidelines for assessment of functional foods; marketing and regulatory issues; conventional and emerging food processing technologies for functional food production.

PRACTICALS :

Introduction of composition of milk. Determination of casein, lipids, carbohydrates, phosphorus by Neumann's Test, Chloride, Calcium and Phosphorous. General information regarding the composition of egg. Estimation of egg white, egg yolk, lipids, calcium, phosphorus and iron. Introduction of composition of wheat and other cereals. Estimation of starch, gliadin, glutelin.

Recommended Books

4. FAO. 2007. Report on Functional Foods. Food and Agriculture Organization of United Nation, Rome, Italy.
5. Shi, J., C.T. Ho and F. Shahidi. 2005. Asian Functional Foods. Marcel Dekker/CRC Press, New York, USA.
6. Shi, J., G. Mazza and M.L. Maguer. 2002. Functional Foods: Biochemical and processing aspects, Vol. 2. CRC Press, New York, USA.
7. Wildman, R.E.C. 2006. Handbook of nutraceutical and functional foods, 2nd Ed. CRC Press, New York, USA>

4. CONTEMPORARY NUTRITION

Theory:

Guidelines for designing a healthy diet, the human body; nutrition basics, the basis of healthy diet, human digestion and absorption, the energy yielding nutrients, alcohols and forbidden foods, nutrition perspective, the energy nutrients and energy balance, carbohydrates, lipids, proteins, energy balance and weight control, nutrition; beyond the nutrients, fitness and sports, eating disorders, under nutrition throughout the world, safety of food and water, focus on the life stages, pregnancy and breast feeding, nutrition from infancy through adolescence, nutrition during adulthood, debilitating diseases, osteoporoses, arthritis and renal diseases, nutrition for school age children, consumer concerns about food and water, concepts of junk, genetically modified and novel foods.

Recommended Books

1. Cataldo C.B, L.K. DeBvruyne and E.N. Whitney. 2003. Nutrition and diet therapy, 6th ed. Thomson learning, USA.
2. Wardlaw, G.M. and A.M. Smith. 2006. Contemporary nutrition, 6th ed. McGraw Hill, USA.
3. Wardlaw, G.M., J.S.S Hampl and R.A. DiSilvestro.2004.perspective in nutrition, 6th ed. McGraw Hill, USA.

5TH YEAR

Clinical Nutrition & Diet Therapy	200 marks
Nutrition in Emergency & Sports	100 marks
Food Safety & Quality Management	100 marks
Nutrition in Medicine	200 marks
Pharmacology	100 marks
Report Writing	Qualifying

1. CLINICAL NUTRITION AND DIET THERAPY

Theory:

Nutritional assessment: clinical history and examination, nutrition support in sepsis, trauma and other clinical conditions. Prevention and treatment of malnutrition: oral supplement, oral feeding and parental nutrition. Obesity, Etiology, principle of treatment and prevention. Nutritional management of diseases: gut, liver, nutritional and dietary advice. Iodine deficiency disorder: methods of correcting assessment of iodine nutritional states, clinical nutrition and bone diseases: dietary factors in dental diseases and advice for dental health. Nutritional strategies for high risk population and dietary advice in relation to nervous system,, kidneys, urinary tract and cardiovascular diseases, cancers and HIV infections. Dietary calculations for overweight, under nutrition and protein deficiency, infections, fevers, anemia. Dietary therapy: diet plan for various physiological and metabolic disorders, nutrition medicines and complementary therapies. Nutritional interventions: nutrition care, plan, standard and modified diets, dietary calculations using the exchange list for diet planning.

Practical:

Two to three weeks practical work in each concerned ward of a teaching hospital, monitoring and studying the hospital patients for their nutritional problems. Diet/meal preparation in various nutritional disorders, e.g. diabetes militias, hepatitis, renal failure, cardiovascular diseases, breast cancer.

Recommended Books:

1. Anjali, S.2007. Therapeutic nutrition. Aavishkar Publishers and Distributers, Jaipur, India.
2. Frances, S. and E. Whitney 2007. Nutrition concepts and controversies (11th ed.) . Thomson Wads Worth. UK.
3. Nix, S. 2008. Williams, Basic nutrition and diet therapy (11th ed). Elsevier Publishers, New Delhi, India.
4. Rekha, S.2004. Diet management (3rd ed). Elsevier Publishers, New Dehli, India.

2. NUTRITION IN EMERGENCY & SPORTS

Nutrition in Emergency

Introduction and concepts: Introduction to nutrition in emergencies, Agency mandates and coordination mechanism, understanding malnutrition, micronutrient malnutrition, causes of malnutrition; nutrition needs assessment and analysis: measuring malnutrition: individual and population assessment, health assessment and the link with nutrition, food security assessment and the link with nutrition, nutrition information and surveillance systems; intervention to prevent and treat malnutrition: general food distribution, supplementary feeding, therapeutic care, micronutrient interventions, Health and livelihood intervention, infant and young child feeding, HIV and AIDS nutrition. Nutrition information, education and communication; monitoring, evaluation and accountability: Monitoring and evaluation, standards and accountability.

Recommended Books:

1. ENN (Emergency Nutrition Network).2011. The harmonized training package(HTP): Resource material for training on nutrition and emergencies, version 2. Nutrition works, emergency nutrition network, global nutrition cluster. Oxford, UK.

2. SC (Save the Children Fund UK.)2004. Emergency Nutrition Assessment: Guidelines for the fieldworkers. Save the children, Westport, UK.
3. WHO (World Health Organization). 2000. The management of nutrition in major emergencies. World Health Organization, Geneva, Switzerland.

Nutrition in Sports

Objectives:

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

- Energy requirements of athletes, body builders, etc.
- Examine methods of increasing muscle mass and to assess the use of sports supplements

Theory:

The principles of fitness, motivation and conditioning; Nutrition for the athletes, stress management, preventing accidents, stretching, posture and aerobics; Vitamins and minerals supplementation for fitness; High and low intensity exercise, cross training, walking for weight control and case studies; Introduction to muscle contraction, fast and slow fibers, how and where energy is stored? How far can a person run? What fuels are used for exercise?; When is each fuel used, different intensity, duration, training, nutrition and gender?; Energy balance, fluid balance, fueling cycle, what can food does for you?; Pre-exercise, during exercise and during recovery; Athletes eating plan, calorie goals, calorie values, carbohydrate goals, protein goals, fat, vitamins and mineral goals; Sports drink and supplementation; My pyramid- for sports man; National and international regulations for supplements.

Recommended Books:

1. Ronald J. M. 2000. Nutrition in Sport. Blackwell Science Ltd.
2. Judy A. D. 2007. Sports Nutrition Fats and Proteins. CRC Press Taylor and Francis Group.
3. Heather H. F., Burgoon L. and Mikesky A. E. 2008. Practical Applications in Sports Nutrition. 3rd edition. Jones & Bartlett Learning Publishers, London, UK.

3. FOOD SAFETY & QUALITY MANAGEMENT

Theory

Pakistan Standards and Quality Control Authority: functions, authorities, standards. Pure Food Rules - 2007: definitions, significant features, enforcement, amendments. Food inspector and public analyst: qualifications, duties, powers. Food adulteration: adulterants, health hazards, methods of detection. Food labelling: perspectives on nutrition labeling. Islamic food laws and regulations: sources, principles, lawful foods, unlawful foods. Consumer laws in Pakistan. International food laws: introduction. The World Trade Organization (WTO) - the agreement on the application of sanitary and phytosanitary measures. GATT. Codex Alimentarius: general, procedural manual, standards, codes, legal force.

Toxicology: definition, dose-response, absorption, translocation, storage excretion, food toxicology. Toxicity by naturally occurring food toxins: plant origin – accidental toxicity, haemagglutinins, goitrogens, cyanogens, lathyrogens, others; animal origin – honey, quail, eggs, milk, meat, fish. Toxicity by extraneous chemicals: agricultural chemicals, food processing, packaging, additives, adulterants. Toxicity from water. Microbial toxins: mycotoxins – moulds, mushrooms; bacterial food intoxication; bacterial food infections. Food allergy and intolerance. Systems for food safety surveillance – GMP, TQM, HACCP and FSMS-ISO22000:2005.

Food quality management: history, importance, systems. Good manufacturing practices (GMP): personal cleanliness, buildings and facilities, sanitary operations, sanitary facilities and controls, equipment and utensils, production and process control, warehousing and distribution, traceability and recall. Hazard analysis and critical control points (HACCP) system: history, prerequisites, preliminary steps, principles. Food Safety Management Systems (FSMS) – ISO22000:2005. Codex Alimentarius Commission (CAC) guidelines for food quality management.

Books Recommended

1. PSQCA (Pakistan Standards and Quality Control Authority). 2010. Standards for different food items. PSQCA, Karachi, Pakistan.
2. Meulen, B. and Velde, M. 2008. European food law handbook. Academic Publishers, Wageningen, the Netherlands.
3. Government of the Punjab. 2008. The Punjab Pure Food Rules – 2007. The Punjab Weekly Gazette. Government Printing Press, Lahore, Pakistan.
4. Riaz, M.N. and Chaudhary, M.M. 2004. Halal food production. CRC Press Taylor & Francis Group, Boca Raton, Florida, USA.
5. Khan, M.S. 1999. Consumer laws in Pakistan. Consumer Rights Commission of Pakistan, Islamabad, Pakistan.
6. Awan, J.A. and Anjum, F.M. 2010. Food toxicology. Unitech Communications, Faisalabad, Pakistan.
7. Shibamoto, T and Bjeldanes, L. 2009. Introduction to food toxicology, 2nd ed. Academic Press, London..
8. CAC (Codex Alimentarius Commission). 2007. Codex Alimentarius Commission – Procedural manual. Joint FAO/WHO Food Standards Programme. FAO, Rome, Italy.
9. ISO (International Standards Organization). 2005. Food safety management systems – requirements for an organization in the food chain. Case Postale, Geneva, Switzerland.
10. Lelieveld, H.L.M., Mostert M.A. and Holah, J. (Editor). 2005. Good manufacturing practices in the food industry. In: Handbook of hygiene control in the food industry. Woodhead Publishing Ltd., Abington, Cambridge, UK.
13. Blanchfield, J.R. 1998. Good manufacturing practices. Institute of Food Science and Technology, London, UK.

4. NUTRITION IN MEDICINE

Theory:

Environmental & Nutritional Factors In Diseases: Environmental Diseases, Nutritional Factor & Disease, Disordered Altered Energy Balance, Obesity, Undernutrition, Micronutrients minerals & their Diseases. Alimentary Tract & Pancreatic Diseases: Dyspepsia, Peptic Ulcers, IBD, IBS, Acute & Chronic Pancreatitis, Malabsorption, GERD. Blood Diseases: Anaemias, Leukemias, Lymphomas. Endocrine Diseases: Hypothyroidism, Hyperthyroidism, Hyperparathyroidism, Hypocalcaemia, Hypercalcaemia, Cushing Disease, Addison Disease, Diabetes Insipidus. Diabetes Mellitus: Clinical Examination, Functional Anatomy & Physiology, Pathogenesis, Presenting Problems, Complication of DM; Diabetic Retinopathy, Neuropathy, Nephropathy, Management of DM i-e Diet, Drug, Insulin, Transplantation etc Rheumatology & Bone Diseases: Gout, Pseudogout, Osteoporosis, Osteomalacia, Rickets, Osteoarthritis, Rheumatoid Arthritis. Kidney & Urinary Tract Diseases: Acute Kidney Injury, Chronic Kidney Disease, Nephrotic Syndrome, Nephritic Syndrome, Renal Stone Disease. HIV Infection & AIDS: Diagnosis & Investigation, History & staging of HIV, Presenting Problems of HIV, Prevention of Infection, Antiretroviral Therapy. Oncology: Investigation, Presenting Problems, Metastatic Diseases, Therapeutics, Specific Cancers. Cardiovascular Diseases: Atherosclerosis, Coronary Artery Disease, Hypertension, Heart Failure, Acute Rheumatic Fever, Infective Endocarditis, Peripheral Arterial Disease. Respiratory Diseases: Asthma, COPD, Tuberculosis, Pneumonia, Cystic Fibrosis, Bronchiectasis, CA Lung. Liver & Biliary Tract Diseases: Acute Hepatitis, Chronic Hepatitis, Hepatic Cirrhosis, Gall Stones. Neurological Disease: Parkinson Disease, Motor Neuron Disease, Multiple Sclerosis, Meningitis, Polyneuropathy. Stroke: Pathophysiology, Clinical Features, Investigation, Management.

Practicals:

Review patient medical records and conduct an interview which collects the following data : Past and current patient history, Demographics, General Health Status, Chief complaint, Medications, Medical & Surgical History, Social History, Dietary History, Present and Pre-morbid functional status, Living Environment, Growth & Development, Lab values, consultations and documentation of the history. Direct assessment of patient's nutritional status and application of Nutrition Care Process: Nutrition Assessment, Nutrition Diagnosis, Nutrition Planning, Nutrition Intervention, Nutrition Monitoring and Evaluation. Clinical practice of Anthropometric Measurements of Adults and Children. Clinical evaluation of signs of Nutritional Deficiency: Evaluation of Hair, Mouth, Eyes,

Nails, Skin, Thyroid Glands, Joints and Bones. Dietary Evaluation of Patients: 24 hour dietary recall, food frequency questionnaire, food diary, observed food consumption, interpretation of dietary data, Qualitative and Quantitative methods

Recommended Books:

1. Davidsons Principles & Practice Of Clinical Medicine (22nd Edition).
2. Short Textbook of Medicine By Inam Danish.
3. Clinical Nutrition in Practice by Nikolaos Katsilambros, &CharilaosDimosthenopoulos, Athens University School of Medicine Laiko University Hospital
4. BASICS IN CLINICAL NUTRITION Fourth edition byLubošSobotka

5. PHARMACOLOGY

General Pharmacology: Introduction, Sources of drugs, Active principles of crude drugs, Physical nature/ classification/ nomenclature of drugs, Nature of drugs, Routes of drugs of administration, Pharmacokinetics, Principle types of drug actions, Pharmacodynamic receptors, Dose response curve, Pharmacokinetics absorption & distribution, Quantal DRC + therapeutic index, Drug dosage, Factors modifying actions & dosage of drugs, Complex drug reactions, Cumulative drug reactions, Pharmacogenetics, Adverse drug effects, Teratogenicity + carcinogenicity, Adverse drug effects, Drug toxicity (blood & skin), Biotransformation, Drug toxicity, Interactions of drugs, Bioavailability + plasma conc. of drug, Development of new drug, Development of new drug II & evaluation, Drug dependence, Kinetics of Metabolisms, Drug act. Systemic Pharmacology: Autonomic nervous system, Autacoids, Ergot alkaloids, Blood, Gastrointestinal tract, Kidney, Musculo Skeletal, Endocrine, Respiratory System, Cardiovascular system, Central Nervous System, Chemotherapy, Clinical Pharmacology.

Recommended Book:

1. Illustrated Reviews of Pharmacology by Lippincott. Basic & Clinical Pharmacology by Katzung

REPORT WRITING

In Final Year the students will be involved in Clinical Practice and they will be given a particular topic for research report writing. One topic along with one Supervisor shall be allotted by the Incharge / Chairperson and approved by the concerned Dean, to a group of up to 10 students in one group. They will prepare a research reports and submitted it to the Incharge/ Chairperson of department through allotted Supervisor. The details of the report are given below.

- Title Page
- Your name
- Student I.D number
- Your Program name
- Your supervisor's name
- The project title
- The name of the University
- Abstract

Abstract

A maximum of one page (300 words) on the work performed and your main conclusions. Abstract should be single line spacing, should not contain any figures, contain a maximum of 2 references, and written in Arial / New Times Roman font size II. The title of the project should be on the first line (Arial / New Times Roman size 11, bold). The name of the student and their supervisor should appear on the next line (Arial / New Times Roman size 11, italic).The abstract should be then be included as a single paragraph. References (if required) should be included at the end (Arial / New Times Roman, size 9).

Points into account while writing Abstract

Explain the purpose of your study/paper. This should optimally be only one sentence long. State the primary objectives and scope of the study or the reasons why the document was written (unless these things are already clear from the title of the document or can be derived from the rest of the abstract). Also state the rationale for your research. Why did you do the research? Is the topic you are researching an ignored or newly discovered one? In terms of Methodology (research methods), clearly states the techniques or approaches used in your study. If you want to introduce new methods or approaches in your abstract, keep in mind the need for clarity.

Describe your results (the findings of your experimentation), the data collected, and effects observed as informatively and concisely as possible. These results of course may be experimental or theoretical, but remember the difference between conjecture and fact and note them in your abstract. Give special

priority in your abstract to new and verified events and findings that contradict previous theories. Mention any limits to the accuracy or reliability of your findings.

By stating your conclusions, you are in essence describing the implications of the results: why are the results of your study important to your field and how do they relate to the purpose of your Investigation? Often conclusions are associated with recommendations, suggestions and both rejected and accepted hypotheses. You may wish to include information that is incidental to the main purpose of your paper, but is valuable to those outside your area of study. If you choose to include such information, be careful not to exaggerate its relative importance to the abstracted document

Declaration of Originality

Place on a separate page;

"I hereby declare that this project is entirely my own work other than the counsel of my supervisor and that it has not been submitted for any academic award, or part thereof, at this or any other educational establishment"

Signed: Author

Counter signed: Supervisor

Acknowledgements (Optional)

To include those individuals or groups of individuals you would like to thank in relation to the support you received.

Table of Contents

You should list all of the sections and sub-sections, together with their corresponding page numbers

List of Tables

List of Figures

List of Appendices

Suggested Chapter Structure

The following outlines a chapter structure suitable to a project, which involved a distinct component of data collection. The structure of the main body is flexible and you should discuss an appropriate structure with your supervisor. The content and importance of each section will depend on the type of project you are undertaking and again should be discussed with your supervisor before submission.

Chapter 1. Introduction

- i) Introduction (Very brief review of literature and indicate significance of study)
- ii) Statement of Problem (Should include clear purpose of study)
- iii) Questions/Hypothesis
- iv) Outline Methodology
- v) Definition of Terms

The introduction should 'set the scene' for the examiners and enable them to appreciate the relevance of your work in a particular research area.

Chapter 2. Literature Review

A literature review is an extended essay, which is based on source material. In simple terms, the merit of your literature review is proportional to the comprehensive nature and originality of your sources. Your writing should be confined to the questions/hypothesis being examined. A literature review is more than a listing of references. You should attempt to synthesize a new understanding of your topic, and provide a critique of what other commentators have had to say on the subject.

Chapter 3. Methodology

- i) Participant Selection (Including ethical considerations)
- ii) Experimental Design
- iii) Measurement Procedures
 - Data collection procedures
 - Rationale for selecting these procedures/questions
- iv) Analysis of Data

The methodology should describe the characteristics of the subjects, award of ethical approval, and where appropriate the apparatus, calibration procedures, reliability of the methods used, experimental protocols and the statistical treatments of the data. Diagrams and photographs may be appropriate to illustrate procedures.

Chapter 4. Analysis of Results

Your results should consist of tables of your findings, illustrated with graphs where appropriate. The results section should contain text, which takes the reader through your graphs and tables, pointing out the salient features. Tables should wherever possible summarize the data from several subjects in the form of means and standard deviations. You do not need to give tables of every piece of original data. If you feel it is essential to include these put them in an appendix.

Chapter 5. Discussion of Results

It is good practice to begin with a summary of your findings. This is your opportunity to interpret your data in the context of what is already known from existing literature. However, make every effort to explain your findings first, justifying the arguments by reference to previously published work, NOT the other way around. The discussion is the place for explanations and opinions. Link your findings with the purpose/questions/hypothesis of your project. Include critical appraisal of your own work and that of others. Address what you would do differently with hindsight?

Chapter 6. Conclusion

- Summary of main findings
- Recommendations (Impact of findings and future research)
- Conclusion

This section should summarize your main findings, highlight areas where more work is needed and suggest avenues for future development of this work. An overall conclusion from the study should be included to complete the project.

References: A list of references must be included at the end of the project document and appropriately referenced within the text according to a recognized standard of the University.

Appendices: In this section, if required, include any raw data, interview transcript, computer program listings, and questionnaires etc., which were not in the results section, but which may need to be consulted.