

Curriculum of Audiology

Introduction to audiology

Audiology is a branch of science that studies hearing, balance, and related disorders. Audiologists treat those with hearing loss and proactively prevent related damage. By employing various testing strategies (e.g. behavioral hearing tests, otoacoustic emission measurements, and electrophysiologic tests), audiologists aim to determine whether someone has normal sensitivity to sounds. If hearing loss is identified, audiologists determine which portions of hearing (high, middle, or low frequencies) are affected, to what degree (severity of loss), and where the lesion causing the hearing loss is found (outer ear, middle ear, inner ear, auditory nerve and/or central nervous system). If an audiologist determines that a hearing loss or vestibular abnormality is present he or she will provide recommendations for interventions or rehabilitation (e.g. hearing aids, cochlear implants, appropriate medical referrals).

Goals of the program

1. Be primary providers of audiology services.
2. Serve as responsible members in the professional community and are willing and able to assume leadership roles in the communities they serve.
3. Identify researchable problems, advocate and participate in research, and incorporate research findings into clinical practice.
4. Understand and place in context the social, economic and cultural issues of practice and effectively advocate for changes in policy
5. Correlate theory with practice and think creatively about, react to, adapt or shape new practice environments.
6. Participate in and provide education for communities, patients, peers, students and others.

Objectives of the program

Graduates of audiology program will

1. Demonstrate in-depth knowledge of the basic and clinical sciences relevant to audiology, both in their fundamental context and in their application to the discipline of audiology.
2. Understand, correlate and apply theoretical foundations of knowledge to the practice of audiology; evaluate and clarify new or evolving theory relevant to audiology.
3. Demonstrate the behaviors of the scholarly clinician by developing and utilizing the process of critical thinking and inquiry, particularly focused on the improvement of the practice of audiology and the delivery of health care.

4. Engage in reflective practice through sound clinical decision making, critical self-assessment and commitment to lifelong learning.
5. Demonstrate mastery of entry level professional clinical skills. Provision of these services is based on the best available evidence and includes audiology examination, evaluation, diagnosis, prognosis, intervention, prevention activities, wellness initiatives and appropriate health care utilization.
6. Prepared to influence the development of human health care regulations and policies that are consistent with the needs of the patient and of the society.
7. Demonstrate leadership, management, and communication skills to effectively participate in audiology practice and the health care team.
8. Incorporate and demonstrate positive attitudes and behaviors to all persons.
9. Demonstrate the professional and social skills to adapt to changing health care environments to effectively provide audiology program.

Audiology program

Semester	Course code	Name of subject	Credit hour
First	RSC-601	Anatomy-I	4(3-1)
	RSC-602	Physiology-I	3(2-1)
	RSC-606	Introduction to computer	3(2-1)
	RSC-605	Pakistan studies	2(2-0)
	RSC-604	English-I	3(3-0)
	AUD-601	Hands on training /introduction to audiology-1	3(2-1)
Second	RSC-611	Anatomy-II	4(3-1)
	RSC-612	Physiology-II	3(2-1)
	RSC-614	English-II	3(3-0)
	RSC-615	Islamic studies	2(2-0)
	RSC-626	Sociology-II	2(2-0)
	AUD-602	General pathology	2(2-0)
	AUD-603	Hands on training/introduction to audiology-II	2(2-0)
Third	AUD-604	anatomy and physiology of basic speech and hearing	3(2-1)
	AUD-605	Acoustics	3(2-1)
	AUD-606	Basic Electronics	3(3-0)
	RSC-621	English-III	3(3-0)
	AUD-607	Behavioral sciences	2(2-0)
	AUD-608	Hands on training/introduction to audiology-III	3(0-3)
FOURTH	RSC-634	Biochemistry	2(2-0)
	AUD-609	Medical audiology	3(3-0)
	AUD-610	Pediatrics audiology	3(3-0)
	AUD-611	Sociology-II	3(3-0)
	AUD-612	Basic electronics-II	3(2-1)
	AUD-613	Pharmacological aspect of audiology	3(2-1)
FIFTH	AUD-614	Rehabilitative clinical audiology	2(2-0)
	AUD-615	Amplification devices	3(3-0)
	AUD-616	Diagnostic audiology-I	3(2-1)
	AUD-617	Hands on training in audiology including to clinical rotation-1	3(0-3)
Sixth	AUD-618	Diagnostic audiology-II	2(2-0)
	AUD-619	Amplification devices-II	2(2-0)
	AUD-620	Rehabilitative clinical audiology -II	3(3-0)
	RSC-664	Biostatistics	3(3-0)
	AUD-621	Hands on training in audiology including rotation to audiology clinic-II	3(0-3)
Seventh	RSC-681	research methodology	3(2-1)
	AUD-622	audiology practice management	2(2-0)
	RSC-674	Biostatistics-II	3(3-0)
	AUD-623	Clinical audiology internship-I	3(0-3)
	AUD-624	Hands on advance training in audiology and research project related to specialty of interest	3(0-3)

Eight	AUD-625	Clinical audiology internship-II	3(3-0)
	AUD-626	hands on training in audiology and research project related to specialty of interest-II	2(0-2)
	AUD-627	Project report	6

First semester

S.NO	COURSE CODE	NAME OF SUBJECTS	CREDITS
1	RSC-601	Anatomy-I	4(3-1)
2	RSC-602	Physiology-I	3(2-1)
3	RSC-606	Introduction to computer	3(2-1)
4	RSC-605	Pakistan studies	2(2-0)
5	RSC-604	English-I	3(3-0)
6	AUD-601	Hands on training/introduction to audiology-1	3(2-1)

Course Description:

The focus of this course is an in-depth study and analysis of the regional and systemic organization of the body. Emphasis is placed upon structure and function of human movement. A comprehensive study of human anatomy with emphasis on the nervous, musculoskeletal, and circulatory systems is incorporated. Introduction to general anatomy lays the foundation of the course. Dissection and identification of structures in the cadaver supplemented with the study of charts, models, prosected materials and radiographs are utilized to identify anatomical landmarks and configurations of the upper limb and thoracic region.

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 marking
- Cartilage
- Development of bone and cartilage

- 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
- Nomenclature.
- Microscopic picture of muscle

STRUCTURES RELATED TO MUSCLES & BONES

- Tendons
- Aponeurosis
- Fasciae
- Synovial bursae
- Tendon Synovial sheaths
- Raphae
- Ligaments
- Condyle
- Epicondyle
- Ridge
- Tuberosity
- Tubercle
- Foramen
- Canal
- Groove

- Process
- 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
- Factors responsible for joint stability.
- Development of joints

CARDIOVASCULAR SYSTEM

- Definition
- Division of circulatory system into pulmonary & systemic
- Classification of blood vessels and their microscopic picture
- Heart and its histology
- Function of the Heart
- 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
- Microscopic picture of nerve
- Introduction of autonomic nervous system
- 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,
- Palmar aponeurosis
- Flexor tendon dorsal digital expansion

NEUROLOGY

- Course, distribution and functions of all nerves of upper limb
- Brachial plexus

ANGIOLOGY (CIRCULATION).

- Course and distribution of all arteries and veins of upper limb.
- Lymphatic drainage of the upper limb
- Axillary lymph node
- Cubital fossa

ARTHROLOGY

- Acromioclavicular and sternoclavicular joints
- Shoulder joint
- Elbow joint
- Wrist joint
- Radioulnar joints
- Inter carpal joints
- Joints MCP and IP
- Surface Anatomy of upper limb
- 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
- Demonstration on Brachial plexus.
- Demonstration of blood supply of brain.
- 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
- Lymphatic drainage of thoracic wall
- 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.
- Large Arteries – Aorta & its branches

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 semester /year

RECOMMENDED TEXT BOOKS

- Gray's Anatomy by Prof. Susan Standring 39th Ed., Elsevier.
- Clinical Anatomy for Medical Students by Richard S.Snell.
- Clinically Oriented Anatomy by Keith Moore.
- Clinical Anatomy by R.J. Last, Latest Ed.
- Cunningham's Manual of Practical Anatomy by G.J. Romanes, 15th Ed., Vol-I, II and III.

- The Developing Human. Clinically Oriented Embryology by Keith L. Moore, 6th Ed.
- Wheater's Functional Histology by Young and Heath, Latest E
- Medical Histology by Prof. Laiq Hussain.
- Neuroanatomy by Richard S.Snell.

PHYSIOLOGY-I

CREDITS 3 (2-1)

Course Description

The course is designed to study the function of the human body at the molecular, cellular, tissue and systems levels. The major underlying themes are: the mechanisms for promoting homeostasis; cellular processes of metabolism, membrane function and cellular signaling; the mechanisms that match supply of nutrients to tissue demands at different activity levels; the mechanisms that match the rate of excretion of waste products to their rate of production; the mechanisms that defend the body against injury and promote healing.

These topics are addressed by a consideration of nervous and endocrine regulation of the cardiovascular, hematopoietic, pulmonary, renal, gastrointestinal, and musculoskeletal systems including the control of cellular metabolism. The integrative nature of physiological responses in normal function and disease is stressed throughout the course.

This course will serve as pre-requisite for the further courses i.e. exercise physiology, pathology, etc.

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
- 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
- Hemodynamics 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

1. Clinical significance of cardiac cycle, correlation of ECG and heart sounds to cardiac cycle
2. Clinical significance of cardiac cycle, interpretation of ischemia and arrhythmias
3. Effects of hypertension
4. Clinical significance of heart sounds
5. Effects of ischemia
6. Shock

PHYSIOLOGY PRACTICALS

Cardiovascular System

1. Cardiopulmonary resuscitation (to be coordinated with the department of medicine)
2. Examination of arterial pulse
3. ECG recording and interpretation
4. Arterial blood pressure
5. Effects of exercise and posture on blood pressure
6. Apex beat and normal heart sounds

RECOMMENDED BOOKS

- Textbook of Physiology by Guyton and Hall, Latest Ed.
- Review of Medical Physiology by William F. Ganong, Latest Ed.
- Physiology by Berne and Levy, Latest Ed.
- Human Physiology: The Basis of Medicine by Gillian Pocock, Christopher D. Richards

- Physiological Basis of Medical Practice by John B. West and Taylor, 12th Ed.

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.

: 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

: Project Week

: Review Week

Text Books/Reference Books:

- Introduction to Computers by Peter Norton, 6th International Edition (McGraw HILL)
- Using Information Technology: A Practical Introduction to Computer & Communications by Williams Sawyer, 6th Edition (McGraw HILL)
- Computers, Communications & information: A user's introduction by Sarah E. Hutchinson, Stacey C. Swayer

- Fundamentals of Information Technology by Alexis Leon, Mathewsleon Leon press.

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-i-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

Books Recommended

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.

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 Françoise 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. Brian Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1992. ISBN 0 19 453402 2.

d) Speaking

6.Hands on training/introduction to audiology-1

credit hour3(0-3)

Second semester

S.NO	COURSE CODE	NAME OF SUBJECT	CREDITS
1	RSC-611	ANATOMY-2	4(3-1)
2	RSC-612	PHYSIOLOGY-2	3(2-1)
3	RSC-614	ENGLISH-2	3(3-0)
4	RSC-615	ISLAMIC STUDIES	2(2-0)
5	RSC-26	SOCIOLOGY-1	2(2-0)
6	AUD-602	GENERAL PATHOLOGY	2(2-0)
7	AUD-603	HANDS ON TRAINING/INTRODUCTION TO AUDIOLOGY-2	2(0-2)

Course Description:

The focus of this course is an in-depth study and analysis of the regional and systemic organization of the body. Emphasis is placed upon structure and function of human movement. A comprehensive study of human anatomy with emphasis on the nervous, musculoskeletal and circulatory systems is incorporated. Introduction to general anatomy lays the foundation of the course. Dissection and identification of structures in the cadaver supplemented with the study of charts, models, prosected materials and radiographs are utilized to identify anatomical landmarks and configurations of the lower limb and abdomen pelvis

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)
- Muscles of lower leg and foot.

NEUROLOGY

- Course, distribution, supply of all nerves of lower limb and gluteal region
- 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
- Surface marking of lower limb

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
- Nerves of perineum

GENERAL HISTOLOGY

- Cell
- Epithelium
- Connective tissue
- Bone
- Muscles tissue
- Nervous tissues
- Blood vessels
- Skin and appendages
- Lymphatic organs

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 semester /year

Recommended Text Books:

- Gray's Anatomy by Prof. Susan Standring 39th Ed., Elsevier.
- Clinical Anatomy for Medical Students by Richard S.Snell.
- Clinically Oriented Anatomy by Keith Moore.
- Clinical Anatomy by R.J. Last, Latest Ed.
- Cunningham's Manual of Practical Anatomy by G.J. Romanes, 15th Ed., Vol-I, II and III.
- The Developing Human. Clinically Oriented Embryology by Keith L. Moore, 6th Ed.

- Wheater's Functional Histology by Young and Heath, Latest Ed.
- Medical Histology by Prof. Laiq Hussain.
- Neuroanatomy by Richard S.Snell.

PHYSIOLOGY II

CREDITS 3 (2-1)

Course Description:

The course is designed to study the function of the human body at the molecular, cellular, tissue and systems levels. The major underlying themes are: the mechanisms for promoting homeostasis; cellular processes of metabolism, membrane function and cellular signaling; the mechanisms that match supply of nutrients to tissue demands at different activity levels; the mechanisms that match the rate of excretion of waste products to their rate of production; the mechanisms that defend the body against injury and promote healing.

These topics are addressed by a consideration of nervous and endocrine regulation of the cardiovascular, hematopoietic, pulmonary, renal, gastrointestinal, and musculoskeletal systems including the control of cellular metabolism. The integrative nature of physiological responses in normal function and disease is stressed throughout the course.

This course will serve as pre requisite for the further courses i.e. exercise physiology, pathology, etc.

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 dyspnea

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.
- 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

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

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,
- 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.

PHYSIOLOGY PRACTICALS

Hematology

- Use of the microscope
- Determination of hemoglobin
- Determination of erythrocyte sedimentation rate
- Determining packed cell volume
- Measuring bleeding and clotting time
- RBC count
- Red cell indices
- WBC count
- Leukocyte count
- 10.Prothrombin and thrombin time

Respiratory System

- Clinical examination of chest
- Pulmonary volume, their capacities and clinical interpretation
- Stethography

RECOMMENDED BOOKS

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

ENGLISH II (FUNCTIONAL ENGLISH)

CREDIT 3(3-0)

Objectives: Enable the students to meet their real-life communication needs.

Course Contents

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

Presentation skills

Personality development (emphasis on content, style and pronunciation)

Note: documentaries to be shown for discussion and review

Recommended books:

Communication Skills

a) Grammar

1. Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 2. Third edition. Oxford University Press 1986. ISBN 0 19 431350 6.

b) Writing

1. Writing. Intermediate by Marie-Christine Boutin, Suzanne Brinand and Françoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 019 435405 7 Pages 45-53 (note taking).

2. 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).

c) Reading

1. Reading. Advanced. Brian Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1991. ISBN 0 19 453403 0.

2. Reading and Study Skills by John Langan

3. Study Skills by Richard Yorke.

Objectives:

This course is aimed at:

- To provide Basic information about Islamic Studies
- To enhance understanding of the students regarding Islamic Civilization
- To improve Students skill to perform prayers and other worships
- To enhance the skill of the students for understanding of issues related to faith and religious life.

Detail of Courses

Introduction to Quranic Studies

- Basic Concepts of Quran
- History of Quran
- Uloom-ul -Quran

Study of Selected Text of Holly Quran

- Verses of Surah Al-Baqra Related to Faith(Verse No-284-286)
- Verses of Surah Al-Hujrat Related to Adab Al-Nabi (Verse No-1-18)
- Verses of Surah Al-Mumanoon Related to Characteristics of faithful (Verse No-1-11)
- Verses of Surah al-Furqan Related to Social Ethics (Verse No.63-77)
- Verses of Surah Al-Inam Related to Ihkam(Verse No-152-154)

Study of Selected Text of Holly Quran

- Verses of Surah Al-Ihzab Related to Adab al-Nabi (Verse No.6,21,40,56,57,58.)
- Verses of Surah Al-Hashar (18,19,20) Related to thinking, Day of Judgment
- Verses of Surah Al-Saf Related to Tafakar,Tadabar (Verse No-1,14)

Seerat of Holy Prophet (S.A.W) I

- Life of Muhammad Bin Abdullah (Before Prophet Hood)
- Life of Holy Prophet (S.A.W) in Makkah
- Important Lessons Derived from the life of Holy Prophet in Makkah

Seerat of Holy Prophet (S.A.W) II

- Life of Holy Prophet (S.A.W) in Madina
- Important Events of Life Holy Prophet in Madina
- Important Lessons Derived from the life of Holy Prophet in Madina

Introduction To Sunnah

- Basic Concepts of Hadith
- History of Hadith
- Kinds of Hadith
- Uloom –ul-Hadith
- Sunnah & Hadith
- Legal Position of Sunnah

Selected Study from Text of Hadith

- Introduction to Islamic Law & Jurisprudence
- Basic Concepts of Islamic Law & Jurisprudence
- History & Importance of Islamic Law & Jurisprudence
- Sources of Islamic Law & Jurisprudence
- Nature of Differences in Islamic Law
- Islam and Sectarianism

Islamic Culture & Civilization

- Basic Concepts of Islamic Culture & Civilization
- Historical Development of Islamic Culture & Civilization
- Characteristics of Islamic Culture & Civilization
- Islamic Culture & Civilization and Contemporary Issues

Islam & Science

- Basic Concepts of Islam & Science
- Contributions of Muslims in the Development of Science
- Quranic & Science

Islamic Economic System

- Basic Concepts of Islamic Economic System
- Means of Distribution of wealth in Islamic Economics
- Islamic Concept of Riba
- Islamic Ways of Trade & Commerce

Political System of Islam

- Basic Concepts of Islamic Political System

- Islamic Concept of Sovereignty
- Basic Institutions of Govt. in Islam

Islamic History

- Period of Khlaft-E-Rashida
- Period of Umayyads
- Period of Abbasids

Social System of Islam

- Basic Concepts of Social System of Islam
- Elements of Family
- Ethical Values of Islam

Reference Books:

- Hameed ullah Muhammad, "Emergence of Islam" , IRI, Islamabad
- Hameed ullah Muhammad, "Muslim Conduct of State"
- Hameed ullah Muhammad, 'Introduction to Islam
- Mulana Muhammad Yousaf Islahi,"
- Hussain Hamid Hassan, "An Introduction to the Study of Islamic Law" leaf Publication Islamabad, Pakistan.
- Ahmad Hasan, "Principles of Islamic Jurisprudence" Islamic Research Institute, International Islamic University, Islamabad (1993)
- Mir Waliullah, "Muslim Jrisprudence and the Quranic Law of Crimes" Islamic Book Service (1982)
- H.S. Bhatia, "Studies in Islamic Law, Religion and Society" Deep & Deep Publications New Delhi (1989)
- Dr. Muhammad Zia-ul-Haq, "Introduction to Al Sharia Al Islamia" Allama Iqbal Open University, Islamabad (2001)

SOCIOLOGY

CREDIT 2(2-0)

Course Description

This course covers the basic knowledge and concepts of sociology to with the aim to help them understand the impact of group, culture and environment on the behavior and health of the patients. Make them realize the importance of the relationship of the physical therapist and the patient and the environment around them

INTRODUCTION TO SOCIOLOGY

- Definition

- Subject matter
- Sociology
- The science of society

SOCIAL ACTION AND INTERACTION

Social processes

- Co-operation
- Competition
- Conflict and Accommodation

SOCIAL GROUPS

- Primary-Secondary
- In and Out Group
- Reference group

CULTURE

- Meanings
- Materials
- Non-material aspects of culture
- Values
- Beliefs
- Sanctions
- Cultural relativism and Ethnocentrism
- Norms
- Folk ways
- Mores and Laws
- Role and Status
- Conflict
- Deviancy
- Social control

SOCIALIZATION AND PERSONALITY

- Socialization and personality formation

SOCIAL INSTITUTION

- Meanings
- Social stratification
- Meanings and Forms (Classes and Castes)

SOCIAL AND CULTURAL CHANGE

- Factors of promoting and resisting social change

THE FIELD OF MEDICAL SOCIOLOGY

- Contribution of sociology to medicine
- Social causes of diseases
- Aging and its socio-medical implication
- Environmental pollution and health
- Patient perspective of Illness
- Patient, Physiotherapist relationship
- Role of Physiotherapists and attendants in the managements of patient

Recommended Text Books:

- Text book of Community Medicine by: Park J E. Latest Edition
- David, Tucket (ed), 1976, An Introduction to Medical Sociology, Lahore, Tavistock Publication.
- Horton, Paul B. and Chester L. Hunt, 1984 Sociology, Singapore: Megraw Hill Book Co.
- Moon, Graham, 1995. Society and Health; An introduction to Social Science for Processionals, London: Routledge.
- Smelter Heil J. 1993. Sociology, New Delhi, Prentice Hall of India:

GENERAL PATHOLOGY

COUSE CODE AUD-602

- Cell Injury and adaptation
- Cell Injury
- Reversible and Irreversible Injury
- Fatty change, Pigmentation, Pathologic calcification
- Necrosis and Gangrene
- Cellular adaptation
- Atrophy, Hypertrophy,
- Hyperplasia, Metaplasia, Aplasia

Inflammation

- Acute inflammation --- vascular changes, Chemotaxis, Oponization and Phagocytosis
- Enlist the cellular components and chemical mediators of acute inflammation
- Differentiate between exudates and transudate
- Chronic inflammation

- Etiological factors, Granuloma
- Cell repair and wound healing
- Regeneration and Repair
- Healing--- steps of wound healing by first and second intention
- Factors affecting healing
- Enlist the complications of wound healing
- Haemodynamic disorders
- Define and classify the terms Edema, Haemorrhage, Thrombosis, Embolism, Infarction&Hyperaemia with at least two examples of each.
- Define and classify Shock with causes of each.
- Describe the compensatory mechanisms involved in shock
- Describe the possible consequences of thrombosis
- Describe the difference between arterial and venous emboli

Neoplasia

- Define the terms Dysplasia and Neoplasia with examples of each
- Enlist the differences between benign and malignant neoplasms
- Enlist the common etiological factors for neoplasia
- Define and discuss the different modes of metastasis

COURSE TITLE: HANDS ON TRAINING IN BASIC AUDIOLOGICAL TECHNIQUES-II

COURSE CODE-603

THIRD SEMESTER

S.NO	COURSE CODE	NAME OF SUBJECTS	CREDITS
1	AUD-604	Anatomy and physiology of basic speech and hearing and balance	3(2-1)
2	AUD-605	Acoustics	3(2-1)
3	AUD-606	Basic electronics	3(3-0)
4	RSC-621	English-3	3(3-0)
5	AUD-607	Behavioral sciences	2(2-0)
6	AUD-608	Hands on training/introduction to audiology-3	3(0-3)

Anatomy and physiology of basic speech and hearing and balance

credit hour 3(2-1)

Anatomical Basis Of Speech, Hearing & Balance

- Structure and Function of the Auditory Pathway
- Anatomy of Peripheral auditory pathways
- Anatomy of Central auditory pathways

Anatomy of the ear

- External ear or outer ear
- Auricle or pinna
- External auditory canal
- Ceruminous glands
- Cerumen
- Eardrum or tympanic membrane
- Middle ear
- Auditory ossicles
- Malleus
- Incus
- Stapes
- Oval window
- Round window
- Auditory tube or eustachian tube
- Internal ear or inner ear or labyrinth
- Bony labyrinth
- Perilymph
- Membranous labyrinth
- Endolymph
- Vestibule
- Utricle
- Saccule
- Semicircular canals
- Ampulla
- Semicircular ducts
- Cochlea
- Cochlear duct or scala media
- Scalavestibuli
- Scala tympani
- Helicotrema
- Vestibular membrane
- Basilar membrane
- Spiral organ or organ of corti

- Hair cells
- Hair bundle
- Tectorial membrane
- Auditory Nerve
- Central Auditory System
- Embryology of the Speech and Hearing systems: A brief overview
- Physiological Basis Of Speech, Hearing And Language
- Physiology of Auditory pathway
- Physiology of equilibrium
- Static equilibrium
- Dynamic equilibrium

Physiology and Mechanics of the Inner Ear

- Physical vs. psychological (subjective) dimensions of sound
- Sound Localization
- Bone Conduction
- Modes of bone conduction
- Cochlear mechanics – basilar membrane mechanics - historical and current status
- Cochlear transduction
- Generation of a traveling wave
- Excitation of hair cells
- Cochlear electrophysiology
- Cochlear potentials
- Evoked potentials
- Cochlear non-linearity-two tone suppression, otoacoustic emission & other recent advances
- Proteins in the cochlea
- Repair, regeneration, protection in the cochlea
- Theories of hearing
- Historical aspects
- Place theory – resonance & non resonance
- Frequency theory
- Traveling wave theory
- Other recent advance like motor theory etc
- Vestibular System
- Physiology of vestibular structures and vestibular nerve
- Integration of senses in balance
- Vestibulo ocular reflex
- Vestibulo spinal reflex
- The auditory nerve
- Central Auditory System

- Neuroanatomy and gross structure of the human nervous system
- Basics of cellular and molecular neurobiology.
- Sensory transduction. (Neurotransmitters)
- Perception and somatosensation.
- Primary somatosensory systems.
- Principles of neuromuscular control of movement.
- Primary descending motor control pathways.
- Cerebellar systems and regulation of movement.
- Cerebellar systems and regulation of movement
- The Basal Nuclei and the initiation of movement.
- Brainstem & Cranial Nerve systems.
- Basic neural substrate of complex cognitive functions
- Review of exponential notation
- Tuning curves
- Auditory Perception

Acoustics

credits 3(2-1)

Acoustics and Physics of sound with detailed Anatomy & Physiology for speech, hearing, balance and language are presented. The main areas to be covered are:

ACOUSTICS:

Basic Acoustics

- Waves
- What is a wave?
- Progressive waves
- Sound
- Wave propagation
- Sinusoids
- Linear and nonlinear systems
- Doppler effect
- Reflection
- Refraction
- Diffraction
- Interference
- Absorption
- Nature of Sound
- Types of sounds: simple vs. complex waves
- Simple Harmonic Motion

- Logarithms/Antilogarithms/Decibels
- Resonance and Filtering
- Distortion
- Sound Transmission
- Psychoacoustic Phenomena
- Loudness
- Pitch
- Differential Sensitivity (Difference Limen - DL)
- Intensity Discrimination
- Frequency Discrimination
- Elements of speech processing
- Binaural Hearing and Sound Localization
- Acoustic impedance
- Helmholtz resonator
- Couplers

Physical Acoustics

- Physical measures (force, pressure, power, intensity, etc.)
- Vibration - frequency, amplitude, phase and Vibration spectra
- Sound propagation
- Time- and frequency-domain representations of sound
- Basic sound types
- Fourier's theorem; Fourier analysis of complex tones
- Measurement of Sound
- Representing signal magnitude
- Instantaneous amplitude
- Peak vs. RMS intensity
- The sound spectrograph
- Physical and psycho-physical scales
- Critical bands
- Combined sources
- Acoustics of Rooms
- Sound propagation in outdoors and indoors
- Direct, early and reverberant sound
- Calculation of reverberation time
- Air absorption
- Background noise
- Acoustic Feedback and equalization
- Acoustics of small rooms
- Sound field in listening rooms
- Quadraphonic sound

- Listening with earphones.

Basic electronics

credits 3(3-0)

This course covers in details an introduction to basics of electricity and electronic components. Personal computers and their interfacing with audiologic equipment are examined. Details of instrumentation, calibration and record keeping requirements shall be covered.

Course Contents:

- Basics of electricity
- Direct and alternating current
- Electrical energy and power
- Power supplies.
- Filters, Amplifiers and Oscillators
- Basic principle of operation and working of;
- Diodes, Transistors, FET's & UJT's, LED's, LCDs, ICs
- Fundamentals of Digital Electronics
- Hardware, memory devices and other peripherals
- Microphones as transducers
- Velocity microphones – uni-directional
- microphones – Microphone impedance and sensitivity
- Loudspeakers as transducers
- Structure of a dynamic loudspeaker
- Air suspension
- Baffles and enclosures – Horn speakers – Multi-speaker systems-Loudspeaker efficiency
- Recording and Reproduction of sound
- Recording characteristics
- Dynamic Range
- Stereophonic recording – Magnetic tape recording
- Tape speed and frequency response – Bias and equalization – Tape noise
- Digital Tape recording – CD ROM recording
- High fidelity recording and playback – AM/FM tuners – Amplifier power and distortion
- Loudspeaker power and distortion – Earphones (Headphones)
- Development of micro-electronics - types of transistors – Passive circuit elements
- Linear and digital Integrated circuits – micro – computers and micro processors – micro electronic devices
- Measuring Instruments – Multi-meter – Cathode ray oscilloscope

- Audio generator – Function Generator
- Frequency counter – Sound Level Meter
- Spectrum Analyzer – Distortion Analyzer
- Level Recorder (Demonstration and handling of the above instruments.)

English-3

credits 3(3-0)

Objectives: Enhance language skills and develop critical thinking

Presentation skills

Essay writing

Descriptive, narrative, discursive, argumentative

Academic writing

How to write a proposal for research paper/term paper

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

Technical Report writing

Progress report writing

Note: Extensive reading is required for vocabulary building

Recommended books

Technical Writing and Presentation Skills

a) Essay Writing and Academic Writing

1. Writing. Advanced by Ron White. Oxford Supplementary Skills. Third Impression 1992. ISBN 0 19 435407 3 (particularly suitable for discursive, descriptive, argumentative and report writing).

2. College Writing Skills by John Langan. Mc=Graw-Hill Higher Education. 2004.

3. Patterns of College Writing (4th edition) by Laurie G. Kirszner and Stephen R. Mandell. St. Martin's Press.

b) Presentation Skills

c) Reading

The Mercury Reader. A Custom Publication. Compiled by norther Illinois University. General Editors: Janice Neulib; Kathleen Shine Cain; Stephen Ruffus and Maurice Scharon. (A reader which will give students exposure to the best of twentieth century literature, without taxing the taste of engineering students).

Behavioral science

credits 2(2-0)

Introduction to Behavioral Sciences and its importance in health.

Bio-Psycho-Social Model of Health Care and the Systems Approach

Normality vs Abnormality

Importance of Behavioral sciences in health

Desirable Attitudes in Health Professionals

Understanding Behavior

Sensation and sense organs

Describe sensation, sense organs/special organs

Perception

Define perception, what factors affecting perception

Attention and concentration

Define attention and concentration. What factors affecting them

Memory

Define memory and describe its stages, types and methods to improving it

Thinking

Define thinking; describe its types and theories

What is cognition and levels of cognition?

Discuss problem solving and decision-making strategies

Communication

Define communication. What are types, modes and factors affecting it. Describe ways to recognize non-verbal cues. Characteristics of a good communicator

Individual Differences

Personality

Define personality. What factors affect personality development? How personality can be assessed? Influence of personality in determining reactions during health, disease, hospitalization, stress

Intelligence.

Define intelligence and the various types of intelligence.

What factors affect it and how it can be assessed?

Emotions

Define emotions. What are the various types of emotions?

Emotional Quotient (EQ)- concept & utility

Motivation

Define motivation and what are the types of motivation?

Learning

Define learning, Principles of learning, modern methods and styles of learning, types of learners, Strategies to improve learning skills

Stress and Stressors

Define and classify stress and stressors

Relationship of stress and stressors with illness

Life Events

Concept of life events and their relationship with stress and illness

Stress Management

What is coping skills

What is conflict and frustration?

What is concept of adjustment and maladjustment?

Interviewing / Psychosocial History Taking

Define, types of interview and listening

Skills of interviewing and listening

Allied Health Ethics-Hippocratic oath

Do's and Don'ts

What is the concept of Allied Health ethics?

Culture and Allied Health practice

Concept of group, its dynamics

Attitude, value, belief, myths, social class, stigma, sick role and illness, health belief models

Psychological reactions

Grief and bereavement, Family and illness

Dealing with difficult patients

What are the psychosocial aspects of illness, hospitalization, rape, torture, terminal illness, death and dying?

Psychosocial issues in Emergency Departments, Intensive Care and Coronary Care Units, Operating Theatres, Cancer wards, Transplant Units, Anaesthesia

Breaking Bad News

Introduction, Models, Methods, Death of the patient, abnormal baby, intractable illness

Pain, Sleep, Consciousness

Concept of pain.

Physiology of pain,

Altered states of consciousness.

Communication skills

Counseling,

Crisis Intervention

Conflict Resolution

Principles of effective communication, active listening, the art of questioning

The art of listening.

Good and bad listener.

Counseling: Scope, Indications and Contraindications,

Steps, Do's and Don'ts, How to deal with real life crisis and conflict situations in health settings

Hands on training/introduction to audiology-3 credits 3(0-3)

HANDS ON TRAINING IN AUDIOLOGICAL TECHNIQUES RELATED TO THE ABOVE MENTIONED SUBJECTS

Fourth semester

S.NO	COURSE CODE	NAME OF SUBJECTS	CREDIT HOUR
1	RSC-634	Biochemistry	2(2-0)
2	AUD-609	Medical audiology	3(3-0)
3	AUD-610	Pediatrics audiology	3(3-0)
4	AUD-611	Sociology-2	3(3-0)
5	AUD-612	Basic electronic-2	3(2-1)
6	AUD-613	Pharmacological aspect of audiology	3(2-1)

Biochemistry

credit 2(2-0)

Course Description:

This course provides the knowledge and skills in fundamental organic chemistry and introductory biochemistry that are essential for further studies. It covers basic biochemical, cellular, biological and microbiological processes, basic chemical reactions in the prokaryotic and eukaryotic cells, the structure of biological molecules, introduction to the nutrients i.e. carbohydrates, fats, enzymes, nucleic acids and amino acids. The nutritional biochemistry concludes the course.

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

Nutritional Biochemistry

Minerals & Trace Elements

- Sources
- RDA
- Biochemical Functions & Clinical Significance of Calcium & Phosphorus
- Sources
- RDA
- Biochemical Functions & Clinical Significance of Sodium Potassium & Chloride

- Metabolism of Iron, Cu, Zn, Mg, Mn, Se, I, F

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
- Balanced Diet

Molecular Biology

- DNA Replication & Repair in Prokaryotes
- DNA Replication & Repair in Eukaryotes

Recommended Text Books:

- Harper's Biochemistry by Robert K. Murray, Daryl K. Granner, Peter A. Mayes, Victor W. Rodwell, Latest Ed.
- Lippincott's Illustrated Review of Biochemistry by Pamela C. Champe and Richard A. Harvey, Latest Ed.
- Practical Clinical Biochemistry by Varley.
- Textbook of Biochemistry by Devlin, 5th Ed.
- Textbook of Medical Biochemistry Vol-I and II by M.A. Hashmi.
- Biochemistry by Stryer, Lubert, Latest Ed

Medical audiology

credit 3(3-0)

Students discuss risk factors, symptoms and pathogenesis of various diseases related to ear, auditory system & Vestibular disorders. Audiologic management /assessments as well as medical/surgical treatments are explained. The areas covered are:

- Conductive hearing disorders
- Sensori-neural hearing disorders

Disease of the external ear

- Audiological findings and management in;
- Congenital malformations
- Otitis externa
- Keratosis Obturans
- Foreign bodies
- Neoplasm

Disease of the middle ear

- Audiological findings and management in;
- Congenital malformations
- Traumatic lesions
- Inflammatory diseases
- Non-suppurative otitis media and its sequelae
- Acute suppurative otitis media
- Chronic suppurative otitis media
- Complications of suppurative otitis media
- Neoplasms

Diseases of the Inner Ear

- Conditions related to cochlea and vestibule
- Pathophysiology, Audiological findings & management in
- Congenital deformities
- Sudden hearing loss
- Systemic disorders
- Meneier's Disease
- Noise induced hearing loss (NIHL)
- Acoustic Trauma
- Ototoxicity
- Traumatic lesions
- Labyrinthitis
- Prebycusis
- Other cochlear pathologies

Diseases Related to Auditory Nerve and Central Auditory Pathway

- Pathophysiology , audiological findings and management;
- Tumors of auditory nerve
- Multiple Sclerosis
- Auditory dys-synchrony
- Space occupying and degenerative lesions of the central auditory nervous system.
- Dead regions of Cochlea
- Consequences of conductive pathology
- Tinnitus evaluation & management
- Hyperacusis evaluation management
- Genetics related to hearing loss
- Gene therapy
- Syndromic Vs Non-Syndromic hearing loss
- Audiological findings
- Overview of methods used for identifying genes
- Audiological findings in carriers of genetic hearing loss
- Introduction to language pathology
- Introduction to Speech Pathology
- Non audiological tests
- X rays, PET, MRI, CT, Others
- Lab tests
- ENG

Paediatric audiology

credit3(3-0)

- Development of the human auditory system
- Basic embryology
- Embryology of the auditory system
- Relevance of the information with special reference to syndromes.
- Development of auditory behavior
- Prenatal hearing
- New born hearing
- Auditory development from 0-2 yrs.
- Causes of hearing loss in children:
- Genetic : - Congenital
- of late onset
- Progressive
- Syndromic/Non-syndromic
- Non -Genetic: Congenital / Acquired
- Importance of case history
- Early Identification of Hearing Loss - Need, with specific reference to

- conductive hearing loss and sensori-neural hearing loss.
- Screening for hearing loss:
- High risk registers

Behavioral Tests:

- Stimuli, procedure, recording of responses
- Interpretation of results and validation of results.
- Mass Media Tests.
- Objective Tests: Historical review
- Immittance Screening, BERA, Otoacoustic Emission
- School screening:
- Objectives: Screening for hearing sensitivity
- Screening for middle ear effusion.
- Need, criteria, instrumentation
- Tests: Individual, Group. Importance of follow up.

Sociology-2

credit 3(3-0)

- Psychological aspects of illness and disability and its relevance's to society culture & industry
- The information regarding services and legislation concerning assistance to the sick and disabled and to their employment
- A knowledge of industrial organization in the country
- The rules and trade unions in so far as they affect the rehabilitation of
- Patients
- Definition of clinical psychology
- Historical development
- Modern history of clinical psychology
- Its current status and scope as a specialty in health sciences
- Role of clinical psychology in speech and hearing disorders.
- Methodology in clinical psychology
- Definition of learning
- Scope and methods –
- Types of learning
- Importance of studying psychology of learning in communication disorders.
- Experimentation in learning
- Human and animal learning
- Quantitative assessment of learning
- Learning curves

- Case history, clinical interviewing
- Clinical observation
- Types of psychological assessments
- Considerations for speech and hearing disorders.
- Classification of abnormal behavior
- History, need, rationale
- Diagnosis and tests used and interpretation of test results.
- Theories of conditioning

Basic electronics-2

credit 3(2-1)

- Applied electronics;
- Fundamentals of electronics and computers
- Block diagram of a computer and its working
- Functional block diagram and working of hearing aids and audiometers.
- Instrumental calibration of pure-tone audiometers.
- Basics of speech audiometry
- Principle of immittance, Electrocochleography, ENG etc
- Operating system languages, application software
- Biomedical signals and Signal Processing
- Principles of generation of acoustic stimuli
- Pure tone, tone bursts clicks, filtered clicks and warble tones
- Acoustic/physical characteristics of all stimuli
- Generation gating and filtering of stimuli
- Evoked potential
- Worked principle
- Electrodes
- Recording of responses
- Electrodes and transducers
- Signal acquisition techniques from electrodes and transducers
- Signal processing techniques such as differential amplification
- Common mode rejection, artifact rejection, filtering, signal averaging etc
- Addition and subtraction waves.

Pharmacological aspect of audiology

credit 3(2-1)

The general principles of drug action related to communicative function will be presented. Emphasis will be on activity, mode of action, side effects, toxicity and drug interactions relevant to the practice of audiology. Special emphasis be given on:

- Introduction to pharmacology
- Receptors
- Mechanisms of drug action
- Pharmacokinetics
- Absorption
- Distribution
- Metabolism
- Elimination
- Drug effect
- Beneficial responses
- Harmful responses
- Allergic responses
- Drug dependence, addiction, abuse and tolerance
- Drug interactions
- Administration of pharmacologic agents
- The drug prescription
- Dosage forms and routes of administration
- Oral routes
- Parenteral routes
- Topical routes
- Factors that influence drug effects
- Special considerations in elderly patients
- Special considerations in pediatric patients
- Ototoxicity
- Ototoxic medications: drugs that can cause hearing loss and tinnitus
- Aminoglycoside antibiotics,
- Anti-neoplastic (anti-cancer drugs).
- Environmental chemicals
- Loop diuretics
- Aspirin and quinine products
- Signs of ototoxicity
- Pharmacological intervention with noise-induced hearing loss
- Antibiotics for acute otitis media

Fifth semester

s.no	Course code	Name of subjects	Credit hours
1	AUD-614	Rehabilitative clinical audiology	2(2-0)
2	AUD-615	Amplification devices	3(3-0)
3	AUD-616	Diagnostic audiology-1	3(2-1)
4	AUD-617	Hands on training in audiology including to clinical rotation-1	3(0-3)

Rehabilitative clinical audiology

credit hours 2(2-0)

An examination of the strategies involved in the management, education and rehabilitation of hearing impaired and deaf children as well geriatric population. Topics discussed include counseling, auditory training, speech and language training and educational opportunities. Consequences of hearing loss (speech & language, Impact on family, associated problems, education, vocational). Main areas to be covered are;

Aural rehabilitation of children

- Aural rehabilitation of working adults
- Aural rehabilitation of elderly
- Aural rehabilitation of developmentally delayed individuals
- Introduction to Manual Communication
- Observation and Education of the Hearing Impaired
- Practicum Education of the Hearing Impaired
- Language Instruction for Hearing-impaired Children
- Education Curricular for Hearing Impaired Children
- Early Intervention Serving Hearing-Impaired Children Birth to Age – 5

Aural Rehabilitation

- Introduction
- Description of program terminology
- Historical development of services to the hearing impaired
- Service delivery models
- Types of programs and settings
- Evaluation of aural rehabilitation services
- The role of self-assessment in aural rehabilitation
- Implications of Hearing Loss

Components of an Aural Rehab Program

- Introduction to Aural Rehabilitation
- Hearing Aids
- Assistive Listening Devices
- Cochlea Implants
- Selection and Evaluation
- Methods of Assessment
- Expectations of Performance

- Speech tracking
- Teaching Coping Strategies
- Auditory Stimuli in Communication:
- Auditory Perception of Speech
- Auditory Training
- Visual Stimuli in Communication:
- Speech reading
- Manual Communication
- Speech Perception of the Hearing Impaired
- Communication Strategies and Conversation Styles
- Communication Strategies Training
- Psychosocial Aspects and Counseling
- Aural Rehabilitation in School Settings
- Pediatric Aural Rehabilitation
- Adult Aural Rehabilitation
- Interpretation of Audiological Data
- Evaluations, surgical procedure
- Post- surgical management
- Rehabilitation/Troubleshooting
- Complications
- Professional and legal issues
- Counseling
- Self-help organizations for individuals with hearing loss
- The role of the speech/ language therapy in aural rehabilitation

Aural Rehabilitation of infants & preschool children

- Multiple handicapped
- Center-based programs
- Home-based programs
- Auditory training
- Speech and language intervention
- Cognitive training AVT and CI therapy
- Outcome measures
- Team approach

Aural Rehabilitation of school children

- Speech and language intervention
- Language development
- Acquisition of childhood language
- Parent-child interactions
- Assessment of language abilities
- Speech development
- Acoustic parameters of speech
- Acquisition of speech skills
- Assessment of speech abilities
- Auditory training
- Language teaching – natural vs structural method
- Educational options - how to select/how to measure success
- Academic needs
- Educational management and alternatives
- Classroom modifications
- Classroom acoustics and students with hearing impairments
- Speech reading
- Outcome measures
- Team approach

Aural Rehabilitation of adults & geriatrics

- Non-audiometric assessment
- Disability versus handicap
- Measurement of intelligence
- Social maturity
- Motor development
- Personality development
- Communication needs
- Language development
- Speech development
- Communication philosophy and controversy
- Counseling children and parents
- Psychosocial variables
- Vocational variables
- Vocational adjustment and career planning
- Deaf persons with secondary disabilities
- Group training
- Speech reading
- Communicative strategies
- Counseling

- Team approach
- Tinnitus management
- Vestibular management

Intervention and management

- Auditory training
- Speech reading
- Speech conservation
- Environmental modifications
- Conversational Therapy
- Visual Training

Approaches to management

- Sensory Integration Therapy
- Inputs of occupational therapy
- Team approach
- Management of hearing impaired with special needs
- Management of Multi Handicapped Hearing Impaired (MHHI)
- Management of cases with central auditory processing problems
- Tinnitus management
- Vestibular management

Amplification devices

credit hours 3(3-0)

All amplification devices like hearing aids and Cochlear implants shall also be covered. The basic principles and products available in market with its types and advantages shall be covered. This course describes the overall principals of prescribing, dispensing and fitting of hearing aid. The ear mold materials and techniques and various related issues. Fabrication of ear mold and proper fitting techniques shall be covered.

Extended low frequency amplification

- Hearing Aids:
- Historical development of hearing aids.
- Hearing aids, components
- Classification
- Types of hearing aids
- Non-electrical hearing aids.
- Electrical hearing aid.
- Digital Hearing Aid Matrix
- Frequency transposition.
- Bone anchored hearing aid.
- BTE hearing aid
- Principles of analog, programmable, digital hearing aids
- Signal enhancing technology
- FM hearing aids
- Body level AC, BC, body baffle effect
- Ear level: BTE, Spectacle (AC/BC), AITE, Canal aid
- Binaural, Pseudobinaural, Monaural
- Directional hearing aids, modular hearing aids.
- Routing of signals, head shadow/baffle/diffraction effects.
- Output limiting: Peak clipping, compression.
- Outcome measures
- Group amplification
- Hard wire, induction loop, FM, infrared
- Merits and demerits of each.
- Mechano - acoustic couplers

- Types
- Procedures
- Effect of acoustic couplers on the characteristics of hearing aid output.
- Evaluation of hearing aids
- Electro-acoustic characteristics measurements for hearing aid
- National and International standards
- Techniques of speech processing and analysis
- Voice response system
- Speaker recognition system and speech recognition system
- Speech synthesis methods
- Interpretation of the analysis.
- Application of tools in studying genetic bases of audiological disorders
- Assistive Listening Devices
- TV listening aid
- Alarm devices
- Telephone listening aids
- Vibrotactile aids.
- EAC: measurements and accessories

Diagnostic audiology-1

credit hour 3(2-1)

In this subject all possible evaluations and assessment techniques shall be covered. This course shall cover the basic of electrophysiological techniques used for hearing assessments in relation to the diagnostic tests. Emphasis on pediatric as well geriatric population shall be dealt with individually.

Audiology: Definition

- A brief history
- Branches and scope.
- Physical basis of hearing

- Review of acoustics relevant to audiology
- Fundamentals of psychoacoustics
- Diagnostic Audiology
- Aim and scope
- Clinical audiometers
- Filters Module: Audiometer calibration
- Instrumentation for cerumen management
- OAE instrumentation
- Concepts of screening and definitive/diagnostic tests.
- Concepts of reliability and validity, accuracy and precision
- Diagnostic assessment of degree and type of hearing impairment.
- Relative merits and demerits of these tests.

Tuning fork tests

- Tuning Fork (TF) Tests: Rinne, Weber, Bing, Gelle and Schwabach tests.
- Their reliability and validity.

Speech Audiometry:

- Historical perspectives.
- Basics of speech audiometry
- Need and principles.
- Common materials, procedures and uses.

Tests:

- Speech Awareness Threshold (SAT)
- Speech Recognition Threshold (SRT)
- Speech/Word Recognition Score (SRS/WRS)
- Materials for each of these tests
- Development of test material
- Instrumentation and calibration
- Administration of tests, recording and interpretation of test results
- Factors affecting the test results
- Role of speech audiometry in differential diagnosis
- Merits and demerits of speech audiometry.

Audiological Tests to Differentiate Site of Lesion

- Test which use pure tone stimuli:
- Historical perspectives
- Difference Limen Tests

- Bekesy Audiometry
- Brief Tone Audiometry
- Short Increment
- Sensitivity Index (SISI)
- Modifications of SISI.
- Loudness Balance Tests - ABLB, MLB.

Tone Decay Test:

- Introduction, Terminology, Different procedures.
- STAT, continuous Tone
- Lateralization and masking
- Screening for hearing loss
- Advantages and Disadvantages of different procedures.
- Tests which use Speech Stimulus PIPB Function

Pure tone Audiometry

- Lateralization and masking
- Hearing thresholds for pure tones and speech
- Hearing screening programs
- Relation of changes in sound pressure and sound power to changes in intensity
- Air Conduction audiometry
- Clinical measurement of AC thresholds.
- Factors affecting threshold.
- Bone Conduction audiometry
- Rationale.
- Special problems in the measurement of BC.
- Role of external and middle ears in BC hearing
- Errors in BC audiometry.
- Electronic pure-tone audiometry
- Functional block diagram, components and their functions
- Concepts of cross over, inter-aural attenuation (IA) and cross hearing and shadow curve.
- Audiometric zero: Concepts of normal hearing sensitivity and normal thresholds of hearing
- Basic interpretation of audiograms: Qualitative (Type) and Quantitative (Degree).
- Basics of clinical masking: Need (Why?) and criteria (When?) for masking during AC BC threshold testing.
- Common materials, procedures and uses.
- Factors affecting the reliability and validity of a pure-tone audiogram
- Tester, Equipment, Environment and Precautions and care in audiometry.

Immittance

- Principle and instrumentation
- Application of Immittance
- Immittance Audiometry
- Principle of Immittance Audiometry
- Instrumentation

Tympanometry

- Low and high frequency tympanometry
- Single and multi-component
- Multiple frequency tympanometry
- Variables effecting tympanometry

Relaxometry

- AR, NAR
- Adaptation of AR, ARLT
- Reflex averaging, reflex sensitization
- Temporal summation of acoustic reflex, binaural summation of AR
- Factors affecting measurement

Hands on training in audiology including rotation to audiological clinis-1 credit 3(0-3)

HANDS ON TRAINING IN AUDIOLOGY INCLUDING ROTATIONS TO AUDIOLOGICAL CLINICS – I

Sixth semester

S.NO	COUSE CODE	NAME OF SUBJECTS	CREDIT HOURS
1	AUD-618	Diagnostic audiology-2	2(2-0)
2	AUD-619	Amplification devices-2	2(2-0)
3	AUD-620	Rehabilitative clinical audiology-2	3(3-0)
4	RSC-664	Biostatistics-1	3(3-0)
5	AUD-621	Hands on training in audiology including rotation to audiology clinics-2	3(0-3)

Diagnostic audiology-2

credit hours 2(2-0)

Otoacoustic emissions and assessment

- The origin of acoustically evoked potentials of the auditory pathway and their assessment
- Origin
- Classification
- Principles in recording of OAEs, protocols for infants, protocols for cochlear pathology
- Contralateral suppression
- Interpretation
- Factors affecting
- Clinical application

Electrocochleography

- Auditory brainstem responses
- Middle latency potentials
- Mismatch negativity
- Discriminatory and obligatory cortical potentials.
- Acoustic reflectance- principles and application
- Evoked Response Audiometry
- Early Response, MLR, LLR
- Instrumentation and calibration
- Test procedure
- Interpretation
- Factors affecting ERR

Early AEP –Generators

- Principles of recording
- Factors affecting recording / interpretation
- Correlation with FMRI, PET
- Electrical ABR
- Clinical disorders
- MLRs and LLRs
- Generators
- Principles of recording
- Factors affecting recording/interpretation including PAM and applications
- Correlation with FMRI, PET
- Electrical LLR
- Clinical disorders

- Vestibular Function Tests
- Caloric Test
- ENG
- Instrumentation and calibration, test procedure,
- Interpretation and artefacts.

Group Testing:

- Group testing procedures, mass hearing screening
- Relevance of automatic audiometry.

Tests to detect Pseudohypacusis:

- Indications for behavioral and test results
- Protocol of test procedures.

Tests for identification:

- Brief history of tests (delayed auditory feedback, electrodermal response audiometry, lip reading test, story test).
- Tone in noise test
- Stenger Test - Pure Tone & Speech
- Lombard Test
- Doerfler - Stewart Test
- Electrophysiological Tests.
- Reporting the test result
- Referral

Tests to detect Central Auditory Dysfunction:

- Definition, terminologies used, incidence and causes,
- indications for administration of CAD Tests, Rationale for CAD
- Tests, Material, Instrumentation, Procedure, Interpretation of the
- following tests:
- Masking level
- Pitch Pattern Test
- Binaural Beats
- Filtered Speech Test
- Dichotic binaural fusion test
- Time altered speech test
- Rapidly alternating speech test
- Speech with alternate masking index
- Staggered spondee word test

- Synthetic sentence identification with ipsilateral competing messages, synthetic sentence
- Identification with contralateral competing message.
- Dichotic digit test
- Dichotic consonant vowel test
- Speech in Noise test
- Assessment, integration and clinical management of more complex cases including tinnitus, auditory neuropathy, acoustic shock, non-organic hearing loss and auditory processing disorders, noise-induced hearing loss.

Pediatric audiometry

- Introduction
- Psychoacoustic Foundations
- Review of pediatric Hearing disorders
- Pediatrics Hearing Assessment
- Audiological assessment and clinical management of infants and children
- The effects of hearing loss
- Hearing Testing in neonates and infants:
- Behavioral Observation Audiometry (BOA)
- Conditioning Techniques including CORA, VRA and its modifications
- TROCA, play audiometry.
- Speech Audiometry in Children:
- Tests and material used to obtain:
- Speech Detection Threshold (SDT)
- Speech Reception Threshold (SRT)
- Speech Recognition Tests including VASC, WIPI; NuChip
- Glendonald Auditory Screening Procedure (gasp)
- Early Speech Perception Test (EST)
- Response elicitation
- Factors affecting these measures
- BC Speech Audiometry
- Role of pure-tone audiometry in diagnosis
- Pediatrics ABR, OAE and vestibular assessment.
- Physiological/Electrophysiological Measures:
- Immittance
- Evoked Response Audiometry including ECOG, BSERA, MLR, LLR, CNV, FFR.
- Otoacoustic emission
- Functional Hearing Loss in children:
- Signs/Symptoms
- Tests
- Central Auditory Processing Disorders in children:

- Signs/Symptoms
- Tests.
- Pediatrics audiological reporting
- Pediatrics treatment options
- Information presented from a family

Clinical Practicum II

This unit aims to develop knowledge and practical skills in audiological assessment in adults and children over the age of 5 years including skills in hearing assessment, acoustic impedance measurement and interpretation, adult speech discrimination testing techniques and an understanding of pediatric assessment strategies for children under the age of 5 years.

Students will also develop skills in audiological reporting and will further develop an understanding of ABR, OAE and vestibular assessment. They will further develop their understanding of hearing aid features and styles and their application.

Amplification devices-2

credit hours 2(2-0)

- Cochlear Implants
- Historical review, parts and working of cochlear implant
- Assistive Listening Devices - types, advances in technology
- Tinnitus maskers
- Cochlear implant
- Description, types, designs and features
- Speech processing strategies
- Assessment strategies
- Middle ear implant, BAHA, Brainstem implant
- Description
- Selection
- Assessment
- Outcome
- General Hearing Aid Information
- General information to a patient on the different types of hearing aid styles, circuit, and options (noise reduction, directional mics, fm, multi-memory, remote control, volume control options, telephone options).
- Hearing Aid Protocol
- General Transformations / Formulas
- Hearing Aid Selection:
- Pre-selection factors: which ear to fit? monoaural or binaural?

- Prescriptive and comparative procedure.
- Functional gain and insertion gain methods:
- Instrumentation, prescription formulae, Articulation
- Index, Speech- banana.
- Merit and demerits of each of these.
- Hearing aids for conductive hearing loss: congenital malformation, chronic middle ear disorders.
- Hearing aids for infants/ children/multiply handicapped.
- Hearing aids for elderly: Recruiting ears, poor Word Recognition Scores (WRS).
- Hearing aids for the sightless.
- Dispensing Hearing Aid.
- Ear moulds: Importance, Types (Hard moulds and soft moulds)
- Procedure of making each type of ear moulds, styles of ear
- Moulds, criteria for selection of one style over the other
- Ear moulds modifications, EAC of hearing aid along with ear
- Trouble shooting of hearing aid.
- Counseling and orienting the hearing aid user (patients and significant others)
- Importance of harness, BTE loops etc.
- Tips to facilitate acceptance of hearing aids
- Battery life, battery charger, etc.
- Candidacy for the cochlear implant (changing criteria)
- Team members and their roles for rehabilitation after cochlear implant, pre-implant
- Merits and demerits of cochlear the implant, current trend outside.

Rehabilitative clinical audiology-2

credit hour 3(3-0)

Auditory Training:

- Definitions and historical background
- Methods of training
- Analytical Vs Synthetic; (including speech tracking)
- For patients of different age groups
- In patients with congenital and acquired hearing losses
- Verbal Vs Nonverbal material
- For individual Vs Group activities
- Individual and group training
- Purpose
- Requirement for each – i.e. space, number, selection of participants
- Other consideration
- Auditory learning
- Role of audition in speech and language development in normal children

- Application in education of the hearing impaired.
- Factors in auditory training
- Motivation of the case, intelligence, age, knowledge of progress, etc.
- Communication strategies
- Anticipated strategies
- Repair strategies

Speech Reading:

- Definitions
- Need; For those with hearing aids; tactile devices; cochlear implants
- For those without sensory aid
- For children
- For adults
- Visibility of speech sounds – Audiovisual perception Vs Visual perception
- Visual perception of speech by the hard of hearing
- Tests for speech reading ability
- Denver Quick test of lip-reading ability
- John Tracy clinic test
- Utlay test
- Helen test
- Mason multiple choice test
- Factors influencing speech reading:
- Related to the speech reader
- Related to the speaker
- Related to the environment

Educational Audiology:

- Education and its aim in aural rehabilitation
- Different methods of teaching language speech reading and listening
- Different approaches to verbal and non-verbal communications
- Classification of hearing handicap
- Early identification and its importance in aural rehabilitation
- Different types of programs available in the country for education of speech hearing
- Educational problems of hard of hearing in Pakistan

Uni sensory Vs Multisensory approach:

- Acoupedic approach
- Manual Vs oral form of communication manual communication:
- Systems that Parallel English, (Manual alphabet)
- Interactive systems (cued speech: Rochester method):

- Those alternative to English (ASL) Indian Sign Language
- Contrived system (SEE-I, SEE-II, Signed English).
- Total Communication
- Methods of teaching language to the hearing impaired
- Natural method: maternal reflective method
- Structured method (grammatical method): Fitzgerald key, box technique
- Computer aided method

Educational placement of hearing-impaired children:

- Preschool training
- Integration
- Partial integration
- Segregation: day school Vs residential school
- Criteria for recommending the various educational placements
- Factors affecting their outcome
- Counseling the parents and teachers regarding the education of the hearing handicapped
- Setting up class rooms for the hearing handicapped
- Home training – need, preparation of lessons, correspondence programs, follow up.
- How to make child wear hearing aid. Acceptance of hearing aid.
- Advantage/disadvantage of schools / integrated schools and mainstreaming

Helping speech and language handicapped for meaningful skills.

- Technique of sense training and training of basic skills.
- Knowledge and use of teaching aids.
- Identification of appropriate vocation for them and selection.
- Auditory training; Speech reading need / importance / steps / material needed
- Preparation and use of material for therapy games and activity for speech therapy

Biostatistics-1

credit hours 3(3-0)

What is Statistics?

Definition of Statistics, Population, sample Descriptive and inferential Statistics, Observations, Data, Discrete and continuous variables, Errors of measurement, Significant digits, Rounding of a Number, Collection of primary and secondary data, Sources, Editing of Data. Exercises.

Presentation of Data

Introduction, basic principles of classification and Tabulation, Constructing of a frequency distribution, Relative and Cumulative frequency distribution, Diagrams, Graphs and their Construction, Bar charts, Pie

chart, Histogram, Frequency polygon and Frequency curve, Cumulative Frequency Polygon or Ogive, Histogram, Ogive for Discrete Variable. Types of frequency curves. Exercises.

Measures of Central Tendency

Introduction, Different types of Averages, Quantiles, The Mode, Empirical Relation between Mean, Median and mode, Relative Merits and Demerits of various Averages. properties of Good Average, Box and Whisker Plot, Stem and Leaf Display, definition of outliers and their detection. Exercises.

Measures of Dispersion

Introduction, Absolute and relative measures, Range, the semi-Inter-quartile Range, The Mean Deviation, The Variance and standard deviation, Change of origin and scale, Interpretation of the standard Deviation, Coefficient of variation, Properties of variance and standard Deviation, Standardized variables, Moments and Moments ratios. Exercises.

Probability and Probability Distributions.

Discrete and continuous distributions: Binomial, Poisson and Normal Distribution. Exercises

Sampling and Sampling Distributions

Introduction, sample design and sampling frame, bias, sampling and non-sampling errors, sampling with and without replacement, probability and non-probability sampling, Sampling distributions for single mean and proportion, Difference of means and proportions. Exercises.

Recommended Books

- Walpole, R. E. 1982. "Introduction to Statistics", 3rd Ed., Macmillan Publishing Co., Inc. New York.
- Muhammad, F. 2005. "Statistical Methods and Data Analysis", Kitab Markaz, Bhawana Bazar Faisalabad.

**Hands on training in audiology including rotation to audiology clinics-
2 credit hours 3(0-3)**

Seventh semester

S.NO	COURSE CODE	NAME OF SUBJECTS	CREDIT HOURS
1	RSC-681	Research methodology	3(2-1)
2	AUD-622	Audiology practice management	2(2-0)
3	RSC-674	Biostatistics-2	3(3-0)
4	AUD-623	Clinical audiology internship-1	3(0-3)
5	AUD-624	Hands on advance training in audiology and research project related to specialty of interest	3(0-3)

Research methodology

credit hour 3(2-1)

Course Description:

This course includes discussion on basic quantitative methods and designs, including concepts of reliability and validity, interpretation of inferential statistics related to research designs, co relational statistic & designs, interclass correlation coefficients, and critical appraisal of the literature.

Research Fundamentals:

- Rehabilitation Research
- Theory in Rehabilitation Research
- Research Ethics

Research Design:

- Research Problems, Questions, and Hypotheses
- Research Paradigms
- Design Overview
- Research Validity

Experimental Designs:

- Group Designs
- Single-System Design

Non-experimental Research:

- Overview of Non experimental Research
- Clinical Case Reports
- Qualitative Research
- Epidemiology
- Outcomes Research
- Survey Research

Measurement:

- Measurement Theory
- Methodological Research

Data Analysis:

- Statistical Reasoning
- Statistical Analysis of Differences; The basics
- Statistical Analysis of Differences; Advanced and special Techniques
- Statistical Analysis of Relationships; The basics

- Statistical Analysis of Relationships; Advanced and special Techniques

Being a Consumer

- Locating the Literature
- Evaluating Evidence One Article at a time
- Synthesizing Bodies of Evidence

Implementing Research:

- Implementing a Research Project
- Publishing and Presenting Research

PRACTICAL

- Literature review
- Preparation, presentation and defense of research proposal
- Poster presentation

RECOMMENDED TEXTBOOK:

- Essentials of clinical research By Stephan P. Glasser
- Rehabilitation Research (Principles and Applications) 3rd Edition By Elizabeth Domholdt

Audiology practice management

credit hour 2(2-0)

This course shall cover the overall concept of setting up an Audiology practice and all related issues like professional responsibilities, ethics, legal obligations etc. shall be covered. Also, the requirements of setting up a practice shall be covered in terms of qualified persons as well as equipment requirements.

- What is practice management
- Professional ethics and audiology
- Quality: the controlling principle of practice management
- Ethics in professional practice
- Rules and regulations, ethics, fee schedule, practice setting, community demographics, business model, etc.
- Financial management of audiology practices and clinics
- What's an audiologist worth?
- Epidemiology of Speech, language and hearing disorders.
- Environmental, Social, Economic Implications.
- Preventive education.

- Approaches to service delivery

- Institution based

- Camp based

- Community based.

- Role of NGOs.

- Review of services in Pakistan.
- Integration of disabled into the community
- Duties and responsibilities of audiologist in various settings.
- Interacting with allied professionals and community health workers
- Planning services for the communication disabled:
- Philosophy, planning, establishment of services for communication disorders
- Infrastructure, budget, staffing, equipment, furniture
- Policy-making, documentation, record keeping, proposal-writing, etc.
- Making services user- friendly
- Legislative support for rehabilitation.
 - o Environment Act.
 - o Consumer Protection Act.
 - o Schemes and concessions under state and central government.
 - o Vocational rehabilitation.
- Strategies for awareness, public education and information.

(Camps, print and audiovisual media, surveys, radio broadcast, street plays, etc.)

- Empowering parents, persons with disabilities and community
- Skill transfer to parents, grass-root level workers, teachers, health workers.
- Levels of prevention:
 - o Health promotion

- o Specific protection
- o Early diagnosis and Treatment – high risk infants
- o Disability limitation
- o Rehabilitation
- The professional as a witness
- Human resource management
- Private practice issues
- Planning and analysis processes necessary to establish a private audiology practice.
- Personality in business
- Establishing a business plan
- Setting up and growing a business
- Office fundamentals
- Feasibility studies
- Business structures
- Financial reports
- Review materials relevant to various business structures (partnerships, corporations, etc.).
- Healthcare business consultants
- The language of accounting, basic terms and concepts, components of the accounting system
- Income statements and balance sheets
- Managed care and reimbursement
- Office and clinical management procedures
- Evidence-based practices
- Principles of and use of marketing within the audiology practice
- Various managed care organizations

- Marketing and audiology
- Equipment selection
- Human resource management
- Federal employment laws
- Resume, interviewing, job search
- Audiology practice enhancement/growth
- Total quality management
- Healthcare model
- Could I be a successful private practice owner?
- Risk management and professional liability
- Best practice, malpractice
- Career choices, continuing education, and mentoring.

Biostatistics-2

credit hour 3(3-0)

Hypothesis Testing

Introduction, Statistical problem, null and alternative hypothesis, Type-I and Type-II errors, level of significance, Test statistics, acceptance and rejection regions, general procedure for testing of hypothesis. Exercises.

Testing of Hypothesis- Single Population

Introduction, testing of hypothesis and confidence interval about the population mean and proportion for small and large samples, Exercises

Testing of Hypotheses-Two or more Populations

Introduction, testing of hypothesis and confidence intervals about the difference of population means and proportions for small and large samples, Analysis of Variance and ANOVA Table. Exercises

Testing of Hypothesis-Independence of Attributes

Introduction, Contingency Tables, Testing of hypothesis about the Independence of attributes. Exercises.

Regression and Correlation

Introduction, cause and effect relationships, examples, simple linear regression, estimation of parameters and their interpretation. r and R^2 . Correlation. Coefficient of linear correlation, its estimation and interpretation. Multiple regression and interpretation of its parameters. Examples

Recommended Books

- Walpole, R. E. 1982. "Introduction to Statistics", 3rd Ed., Macmillan Publishing Co., Inc. New York. Muhammad, F. 2005.
- "Statistical Methods and Data Analysis", Kitab Markaz, Bhawana Bazar Faisalabad

Clinical audiology internship-1

credit hour 3(0-3)

Hands on advance training in audiology and research project related to specialty of interest-1

credit hour 3(0-3)

Eight semesters

S.NO	COURSE CODE	NAME OF SUBJECTS	CREDIT HOUR
1	AUD-625	Clinical audiology internship-2	
2		Project report	
3	AUD-626	Hands on training in audiology and research project related to specialty of interest -2	

Clinical audiology internship-2

- Uses appropriate instructions for administering tests
- Degree of hearing loss
- Contour of audiograms
- Calibration of audiometers (Demonstration)
- Combination of equipment for different types of calibration
- Preparing correction chart
- Completes otoscopic screen prior to tympanometry and prior to and after making ear mold impressions
- Completes hearing aid fittings and electroacoustic analyses of hearing aids
- Report related to complete electroacoustic checks of hearing aids for fitting/follow-up sessions.
- Makes ear mold impressions
- Recites criteria for masking; completes masking procedures with assistance
- Interprets pure tone and speech audiometric and tympanometry results, at least 10.
- Begins observing client's overall communicative performance as a basis for referral for additional services
- Increases efficiency in conducting clinical sessions
- Initiates modifications in test procedure to meet clients' needs.
- Initially assists, then begins conducting basic behavioral audiometric and tympanometry workups
- Uses appropriate lighting arrangement in testing suites
- Assists with behavioral infant testing
- Assists with evaluations, adjustments and electroacoustic analyses of hearing aids
- Assists making ear mold impressions, completes hearing aid form, screening items and assists with hearing aid orientations
- Completes a fee slip for all clinical activities (including screenings, ear mold impressions, tymps, hearing aid fittings)
- Checks with supervisor prior to releasing a client
- Obtains a signed release form for distribution of report(s)
- Initially assists, then actually prepares reports
- Uses a word processor to complete rough and final drafts of reports
- Allows equipment to run without abusing
- Returns all materials and equipment to appropriate storage areas after each use
- Maintains security when using clinic resources at night and over the weekend
- Keeps clinical area and testing suites neat and orderly
- Follows the Clinic's Universal Precautions Procedures
- Keeps an ongoing record of clinical hours
- Meets with the Audiology coordinator to tally and file clinical hours

- Demonstrates appropriate professional behavior when interacting with faculty, staff, and clientele/their families;
- Does not remove client folders or contents from the clinic area Maintains confidentiality of all clinical information-
- Makes and completes the personal log book for all the practical procedures done during his/her visit.

Project report

Hands on training in audiology including and research project related to specialty of interest

RECOMMENDED BOOKS AND JOURNALS

1. Auditory Science

1.Durant, J.D & Lovrinic.J.H: Bases of hearing Sciences. Williams & Wilkins. Latest Edition

2.Auw. W.L., Popper.A.N. Fay.R.R (Ed) 2000: Hearing by whales & Dolphins. Springer- Venlag, New York, USA.

3.John. M. Palmer. Anatomy for Speech and Hearing. Williams and Wilkins. Latest Edition

4.Bekey: Experiments in hearing McGraw-Hill Book company. Latest Edition Dallos.P. Popper.A.W., Fry.R.R. The Cochlea, Springer-Venlag, New York, USA. Latest Edition

2. Basic Electronics/Acoustics/ Instrumentation:

1.Grob. Electronic circuits and applications. London. Mc. Graw Hill. Latest Edition

2.Hall. Microprocessor and interfacing programming hardware. New Delhi Mc. Graw Hill

3.Hall. J. W. Handbook of Auditory evoked responses. Masschusettes Allyn & Bausen. Latest Edition

4.Kingsler & Fray. Fundamentals of Acoustics. New York. Latest Edition.