



SGRD University of Health Sciences, Sri Amritsar

ORDINANCE & SYLLABUS: MASTER OF SCIENCE IN MEDICAL (ANATOMY, BIOCHEMISTRY, MICROBIOLOGY AND PHYSIOLOGY) (2 YEARS DEGREE COURSE)

1.1 THE ADMISSION/ EXAMINATION FOR THE DEGREE OF M.Sc. MEDICAL SHALL BE HELD IN THE FOLLOWING SPECIALIZATION:

- a) Medical Anatomy
- b) Medical Physiology
- c) Medical Biochemistry
- d) Medical Microbiology

1.2 DURATION: The duration of the course leading to the Degree of M.Sc. shall be of two academic years. There shall be actual teaching for a minimum of 180 days excluding admissions, preparation and examination days in each year.

2.0. ELIGIBILITY:

This course shall be open to a candidate who have passed regular MBBS/BDS/BPT/B.Sc. Medical Sciences /BAMS/B.Sc. allied health sciences examination with at least 50% marks in aggregate from a recognized University, or any other examinations recognised by the Board of Management of this University as equivalent course/examination shall be eligible to join the First year of M.Sc. course.

3.0. EXAMINATION:

- 3.1 The examination shall be held twice a year in the months of May/June and November/December or on such other dates as may be decided by the Board of Management on the recommendation of Faculty of Medical Sciences and Academic Council.
- 3.2 Normally, the University shall conduct not more than two examinations in a year, for any subject, with an interval of not less than four and not more than six months between the two examinations.

The amount of examination fee to be paid by a regular student shall be as prescribed by the University from time to time. A candidate who re-appears in one or more paper(s) shall pay examination fee as for the whole examination.

Note: Vice-Chancellor may permit acceptance of examination form and fee ten days before the commencement of examination with a late fee.

SUPPLEMENTARY EXAMINATION: The supplementary examinations for reappearing candidates shall be held ordinarily in the month of November/December.

4.0. FIRST YEAR M.Sc.

- a) The First Year M.Sc. shall be open to a student who has been enrolled for one academic year preceding the examination in a Colleges/institutions affiliated to this University.

- b) The First Year M.Sc. shall be conducted by the Head of the Department in the following subjects:

| Paper code | Course Title | Course type | | Total |
|---|-----------------------|-------------|-----------|-------|
| | | Theory | Practical | |
| Paper-I | As per specialization | 50 | 50 | 100 |
| Paper-II | As per specialization | 50 | 50 | 100 |
| Choosing the subject of the thesis and supervisor Synopsis preparation | | | | |

Note: The awards will be retained by the Heads of the Department for the purpose of Calculating Internal Assessment in the Second Year.

Distribution of teaching hours for M.Sc. First Year

| Paper code | Subject | Theory hour | Practical hour | Clinical Practice hour | Total hour |
|--------------|-----------------------|-----------------|-----------------|------------------------|------------------|
| Paper-I | As per specialization | 100 hour | 100 hour | 1200 hour | 1600 hour |
| Paper-II | As per specialization | 100 hour | 100 hour | | |
| Total | First year | 200 hour | 200 hour | 1200 hour | 1600 hour |

5.0. THESIS

- After the allotment of Supervisor and Co-Supervisor by the Head of the Department, Every candidate shall submit a thesis plan (synopsis) to the University within six months from the date of admission.
- Every candidate shall carry out work on an approved research project under the guidance of a recognized PG Teacher (First preference given to Professor only or I. Teachers holding Ph.D. qualification having at least 3 years teaching experience after Ph.D. may be appointed as supervisor, II. After MD/MS 10 years of teaching and research experience). The teachers mentioned at [I and II] should also have at least 5 research papers in indexed National and International Journals.
- Thesis shall be submitted to the University six months before the commencement of the Second Year Theory Examinations i.e. by -30th November of the preceding year for May/June examinations.
- The Vice-Chancellor may allow a candidate to submit the thesis within one month after the date fixed for the purpose with the prescribed late fee.
- The thesis shall embody the results of the candidate's own research and/or experience and shall contain precise reference to the publications quoted, and 'must attain a good standard and shall be satisfactory in literary presentation and in other respects and should end with a summary embodying conclusions arrived at by the candidate. The thesis shall be typewritten Times New Roman 12 font 1.5 cm spacing on one side of the paper (size 11" x 8 1/2") with margins of 1 1/2" on each side, bound, indicating on the outside cover its title and the name of the candidate.
- The thesis shall be examined by a minimum of two examiners. One internal and one external examiner. Ordinarily, this examiner will not be appointed the External Examiner for theory and Clinical/Practical examination. The candidates who have submitted the thesis in University will be allowed to appear in the final examination. However, the result shall be declared only on receipt of the thesis acceptance from both the examiners.
- The internal examiner shall send only report to the University after evaluation of thesis and the evaluated copy will be deposited in the college library for reference of the

students. The external examiner shall also send copy of the thesis along with the report to the University. The University shall keep two copies in the University Library for reference of the students.

6.0. SECOND YEAR M.Sc.

The Second year M.Sc. shall be open to a student:

- A. Who has been enrolled for two academic year preceding the examination in a Colleges/institutions affiliated to this University.
- B. has submitted his/her name to the Controller of Examination/Registrar by the Principal of the Colleges/institutions with the following certificates:
 - I. of having attended separately in theory and practical/clinical not less than 75% percent of the lectures delivered and practicals conducted in each of the subjects prescribed for the examination provided that deficiency in the number of lectures delivered and practicals conducted may be condoned by the Principal to the extent of 10% of the lectures delivered.
 - II. Of having secured at least 50% marks of the total marks fixed for internal assessment in each subject, separately, in order to be eligible to appear in all University examinations.
- III. Must have submitted the thesis.

6.1. INTERNAL ASSESSMENT:

Internal Assessment shall be submitted to the University at least two weeks before the commencement of theory examinations or within one week from the issuance of Roll Numbers by the University. All the colleges shall adopt uniform criteria for Internal Assessment as follows:

- a. Attendance above 90% to be acknowledged with 10% extra weightage for Internal Assessment.
- b. At least two tests to be held in each year in addition to the pre-final (send up) examination. The Internal Assessment should be the average of all awards of these tests taken together.
- c. Criteria for calculation of Internal Assessment
 - (i) House Examinations — 80%
 - (ii) Attendance (above 90%) -10%
 - (iii) Subject assessment (candidate's conduct and extracurricular participation) -10%
- d. Additional mandatory requirement for Internal Assessment are as follow:
 - i All test marks obtained by candidates will be displayed on Notice Boards of respective departments as and when they are awarded.
 - ii All computations of Internal Assessment of the entire class made by the HOD of the department shall be displayed on the notice board of the department showing individual test marks, advantage of all tests, attendance advantage and subjective assessment and the total Internal Assessment thus derived for at least one week before sending the awards to the Principal's office.
 - iii Professor Incharge/HOD preparing Internal Assessment shall certify that the detailed assessment of the entire class has been displayed on the department Notice Board for at least one week prior to its being submitted for onward transmission to the University and that adequate opportunity has been given to all the students to file any objections and that the same have been addressed satisfactory.

- iv The Principal forwarding the Internal Assessment to the University shall countersign the above referenced certificate of the HOD/Professor Incharge preparing the Internal Assessment.
- e. The re-appear/fail students will be re-assessed every time for the purpose of Internal Assessment.
 - i If a candidate fulfils the condition laid in clause 6 above he/ she may be allowed to take the examination.
 - ii Every candidate before appearing in Second Year Examination must have cleared House Examination securing at least 50 percent marks in both theory as well as practical separately.
 - iii The Second Year M.Sc. Annual Examination shall be held in May/June and the supplementary within six months of the Annual Examination.
 - iv The examination shall be held according to the scheme of examination and Syllabus prescribed by the Academic Council. A candidate who fails in an examination or having been eligible fails to appear in the examination shall take the examination according to syllabus prescribed by the University for regular students provided that the syllabus for the candidate of Supplementary examination shall be the same as was in force in the last annual examination.

| Paper codes | Subject | Marks | Internal Assessment | Viva |
|-------------------------------------|-----------------------|------------|---------------------|------|
| Paper-I | As per specialization | 100 | 50 | 50 |
| Paper-II | As per specialization | 100 | | |
| Paper-III | As per specialization | 100 | | |
| Paper-IV | As per specialization | 100 | | |
| Internal assessment and Viva | | 100 | | |
| Total | | 500 | | |
| As per specialization | Practical | 200 | | |
| As per specialization | Thesis | 100 | 50 | 50 |
| Total | | 800 | | |

- i. Each theory paper shall be of three hours duration.
- ii. The minimum number of marks to pass the examination shall be 50% in theory & practical separately.
- iii. The candidate who will absent himself/herself from the examination will be deemed to have been failed in the examination.
- iv. The candidate who has completed his/her training of two years and has failed in the examination may appear again in a subsequent examination without further training and without submitting a new thesis.
- v. The candidate must pass the examination in a maximum of three (1 +2) attempts +1 (mercy chance on the discretion of Vice-Chancellor) failing which, he/ she will not be allowed to continue his studies.

DISTRIBUTION OF TEACHING HOURS FOR M.Sc. SECOND YEAR

| Paper | Subject | Theory hour | Practical hour | Clinical Practice hour | Total hour |
|-----------|-----------------------|-------------|----------------|------------------------|------------|
| Paper-III | As per specialization | 100 hour | 100 hour | 1200 hour | 1600 hour |
| Paper-IV | As per specialization | 100 hour | 100 hour | | |

| | | | | | |
|-------|-------------|----------|----------|-----------|-----------|
| Total | Second year | 200 hour | 200 hour | 1200 hour | 1600 hour |
|-------|-------------|----------|----------|-----------|-----------|

7.0. ACADEMIC QUALIFICATIONS AND APPOINTMENT OF EXTERNAL/INTERNAL EXAMINERS

I. M.D/Ph.D as per specialization (Anatomy/Biochemistry /Microbiology /Pathology /Physiology) with minimum one year of teaching/professional experience after Post-graduation in a teaching institution or in a laboratory.

OR

II. M.Sc. Medical with minimum five years of teaching/professional experience of which at least 2 years after the post-graduate qualification in a teaching Institution or laboratory approved by this University.

III. There shall be two examiners out of which one shall be external examiner recommended by Board of Studies and approved by Academic Council. The Board of Studies shall supply the panel of examiners to university for appointment of internal/external examiners by the Vice-Chancellor.

IV. Paper setting and moderation of Question Papers:

a) The University may get each paper set from External Examiner only. The moderation of question papers may be got done under the directions of the Vice-Chancellor, if necessary.

b) The answer books shall be got evaluated by putting fictitious roll numbers thereon or spot evaluation (table marking) or any other method under the directions of the Vice-Chancellor.

8.0. MAXIMUM DURATION:

A candidate must pass the whole course within **Four years** of his/her admission to First year of the course failing which he/she will be required to repeat the course de novo.

9.0. EXAMINATION FEE:

The amount of examination fee to be paid by a regular student shall be as prescribed by the University from time to time. A candidate who re-appears in one or more paper(s) shall pay examination fee as for the whole examination.

10. PASSING SCORE:

The minimum score required to pass examination shall be:

- I. 50% in aggregate of Internal Assessment & Theory examination marks for each theory subject.
- II. 50% in aggregate of internal assessment & Practical examination marks for the subject.

11. DECLARATION OF RESULT:

A candidate result shall be declared successful only when his/her thesis has been accepted and the candidate has obtained a minimum of 50% in theory and practical separately.

A successful candidate on the basis of theory and practical marks taken together shall be classified as under:

Second Class : A candidate obtaining 50% or more marks but less than 60% marks.

First Class : A candidate obtaining 60% or more marks.

First Class with

distinction : A candidate obtaining 80% or more marks.

Note: There shall be no provision for grace marks

Instructions to Paper Setter

Note:

1. The question paper covering the entire course shall be divided into two sections. Each section to be attempted in a separate answer book and to be evaluated by separate examiners.
2. Part A - Question No. I and II are Compulsory and the candidate will attempt any four questions out of question No.3, 4, 5, 6 and 7.
3. Part B - Question No. I and II are Compulsory and the candidate will attempt any three questions out of question No.3, 4, 5, 6 and 7.

Section A: (Max. marks 50)

Question 1: This will of 10 marks long answer question and will be compulsory. The answer must be given in at least five pages.

Question 2: This will consist of four short answer questions. All questions will be compulsory. The questions will carry 5 marks each and total weight-age being 20 marks.

Question 3 to 7: These will consist of short answer questions. Attempt any four questions. The questions will carry 3 marks and 2 marks respectively and total weightage of each question being 5 marks (20 Marks overall).

Section B: (Max. marks 50)

Question 1 : This will of 10 marks long answer question and will be compulsory. The answer must be at least five pages

Question 2: This will consist of four short answer questions. All questions will be compulsory. The questions will carry 5 marks each and total weightage being 20 marks.

Question 3 to 6: These will consist of short answer questions. Attempt any four questions. The questions will carry 3 marks and 2 marks respectively and total weightage of each question being 5 marks (20 Marks overall).

SYLLABUS OF M.Sc. MEDICAL ANATOMY (ANNEXURE-I)

SYLLABUS OF M.Sc. MEDICAL BIOCHEMISTRY (ANNEXURE-II)

SYLLABUS OF M.Sc. MEDICAL MICROBIOLOGY (ANNEXURE-III)

SYLLABUS OF M.Sc. MEDICAL PHYSIOLOGY (ANNEXURE-IV)

SCOPE AND OBJECTIVE OF M.Sc. MEDICAL ANATOMY

1. M.Sc. Medical Anatomy is a two-year post-graduate programme streamlined to equip students with the knowledge of organ systems, tissue structures, and human body together with its cellular and structural components and dynamics.
2. The curriculum of the programme enables students to upgrade their knowledge and develop investigative skills by participating in projects in different areas in anatomical sciences, critical reviews of literature, a collection of material, the processing, analysis, and evaluation of data.
3. Students' under this programme, gain hands-on clinical experience and final assessments are made based on their performances. Upon successful completion of the programme, aspirants will gain a solid knowledge of anatomy.

3.1. Learning Activities and Training

- Demonstrate comprehensive understanding of the structure.
- Function and development of the human body as related to anatomy, Demonstrate elementary understanding of the clinical applications of anatomy, Critically evaluate the impact of the recent information on the genesis of current concepts related to various topics of anatomy;
- Recapitulate the information Imparted to the undergraduate students of anatomy, Perform and critically evaluate the practical excursive done by undergraduate students, Identify a research problem which could be basic, fundamental or applied in nature; define the objectives of the problem and give a fair assessment as to what is expected to be achieved at the completion of the project;
- Design and carry out technical procedures required for the study; record accurately and systematically the observations and analyze them objectively: effectively use statistical methods for analyzing the data; interpret the observations in the light of existing knowledge and highlight in what way his observations have advanced scientific knowledge; write a scientific paper on the lines accepted by standard scientific journals; Design. fabricate and use indigenous gadgets for experimental purposes;
- Demonstrate familiarity with the principles of medical education including definitions of objectives, curriculum construction, merits and merits of various tools used in the teaching learning process: use of learning aids and learning settings, and methods of evaluation; Share learning experiences with the undergraduate and postgraduate students using appropriate pedagogical skills and methods;
- Draw out meaningful curricula for teaching medical and paramedical courses; give lucid , interactive lectures, presenting the information in a logical, simple and comprehensive manner; generate interest and curiosity amongst the students during lectures; give practical demonstrations;
- Organize the laboratories for various practical exercises, substitute and fabricate some of the simpler equipment for teaching purposes;
- Handle and order for stores, draw up lists of equipment required to equip anatomy laboratories.

DISTRIBUTION OF MARKS & SCHEME OF EXAMINATION FOR FIRST YEAR MEDICAL ANATOMY

| Paper code | Course Title | Course type | | Total |
|---|--|-------------|-----------|-------|
| | | Theory | Practical | |
| ANT.501A | Basic Anatomy, Neuro Anatomy, Gross Anatomy including applied anatomy of the Head, Neck, Brain and Upper limb. | 50 | 50 | 100 |
| ANT. 502A | General Embryology, Gross anatomy including applied anatomy of Abdomen, Thorax and Lower limb. | 50 | 50 | 100 |
| Choosing the subject of the thesis and supervisor Writing the protocol | | | | |

Note: The awards will be retained by the Heads of the Department for the purpose of calculating Internal Assessment in the Second Year.

DISTRIBUTION OF TEACHING HOURS FOR M.SC. MEDICAL ANATOMY FIRST YEAR

| Paper | Subject | Theory hour | Practical hour | Clinical Anatomy Practice hour | Total hour |
|------------------|--|-----------------|-----------------|--------------------------------|------------------|
| ANT.501A | Basic Anatomy, Neuro Anatomy, Gross Anatomy including applied anatomy of the Head, Neck, Brain and Upper limb. | 100 hour | 100 hour | 1200 hour | 1600 hour |
| ANT. 502A | General Embryology, Gross anatomy including applied anatomy of Abdomen, Thorax and Lower limb. | 100 hour | 100 hour | | |
| Total | First year | 200 hour | 200 hour | 1200 hour | 1600 hour |

DISTRIBUTION OF MARKS & SCHEME OF EXAMINATION FOR SECOND YEAR MEDICAL ANATOMY

| Paper codes | Subject | Marks | Internal Assessment | Viva |
|------------------|---|------------|---------------------|------|
| ANT.501A | Basic Anatomy, Neuro Anatomy, Gross Anatomy including applied anatomy of the Head, Neck, Brain and Upper limb. | 100 | 50 | 50 |
| ANT. 502A | General Embryology, Gross anatomy including applied anatomy of Abdomen, Thorax and Lower limb. | 100 | | |
| ANT.503A | Histology/Microscopic anatomy and Systemic Embryology | 100 | | |
| ANT.504A | Physical anthropology, Medical genetics, Forensic Anatomy, Radiological anatomy including recent advances in Anatomy. | 100 | | |
| Total | | 500 | | |
| ANT.505A | Practical | 200 | | |
| ANT. 600 | Thesis | 100 | 50 | 50 |
| Total | | 800 | | |

DISTRIBUTION OF TEACHING HOURS FOR M.Sc. MEDICAL ANATOMY SECOND YEAR

| Paper | Subject | Theory hour | Practical hour | Clinical Anatomy Practice hour | Total hour |
|--------------|---|-----------------|-----------------|--------------------------------|------------------|
| ANT.503A | Histology/Microscopic anatomy and Systemic Embryology | 100 hour | 100 hour | 1200 hour | 1600 hour |
| ANT.504A | Physical anthropology, Medical genetics, Forensic Anatomy, Radiological anatomy including recent advances in Anatomy. | 100 hour | 100 hour | | |
| Total | Second year | 200 hour | 200 hour | 1200 hour | 1600 hour |

SYLLABUS OF M.Sc. ANATOMY

1. Anatomical terminology

- Normal anatomical position, Various planes, Terms used in relation to Trunk and Limbs, laterality and movements in the human body

2. General /Basic Anatomy

- Skin-structure & functions of skin with its appendages, principles of skin incisions, dermatomes, Fascia- superficial and deep fascia with modifications, Classification of bones with examples, structure, blood supply, functions, types and laws of ossification, Classification of Cartilage with examples, structure and functions, Classification of joints with examples, features and movements in detail, Classification of muscles with examples, structure, functions, Shunt and Spurt muscles, Cardiovascular system-structure and functions of arteries, veins and capillaries, differences between arteries and veins, between pulmonary and systemic circulation and significance of end-arteries, Lymphatic system-components and functions, mechanism of lymph circulation, spread of tumors via lymphatics, Nervous system-components of central, peripheral & autonomic nervous system, structure and classification of neurons.

3. Skeletal System/Osteology

Region wise

A. Head and Neck

Skull

- Anatomical position of skull, Features of Norma Frontalis, Verticalis, Occipitalis, Lateralis and Basalis, Classification and distribution of sutures, wormian bones, Subdivisions of cranial cavity, Identification of foramina and structures passing through them, Salient features, articulation, muscle attachments of Individual skull bones and Clinical correlation.

Mandible- Parts, articulations, attachments, important relations blood and nerve supply, clinical correlation, age changes.

B. Trunk

- Vertebrae - typical, atypical vertebrae of cervical, thoracic, lumbar & sacral regions, parts of vertebra, salient features of all vertebrae, articulations, attachments, blood supply, sacralization of lumbar vertebra, lumbarization of 1st sacral vertebra, Vertebral column – normal and abnormal curvatures,

Intervertebral disc – structure and functions, Clinical correlation.

C. Thoracic cage:

- Bones of Thorax with attachments, Ribs (Typical and Atypical) & Costal cartilages, Sternum, Joints of the thorax

D. Pelvis

- Anatomical position, Parts, Differences between male and female pelvis with types, Articulations, Attachments, Blood supply and nerve supply

E. Limbs

- Identification of given bone, Side determination, Salient features and anatomical position, Joints formed by the given bone, Important Muscle Attachments, Identify bones in an articulated hand and foot, Scaphoid fracture and anatomical basis of avascular necrosis, Importance of ossification of lower end of femur and upper end of tibia, Clinical correlation

4. Arthrology/ Joints

- Definition and Classification of joints, Region wise all joints of the body- large and small, Bones taking part, Articular cartilage, Capsule and its thickenings, Ligaments, Synovial membrane, Intra capsular structures (if any), Structure, nutrition of articular cartilage and its significance, Innervation, Blood supply, Movements with muscles responsible for such movements, Relations, Clinical correlation

5. Gross Anatomy

A. Upper Limb

- Introduction to upper limb, Pectoral Region, Breast, Axilla & brachial Plexus, Scapular Region, Front & back of Arm, Cubital Fossa, Front of Forearm & palm, Back of Forearm & Dorsum of hand, Joints of upper limb, Arteries of upper limb, Venous & Lymphatic drainage of upper Limb, Nerves, Dermatomes and Nerve Injuries, Applied anatomy of each region, Comparison of upper and Lower limbs

B. Lower Limb

- Introduction to Lower Limb, Front, Medial side and back of Thigh, Gluteal region, Popliteal fossa, Front of Leg & dorsum of foot, Back of Leg & Sole of foot, Lateral & medial sides of leg, Arteries of Lower Limb, Venous drainage & lymphatic drainage of lower limb, Joints of lower limb, Arches of foot, Nerves, dermatomes and nerve injuries, Applied anatomy of each region

C. Thorax

- Introduction to thorax Walls of thorax & Respiratory Movements, Thoracic inlet, cavity and outlet, Lungs (bronchopulmonary segments) with Pleura, Heart with Pericardium, Coronary circulation, Superior vena cava, Aorta and pulmonary Trunk, Trachea, Oesophagus and Thoracic Duct, Arteries & veins of Thorax, Sympathetic Chain, Intercostal nerves, Mediastinum- subdivisions, detailed contents and applied, Joints of thorax, Applied aspects of all regions

D. Abdomen and Pelvis

- Introduction of Abdomen and pelvis, Abdominal walls (anterior & posterior) including fascia, Peritoneal cavity including details of fossae, sub-phrenic spaces, Viscera of abdominal cavity – stomach, duodenum, small and large gut, rectum, anal canal, appendix, caecum, Liver, gall bladder, spleen, pancreas, supra-renal glands, clinical correlation of each part, Extrahepatic biliary apparatus, Portal vein & portocaval anastomoses, Diaphragm including details of diaphragmatic hernias, Boundaries and contents of Pelvis, pelvic viscera, pelvic inlet, pelvic outlet, pelvic floor, Vessels of Abdomen and pelvis, Nerves of

abdomen and pelvis, Female reproductive system- Uterus, uterine tubes, ovaries, cervix, vagina, Male reproductive system- Testis, epididymis, vas deferens, prostate & penis, Urinary system –Kidneys, ureters, urinary bladder, urethra, Perineum, Pelvic diaphragm, Joints of abdomen and pelvis, Applied aspects of each region

E. Head and Neck

- Scalp, face and Parotid region, Facial nerve Palsy, Cervical fascia, General arrangement of triangles of neck with contents, Cranial cavity with dural venous sinuses, Vertebral canal, Orbit (muscles, nerves and vessels), Ganglia- Otic, Ciliary, submandibular and Pterygopalatine, Submandibular region & submandibular ganglion, Temporal & infratemporal regions, Lymph nodes & lymphatic drainage of head & neck, Deep structures in neck, Nose and paranasal air sinuses, Tongue, Mouth and Pharynx , Larynx , External, middle and internal Ear, Eyeball, Sympathetic chain, Cranial Nerves with their, nuclei, Blood Vessels of head & neck, Joints of head and neck, Applied anatomy of all regions of head and neck

6. Microscopic anatomy/ Histology

- Epithelial tissue – Various types that correlate to its function, ultrastructure, Glands- Classification and structure-function correlation of the same, Connective tissue- Various types with functional correlation, ultrastructure, Cartilage - Microanatomy of Hyaline, Elastic and Fibrocartilage, Bone – Various types and structure- function correlation of the same, Muscular tissue- Microanatomy of smooth, cardiac and striated muscles, Nervous Tissue- Microanatomy of spinal cord, cerebral cortex and cerebellum, Cardiovascular system- Microanatomy of elastic and muscular arteries, veins, capillaries, heart, Lymphoid-tissue- Microanatomy of Spleen, thymus, tonsil, lymph node, Digestive system- Microanatomy of tongue, salivary glands, oesophagus, stomach, duodenum, jejunum, ileum, appendix, large gut, liver, gall bladder and pancreas, Urinary System-Microanatomy of kidney, ureter and urinary bladder, Male reproductive system- Microanatomy of testis, epididymis, vas deferens, prostate, Female reproductive system- Microanatomy of ovary, fallopian tube, uterus, cervix, mammary gland lactating, non –lactating, placenta, umbilical cord, Integumentary System - Microanatomy of skin, Respiratory system- Microanatomy of Epiglottis, Trachea and Lungs , Endocrine system - Microanatomy of pituitary, pineal, thyroid, parathyroid and adrenal, Special sense organs- Microanatomy of cornea and retina

7. Genetics

- Anatomical principles underlying contraception, Structure of Chromosomes with classification, Structural and numerical chromosomal aberrations, Technique of karyotyping with its applications, SKY, FISH & other recent advances, Lyon Hypothesis, Various modes of inheritance with examples, Pedigree charting for the various types of inheritance & examples of diseases of each mode of inheritance, Multifactorial inheritance with examples, Genetic basis & clinical features of Achondroplasia, Cystic fibrosis, Haemophilia, Sickle cell anaemia, Duchene’s muscular dystrophy, vitamin D resistant rickets, Edward syndrome, Prader Willi syndrome & Patau syndrome, Mosaics and chimeras, Genetic basis of variation: polymorphism and mutation, Principles of genetic counselling, Dermatoglyphics, Teratogenesis, Molecular genetics-DNA organization of chromosomes, molecular structure of nucleic acids, classification of DNA & RNA, gene and genetic code, types of genes, genetic control on protein biosynthesis, penetrance and expressivity, Immunogenetics, Developmental genetics, Population Genetics, Molecular diagnosis for prevalent diseases in Punjab e.g Thalessemia- PCR-ARMS technique, Reverse Dot Blot technique, Alpha thalessemia - deletion analysis and sequencing

8. GENERAL EMBRYOLOGY

- Introduction: Stages of human life, explain the terms phylogeny, ontogeny, trimester,

viability, Uterine changes occurring during the menstrual cycle, spermatogenesis, Oogenesis, growth of ovarian follicle and ovulation, Second week of development- cleavage, blastocyst formation, Implantation: types, formation of decidua, its subdivisions and abnormal implantation, development of trophoblast, bilaminar germ disc, Extraembryonic mesoderm, Extraembryonic coelom, connecting stalk, formation of prochordal plate, Third week of development- Primitive streak, Primitive node, formation of intra - embryonic mesoderm, trilaminar germ disc, notochord, buccopharyngeal and cloacal membranes, pericardial bar, intra-embryonic mesoderm, intra - embryonic coelom, derivatives of ectoderm, endoderm, mesoderm, Fourth to eighth week of development- Formation of somites, neural tube, neural tube defects, cephalo - caudal folding and lateral foldings of embryo, formation of gut and its subdivisions, vitelline duct, Foetal Membranes - Formation, functions & fate of chorion, amnion, yolk sac, allantois and decidua, Placenta- Formation, features, types, foetomaternal circulation, placental barrier, role of placental hormones in uterine growth & parturition, Umbilical cord- Formation & structure, various types of umbilical cord attachments, Prenatal Diagnosis- indications, process and disadvantages of amniocentesis, chorion villus biopsy and other methods, Twinning- Embryological basis of monozygotic & dizygotic twins

9. SYSTEMIC EMBRYOLOGY

- Development of pharyngeal arches, structures developed from it, Pharyngeal pouches and pharyngeal clefts, Development of Face, oral cavity, palate, Development of respiratory system, Development of nervous system, Development of skeletal system and muscular system, Development of body cavities, Development of digestive system, Rotation of gut, development of Liver, gall bladder, spleen and pancreas, development of hindgut, Development of urinary system, Development of genital system in male, Development of genital system in female, Development of heart loop, formation of chambers, Development of interatrial and interventricular septum, Embryological basis of atrial septal defect, ventricular septal defect, Fallot's tetralogy, Development of arteries, Development of Portal vein, inferior vena cava, Foetal circulation, Development of Eye, Development of Ear, Development of glands – Exocrine and endocrine, Development of Mammary gland, Congenital malformations associated with each system

10. Neuroanatomy

- Cells of the nervous System – Structure and functions of neurons and neuroglia, Peripheral nervous System - spinal nerves, plexus formation and peripheral Ganglia, Autonomic nervous System- Subdivisions, distribution, ganglia, functions and clinical applications, Spinal Cord- External & internal features, transverse section at sacral, lumbar, thoracic, cervical levels, grey matter & white matter, functional columns of nuclei, ascending & descending tracts, central canal, blood supply, applied anatomy, lumbar puncture, Meninges- Extent & modifications, CSF- Composition, secretion, circulation with its applied anatomy, cisterns, Medulla Oblongata - External & internal features, transverse sections, cranial nerve nuclei in medulla oblongata, blood supply, medial and lateral medullary syndrome, Pons- External & internal features, cranial nerve nuclei in pons, transverse sections, blood supply, applied anatomy, Mid brain- External & internal features, transverse sections, cranial nerve nuclei in midbrain, blood supply, applied anatomy, Cerebellum- Subdivisions with functional and evolutionary correlations, structure, submerged nuclear masses, structural organization, Connections of cerebellar cortex, cerebellar peduncles, cerebellar dysfunction, Thalamic Complex- Subdivisions and functions, connections, thalamic nuclei, applied anatomy, Hypothalamus, metathalamus, epithalamus, subthalamus – Parts, gross relations, major nuclei, connections, applied anatomy, Cerebral hemisphere- Surfaces, sulci, gyri, poles, functional areas, structure and connections of basal ganglia, white matter, structural organization, blood supply and applied anatomy Limbic System-

Parts, connections, functions and clinical correlations, Ventricular system- Boundaries and features of Lateral, 3rd and 4th ventricle, Cranial nerves -Nuclei, course, distribution, branches, lesions.

11. Radiological anatomy

Principles of various procedures

- Plain X ray abdomen, Barium swallow, Barium meal, Barium enema, Cholecystography, Intravenous Pyelography, Hysterosalpingography, Arteriography, Ultrasound, CT Scan, MRI, PET scan, SPECT scan, other special procedures to visualize viscera and cavities

12. Forensic anatomy

- Anatomy applicable to forensic medicine with respect to age determination, sexing of bones and other forensic aspects.

13. Anthropometry

- Anthropometry measurements (height, weight, body mass index (BMI), body circumferences (waist, hip and limbs), skinfold thickness, Measuring instruments Procedures, Types, Characteristics, Uses, Importance, Anthropometry and biomechanics

SCOPE AND OBJECTIVE OF M.Sc. MEDICAL BIOCHEMISTRY

Master of Science (M. Sc.) in Medical Biochemistry is a postgraduate programme which offers a specialization in clinical field.

M.Sc. in Medical Biochemistry is a comprehensive study of biological processes with the applicability of chemistry in the procedures. The study of the program deals extensively with the subjects of biology and medicine combined together. This course is extensively career oriented which helps graduates take up lucrative career options after its completion. Furthermore, taking up the study of master's program in the field of Medical Biochemistry builds a strong foundation for students who wish to pursue research programs in the future.

- i The program aids candidates in polishing their skills of analyzing the subject, strengthening their memory as well as gain a logical mindset to get to the depth of the study.
- ii The program study renders a balance between classroom study and projects conducted as applicable to the program.
- iii The students are instilled with the qualities to handle technical equipment, conduct study and draw statistical evidence.
- iv Students gain the ability to use their knowledge to strengthen their memory, stamina, patience and improve their analytical and evaluative skills. The topics of study include the process of metabolism, growth, heredity, and reproduction.
- v Graduates after the successful completion of the course can venture into the areas of teaching, research, and technology sectors.
- vi They have a wide arena of opportunity in the field of Forensic science, Food companies, Biotechnology, and environment agency. The aim of the course dwells in imbining students with all the qualities and study in a refined manner making them capable for future study of research benefitting them on the career front.

DISTRIBUTION OF MARKS & SCHEME OF EXAMINATION FOR FIRST YEAR MEDICAL BIOCHEMISTRY

| Paper code | Course Title | Course type | | Total |
|---|-------------------|-------------|-----------|-------|
| | | Theory | Practical | |
| BIC.501A | Molecular Biology | 50 | 50 | 100 |
| BIC. 502A | Immunochemistry | 50 | 50 | 100 |
| Choosing the subject of the thesis and supervisor Writing the protocol | | | | |

Note: The awards will be retained by the Heads of the Department for the purpose of calculating Internal Assessment in the Second Year.

DISTRIBUTION OF TEACHING HOURS FOR M.SC. MEDICAL BIOCHEMISTRY FIRST YEAR

| Paper | Subject | Theory hour | Practical hour | Clinical Practice hour | Total hour |
|------------------|-------------------|-----------------|-----------------|------------------------|------------------|
| BIC.501A | Molecular Biology | 100 hour | 100 hour | 1200 hour | 1600 hour |
| BIC. 502A | Immunochemistry | 100 hour | 100 hour | | |
| Total | First year | 200 hour | 200 hour | 1200 hour | 1600 hour |

DISTRIBUTION OF MARKS & SCHEME OF EXAMINATION FOR SECOND YEAR MEDICAL BIOCHEMISTRY

| Paper codes | Subject | Marks | Internal Assessment | Viva |
|--------------|--|------------|---------------------|------|
| BIC.501A | Molecular Biology | 100 | 50 | 50 |
| BIC. 502A | Immunochemistry | 100 | | |
| BIC.503A | Nutrition and Dietetics | 100 | | |
| BIC.504A | Clinical Biochemistry and Medical Statistics | 100 | | |
| Total | | 500 | | |
| BIC.505A | Practical | 200 | | |
| BIC. 600 | Thesis | 100 | 50 | 50 |
| Total | | 800 | | |

DISTRIBUTION OF TEACHING HOURS FOR M.SC. MEDICAL BIOCHEMISTRY SECOND YEAR

| Paper | Subject | Theory hour | Practical hour | Clinical Practice hour | Total hour |
|--------------|--|-----------------|-----------------|------------------------|------------------|
| BIC.503A | Nutrition and Dietetics | 100 hour | 100 hour | 1200 hour | 1600 hour |
| BIC.504A | Clinical Biochemistry and Medical Statistics | 100 hour | 100 hour | | |
| Total | Second year | 200 hour | 200 hour | 1200 hour | 1601 hour |

SYLLABUS OF M.Sc. MEDICAL BIOCHEMISTRY

Paper I: Molecular Biology

Nucleic acids-structure and function; organisation, replication and synthesis of DNA; Transcription and Synthesis of RNA; genetic code, Translation and synthesis of proteins; gene expression, recombinant DNA and biotechnology-cloning, gene-mapping and therapy.

Paper II: Immunochemistry

Immune system; Immunoglobulins-structure and function; Antigenicity ; Antigen-antibody reactions, Autoimmunity, Cell mediated immunity; Histocompatibility antigens; clinical immunology, Estimation Of immunoglobulins, Synthesis Of Immunoglobulins, Monoclonal Antibodies.

Paper III: Nutrition and Dietetics

Introduction: energy requirements; Basal metabolic rate; specific dynamic action, Balanced diet, Caloric and Nutritive value of foods; infant nutrition; Nutrition and fertility; Protein caloric value, malnutrition- Kwashiorkor and Marasmus, Recommended dietary allowances in health and disease, Biochemistry of ageing, toxicants in foods

Paper IV: Clinical Biochemistry and Medical Statistics

Metabolic disorders of carbohydrate, lipids, nucleic acids, proteins; hormones, Vitamins and minerals, inborn errors, blood and its disorders, clinical enzymology, quality control and Laboratory

methodology, acid base balance, water balance , Elementary knowledge and medical statistics, Recent advances in Biochemistry.

Practicals

- Safety Measures , First Aid and General laboratory glass water
- Analysis of normal urine sample.
- To analyses organic constituents of urine
- To analyses inorganic constituents of urine
- Qualitative estimation of urine for its abnormal
- Continents:- Sugar, blood, proteins, ketone bodies, porphobilinogen
- Quantitative estimation of .Blood sugar, urinary sugar, Blood urea, urinary, Serum creatinine, Serum and urinary Uric Acid, Serum Protein, Serum Total Cholesterol and HDL, SGOT, SGPT, Serum AFP, CSF analysis, Measurement of pH Isolation and determination of DNA and RNA from tissues.

Techniques:

- a. Colorimetry and Spectrophotometry
 - b. Semiautoanalyzers
 - c. Autoanalyzers
 - d. Electrophoresis
 - e. Chromatography
 - f. ELISA
 - g. Chemiluminescence
- Liver Function tests
 - Kidney Function tests
 - CSF analysis
 - Analysis of Barbiturates and Salicylates
 - Flame Photometry
 - Estimation of hormones
 - a. Thyroid Hormones
 - b. Insulin
 - c. C peptides
 - Estimation of tumour markers
 - a. AFP
 - b. Beta HCG
 - c. CEA
 - Estimation of drugs
 - Use of blood gas analyser

SCOPE AND OBJECTIVE OF M.Sc. MEDICAL MICROBIOLOGY

A full-time M.Sc. Medical Microbiology program lasts two years. This course needs more practical knowledge than academic comprehension. Students study Bacteriology, Immunology, Virology, Mycology, R-DNA Technology, Media Microbiology, and Environmental Microbiology etc. The possible job roles that the students can look forward to in this field are Researchers, Biomedical Scientist, Science Writer, Medical Representative and much more.

Learning Activities and Training

- Learn a wide spread portion of Medical Science
- In-depth knowledge of Virus, infections, pathogens, parasites, molecules, bacteria, and fungus etc.
- Detailed framed knowledge and information of human diseases and its preventions.
- Students are required to inculcate following skills: Critical thinking, Critical awareness, Practical Skills, Applicability, Accountability
- Generating new ideas and its successful Clinical representation and
- Self mutation regarding the subject and the knowledge etc.
- The global rise in microbial infections is being exacerbated by the fast development of drug-resistant variations and opportunistic infections by microorganisms.
- Choosing the MSc Medical Microbiology course will help students gain a holistic view of this medical field and understand the role of genomics and molecular approaches in diagnostics

DISTRIBUTION OF MARKS & SCHEME OF EXAMINATION FOR FIRST YEAR MEDICAL MICROBIOLOGY

| Paper code | Course Title | Course type | | Total |
|---|--------------------------------------|-------------|-----------|-------|
| | | Theory | Practical | |
| MIC.501A | General Microbiology and Immunology | 50 | 50 | 100 |
| MIC. 502A | Systematic Bacteriology and Mycology | 50 | 50 | 100 |
| Choosing the subject of the thesis and supervisor Writing the protocol | | | | |

Note: The awards will be retained by the Heads of the Department for the purpose of calculating Internal Assessment in the Second Year.

DISTRIBUTION OF TEACHING HOURS FOR M.SC. MEDICAL MICROBIOLOGY FIRST YEAR

| Paper | Subject | Theory hour | Practical hour | Clinical Practice hour | Total hour |
|--------------|--------------------------------------|-----------------|-----------------|------------------------|------------------|
| MIC.501A | General Microbiology and Immunology | 100 hour | 100 hour | 1200 hour | 1600 hour |
| MIC. 502A | Systematic Bacteriology and Mycology | 100 hour | 100 hour | | |
| Total | First year | 200 hour | 200 hour | 1200 hour | 1600 hour |

DISTRIBUTION OF MARKS & SCHEME OF EXAMINATION FOR SECOND YEAR MEDICAL MICROBIOLOGY

| Paper codes | Subject | Marks | Internal Assessment | Viva |
|--------------|--|------------|---------------------|------|
| MIC.501A | General Microbiology and Immunology | 100 | 50 | 50 |
| MIC. 502A | Systematic Bacteriology and Mycology | 100 | | |
| MIC.503A | Parasitology and Virology | 100 | | |
| MIC.504A | Recent Advances in Medical Microbiology and Medical Statistics | 100 | | |
| Total | | 500 | | |
| MIC.505A | Practical exercises | 200 | | |
| MIC. 600 | Thesis | 100 | 50 | 50 |
| Total | | 800 | | |

DISTRIBUTION OF TEACHING HOURS FOR M.Sc. MEDICAL MICROBIOLOGY SECOND YEAR

| Paper | Subject | Theory hour | Practical hour | Clinical Practice hour | Total hour |
|--------------|--|-------------|----------------|------------------------|------------|
| MIC.503A | Parasitology and Virology | 100 hours | 100 hours | 1200 hour | 1600 hours |
| MIC.504A | Recent Advances in Medical Microbiology and Medical Statistics | 100 hours | 100 hours | | |
| Total | Second year | 200 hours | 200 hours | 1200 hours | 1600 hours |

SYLLABUS OF M.Sc. MEDICAL MICROBIOLOGY

GENERAL MICROBIOLOGY AND IMMUNOLOGY

| Sr. No. | Topic of Lecture | Contents |
|---------|--|--|
| 1. | Introduction and Historical Importance of Medical Microbiology in Background | Importance of Medical Microbiology in diagnosis and prevention of infectious diseases. Contribution of Antony van Leeuwenhook, Pasteur, Lister, Robert Koch. |
| 2. | Definition | Medical Microbiology which includes the branches, Bacteriology, Virology, Mycology, Parasitology and Immunology |
| 3. | Morphology of Bacteria and classification | Morphological classification, Method of studying of bacteria, staining methods and their principles, preparation of stains and reagents preparation of smears, modification of following staining methods. Simple staining, differential staining (Gram staining, AFB staining), Negative staining, Fluorochrome staining, staining of volution granules, staining of spirochetes, spore staining, capsular staining, flagellar staining |
| 4. | Physiology of Bacteria including growth requirement and metabolism | Nutrition and growth of bacteria, growth curve Culture Media:- Definition, Classification important constituents of culture media, preparation of culture media, quality control of culture media. Inoculation & purification methods in bacteriology. Quantitation of bacterial growth. Preservation of bacteria. |
| 5. | Identification of Bacteria | Specimen collection, processing of specimens culture methods, preparation of media and reagents, |

| | | |
|-----|--|--|
| | | interpretation quality control for biochemical reactions, and serological tests |
| 6. | Sterilization and Disinfections | Definition of sterilization, disinfection, Asepsis, antisepsis, Enumeration of physical methods of sterilization which includes principles, Detail on working and efficacy testing of autoclave, Hot air oven, Inspector and, Koch's steamer. Concept of central sterile Supply Department (CSSD), Modes Aldehydes, Acids, Alcohol, Heavy metals, Oxidizing agents. Universal Biosafety precautions, quality control. Common glassware for microbiology and its cleaning and sterilization. 13 |
| 7. | Chemotherapy | Antimicrobial susceptibility tests, disk diffusion test Kirby – Bauer's method and Stoke's method. Tube dilution test i.e. Minimum inhibitory concentration test. Briefly about antibiotic policy. |
| 8. | Bacterial Genetics and Drug Resistance | Definition, Genotype and Phenotype, Basic structure of DNA, Mutation, Transduction, Transformation, Conjugation and R factor. Mechanisms of Drug resistance and transfer of resistance. Brief introduction to genetic engineering. |
| 9. | Normal Flora | Introduction - various sites, types and role. |
| 10. | Waste Disposal | Definition of waste, Classification, Segregation, Transport and Disposal. |

IMMUNOLOGY

| Sr. No. | Topic of Lecture | Contents |
|---------|------------------------|--|
| 1. | Introduction | Definition of immunity, types of immunity, factors responsible, active and passive immunity, local immunity |
| 2. | Antigens | Definition, types, antigen determinants, properties of antigen. |
| 3. | Antibodies | Definition, nature, structure of immunoglobulin – immunoglobulin classes, Physical and biological properties of immunoglobulin. |
| 4. | Serological Reactions | application of precipitation, Gel diffusion, Agglutination, Complement fixation, ELISA, RIA, immunofluorescence test, neutralization and opsonization. |
| 5. | Structure and function | Primary lymphoid organs – thymus, bursa of Fabricius, of Immune System Bone marrow. Secondary lymphoid organs lymph nodes, spleen, mucosa – associated lymphoid tissue, gut associated lymphoid tissue (MALT and GALT). Cells of immune system – lymphocytes, T cell, B cells, Null cells, Antigen presenting cells (APC). |
| 6. | Immune Response | Humoral – Primary and Secondary immune responses, principle and uses of monoclonal antibodies, factors affecting immune response. CMI – Definition, types, role of T cells and macrophages. Immune tolerance – Definition and mechanism of tolerance. |
| 7. | Complement | Definition, components, synthesis, pathways of activation, role and biological functions, measurement |
| 8. | Hypersensitivity | Definition, Classification, Difference between immediate and delayed reactions, mechanism and manifestation of anaphylaxis, types and tests for anaphylaxis. |
| 9. | Autoimmunity | Autoimmunity Definition, Mechanism, Classification and Pathogenesis. |

| | | |
|-----|-------------|---|
| 10. | Vaccination | Nature of vaccines, rationale and dosage. Principles of Immunization. Future Vaccines |
|-----|-------------|---|

SYSTEMIC BACTERIOLOGY AND MYCOLOGY

| Sr. No. | Topic of Lecture | Contents |
|---------|--|---|
| 1. | Gram Positive Cocci | Staphylococcus Classification, Morphology, Pathogenesis, Laboratory diagnosis, Streptococcus/Enterococcus/Pneumococcus Classification, Morphology, Pathogenesis, Laboratory diagnosis, Rapid bedside diagnostic tests. |
| 2. | Gram Negative Cocci | Neisseria. Morphology, Pathogenesis, Laboratory diagnosis Rapid bedside diagnostic tests |
| 3. | Gram Positive Bacilli | C. diphtheriae. Morphology, Pathogenesis, Laboratory diagnosis Mycobacterium tuberculosis. Classification, Morphology, Growth on L.J., Pathogenesis, Laboratory diagnosis, Atypical Mycobacteria. Classification, Morphology Growth on L.J., Pathogenesis, Laboratory diagnosis. M. leprae Classification, Morphology Pathogenesis Laboratory Diagnosis. |
| 4. | Cl.welchii, Cl tetani, and Cl. botulinum | Classification , Morphology, Laboratory diagnosis, |
| 5. | Anaerobic Gram Negative Bacilli (Nonspore bearing) | Classification, Morphology, Cultural characteristics, Pathogenesis, Laboratory diagnosis. |
| 6. | Enterobacteriaceae E.coli, Klebsiella, Proteus | General Characters and Classification. Morphology, Pathogenesis, Laboratory diagnosis |
| 7. | Salmonella, Shigella | Classification, Morphology, Pathogenesis, Laboratory diagnosis |
| 8. | Yersinia | Morphology, Pathogenesis, Laboratory diagnosis.. |
| 9. | Haemophilus, Bordetella Brucella | Morphology, Pathogenesis, Laboratory diagnosis.. |
| 10. | Vibrio, Campylobacter, H.pylori | Classification, Morphology, Pathogenesis, Laboratory diagnosis |
| 11. | Pseudomonas | Morphology, Resistance, Pathogenesis, Laboratory diagnosis, |
| 12. | Spirochaetes | Classification, Morphology, Resistance, Pathogenesis, Laboratory diagnosis. |
| 13. | Actinomycetes, Nocardia | Morphology, Pathogenesis, Laboratory diagnosis. |
| 14. | Rickettsia, Chlamydia, Mycoplasma | Classification, Morphology, Pathogenesis, Laboratory diagnosis |
| 15. | Bacteriology of Air, Water, Milk and Food | Bacterial counts. |

MYCOLOGY

| Sr. No. | Topic of Lecture | Contents |
|---------|----------------------|--|
| 1. | General Mycology | Morphological and clinical classification of fungi, Method of identification. Laboratory diagnosis of fungus, including sample collection. |
| 2. | Superficial Mycosis | Enumerate, clinical feature, morphological features. Predisposing factors, Lab diagnosis – Specimen collection, Microscopy, Cultural characteristics of important species. |
| 3. | Subcutaneous Mycosis | Enumerate, Predisposing factors, Mycetoma, Rhinosporidiosis, Pathogenesis and Lab Diagnosis. Mention briefly about Sporotrichosis and subcutaneous phycomycosis |
| 4. | Systemic Mycoses | Classification, Predisposing factors, Candida, Cryptococcus, Histoplasma capsulatum morphology, Pathogenesis, Lab Diagnosis |

| | | |
|----|--------------------------------|---|
| | | with cultural characteristic, blastomycosis, Paracoccidiomycosis, coccidiomycosis. |
| 5. | Opportunistic fungal Infection | Classification, Predisposing factors, Morphology of Mucor, Aspergillus, Pneumocystis carinii. |

PRACTICAL

General Microbiology: Preparation of bacterial smear and staining – Gram's, Acid-fast, staining of bacterial spores, flagella, capsule, spirochaetes. Preparation of media, cultivation of bacteria, Biochemical tests for identification of bacteria, preservation of stock cultures of bacteria.

Systemic Bacteriology: Transport, primary smear, Hanging drop, Selection of media, Isolation of bacteria from mixed cultures, Study of morphological, cultural and biochemical characters of common bacterial pathogens, serotyping of bacteria. Animal pathogenicity testing, Antibacterial drug Sensitivity, Serological reactions and their interpretation, Newer methods of diagnosis.

PARASITOLOGY AND VIROLOGY

| Sr. No. | Topic of Lecture | Contents |
|---------|-----------------------------------|--|
| 1. | Introduction to Parasitology | Parasite:- Their nature, classification, explanation of terminology, emerging parasitic infections |
| 2. | E. histolytica | Geographical distribution, habitat, morphology, life cycle, Pathogenesis, laboratory diagnosis. |
| 3. | Flagellates & Free living amoebae | Giardia, Trichomonas, Free living amoebae-Negleria, Acanthamoeba, Balamuthia., Morphology, lifecycle, Pathogenesis, laboratory diagnosis. |
| 4. | Haemoflagellates | Leishmania donovani-Geographical distribution habitat Morphology, Life Cycle, Pathogenesis, Laboratory diagnosis, Brief account of Trypanosomes |
| 5. | Malaria | Malaria parasites:- Geographical distribution, habitat, Morphology, Life cycle, Pathogenesis, Laboratory Diagnosis |
| 6. | Miscellaneous Pathogenic Protozoa | Toxoplasma. Brief account on Cryptosporidium, Protozoa Isospora, Balantium Coli. |
| 7. | Cestodes | Taenia saginata and solium, Echinococcus granulosus Life cycle, Morphology, Pathogenesis, Laboratory diagnosis. Brief account of H.nana, D.latum. |
| 8. | Trematodes | Schistosomiasis – Geographical distribution, habitat, Morphology, Life cycle, Pathogenesis, Laboratory Diagnosis. Brief account of Fasciola hepatica. |
| 9. | Intestinal Nematodes | Geographical distribution, habitat, Morphology, Life cycle, Pathogenesis, Laboratory diagnosis, of E. vermicularis, T. Trichura. Brief account on S. stercoralis Life cycle, Morphology, Laboratory diagnosis. |
| 10. | Tissue Nematodes | Geographical distribution, habitat, Morphology, Life cycle, Morphology, Pathogenesis, Laboratory diagnosis, D. medinensis, in brief – T. spiralis. |

VIROLOGY

| Sr. No. | Topic of Lecture | Contents |
|---------|------------------|---|
| 1. | General Virology | Basic structure, Shape, Size, Symmetry, resistance, multiplication, classification of viruses, pathogenesis Laboratory diagnosis of viral infections, Collection of samples, Transport, Cultivation and method of diagnosis., |

| | | |
|----|---------------------------|--|
| 2. | Herpes Viruses | List of viruses included, Lesions produced, pathogenesis and latency, laboratory diagnosis |
| 3 | Hepatitis | Viruses Immunity, Resistance, Laboratory Diagnosis |
| 4. | Orthomyxo Viruses | Morphology, Pathogenesis, Classification, antigenic variation in influenza virus. |
| 5 | Arboviruses | List of arboviruses prevalent in India, Dengue, Definition, Classification, Pathogenesis, Laboratory diagnosis |
| 6 | Retroviruses HIV/AIDS, | Morphology, Pathogenesis , Immunity, Lab diagnosis, Laboratory tests and their interpretation, Universal precautions, Specific precautions, Recent trends in diagnosis |

MEDICAL STATISTICS

| Sr. No. | Contents |
|---------|--|
| 1. | Introduction Statistics: Meaning of statistics, Population & sample, Descriptive & inferential statistic, Data & its collection, Quantitative & Qualitative data, Measurement of data (NOIR), Sampling techniques |
| 2. | Presentation of data: Frequency Distribution, Types of graph-Line, Bar chart, Pie diagram, Histogram, Frequency polygon/Construction of Contingency table |
| 3. | Measures of Central tendency: Arithmetic Mean, Geometric Mean, Harmonic Mean Median, Discrete data & grouped data, Mode Discrete data & grouped data Measures of relative positions: Quartile, Decile, Percentiles |
| 4. | Measures of dispersion Range, Quartile deviation, Mean deviation & Standard deviation, Coefficient of variation |
| 5. | Statistical of distribution Normal Distribution, probability, Skewness, Kurtosis |
| 6. | Sample size determination |
| 7. | Confidence interval estimates Testing of hypotheses, Errors of sampling, Type 1 error, Type 2 error, Non parametric test- Chi square test |
| 8. | Parametric test Z test, Student 't' test unpaired & paired, ANOVA |
| 9. | Correlation & regression Measures of agreement: Kappa statistics & Intra class correlation coefficient (ICC) |

PRACTICAL

Immunology

Tests based on agglutination, latex agglutination, precipitation, Immunodiffusion-RID, Double ID, Immunoelectrophoresis, Counter current immunoelectrophoresis, Haemagglutination, Haemagglutination inhibition, ELISA, Delayed Hypersensitivity tests, Western blot demonstration, Immunofluorescent technique.

Parasitology

Collection & transport of specimens Examination of stool for parasites. Examination of blood & bone marrow for parasites.

Examination of other body fluids & biopsy specimens for parasites.

Culture techniques for parasites. Serological diagnostic methods, skin tests.

Mycology

Media & Strains preparation for Mycology, Diagnostic Methods in Mycotic Infections, Identification test in Mycology, Serological tests in Mycology Skin tests.

Recommended Books:

1. Practical Medical Microbiology – Mackie and McCartney – latest Ed
2. Text book of Medical Microbiology – CP Baveja Theory
3. Text book of Medical Microbiology – CP Baveja Practical
4. Medical Lab Manual – Vol I – Monica Cheesbrough - ELBS
5. Medical Lab Manual – Vol II – Monica Cheesbrough - ELBS

SCOPE AND OBJECTIVE OF M.Sc. MEDICAL PHYSIOLOGY

The candidate qualifying for the award of M.Sc. (Physiology) should be able to:

1. Demonstrate comprehensive understanding of physiology as well as that of the applied disciplines;
2. Demonstrate adequate knowledge of the current developments in medical sciences as related to physiology
3. Teach undergraduates and postgraduates in physiology
4. Plan and conduct research;
5. Plan educational programs in physiology utilizing modern methods of teaching and evaluation; and Organize and equip physiology laboratories.

Objectives

- Demonstrate comprehensive understanding of the structure, function and development of the human body as related to physiology.
- Demonstrate elementary understanding of the clinical applications of physiology,
- Critically evaluate the impact of the recent information on the genesis of current concepts related to various topics of physiology
- Recapitulate the information Imparted to the undergraduate students of physiology,
- Perform and critically evaluate the practical exercises done by undergraduate students.
- Identify a research problem which could be basic, fundamental or applied in nature; define the objectives of the problem and give a fair assessment as to what is expected to be achieved at the completion of the project; design and carry out technical procedures required for the study; record accurately and systematically the observations and analyze them objectively: effectively use statistical methods for analyzing the data; interpret the observations in the light of existing knowledge and highlight in what way his observations have advanced scientific knowledge; write a scientific paper on the lines accepted by standard scientific journals;
- Design, fabricate and use indigenous gadgets for experimental purposes;
- Demonstrate familiarity with the principles of medical education including definitions of objectives, curriculum construction, merits and merits of various tools used in the teaching learning process: use of learning aids and learning settings, and methods of evaluation;
- Share learning experiences with the undergraduate and postgraduate students using appropriate pedagogical skills and methods;
- Draw out meaningful curricula for teaching medical and paramedical courses; give lucid, interactive lectures, presenting the information in a logical, simple and comprehensive manner; generate interest and curiosity amongst the students during lectures; give practical demonstrations;
- Handle and order for stores, draw up lists of equipment required to equip physiology laboratories

Department in the following subjects:

DISTRIBUTION OF MARKS & SCHEME OF EXAMINATION FOR FIRST YEAR MEDICAL PHYSIOLOGY

| Paper code | Course Title | Course type | | Total |
|---|--|-------------|-----------|-------|
| | | Theory | Practical | |
| PHY.501A | General and Nerve Muscular Physiology | 50 | 50 | 100 |
| PHY. 502A | Cardiovascular, Renal and Respiratory Physiology | 50 | 50 | 100 |
| Choosing the subject of the thesis and supervisor Synopsis preparation | | | | |

Note: The awards will be retained by the Heads of the Department for the purpose of calculating Internal Assessment in the Second Year.

DISTRIBUTION OF TEACHING HOURS FOR M.Sc. MEDICAL PHYSIOLOGY FIRST YEAR

| Paper | Subject | Theory hour | Practical hour | Clinical Physiology Practice hour | Total hour |
|--------------|--|-----------------|-----------------|-----------------------------------|------------------|
| PHY.501A | General and Nerve Muscle Physiology | 100 hour | 100 hour | 1200 hour | 1600 hour |
| PHY. 502A | Cardiovascular, Renal and Respiratory Physiology | 100 hour | 100 hour | | |
| Total | First year | 200 hour | 200 hour | 1200 hour | 1600 hour |

DISTRIBUTION OF MARKS & SCHEME OF EXAMINATION FOR SECOND YEAR MEDICAL PHYSIOLOGY

| Paper codes | Subject | Marks | Internal Assessment | Viva |
|--------------|---|------------|---------------------|------|
| PHY.501A | General and Nerve Muscular Physiology | 100 | 50 | 50 |
| PHY. 502A | Cardiovascular, Renal and Respiratory Physiology | 100 | | |
| PHY.503A | Nutrition, Metabolism, Gastrointestinal, Endocrines & Reproductive Physiology | 100 | | |
| PHY.504A | Nervous system and Special Senses | 100 | | |
| Total | | 500 | | |
| PHY.505A | Practical | 200 | | |
| PHY. 600 | Thesis | 100 | 50 | 50 |
| Total | | 800 | | |

DISTRIBUTION OF TEACHING HOURS FOR M.Sc. MEDICAL PHYSIOLOGY SECOND YEAR

| Paper | Subject | Theory hour | Practical hour | Clinical Physiology Practice hour | Total hour |
|--------------|---|-----------------|-----------------|-----------------------------------|------------------|
| PHY.503A | Nutrition, Metabolism, Gastrointestinal, Endocrines and Reproductive Physiology | 100 hour | 100 hour | 1200 hour | 1600 hour |
| PHY.504A | Nervous system & Special senses | 100 hour | 100 hour | | |
| Total | Second year | 200 hour | 200 hour | 1200 hour | 1600 hour |

SYLLABUS OF M.Sc. MEDICAL PHYSIOLOGY

1. GENERAL AND NERVE MUSCLE PHYSIOLOGY-

General & Cellular Physiology:

Cell as the living unit of the body, The internal environment, Homeostasis, Control systems, Organization of a cell, Physical structure of a cell Transport across cell membranes, Functional systems in the cells, Genetic code, its expression, and regulation of gene expression • Cell cycle and its regulation

Hematology

Erythrocytes, Erythropoiesis, - structure & function of RBC's - formation of hemoglobin -destruction & fate of RBCs -anemias,- polycythemia, Leucocytes -general characteristics -genesis & life span of WBC classification& functions of each type of WBC -leucopenia -leukemias, Blood groups,Classification , - Antigenicity - Agglutination - blood typing -principles of transfusion medicine, Hemostasis - components of hemostasis - mechanisms of coagulation - coagulation tests ,-anticoagulants, Immunity Innate immunity, Acquired immunity, Allergy, hypersensitivity and immunodeficiency, Psychoneuroimmunology

Nerve & Muscle Physiology

Resting membrane potential, Action potential •Classification of nerve fibres, Nerve conduction, Degeneration and regeneration in nerves, Functional anatomy of skeletal muscle, Neuro-muscular transmission and blockers, •Excitation-contraction coupling, Mechanisms of muscle contraction, Smooth muscle

2. CARDIOVASCULAR, RENAL AND RESPIRATORY PHYSIOLOGY

Renal Physiology & Fluid Balance

Body fluid compartments, Water balance; regulation of fluid balance, Urine formation, Regulation of extracellular sodium & osmolarity, Renal mechanisms for the control of blood volume, blood pressure & ionic composition, Regulation of acid-base balance, Micturition, Diuretics, Renal failure

Cardio-vascular Physiology

Properties of cardiac muscle, Cardiac cycle, Heart as a pump, Cardiac output, Nutrition & metabolism of heart, Specialized tissues of the heart, Generation & conduction of cardiac impulse, Control of excitation & conduction, Electrocardiogram, Arrhythmias, Principles of Hemodynamics, Neurohumoral regulation of cardiovascular function, Microcirculation & lymphatic system, Regional circulations, Cardiac failure, Circulatory shock

Respiration

Functional anatomy of respiratory system, Pulmonary ventilation, Alveolar ventilation, Mechanics of respiration, Pulmonary circulation, Pleural fluid, Lung edema, Principles of gas exchange, Oxygen & carbon-dioxide transport, Regulation of respiration, Hypoxia, Oxygen therapy & toxicity Artificial respiration

Environmental Physiology

Physiology of hot environment, Physiology of cold environment, High altitude, Aviation physiology, Space physiology, Deep Sea diving & hyperbaric conditions

3. NUTRITION, METABOLISM, GASTROINTESTINAL SYSTEM, ENDOCRINES & REPRODUCTIVE PHYSIOLOGY

Nutrition & Metabolism

Carbohydrates, Fats, Proteins, Minerals, Vitamins, Dietary fibre, Recommended Dietary Allowances, Balanced diet, Diet for infants, children, pregnant & lactating mothers, and the elderly, Energy metabolism, Obesity & Starvation

Gastro-intestinal System

General principles of G-I function, Mastication & swallowing, Esophageal motility, Salivary secretion, Gastric mucosal barrier, Pancreatic & biliary secretion, Gastrointestinal motility, Digestion & absorption, Functions of Colon, Pathophysiology of peptic ulcer and diarrheal disease, Liver function

Endocrines & Reproduction

Classification of Hormones, Mechanism of Hormone action, Measurement of hormones in Blood, Endocrine functions of the hypothalamus, Pituitary, Thyroid, Adrenals, The endocrine pancreas, Pathophysiology of diabetes, Parathyroid, calcitonin, Vit D & calcium metabolism, Pineal gland, Testosterone & male sex hormones, Spermatogenesis Hyper & hypogonadism, Menstrual cycle, Female sex hormones, Pregnancy & Lactation, Functions of Placenta, Parturition, Lactation

4. NERVOUS SYSTEM AND SPECIAL SENSES

General, Sensory & Motor Physiology

Organization of nervous system, Intemeuronal communication, Classification of somatic senses, Sensory receptors, Sensory transduction, Information processing, Dorsal column & medial lemniscal system, Thalamus, Somatosensory cortex, Somatosensory association areas, Pain, Organization of spinal cord for motor function, Reflexes & reflex arc, Brain stem & cortical control of motor function, Cerebellum, Basal ganglia, Maintenance of posture and equilibrium, Motor cortex, Spinal cord lesions, Hypothalamus, Higher functions of Nervous system

Special Senses

Optics of vision Receptors & neural functions of retina, Colour vision, Perimetry, Visual pathways, Cortical visual function, Functions of external and middle ear, Cochlea Semicircular canals, Auditory pathways, Cortical auditory function, Deafness & hearing aids, Primary taste sensations, Taste buds, Transduction & transmission of taste signals, Perception of taste, Peripheral olfactory mechanisms, Olfactory pathways, Olfact01Y perception

Limbic Svstem and Higher Nervous System

Autonomic nervous system, Limbic system and hypothalamus, EEG Sleep, Emotions & Behaviour, Learning & Memory, Yoga

Practical Syllabus

Haematology

Construction of Price Jones curve, Arneht count: Sex differences in neutrophil, Absolute eosinophil count, Reticulocyte count, Platelet count, Laboratory tests for haemostasis: Bleeding time, Clotting time, Prothrombin time, clot retraction

Amphibian Experiments.

Nerve Muscle experiments

Common electrical and mechanical appliances, Nerve muscle preparation, Simple muscle twitch, Effect of two successive stimuli on skeletal muscle contraction, Effect or variation in temperature on simple muscle contraction, Effect of fatigue on nerve muscle preparation. Demonstration of neuromuscular transmission, Determination of velocity of nerve conduction of sciatic nerve in frog, The effect of load on the simple muscle curve, Genesis of tetanus and clonus, Recording of isometric contraction, Effects of various agents on the contraction or smooth muscles of frogs rectum.

Cardiovascular system.

Recording of normal cardiogram of frog's heart, Effect of cold and warm saline on sinus venosus and ventricle of frog's heart, Effect of 1st and 2nd determination of BMR Stannius ligatures •on frog's heart, Demonstration of all or none phenomena, treppe and summation of subliminal stimuli in quiescent frog's heart (properties of cardiac muscle), Refractory period in a beating heart, Demonstration of the effect of stimulation of vagus and white crescentric line on frog's heart, Fixation of autonomic pathway to the frog's heart, Perfusion of isolated frog's heart, study of the effect of ions and drugs.

MAMMALIAN EXPERIMENTS

A. Isolated organ bath/perfusion studies:

1. To study the inotropic and chronotropic functions isolated perfused rabbit's
2. Heart, Intestinal motility (rat/rabbit); effects of various agents on the contraction of smooth muscles of intestine.

HUMAN EXPERIMENTS

A.Nerve-Muscle

1. Electromyography and its recording, Genesis of fatigue using Mosso's ergograph

B. Energy balance, metabolism, nutrition

1. Determination of BMR

c. Central Nervous system

1. Clinical examination of nervous system including sensory and motor, Reflexes, Cranial nerves examination

PRACTICAL DEMONSTRATION

A. Central Nervous system

1. Preparation of spinal frog and study of properties of reflexes, Audiometry

B. Energy balance, metabolism, nutrition

1. Mechanical efficiency at different grades of exercise.

C. Reproductive system

1. Pregnancy diagnostic tests (Immunological tests), Determination of sperm count, motility and morphology in a sample of human semen.

D. Miscellaneous. Principles of radio-immuno assay (RIA)