Proposed Study & Evaluation Scheme

M.Sc. (Medical Anatomy)

SGT University
Budhera, Gurgaon.

M.Sc. (Medical Anatomy)

Programme : M.Sc. (Med-Anatomy)
Duration : 3 Year full time (annual system)
Medium : English

Eligibility:

1. MBBS from a recognized medical college
2 B. Sc Medical Anatomy from any UGC approved university.
3. BDS recognized by D.C.I.
4. BPT recognized by regulatory body
5. Graduation in any medical/science/life sciences field from any UGC approved University.

Goal:

The postgraduates in MSc (Medical Anatomy) passing out of Faculty of Medicine and Health Sciences SGT University should be

i. Competent medical facilitators with basic competence in teaching the undergraduate medical and paramedical professional courses' students.
ii. Well versed with principles of research methodology
iii. Able to apply the acquired knowledge and skill to advance medical education

Objectives :

At the end of the course in Master of Science in Medical Anatomy the student should be able to.

1. demonstrate comprehensive knowledge of structure & function of human body, anatomy of human development, basic principles of genetics, knowledge of light microscopic structure of human body.
2. communicate the acquired knowledge clearly & with precision to undergraduate medical and paramedical professional courses' students
3. apply knowledge of various laboratory techniques involved in preparation of museum specimens, preparation of histology slides and embalming of human cadaver .
4. demonstrate understanding of Radiological anatomy including newer Imaging techniques

Learning activities & training:

1. **Interactive lectures**: gross anatomy, micro anatomy, embryology, neuro anatomy and genetics
2. **Practical sessions**: gross anatomy, micro anatomy, embryology and neuro anatomy Practical sessions will include SGD (small group discussions), PBL (problem based learning), SDL (self directed learning)

3. **Attitude, Ethics and Communication (AETCOM) Skills:**- journal club, seminars, modules

4. **Hand on experience**:- Techniques in micro anatomy, museum specimens, anthropology and embalming,

5. **Teaching assignments**:- Taking U.G classes, demonstrations & practicals for two semester.
6. **Hands on experience**: in using various of A .V aids for teaching. Preparation of powerpoint presentation according to standard norms.
7. **Participation** in conferences, symposia, seminars & workshops.

8. **Statistics** : Elementary knowledge of medical statistics.

9. **Research :-** Thesis - Project should be submitted 6 month before the final examination.

Evaluation

Written and Practical assessment (minimum 3 in each year).
Internal assessment will be calculated -- 20 marks each for theory & practical in the 1st year.
Internal assessment will be calculated -- 60 marks for theory & 50 marks for practical in the 3rd year.
University Examination shall be held according to the schedule given below:-

Study & Evaluation Scheme

Programe: M.Sc. (Medical Anatomy)

1st Year PRELIMINARY EXAMINATIONS:-

Course Code	Subject	Theory				Practical			
		Theory	**Int. Assess**	**Viva**	**Total**	**Marks**	**Int.Asses.**	**Total**	**Grand Total**
1	Basics of Anatomy	100	20	20	140	40	20	60	200
2	Basics of Physiology	100	20	20	140	40	20	60	200
3	Basics of Biochemistry	100	20	20	140	40	20	60	200

Grand Total-600

3rd Year FINAL EXAMINATIONS:-

Theory							Practical		
Paper-I	Paper-II	Paper-III	Paper-IV	Int. Asses.	Viva	Total	Practical	Int. Asses.	Total
75	75	75	75	60	40	400	150	50	200

Grand Total-600

Panel of Examiners: Ist Year

There shall be panel of 2 Examiners; one internal & one external examiner recommended by the Principal & approved by the university,-

Panel of Examiners: Final Year

There shall be panel of 4 Examiners; two internal & two external examiners recommended by the Principal & approved by the university,-

Result:

Shall be prepared and declared as below: -

1. 50% & above separately in theory & practical -- pass
2. 75% & above separately in theory & practical -- pass with distinction.
3. Below 50 % marks in theory and practical separately -- fail

Eligibility for appearing in University Examination:-

1. 80% Attendance in theory and 85 % Attendance in Practical
2. The candidate should attain 40% marks in the internal assessment failing which he or she will not be allowed be appear in the University examination.

Question Paper Structure:-

1. 1st Year Preliminary Examinations question paper:-

The question paper will consist of two sections A & B each of 50 marks. Total 100marks

Section A

Q1.	Structured long questions	**10 marks**
Q2.	Short questions total number 3 of 5 marks each	**15 marks**
Q3.	Short questions total number 5 of 3 marks each	**15marks**

Section B

Q4.	Structured long questions	**10 marks**
Q5.	Short questions total number 3 of 5 marks each	**15 marks**
Q6.	Short questions total number 5 of 3 marks each	**15marks**

Section C

	20 MCQs of 1mark each	**20marks**

1. 3rd Year University Examinations question paper:-

Four question papers of 75marks each. Each paper will consist of 5 questions of 15marks each. All the questions are to be attempted. Questions can be Structured long questions, short answer question, diagrams & enumeration type. The questions should give coverage to the whole syllabus.

Reappear or Supplementary Exam:-

Candidate who has been placed under reappear category shall be allowed to continue studies in the next year but he / she will have to pass the Supplementary Examination within 3 months after the regular examination. Failure in supplementary examination will cause reversion to the corresponding

junior batch.

BASICS OF ANATOMY COURSE CONTENTS

YEAR –I

General Anatomy

1. Anatomical nomenclature and terminology, normal anatomical position, Anatomical plane, Anatomical positions, Clinical positions, Terms related to movements
2. Basics of cytology: Structure of cell wall, Cell organelles
3. Musculoskeletal system:
   (a) Bones - classification, features of a long bone, ossification, blood supply of bones
   (b) Muscles- classification of muscle tissue according to structure & action
4. Integumentary system: Thick Skin & Thin, Skin appendages, functions
5. Cardiovascular system: Morphology & classification of blood vessels, blood capillaries
6. Nervous system: Central Nervous system & Peripheral Nervous system, Gross basic Anatomy, Cranial nerves, Spinal nerves, Functions of nerves, Autonomic nervous system
7. Endocrine system: Classification & basic functions
8. Lymphatic system: Formation of lymph, Lymphatic ducts, Thoracic duct, Functions

Regional Anatomy:-

1. Digestive system: Parts of digestive system, gross anatomy and functions
2. Excretory system: Parts of excretory system, gross a anatomy & functions of kidney, ureter & urinary bladder
3. Reproductive system: Male reproductive system - gross anatomy of testis, epididymis, vas-deferens, seminal vesicles and prostate. Female reproductive system- gross anatomy of ovaries, uterine tube, uterus, vagina, menstruation cycle
4. Respiratory system:- Parts, Pleura & Lungs
5. Cardiovascular System:- Pericardium & Heart.
6. Nervous System:- Knowledge of cranial Nerves. Gross anatomy of brain including ventricular system
7. Head & Neck:- Organs, Glands, Nerves & vessels.
8. Basics of genetics: Cell division mitosis, meiosis, Cell cycle, Chromosomes

Note :

a. **Gross anatomy (Elementary Anatomy):-**
Gross anatomy of each part including functional, sectional and radiological anatomy

b. **General Histology:-**
Includes cell structure, cell division & basic tissues of the body. e.g. epithelium, connective tissue, glands, bone and cartilage muscle- tissue, nervous tissue, vessels & lymphoid tissue .integumentary system ***and basic concept of H & E staining.***

BASICS OF ANATOMY (PRACTICAL)
YEAR –I

Course Contents

Practical : Demonstration of the following

1. Anatomical terminology (anatomical plane, anatomical positions, clinical practice, terms related to movements)
2. Gross features of bones of all regions of Anatomy

Gross Anatomy on the dissected parts:-

1. Upperlimb
2. Lower limb
3. Thorax
4. Abdomen
5. Pelvis
6. Head, Neck and face

Histology:

1. Microscopes – parts & functions of various components
2. Light microscopic structure of basic tissues of the body

Surface anatomy:-

1. Includes body land marks, pressure points, palpation of various superficial arteries and Lymph node palpation
2. Demonstration of various movement of joints

Radiological anatomy:-

Normal study of plane x-rays in different views like AP, PA and Lateral etc of all the regions

ANATOMY
YEAR –II

Course Contents (Theory)

Gross Anatomy
Structure of superior & inferior extremities, Thorax, abdomen and pelvis in detail, including sectional and radiological anatomy.

Systemic Histology
All systems/organs of body - Cellular organization, light microscopic Features, structure, function correlation.

General Embryology
Gametogenisis, General Embryology up to full term birth

Includes:-

(a) Gametogenesis
(b) Uterine and ovarion cycles
(c) Fertilization, cleavage, blastocyst, implantation of ovum
(d) Formation of germ layers, primitive streak, notochord, neural tube.
(e) Differentiation in germ layers & their derivatives
(f) Folding of embryo, foetal membranes & placenta
(g) Twinning and amniotic fluid

DEVELOPMENTAL ANATOMY
Systemic embryology

Development of various system & embryological basis of congenital anomalies

PRACTICALS
YEAR –II

Practical based on the following topics and dissection & demonstration of gross anatomy as per the curriculum of the theory papers

Gross Anatomy

1. Structure of superior & inferior extremities, Thorax, abdomen and pelvis
2. Dissection & demonstration of these parts of body
3. Museum Techniques: Preparation of museum specimens, fixation and preservation of human body

Embryology:-

Models & specimens of early human development & specimens of congenital malformations

Histology;-

1. Study of systemic histology in detail under light microscopes
2. Preparation of tissue blocks, section cutting and routine H & E staining of the tissues
4. Identification of organs in light and electronic microscopy

Radiological Anatomy:-

1. Contrast X-Rays barium swallow, barium meal, Barium meal follow through, barium enema
2. I V P , Hysterosalipingography.
3. Basics CT & MRI scans
4. Angiography

ANATOMY
YEAR – III

Course Content (THEORY)

Gross Anatomy, Histology including Osteology

Neuro Anatomy

1. Gross Anatomy of all parts of Nervous system
2. Spinal cord including all tracts & their applied aspect
3. Medulla oblongata, midbrain, cerebellum, thalamus, hypothalamus, limbic lobe and their functions
4. Cerebral hemisphere, gyri, sulci, motor and sensory area, white matter, basal ganglia
5. Cranial nerves
6. Ventricular system of brain & Circulation of C.S.F.
7. Blood supply of brain
8. Cross sectional anatomy of brain

Genetics

1. Normal and abnormal chromosomes
   Human Chromosomes - Structure, number and classification
   Chromosome abnormalities including syndromes
   Prenatal diagnosis, Genetic Counselling
2. Recent advances in human anatomy and clinical anatomy.

PRACTICAL
YEAR - III

1. Dissection & demonstration of head- neck- face region.
2. Embryology of head & neck
3. Histology pertaining to the area
4. Dissection & demonstration of brain & its parts, spinal cord
5. Study of brain sections
6. Comparative Anatomy
7. Revision of osteology
8. Related surface marking & radiology
9. Histology techniques & embalming methods
10. Preparation of audiovisual aids for teaching, presentations of seminars & journal club.
11. Basic knowledge of computer

12 Submission of research project / thesis to the university six month before the final examination.

THESIS
YEAR - III

Guidelines

1. Each M.Sc. Medical student will carry out research work under the supervision of a faculty member (Guide) with post-M.D./ Ph.D. teaching experience of three years or more in the subject. However, a teacher with M.D/Ph.D. degree in ·the subject or related subjects shall be qualified for being taken in as Co-guide.

2. The Guide, will be allotted to each student at the commencement of second year. The student will prepare a Plan of Thesis under the supervision of the Guide, and submit it to the ethical' committee within two months of commencement of second year the committee will convey approval/disapproval of the plan within one month.

3. In case the Plan is disapproved, a fresh Plan must be submitted within one month. After approval of the Plan, the student will begin work on the thesis.

4. The progress of work will be monitored regularly by the Guide. The thesis not exceeding 100 pages typed on A4 paper on one side only in double spacing is to be submitted to the university through the Guide six months before the date of III year University examination.

5. It will be evaluated by a panel of examiners (1 external & 1 internal at least) approved by the Vice Chancellor. The approval of the thesis by the panel will be a pre-requisite for the candidate to appear in the written/practical examination of lll year. If the thesis is returned for revision, the suggested revision must be done and the revised thesis submitted for evaluation to the examiner (s) who has/have suggested for the revision. '.

6. After approval of revised thesis, the candidate can appear in the next 3rd year examination provided the approval is received one month before the examination. If the thesis is disapproved, the entire process from submission of a new Plan to submission of Thesis is to be repeated. On approval of new thesis, the candidate can .appear in the next 3rd year examination provided there is a one month gap between the receipt of approval and commencement of examination.

Note: A student is required to submit four hard copies of the thesis along with the soft copy in the prescribed format given by the college.

Books recommended:-

List of books recommended

1. Gray's Anatomy for students by Drake etc
2. Cunningham's manual of Practical Anatomy vol-I, II & III by *C.j.* Romones, 15th Ed. 2003
3. Text book of human anatomy by B.D. Chourasia vol- I, II & III
4. Embryology for students by Inderbir Singh & G. Pal
5. Langman's clinical embryology by Sadler
6. Surface & radiological anatomy by A. Halim
7. Human histology by Inderbir Singh
8. Difiore's atlas of human histology, 11th Ed 2008

Reference books

1. Grays Anatomy 40th Ed. By Standring et al
2. Text book of neuro anatomy by Vishram Singh Grants method of anatomy, 11th Ed. 2004
3. Mc Gregor's synopsis of surgical anatomy by D *1* Du Plessis, 12th Ed. 1999
4. Clinical anatomy by Snell
5. Text book of histology by Ham
6. Regional anatomy by R.J. Last
7. Genetics in medicine 6th Edn, 2001 W.B. Saunder's & co Philadelphia, London.

M. Sc. (Medical Biochemistry)

Programme : M.Sc. (**Med- Biochemistry**)

Duration : 3 Year full time (annual system)

Medium : English

Program outcome- At the end of course, postgraduates should be able to

- Plan, execute and evaluate teaching assignments in Medical Biochemistry
- Plan, execute, analyze and present the research work in medical Biochemistry.
- To acquire various skills for collaborative research.
- To participate is various workshops/seminars/journal clubs/demonstration in the allied departments
- **Program specific outcome** At the end of the course in Master of Science in Biochemistry the student should be able to capable of catering following responsibilities:
- Teaching Skills
- Research Methodology
- Laboratory and Diagnostic skills
- Communication and attitudinal skills

Eligibility :

- B. Sc Medical Biochemistry from any UGC approved university.
- MBBS/BDS recognized by M.C.I/D.C.I.
- Graduation in any medical/science/ life sciences field from any UGC approved University.

Objectives

At the end of the course in Master of Science in Biochemistry the student should be able to.

- Acquire comprehensive knowledge of infectious agents, its identification by laboratory techniques.
- Ability to communicate the acquired knowledge clearly & with precision.
- Acquire knowledge of drugs used in treatment of such infections, preparation of museum specimens etc.
- Be familiar with the recent advances in the medical Biochemistry.

Learning activities & training:

1. **Didactic teaching:-**
2. **Communication Skills:-** Journal club,Seminars.
3. **Hand on experience:-** Techniques in Biochemistry, museum specimens and experimental work
4. **Teaching assignments:**- Taking U.G classes, demonstrations & practical for one semester. Preparation of A .V aids for teaching, presentations, and setting objective questions - SAQs / MCQs. Participation in symposia, seminars & workshops.
5. **Research:-** Project / thesis - Project should be submitted 6 month before the final examination.
6. **Evaluation** Written and practical assessment every semester. Internal assessment tests in theory &practical shall be conducted every year of M.Sc. course. University Examination shall be held b the university at the end of each year which is as follows:-

Study & Evaluation Scheme

Programe : M.Sc. (Medical Biochemistry)

1st Year PRELIMINARY EXAMINATIONS:-

Course Code	Subject	Theory				Practical			
		Theory Written	Internal Assessment	Viva	Total	Marks	Internal Assessment	Total	Grand Total
1	Basics of Anatomy	100	20	20	140	40	20	60	200
2	Basics of Physiology	100	20	20	140	40	20	60	200
3	Basics of Biochemistry	100	20	20	140	40	20	60	200

Grand Total-600

(There shall be two papers ie Paper-A&Paper-B of 50 marks each.)

- **Paper-A:** Part I = 25 marks
  Part II = 25 marks
- **Paper-B: -** Part I = 25 marks
  Part II = 25 marks

3rd Year FINAL EXAMINATIONS:-

Theory							Practical		
Paper-I	Paper-II	Paper-III	Paper-IV	Internal Assessment	Viva	Total	Practical	Internal Assessment	Total
75	75	75	75	60	40	400	150	50	200

Grand Total-600

- **Paper I –**
- **Paper II –**
- **Paper III –**
- **Paper IV –**

Panel of Examiners:

There shall be panel of 4 Examiners; two internal & two external examiners recommended by the Principal & approved by the university,-

Result:

Shall be prepared and declared as below: -

- 50% & above separately in theory & practical pass
- 75% & above separated in theory & practical pass with distinction.
- Below 50% in any theory or practical fail

Eligibility for appearing in university examination:-

1. 75% Attendance in theory and 80 % Attendance in Practical
2. The candidate should attain 40% marks in the internal assessment failing which he or she will not be allowed be appear in the University examination

Reappear or Supplementary Exam:-

Candidate who has been placed under reappear category shall be allowed to continue studies in the next year but he / she will have to pass the supplementary Examination with in 3 months after the regular examination. Failure in supplementary examination will cause revertion to the corresponding junior batch to the whole syllabus

Question Paper Structure:-

The question paper shall consist of 6 questions carrying equal marks, all the questions are to be attempted. Questions can be short question / answer, long question, diagrams & enumerators giving coverage.

1. The question paper shall consist of EIGHT questions, out of which first question shall be of short answer type (not exceeding 50 words) and will be compulsory. Question No. 1 shall contain 8 parts representing the entire syllabus and students shall have to answer any five (weightage 3 marks each).
2. Out of the rest SEVEN questions, students shall be required to attempt any five questions. The weight age of questions no. 2 to 8 shall be 12 marks each.

M.Sc. (Medical Biochemistry) – 1st Year

Basics of Anatomy

General Anatomy:

1. Anatomical terminology, Anatomical plane, Anatomical positions, Clinical positions, Terms related to movements.
2. Basics of cytology: Structure of cell wall, Cell organelles, **functional** complexes
3. Musculoskeletal system:
   (a) Bones & classification, Morphology, ossification functions, blood supply
   (b) Muscles, Morphology, classification blood supply, innervations, functions
4. Integumentary system: Thick skin, thin skin, layers of dermis epidermis, skin appendages, blood supply, innervations, functions.
5. Cardiovascular system: Morphology of blood vessel, classification of blood vessels, blood capillaries, blood circulation, functions.
6. Nervous system: Central Nervous System, Peripheral **Nervous** System, Gross Basic Anatomy, Cranial nerves, Spinal nerves, Functions of nerves, **Autonomic** nervous system.
7. Endocrine system: Classification, Hormone produces, Control of hormone secretion, basic functions.
8. Lymphatic system: Formation of lymph, Lymphatic ducts, Thoracic duct, Lymph circulation, functions.
9. Digestive system: Parts of digestive system, gross anatomy and functions.
10. Excretory system: Parts of excretory system, gross anatomy of kidney, ureter, urinary bladder, penis and their functions
11. Reproductive system: Male reproduction system- **gross** anatomy of testis, epididymis, vas deferens, seminal vesicles and prostate. Female reproductive system- gross anatomy of ovaries, uterine tube, uterus, vagina, menstruation cycle.
12. Basics of genetics: Cell division ,mitosis, meiosis, Cell cycle, Chromosomes.

Gross Anatomy (Elementary Anatomy):

1. Superior Extremities
2. Inferiors Extremities
3. Thorax
4. Abdomen
5. Pelvis
6. Head, Neck & Fact Region

Books Recommended:

1. Williams et aI. *Gray's Anatomy.* Churchill Livingstone.
2. Young, B. and 1. Heath. *Wheaters' Functional Histology.* Churchill Livingstone.
3. Ross, M.H. *Histology: A Text & Atlas.* Williams & Wilkins.
4. Langman, Jan. *Medical Embryology.* William and Wilkins.
5. Thompson, J.S. and M.W. Thompson. *Genetics in Medicine.* Philadelphia:W.B. Saunders.
6. Stuin, J and M.B. Carpenter. *Human Neuroanatomy.*
7. Snell, Richard S. *Clinical Neuroanatomy for MedicaL Students.* William and Wilkins.

M.Sc. (Medical Biochemistry) - 1st Year
Basics of Physiology

1. **Cell Physiology:**

   Cell structure and membrane transport, Resting Membrane Potential, Composition of ECF and RCF, Nernst Equation, Equilibrium Potential, Goldmann Equation.

2. **Nerve-Muscle and Biopotentia:**

   Neuron (structure, function and classification), Neuroglia, Action Potential, Neuromuscular junction, Skeletal Muscle (structure, mechanism of **contraction** and relaxation), Smooth Muscle (structure, mechanism of contraction and relaxation).

3. **Blood:**

   Function and Composition, Erythocytes, Haemoglobin, Blood Groups, Leucocytes, Thrombocytes, Immunity

4. **Cardiovascular System:**

   Cardiac Muscle, Physiological anatomy of heart and conduction system, Cardiac Action Potential, Normal ECG, Cardiac cycle, Heart sounds, Cardiac output and blood pressure, Coronary circulation.

5. **Respiration:**

   Functional anatomy of the respiratory system, Mechanism of breathing, Dead space, Surfactants, Dynamic and static lung volumes and capacities, Transport of oxygen and carbon dioxide, Regulation of Respiration, Cyanosis, Hypoxia, Oxygen toxicity.

6. **Gastrointestinal Tract:**

   Functional anatomy, Salivary glands (secretion and function of saliva, deglutition), Stomach (composition, regulation of secretion and function of the gastric juice), Liver (secretion and function ofbi1e), Pancreas (secretion and function), Intestines, Intestinal secretion (composition and function), Movements of Intestines, Hormones of GIT.

7. **Excretory System:**

   Function of kidney, Structure of ephron, Juxta glomerular apparatus, Formation of urine. Counter current mechanism, Acidification of urine & role of kidney in maintenance of acid- base balance, Renal function tests, Micturition.

8. **Autonomic Nervous System:**

   Organization of the ANS, Chemo-transmitters, Effect of sympathetic and parasympathetic stimuli on different organ systems.

9. **Central Nervous System:**

   General organization of CNS & PNS, Sensory system (General sensations, receptors,

sensory pathways, sensory areas of brain).

Brain: Functions of Cerebellum, thalamus, hypothalamus, basal ganglia, limbic system, reticular activating system; Higher Function: Sleep.

10. Special Senses:

Eye (functional anatomy, refractory indices of media, rods and cones, role of vitamin A, visual pathway), Ear (structure of internal ear, mechanism of hearing), Taste (distribution and structure of taste buds and taste papillae, primary taste modalities, taste pathway), Smell (olfactory epithelium and pathway).

11. Endocrine System:

Mechanism of action of hormones, Functions of the following glands: Pituitary, thyroid, parathyroid, adrenal (cortex and medulla), pancreas.

12. Reproductive System:

General organization of male and female reproductive systems, Male: Spermatogenesis and actions of male sex hormones, Female: Sexual cycles and actions of female sex hormones, pregnancy, parturition and lactation, Family planning.

Books Recommended (Latest Edition):

1. Guyton, A. *Textbook of Medical Physiology*. Elsevier.
2. Ganong, W.F. *Review of Medical Physiology.* Lange.
3. Khurana, I. *TextbBook of Physiology*. Elsevier.
4. Berne, Y. *Principles of Physiology*. Elsevier Mosby.
5. Rhodes and Bell. *Medical Physiology: Clinical Medicine*. Williams &Wilkins,.

M.Sc. (Medical Biochemistry) - 1st Year
Basics of Biochemistry

Basic concepts of Biochemistry to be studied under the following headings:

1. Cell structure and function and transport through the biological membrane.
2. Chemistry of Biomolecules - Ccarbohydrate, lipids, amino acids, proteins and nucleic acids.
3. Chemistry of Blood & haemoglobin.
4. Enzymes.
5. Bioenergetics and Biologic oxidation.
6. Metabolism of carbohydrates, proteins, lipids and nucleotides.
7. Integration of metabolism.
8. Nutrition, vitamins & minerals.
9. Molecular Biology.
10. Detoxification & Xenobiotics.
11. Oxygen derived free radicals.
12. Immunology.
13. Organ function tests.

Books Recommended:

1. Stryer, Lubert, ed. *Biochemistry*. New York: W.H. Freeman.
2. Lehninger, Nelson and Cox, ed. *Principles of Biochemistry*. New Delhi: CBS Publishers.
3. Murray, R.K. and P.A. Mayes, ed. *Harper's Biochemistry.*
4. Devlin, Thomas M., ed. *Textbook of Biochemistry with Clinical Correlations*. New York: Wiley-Liss.
5. Lewin, Benjamin, ed. Genes VI. Oxford: Oxford University Press.

M.Sc. (Medical Biochemistry) – 1st Year
Research methodology

Unit – 1

Methods of collection of data, classification and graphical representation of data. Binomial and normal probability distribution. Polygon, histogram, measure of central tendency. Significance of statistical methods, probability, degree of freedom, measures of variation - Standard deviation, Standard error.

Unit – 2

Sampling, sample size and power. Statistical inference and hypothesis. Tests for statistical significance: t-test, Chi-square test, confidence level, Null hypothesis.

Unit – 3

Analysis of Variance (one way and two way ANOVA). Factorial designs (including fraction factorial design). Theory of probability, Permutation and Combination, Ratios, Percentage and Proportion and Multiple comparison procedures.

Unit – 4

Non-parametric tests, Experimental design in clinical trials, Statistical quality control, Validation, Optimization techniques and Screening design. Linear regression and Correlation, least square method, significance of coefficient of correlation, nonlinear regression.

Unit – 5

Report Preparation: Types and Layout of Research Report, Precautions in Preparing the Research Report. Bibliography and Annexure in the Report: Their Significance, Drawing Conclusions, Suggestions and Recommendations to the Concerned Persons. Use of SPSS in Data Analysis.

Books Recommended:

1. Cooper & Schindler. *Business Research Methods*. New Delhi: Tata McGraw Hill.
2. *Saunders' Research Methods for Business Students*. Pearson Education, 2007.
3. Malhotra, Naresh K. *Marketing Research*. Pearson Education.
4. Fisher, R.A. *Statistical Methods for Research Works*. Edinburgh: Oliver & Boyd.
5. Chow. *Statistical Design and Analysis of Stability Studies*. New York: Marcel Dekker.
6. Finney, O.J. *Statistical Methods in Biological Assays*. New York: Hafner.
7. Montgomery, D.C. *Introduction to Statistical Quality Control*. New York : Willy.
8. Lipschutz. *Introduction to Probability and Statistics*. New York: McGraw-Hill.

M.Sc. (Medical Biochemistry) - 1st Year
BASICS OF ANATOMY (PRACTICALS)

Practical : Demonstration of the following on dissected parts

1. Anatomical terminology (anatomical plane, anatomical positions, other positions required in clinical practice, terms related to movements and sections etc.)
2. Basics of cytology
3. Musculoskeletal system
4. Integumentary system
5. Cardiovascular system
6. Nervous system
7. Endocrine system
8. Lymphatic system
9. Digestive system
10. Excretory system
11. Reproductive system
12. Basics of Genetics (cell division, cell cycle)

Gross Anatomy Dissections:

1. Superior Extremities
2. Inferiors Extremities
3. Thorax
4. Abdomen
5. Pelvis
6. Head, Neck and Face

M.Sc. (Medical Biochemistry) 1st Year
BASICS OF ANATOMY (PRACTICALS)

1. Study of microscope
2. Preparation and staining of blood film and identification of different blood cells
3. Differential leukocyte count
4. Determination of blood group
5. Estimation of haemoglobin
6. Haemin crystal
7. Determination of bleeding and clotting time
8. Total leukocyte count

Books Recommended:

1. Burtis and Ashwood, ed. *Textbook of Clinical Chemistry*. Philadelphia: W.B.Saunders.
2. Keith, Wilson and John Walker, ed. *Principles and Techniques of Practical Biochemistry*. Cambridge: Cambridge University Press.

M.Sc. (Medical Biochemistry) – 1st Year
BASICS OF BIOCHEMISTRY (PRACTICALS)

Basic awareness of laboratory with respect to equipments and glassware, units of measurement and calibration of volumetric apparatus, preparation and storage of reagents, standard solutions, buffer solutions and pH determination.

1. Introduction : Handling of chemicals, preparation of regents, Pipetting etc.
3. Colour reactions of carbohydrates.
4. Colour reactions of Lipids .
5. Colour reactions of proteins.
6. Precipitation reactions of protein.
7. Individual proteins -Albumin, Globulin, Casein & Gelatin.
8. Unknown protein identification .
9. Milk Analysis.
10. Starch digestion by salivary amylase and products.
11. Normal constituents of urine.
12. Abnormal constituents of urine and reporting of abnormal urine.
13. pH determination and buffer preparation.
14. Demonstration: Spectroscopic examination of blood.
15. Verification of Beer's Lambert Law: Colorimetry, Spectrophotometry.
16. Estimation of serum glucose level and glucose tolerance test.
17. Estimation of total protein and albumin level and calculation of *A/G* Ratio.
18. Estimation of serum urea level and calculation of urea clearance.
19. Estimation of Serum Uric Acid level.
20. Estimation of Serum Creatinine level and Calculation of Creatinine clearance.
21. * Liver Enzymes Diagnostic Enzymology :- * Cardiac Enzymes * Misc.
22. Estimation of Serum ALP Activity
23. Clinical problems involving organ function tests.
24. Demonstration: Electrophoresis. (Paper, agarose & PAGE)
25. Demonstration: Chromatography (Paper HPLC)
26. Demonstration: Flame photometry.
27. Special Technique:- Bioluminescence, fluormometry, Chemiluminescence.

28. Quality Control.
29. Molecular Biology Practicals.

Books Recommended:

1. Burtis and Ashwood. *Tietz's Textbook of Clinical Chemistry*. Philadelphia: W.B. Saunders.
2. Keith, Wilson and John Walker, ed. *Principles and Techniques of Practical Biochemistry*. Cambridge: Cambridge University Press.

M.Sc. (Medical Biochemistry)

TEACH1NG PRACTICE

Course Contents:

1. Acquire competence to plan for instructions and delivery of curriculum.
2. Obtain feedback both about teaching as well as student learning.
3. To develop broad understanding of modern principles and procedures used in medical science education.
4. Development of essential skills for practicing modern medical science teaching.

For teaching practice, the student shall take classes as decided and allocated by the Department. For evaluation purpose, a board of three examiners comprising one internal and two external examiners will be appointed by the Vice Chancellor from the panel of examiners by the recommended by the Director/Dean of the College/Faculty. All the three examiners will assess the student separately and average of these marks shall be awarded as final marks to the student concerned.

M.Sc. (Medical Biochemistry)

THESIS

Guidelines:

1. Each M.Sc. Medical student will carry out research work under the supervision of a faculty member (Guide) with post- M.D./ Ph.D. teaching experience of three years or more in the subject. However, a teacher with M.D./Ph.D. degree in the subject or related subjects shall be qualified for being taken as Co-guide.
2. The Guide will be allotted to each student at the commencement of second year. The student will prepare a Plan of Thesis under the supervision of the Guide, and submit it to the University within two months of commencement of second year. The University will convey approval/disapproval of the Plan within one month.
3. In case, the Plan is disapproved, a fresh plan must be submitted within one month. After approval of the plan, the student will begin work on the thesis.
4. The progress of work will be monitored regularly by the Guide. The thesis not exceeding 100 pages typed on A4 paper on one side only in double spacing is to be submitted to the University through the Guide, six months before the date of 3rd Year University examination.
5. It will be evaluated by a panel of two examiners (01 external & 01 internal at least) approved by the Vice Chancellor. The approval of the thesis by the panel will be a pre-requisite for the candidate to appear in the written/practical examination of 3rd year. If the thesis is returned for revision, the suggested revision must be done and the revised thesis submitted for evaluation to the examiner(s) who has/ have suggested for the revision.
6. After approval of revised thesis, the candidate can appear in the ext 3rd Year Examination, provided the approval is received one month before the examination. If the thesis is disapproved, the entire process from submission of a new plan to submission of Thesis is to be repeated. On approval of new thesis, the candidate can appear in the next 3rd Year examination, provided there is a one month gap between the receipt of approval and commencement of examination.

Note: A student is required to submit four hard copies of the thesis alongwith the soft copy in the prescribed format given by the University.

M. Sc. (Medical Microbiology)

Programme : M.Sc. (Med-Microbiology)

Duration : 3 Year full time (annual system)

Medium : English

Vision

Microbiology is the study of the microscopic living organisms of that has given medicine its great success in the diagnosis, prevention and cure of disease. The conquest of epidemic and fatal infections by the science of microbiology has shifted the front of challenges of medicine away from problems of infections considerably due to timely diagnosis of infections. Along with the improved nutrition and living conditions achieved in the last century, the discipline of microbiology with its virtue of diagnosing the life threatening infectious diseases, has brought about a revolution in human health ensuring safe human life and increasing the life expectancy. Ironically however, due to emergence of microbial resistance, the balance has once again shifted back towards pre-antibiotic era. Treatment of microbial infections is becoming more difficult due to emergence of multidrug resistance, seen routinely in both community and hospital settings. Microbial genomes can now be sequenced so that infectious disease outbreaks can be investigated in real time to identify pathogens and carriers and to effectively control the outbreaks. The discipline of microbiology in the 21st century is also substantially engaged in surveillance of food safety and combating bioterrorism. Many medical institutions in developing world teach microbiology as a postgraduate program packed with theoretical knowledge with great emphasis on transforming the theoretical knowledge to their application in control of infectious disease. The universities and Medical Council of India have modified syllabus with greatest emphasis on applied microbiology. Yet, there continues to be considerable debate concerning the best way to restructure the curriculum in microbiology in the light of exponential rise in knowledge base.

Mission :

The primary goal of teaching Microbiology is to provide understanding of the naturalhistory of infectious diseases their epidemiology, etiology, pathogenesis, laboratory diagnosis, control and prevention. The main aim of this course is to train students in the field of

Medical Microbiology. Theoretical as well as practical training is imparted to the candidates in the subspecialities viz. Bacteriology, Virology, Parasitology, Immunology and Mycology. They are introduced to basic research methodology so that they can conduct fundamental and applied research.

Program outcome- At the end of course, postgraduates should be able to

- Plan, execute and evaluate teaching assignments in Medical Microbiology
- Plan, execute, analyze and present the research work in medical microbiology.
- To acquire various skills for collaborative research.
- To participate is various workshops/seminars/journal clubs/demonstration in the allied departments

Program specific outcome At the end of the course in Master of Science in Microbiology the student should be able to capable of catering following responsibilities:

- Teaching Skills
- Research Methodology
- Laboratory and Diagnostic skills in Clinical Microbiology
- Molecular techniques relevant to infectious diseases
- Communication and attitudinal skills

Eligibility :

- B. Sc Medical Microbiology from any UGC approved university.
- MBBS/BDS recognized by M.C.I/D.C.I.
- Graduation in any medical/science/ life sciences field from any UGC approved University.

Objectives

At the end of the course in Master of Science in Microbiology the student should be able to.

- Acquire comprehensive knowledge of infectious agents, its identification by laboratory techniques.
- Ability to communicate the acquired knowledge clearly & with precision.

- Acquire knowledge of drugs used in treatment of such infections, preparation of museum specimens etc.
- Be familiar with the recent advances in the medical microbiology.

Learning activities & training:

1. **Didactic teaching:-** Topics in General Bacteriology, Immunology, Systematic bacteriology, Virology, Parasitology and Mycology with related practical session
2. **Communication Skills:-** Journal club,Seminars.
3. **Hand on experience:-** Techniques in Microbiology, museum specimens and experimental work
4. **Teaching assignments:**- Taking U.G classes, demonstrations & practical for one semester. Preparation of A .V aids for teaching, presentations, and setting objective questions - SAQs / MCQs. Participation in symposia, seminars & workshops.
5. **Research:-** Project / thesis - Project should be submitted 6 month before the final examination.
6. **Evaluation** Written and practical assessment every semester. Internal assessment tests in theory &practical shall be conducted every year of M.Sc. course. University Examination shall be held b the university at the end of each year which is as follows:-

Study & Evaluation Scheme

Programe : M.Sc. (Medical Microbiology)

1st Year PRELIMINARY EXAMINATIONS:-

Course Code	Subject	Theory				Practical			
		Theory Written	Internal Assessment	Viva	Total	Marks	Internal Assessment	Total	Grand Total
1	Basics of Anatomy	100	20	20	140	40	20	60	200
2	Basics of Physiology	100	20	20	140	40	20	60	200
3	Basics of Biochemistry	100	20	20	140	40	20	60	200

Grand Total-600

(There shall be two papers ie Paper-A&Paper-B of 50 marks each.)

- **Paper-A:** Part I = 25 marks
  Part II = 25 marks
- **Paper-B: -** Part I = 25 marks
  Part II = 25 marks

3rd Year FINAL EXAMINATIONS:-

Theory							Practical		
Paper-I	Paper-II	Paper-III	Paper-IV	Internal Assessment	Viva	Total	Practical	Internal Assessment	Total
75	75	75	75	60	40	400	150	50	200

Grand Total-600

- **Paper I –** General Bacteriology & Immunology.
- **Paper II –** Systematic Bacteriology and Mycology
- **Paper III –** Virology & Parasitology.
- **Paper IV –** Applied Microbiology and Recent Advances in Microbiology

Panel of Examiners:

There shall be panel of 4 Examiners; two internal & two external examiners recommended by the Principal & approved by the university,-

Result:

Shall be prepared and declared as below: -

- 50% & above separately in theory & practical pass
- 75% & above separated in theory & practical pass with distinction.
- Below 50% in any theory or practical fail

Eligibility for appearing in university examination:-

1. 75% Attendance in theory and 80 % Attendance in Practical
2. The candidate should attain 40% marks in the internal assessment failing which he or she will not be allowed be appear in the University examination

Reappear or Supplementary Exam:-

Candidate who has been placed under reappear category shall be allowed to continue studies in the next year but he / she will have to pass the supplementary Examination with in 3 months after the regular examination. Failure in supplementary examination will cause revertion to the corresponding junior batch to the whole syllabus

Question Paper Structure:-

The question paper shall consist of 6 questions carrying equal marks, all the questions are to be attempted. Questions can be short question / answer, long question, diagrams & enumerators giving coverage.

1. The question paper shall consist of EIGHT questions, out of which first question shall be of short answer type (not exceeding 50 words) and will be compulsory. Question No. 1 shall contain 8 parts representing the entire syllabus and students shall have to answer any five (weightage 3 marks each).
2. Out of the rest SEVEN questions, students shall be required to attempt any five questions. The weight age of questions no. 2 to 8 shall be 12 marks each.

M.Sc. (Medical Microbiology) – 1st Year

Basics of Anatomy

General Anatomy:

1. Anatomical terminology, Anatomical plane, Anatomical positions, Clinical positions, Terms related to movements.
2. Basics of cytology: Structure of cell wall, Cell organelles, **functional** complexes
3. Musculoskeletal system:
   (a) Bones & classification, Morphology, ossification functions, blood supply
   (b) Muscles, Morphology, classification blood supply, innervations, functions
4. Integumentary system: Thick skin, thin skin, layers of dermis epidermis, skin appendages, blood supply, innervations, functions.
5. Cardiovascular system: Morphology of blood vessel, classification of blood vessels, blood capillaries, blood circulation, functions.
6. Nervous system: Central Nervous System, Peripheral **Nervous** System, Gross Basic Anatomy, Cranial nerves, Spinal nerves, Functions of nerves, **Autonomic** nervous system.
7. Endocrine system: Classification, Hormone produces, Control of hormone secretion, basic functions.
8. Lymphatic system: Formation of lymph, Lymphatic ducts, Thoracic duct, Lymph circulation, functions.
9. Digestive system: Parts of digestive system, gross anatomy and functions.
10. Excretory system: Parts of excretory system, gross anatomy of kidney, ureter, urinary bladder, penis and their functions
11. Reproductive system: Male reproduction system- **gross** anatomy of testis, epididymis, vas deferens, seminal vesicles and prostate. Female reproductive system- gross anatomy of ovaries, uterine tube, uterus, vagina, menstruation cycle.
12. Basics of genetics: Cell division ,mitosis, meiosis, Cell cycle, Chromosomes.

Gross Anatomy (Elementary Anatomy):

1. Superior Extremities
2. Inferiors Extremities
3. Thorax
4. Abdomen
5. Pelvis
6. Head, Neck & Fact Region

Books Recommended:

1. Williams et aI. *Gray's Anatomy.* Churchill Livingstone.
2. Young, B. and 1. Heath. *Wheaters' Functional Histology.* Churchill Livingstone.
3. Ross, M.H. *Histology: A Text & Atlas.* Williams & Wilkins.
4. Langman, Jan. *Medical Embryology.* William and Wilkins.
5. Thompson, J.S. and M.W. Thompson. *Genetics in Medicine.* Philadelphia:W.B. Saunders.
6. Stuin, J and M.B. Carpenter. *Human Neuroanatomy.*
7. Snell, Richard S. *Clinical Neuroanatomy for MedicaL Students.* William and Wilkins.

M.Sc. (Medical Microbiology) - 1st Year

Basics of Physiology

1. **Cell Physiology:**

   Cell structure and membrane transport, Resting Membrane Potential, Composition of ECF and RCF, Nernst Equation, Equilibrium Potential, Goldmann Equation.

2. **Nerve-Muscle and Biopotentia:**

   Neuron (structure, function and classification), Neuroglia, Action Potential, Neuromuscular junction, Skeletal Muscle (structure, mechanism of **contraction** and relaxation), Smooth Muscle (structure, mechanism of contraction and relaxation).

3. **Blood:**

   Function and Composition, Erythocytes, Haemoglobin, Blood Groups, Leucocytes, Thrombocytes, Immunity

4. **Cardiovascular System:**

   Cardiac Muscle, Physiological anatomy of heart and conduction system, Cardiac Action Potential, Normal ECG, Cardiac cycle, Heart sounds, Cardiac output and blood pressure, Coronary circulation.

5. **Respiration:**

   Functional anatomy of the respiratory system, Mechanism of breathing, Dead space, Surfactants, Dynamic and static lung volumes and capacities, Transport of oxygen and carbon dioxide, Regulation of Respiration, Cyanosis, Hypoxia, Oxygen toxicity.

6. **Gastrointestinal Tract:**

   Functional anatomy, Salivary glands (secretion and function of saliva, deglutition), Stomach (composition, regulation of secretion and function of the gastric juice), Liver (secretion and function ofbi1e), Pancreas (secretion and function), Intestines, Intestinal secretion (composition and function), Movements of Intestines, Hormones of GIT.

7. **Excretory System:**

   Function of kidney, Structure of ephron, Juxta glomerular apparatus, Formation of urine. Counter current mechanism, Acidification of urine & role of kidney in maintenance of acid- base balance, Renal function tests, Micturition.

8. **Autonomic Nervous System:**

   Organization of the ANS, Chemo-transmitters, Effect of sympathetic and parasympathetic stimuli on different organ systems.

9. **Central Nervous System:**

   General organization of CNS & PNS, Sensory system (General sensations, receptors,

sensory pathways, sensory areas of brain).

Brain: Functions of Cerebellum, thalamus, hypothalamus, basal ganglia, limbic system, reticular activating system; Higher Function: Sleep.

10. **Special Senses:**

    Eye (functional anatomy, refractory indices of media, rods and cones, role of vitamin A, visual pathway), Ear (structure of internal ear, mechanism of hearing), Taste (distribution and structure of taste buds and taste papillae, primary taste modalities, taste pathway), Smell (olfactory epithelium and pathway).

11. **Endocrine System:**

    Mechanism of action of hormones, Functions of the following glands: Pituitary, thyroid, parathyroid, adrenal (cortex and medulla), pancreas.

12. **Reproductive System:**

    General organization of male and female reproductive systems, Male: Spermatogenesis and actions of male sex hormones, Female: Sexual cycles and actions of female sex hormones, pregnancy, parturition and lactation, Family planning.

Books Recommended (Latest Edition):

1. Guyton, A. *Textbook of Medical Physiology*. Elsevier.
2. Ganong, W.F. *Review of Medical Physiology.* Lange.
3. Khurana, I. *TextbBook of Physiology*. Elsevier.
4. Berne, Y. *Principles of Physiology*. Elsevier Mosby.
5. Rhodes and Bell. *Medical Physiology: Clinical Medicine*. Williams &Wilkins,.

M.Sc. (Medical Microbiology) - 1st Year
Basics of Biochemistry

Basic concepts of Biochemistry to be studied under the following headings:

1. Cell structure and function and transport through the biological membrane.
2. Chemistry of Biomolecules - Ccarbohydrate, lipids, amino acids, proteins and nucleic acids.
3. Chemistry of Blood & haemoglobin.
4. Enzymes.
5. Bioenergetics and Biologic oxidation.
6. Metabolism of carbohydrates, proteins, lipids and nucleotides.
7. Integration of metabolism.
8. Nutrition, vitamins & minerals.
9. Molecular Biology.
10. Detoxification & Xenobiotics.
11. Oxygen derived free radicals.
12. Immunology.
13. Organ function tests.

Books Recommended:

1. Stryer, Lubert, ed. *Biochemistry*. New York: W.H. Freeman.
2. Lehninger, Nelson and Cox, ed. *Principles of Biochemistry*. New Delhi: CBS Publishers.
3. Murray, R.K. and P.A. Mayes, ed. *Harper's Biochemistry.*
4. Devlin, Thomas M., ed. *Textbook of Biochemistry with Clinical Correlations*. New York: Wiley-Liss.
5. Lewin, Benjamin, ed. Genes VI. Oxford: Oxford University Press.

M.Sc. (Medical Microbiology) – 1st Year
Research methodology

Unit – 1

Methods of collection of data, classification and graphical representation of data. Binomial and normal probability distribution. Polygon, histogram, measure of central tendency. Significance of statistical methods, probability, degree of freedom, measures of variation - Standard deviation, Standard error.

Unit – 2

Sampling, sample size and power. Statistical inference and hypothesis. Tests for statistical significance: t-test, Chi-square test, confidence level, Null hypothesis.

Unit – 3

Analysis of Variance (one way and two way ANOVA). Factorial designs (including fraction factorial design). Theory of probability, Permutation and Combination, Ratios, Percentage and Proportion and Multiple comparison procedures.

Unit – 4

Non-parametric tests, Experimental design in clinical trials, Statistical quality control, Validation, Optimization techniques and Screening design. Linear regression and Correlation, least square method, significance of coefficient of correlation, nonlinear regression.

Unit – 5

Report Preparation: Types and Layout of Research Report, Precautions in Preparing the Research Report. Bibliography and Annexure in the Report: Their Significance, Drawing Conclusions, Suggestions and Recommendations to the Concerned Persons. Use of SPSS in Data Analysis.

Books Recommended:

1. Cooper & Schindler. *Business Research Methods*. New Delhi: Tata McGraw Hill.
2. *Saunders' Research Methods for Business Students*. Pearson Education, 2007.
3. Malhotra, Naresh K. *Marketing Research*. Pearson Education.
4. Fisher, R.A. *Statistical Methods for Research Works*. Edinburgh: Oliver & Boyd.
5. Chow. *Statistical Design and Analysis of Stability Studies*. New York: Marcel Dekker.
6. Finney, O.J. *Statistical Methods in Biological Assays*. New York: Hafner.
7. Montgomery, D.C. *Introduction to Statistical Quality Control*. New York : Willy.
8. Lipschutz. *Introduction to Probability and Statistics*. New York: McGraw-Hill.

M.Sc. (Medical Microbiology) - 1st Year
BASICS OF ANATOMY (PRACTICALS)

Practical : Demonstration of the following on dissected parts

1. Anatomical terminology (anatomical plane, anatomical positions, other positions required in clinical practice, terms related to movements and sections etc.)
2. Basics of cytology
3. Musculoskeletal system
4. Integumentary system
5. Cardiovascular system
6. Nervous system
7. Endocrine system
8. Lymphatic system
9. Digestive system
10. Excretory system
11. Reproductive system
12. Basics of Genetics (cell division, cell cycle)

Gross Anatomy Dissections:

1. Superior Extremities
2. Inferiors Extremities
3. Thorax
4. Abdomen
5. Pelvis
6. Head, Neck and Face

M.Sc. (Medical Microbiology) 1st Year
BASICS OF ANATOMY (PRACTICALS)

1. Study of microscope
2. Preparation and staining of blood film and identification of different blood cells
3. Differential leukocyte count
4. Determination of blood group
5. Estimation of haemoglobin
6. Haemin crystal
7. Determination of bleeding and clotting time
8. Total leukocyte count

Books Recommended:

1. Burtis and Ashwood, ed. *Textbook of Clinical Chemistry*. Philadelphia: W.B.Saunders.
2. Keith, Wilson and John Walker, ed. *Principles and Techniques of Practical Biochemistry*. Cambridge: Cambridge University Press.

M.Sc. (Medical Microbiology) – 1st Year
BASICS OF BIOCHEMISTRY (PRACTICALS)

Basic awareness of laboratory with respect to equipments and glassware, units of measurement and calibration of volumetric apparatus, preparation and storage of reagents, standard solutions, buffer solutions and pH determination.

1. Introduction : Handling of chemicals, preparation of regents, Pipetting etc.
3. Colour reactions of carbohydrates.
4. Colour reactions of Lipids .
5. Colour reactions of proteins.
6. Precipitation reactions of protein.
7. Individual proteins -Albumin, Globulin, Casein & Gelatin.
8. Unknown protein identification .
9. Milk Analysis.
10. Starch digestion by salivary amylase and products.
11. Normal constituents of urine.
12. Abnormal constituents of urine and reporting of abnormal urine.
13. pH determination and buffer preparation.
14. Demonstration: Spectroscopic examination of blood.
15. Verification of Beer's Lambert Law: Colorimetry, Spectrophotometry.
16. Estimation of serum glucose level and glucose tolerance test.
17. Estimation of total protein and albumin level and calculation of *A/G* Ratio.
18. Estimation of serum urea level and calculation of urea clearance.
19. Estimation of Serum Uric Acid level.
20. Estimation of Serum Creatinine level and Calculation of Creatinine clearance.
21. * Liver Enzymes Diagnostic Enzymology :- * Cardiac Enzymes * Misc.
22. Estimation of Serum ALP Activity
23. Clinical problems involving organ function tests.
24. Demonstration: Electrophoresis. (Paper, agarose & PAGE)
25. Demonstration: Chromatography (Paper HPLC)
26. Demonstration: Flame photometry.
27. Special Technique:- Bioluminescence, fluormometry, Chemiluminescence.

28. Quality Control.
29. Molecular Biology Practicals.

Books Recommended:

1. Burtis and Ashwood. *Tietz's Textbook of Clinical Chemistry*. Philadelphia: W.B. Saunders.
2. Keith, Wilson and John Walker, ed. *Principles and Techniques of Practical Biochemistry*. Cambridge: Cambridge University Press.

M.Sc. (Medical Microbiology) – 1st Year

FUNDAMENTALS OF COMPUTERS (PRACTICAL)

Unit - I

Basic computer organization functionality computer codes computer classification Boolean algebra, primary storage, secondary storage devices, input-output devices, computer software, computer languages, operating system, business data processing concepts, data communication and networks and advances.

Unit – II

Planning the computer program, algorithm, flowcharts, and decision tables.

Unit – III

Writing simple programs in 'C', Numeric constants and variables, Arithmetic Expressions, Input & Output in 'C' Programs, Conditional statements, implementing loops in programs, arrays, logical expressions, and control statements such as switch, break and continue functions, processing character strings, files in 'C'.

Unit – IV

MS Office (Word, Excel, PowerPoint), Basic Database concept and classification, operations performed on database, using MS-Access, Internet features.

Unit – V

Computer applications in Microbiology and clinical studies.

Books Recommended:

1. Sinha, R.K. *Computer Fundamentals*. New Delhi: BPB.
2. Raja Raman, Y. *Computer Programming in 'C*. New Delhi: PHI.
3. Hunt, N and I. Shelley l. *Computers and Common Sense*. New Delhi: PHI.

M.Sc. (Medical Microbiology)

GENERAL BACTERIOLOGY

General bacteriology

1. History of Microbiology
2. Microscopy
3. Bio-safety including universal precautions
4. Physical and biological containment
5. Sterilization and disinfection
6. Morphology of bacteria and other microorganisms
7. Nomenclature and classification of microorganisms
8. Normal flora of human body
9. Growth & nutrition of bacteria
10. Bacterial metabolism
11. Bacterial toxins
12. Microbiology of air, milk and water
13. Microbial Pathogenicity
14. Antimicrobial drug and drug resistance
15. Bacterial genetics
16. Molecular genetics relevant for medical microbiology
17. Collection of specimens for bacteriological Investigations.
18. Methods of culture, techniques and organisms encountered in: CSF, blood culture, sputum, pus, urine, stool, UTI, endocarditis, Bone and joint infections.

Immunology

1. Components of the immune system
2. Innate and acquired immunity including vaccine
3. Antigens
4. Antibodies
5. Complement
6. Antigen - Antibody Reactions
7. Hypersensitivity Reactions
8. Cell mediated & Humoral Immunity

9. Immunodeficiency
10. Autoimmunity
11. Transplantation immunity
12. Tumor immunity

Systematic bacteriology

1. Isolation & identification of bacteria
2. Gram positive cocci of medical importance including Staphylococcus, Streptococcus, etc.
3. Gram negative cocci of medical importance including Neisseria and Moraxella etc.
4. Gram positive bacilli of Medical importance including Coryneform organisms and Bacillus
5. Actinomycetes andListeria etc.
6. Anaerobic Bacteria of Medical Importance which includes Spore and non spore forming bacteria.
7. Gram negative bacilli of medical importance includingEnterobacteriaceae, Vibrios, Aeromonas, Plesiomonas, Haemophilus, Bordetella, Brucella, Gardnerella, Pseudomonas & other non-fermenters.
8. Helicobacter, Campylobacter
9. Mycobacterium species of Medical Imoprtance.
10. Spirochaetes
11. Chlamydiae
12. Mycoplasmatales: Mycoplasma &Ureaplasma.
13. Rickettsiae, Coxiella & Bartonella.

Virolology

1. General properties of viruses, including virus isolation and identification of viruses
2. Classification of viruses
3. Pathogenesis of viral infections
4. Genetics of viruses, including replication of DNA & RNA virues
5. DNA viruses of medical importance including Poxviridae, Herpesviridae, Adenoviridiae, Hepadna virus, Papova and Parvo viruses & Pox viruses.

6. RNA viruses of medical importance including Enteroviruses, Togaviridae, Flaviviruses, Orthomyxoviruses, Paramyxoviruses, Reoviridiae, Rhabdoviridae, Arenaviridae, Bunyaviridae, Retroviridae, Filoviruses, Hepatitis virus, Human immunodeficiency virus, Arboviruses, Coronaviridae, Calci viruses etc.
7. Slow viruses including prions
8. Oncogenic Viruses
9. Viral Vaccines & anti-viral drugs

Parasitology

1. General characteristics & classification of parasites
2. Methods of identification of parasites
3. Protozoan parasites of Medical Importance including Entamoeba histolytica, Free living amoebae, Giardia, Trichomonas, Leishmania, Plasmodium, Toxoplasma, Cryptosporidium, Microsporidium, Cyclospora, Isospora, Balantidium etc.
4. Helminths of Medical Importance including those belonging to **PhylumCestoda** (Diphyllobothrium, Taenia, Echinococcus, Hymenolepis),**PhylumTrematoda** (Schistosomes, Fasciola, Fasciolopsis, Paragonimus) and **PhylumNematoda** (Trichiuris, Trichinella, Strongyloides, Ancylostoma, Necator, Ascaris, Toxocara, Enterobius, Filarial worms, Dracunculus etc.)
5. Entomology: common arthropods & other vectors viz. mosquito, sandfly, ticks, mite, cyclops, louse, myasis.
6. Antiparasitic agents.

Mycology

1. General characteristics & classification of fungi
2. Morphology & reproduction of fungi
3. Laboratory Diagnosis of Fungal Infections
4. Superficial Mycoses
5. Subcutaneous Mycoses includes Mycetoma & Dematiaceous Fungi
6. Systemic Mycoses
7. Opportunistic Mycoses
8. Antifungal agents

Clinical and Applied Microbiology Including Recent Advances

1. Epidemiology of infectious diseases
2. Immunotherapy
3. Hospital acquired infections, Health Associated Infections
4. Bio Medical Waste Management
5. Investigation of an infection outbreak
6. Antimicrobial Susceptibility Testing
7. Infections of various organs and systems of human body viz. respiratory tract infections, urinary, tract infections, central nervous system infections, congenital infections, reproductive tract infections, gastrointestinal infections, , pyrexia of unknown origin, infections of eye, ear & nose, septicaemia, endocarditis, haemorrhagic fever.
8. Opportunistic infections.
9. Sexually transmitted diseases
10. Vaccinology: principle, methods of preparation, administration of vaccines
11. Molecular techniques as applicable to microbiology
12. Automation in Microbiology
13. Computers in Microbiology
14. Statistical analysis of microbiological data and research methodology
15. Animal & human ethics involved in microbiological work
16. Emerging infectious diseases.
17. Bioterrorism.

M.Sc. (Medical Microbiology)
TEACHING METHODOLOY

Course Contents:

1. Challenges for teachers in Medical Education.
2. Teaching strategies:
    (a) Lecture method
    (b) Small group teaching
    (c) Inquiry and problem solving methods
    (d) Case study
    (e) Team projects
    (f) Presentation
    (g) Seminar
    (h) Field visit
    (i) Simulation
    (j) Computer-based instructions
    (k) Bed side learning
    (l) One to one teaching
    (m) Self-directed teaching
3. Preparation of lesson.
4. Selection of teaching methods.
5. Identification and review of literature.
6. Identification of teaching resources.
7. Developing teaching aids for instructional activities that link research and theory to practice.
8. Contact development; key element of curriculum design and evaluation.
9. Implementation and monitoring of curriculum transaction and student's evaluation.
10. Student feedback: Designing and implementation.
11. Research paper writing.

M.Sc. (Medical Microbiology)

Practical

Bacteriology - Must acquire

1. Collection/transport of specimens for microbiological investigations
2. Preparation, examination & interpretation of direct smears from clinical specimens
3. Inoculation of clinical specimens on media for isolation, purification, identification and quantitation purposes.
4. Preparation of stains viz. Gram, Albert's, capsules, spores, Ziehl Neelsen (ZN) Silver impregnation stain and special stains for capsule and spore etc.
5. Preparation and pouring of media like Nutrient agar, Blood Agar, Mac-conkey agar, Sugars, Serum, sugars, Kligler iron agar, Robertson's cooked meat broth, Lowenstein Jensens medium, Sabouraud's dextrose agar etc.
6. Preparation of reagents -Oxidase, Kovac etc.
7. Quality control of media, reagents etc.
8. Care & operation of Autoclave, Hot air Oven, Distillation plant, Various Filters like Sietz & membrane filters, Water Bath, Centrifuge, Refrigerators, Incubators etc
9. Care and operation of microscopes
10. Washing and sterilisation of glassware (plugging and packing)
11. Safe Laboratory practices and PPE
12. Sterility tests of cultures, media, reagents, autoclave & disinfectants.
13. Identification of bacteria of medical importance
14. Techniques of anaerobiasis
15. Tests for Motility:hanging drop, Cragie's tube, dark ground microscopy for spirochaetes
16. Preparation of antibiotic discs; performance of antimicrobial susceptibility testing, eg. Kirby Bauer, Stoke's method, Estimation of Minimal Inhibitory/Bactericidal concentrations by tube/plate dilution methods.
17. Testing of disinfectants -Phenol coefficient and "in use" tests
18. Disposal of contaminated materials like cultures and Infectious Waste
19. Disposal of infectious waste
20. Maintenance & preservation of bacterial cultures

Bacteriology - Desirable to acquire

1. Epidemiological Typing Methods (Phage typing, Bacteriocin typing, Molecular typing etc)
2. Antimicrobial susceptibility tests for Mycobacteria
3. Special staining techniques for Mycoplasma, Treponemes, Gardenerella.
4. Special tests-Bile solubility, chick cell agglutination, sheep cell haemolysis, niacin and catalase tests for Mycobacterium, satellitism, CAMP test, catalase, slide & tube agglutination tests.
5. Tests for Beta-lactamase production.
6. Bleeding techniques of animals including sheep
7. Inoculation of infective material by different routes in animals
8. Performance of autopsy on animals & disposal of animals
9. Animal pathogenicity/toxigenicity testing for *C.diphtheriae, C.tetani, S.pneumoniae, S.typhimurium, K.pneumoniae etc.*
10. Care and breeding of laboratory animals viz. mice, rats, guinea pigs, rabbits etc.
11. Bacteriological tests for water, air and milk

Immunology - Must acquire

1. Collection of blood by venepuncture, separation of serum, plasma and preservation of serum for short and long periods
2. Performance of serological tests viz. Widal, Brucella tube agglutination, indirect hemagglutination, VDRL, ASO and IFA.
3. Immunodiffusion in gel (Ouchterlony), counter-immunoelectrophoresis.
4. Enzyme linked immunosorbent assay
5. Latex agglutination tests

Immunology - Desirable to acquire

1. Estimation of serum Immunoglobulins
2. Immunoelectrophoresis
3. Immunoblotting
4. Performance of serological tests viz. Weil Felix, cold agglutination, Paul Bunnel test
5. Lymphocyte Phenotyping: FACS (flowcytometery)

6. Preparation of antigens from bacteria or tissues like Widal, Weil Felix, VDRL, SLO and group polysaccharide of Streptococcus etc. and their standardisation.
7. Raising of antisera in laboratory animals

Mycology - Must acquire

1. Collection and transport of specimens
2. Processing of samples for microscopy and culture.
3. Direct examination of specimens by KOH, Gram's, Acid fast, Giemsa, Lactophenol cotton blue & special fungal stains
4. Isolation and identification of medically important fungi & common laboratory contaminants
5. Maintenance of stock cultures

Mycology-Desirable to acquire

1. Antigen detection in cryptococcosis, aspergillosis, candidiasis
2. Skin test using aspergillin, candidin, histoplasmin, sporotrichin
3. Isolation and identification of actinomycetes.
4. Calcofluor staining & examination under fluorescent microscope
5. Special techniques like Wood's lamp examination, hair baiting, hair perforation, paraffin baiting and slide culture
6. Animal pathogenicity tests viz. intravenous, intracerebral and intra peritoneal inoculation of mice for fungal pathogenicity study.

Parasitology - Must acquire

1. Collection and transport of specimens for diagnosis of parasitic infections
2. Examination of faeces for parasite ova and cysts etc. by direct and concentration methods (salt floatation and formalin-ether methods)
3. Egg counting techniques for helminths micrometry and mounting of slides
4. Examination of blood for protozoa and helminths by wet mount, thick and thin stained smears
5. Examination of blood for microfilariae including concentration techniques
6. Examination of other specimens eg. Urine, CSF, Bone marrow etc. for parasites
7. Histopathology sections -examination and identification of parasites

8. Preparation & performance of stains -Leishman, Giemsa, Lugol's iodine.
9. Micrometry
10. Identification of medically important adult worms
11. Identification of common arthropods and other vectors viz. mosquito, sandfly, ticks, mites, Cyclops
12. Preservation of parasites-mounting, fixing, staining etc.

Parasitology - Desirable to acquire

1. Maintenance of parasites in laboratory by in-vitro cultures
2. Permanent staining techniques like iron hematoxylin
3. QBC for Malaria & Filaria .
4. Preparation of media -NIH, NNN etc

Virology - Must acquire

1. Preparation of glassware for tissue cultures (washing, sterilisation).
2. Preparation of buffers like PBS, Hank's
3. Preparation of clinical specimens for isolation of viruses
4. Collection & transport of specimens
5. Recognition of CPE producing viruses
6. Handling of mice, rats and guinea pigs for collection of blood, pathogenicity tests, etc.
7. Preservation in -70°C and liquid nitrogen

Virology - Desirable to acquire

1. Electron microscopy of virus -TEM, SEM
2. Preservation of viruses
3. Molecular techniques in virology
4. Serological tests -ELISA for HIV & HBsAg, Haemagglutination Inhibition test for Influenza, Measles Course and Curriculum of M D Microbiology 131
5. Chick Embryo techniques-inoculation and harvesting
6. Special staining procedure for viruses

7. Performance of haemadsorption for Parainfluenza, Haemagglutination of Influenza, Immunofluorescence, Neutralisation for Enteroviruses and Respiratory viruses. Identification tests on tissue cultures and supernatants etc.

M.Sc. (Medical Microbiology)

TEACH1NG PRACTICE

Course Contents:

1. Acquire competence to plan for instructions and delivery of curriculum.
2. Obtain feedback both about teaching as well as student learning.
3. To develop broad understanding of modern principles and procedures used in medical science education.
4. Development of essential skills for practicing modern medical science teaching.

For teaching practice, the student shall take classes as decided and allocated by the Department. For evaluation purpose, a board of three examiners comprising one internal and two external examiners will be appointed by the Vice Chancellor from the panel of examiners by the recommended by the Director/Dean of the College/Faculty. All the three examiners will assess the student separately and average of these marks shall be awarded as final marks to the student concerned.

M.Sc. (Medical Microbiology)

THESIS

Guidelines:

1. Each M.Sc. Medical student will carry out research work under the supervision of a faculty member (Guide) with post- M.D./ Ph.D. teaching experience of three years or more in the subject. However, a teacher with M.D./Ph.D. degree in the subject or related subjects shall be qualified for being taken as Co-guide.
2. The Guide will be allotted to each student at the commencement of second year. The student will prepare a Plan of Thesis under the supervision of the Guide, and submit it to the University within two months of commencement of second year. The University will convey approval/disapproval of the Plan within one month.
3. In case, the Plan is disapproved, a fresh plan must be submitted within one month. After approval of the plan, the student will begin work on the thesis.
4. The progress of work will be monitored regularly by the Guide. The thesis not exceeding 100 pages typed on A4 paper on one side only in double spacing is to be submitted to the University through the Guide, six months before the date of 3rd Year University examination.
5. It will be evaluated by a panel of two examiners (01 external & 01 internal at least) approved by the Vice Chancellor. The approval of the thesis by the panel will be a pre-requisite for the candidate to appear in the written/practical examination of 3rd year. If the thesis is returned for revision, the suggested revision must be done and the revised thesis submitted for evaluation to the examiner(s) who has/ have suggested for the revision.
6. After approval of revised thesis, the candidate can appear in the ext 3rd Year Examination, provided the approval is received one month before the examination. If the thesis is disapproved, the entire process from submission of a new plan to submission of Thesis is to be repeated. On approval of new thesis, the candidate can appear in the next 3rd Year examination, provided there is a one month gap between the receipt of approval and commencement of examination.

Note: A student is required to submit four hard copies of the thesis alongwith the soft copy in the prescribed format given by the University.

Books Recommended:

1. Arora, D.R. and Brij Bala Arora. *Textbook of Microbiology*. 4th ed. New Delhi: CBS Publishers, 2012.
2. Arora, D.R. and Brij Bala Arora. *Medical Parasitology*. 4th ed. New Delhi: CBS Publishers, 2014.
3. Arora, D.R. and Brij Bala Arora. *Medical Mycology*. New Delhi: CBS Publishers, 2013.
4. Arora, D.R. *Practical Microbiology*. New Delhi: CBS Publishers, 2007.
5. Bailey and Scott's *Diagnostic Microbiology.* 9th ed. St. Louis: C.V. Mosby, 2003.
6. Collee and McCartney. *Practical Medical Microbiology.* 14th ed. 1999.
7. Cruckshank vol. I & II
8. Koneman, E.W., S.O. Allen, P.C. Schreckenberg, and W.C. Winn, eds. *Atlas and Textbook of Diagnostic Microbiology.* 4th ed. Philadelphia: J.B. Lippincott, 1992.
9. Murray, P.R, E.J. Baron, M.A. Pfaller, P.C. Tenover, and R.H. Yolken, eds. *Manual of Clinical Microbiology.* 6th ed. Washington DC: American Society for Microbiology, 2005.
10. Roitt, Ivan M. *Immunology*. 10th ed. Oxford: Blackwell, 1994.
11. Woods G.L and J.A. Washington. *Clinician and the Microbiology Laboratory*.

Proposed Study & Evaluation Scheme

M.Sc. (Medical Physiology)

SGT MEDICAL COLLEGE, HOSPITAL & RESEARCH INSTITUTE Budhera, Gurgaon - 122505

M.Sc. (Medical Physiology)

Programme : M.Sc. (Med. -Physiology)

Duration : 3 years full time (annual system)

Medium : English

Eligibility :

a) MBBS from MCI recognized Medical College.

b) BDS from DCI recognized Dental College or

c) Graduation in any related medical/science / life science field with a minimum of three years degree course including MAMS, BHMS, BPT, B Sc Nursing & B.Sc MLT from any UGC approved university.

Objectives:

The candidate qualifying for the award of M.5c. (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
6. Organize and equip physiology laboratories. learning activities & training:

Learning activities & training :

(a) Didactic teaching :-

Topics in gross anatomy, micro anatomy, embryology, neuro anatomy and genetics along with related practical sessions.

(b) Communication Skills:-

journal club. Seminars (c) Hand on experience:-

(c) Hand on experience :-

Techniques in micro anatomy, museum specimens & embalming, and experimental work.

(d) Teaching assignments :-

Taking U.G. classes, demonstrations & practical for one semester. Preparation of A.V. aids for teaching, presentations, and setting objective questions - SAQs / MCQs. Participation in symposia, seminars & workshops.

(e) Research :-

Project / thesis - Project should be submitted 6 month before the final examination.

Evaluation :-

Written and practical assessment every semester. Internal assessment tests of 25 marks each for theory & practical shall be conducted in the 1st & 2nd years of M.Sc course and 50 marks in the third year course.

University examination shall be held by the university at the end of each year which is as follow :-

At the end of 1st year -	1st university examination		
Two theory papers:	Duration 3 hrs, Marks 75 each =		150 Marks
Grand viva		=	25 Marks
Int. Assessment		=	25 Marks
Total		=	200 Marks
Practical 75 & internal assessment 25		=	100
Grand Total		=	300 Marks

At the end of 2nd year -		2nd university examination	
Two Theory Papers	:	Duration 3 hrs, Marks 75=150	
Grand Viva		=	25
Internal Assessment	:	=	75
Practical Examination		=	75
Internal Assessment		=	25
Total		=	100
Grand Total		=	200+100=300

At the end of 3rd year -		Final University Examination	
Two Theory Papers	:	Duration 3 hrs, 100 Marks each = 200	
Grand Viva		=	50
Internal Assessment	:	=	25
Total (Theory)		=	275
Practical		=	100
Internal Assessment		=	25

Total	=	125
Grand Total	=	275+125=400

Panel of Examiners:

There shall be panel of 4 Examiners; two internal & two external examiners recommended by the principle & 3pproved by the university.

Result:

Shall be prepared and declared as below: ..

a) 50% & above separately in theory & practical pass
b) 75% & above separated in theory & practical pass with distinction. (c) Below 50% in any theory or practical fail

Eligibility for appearing in university examination

a) 80% Attendance in theory
   85 % Attendance in Practical
b) The candidate should attain 40% marks in the internal assessment failing which he or she will not be allowed be appear in the University examination.

Question Paper Structure:-

The question paper shall consists of 5 questions carrying equal marks, all the questions are to be attempted. Questions can be short question / answer, long question, diagrams & enumerators giving coverage the wole syllabus of that particular year.

Reappear or Supplementary Exam:-

Candidate who has been placed under reappear category shall be allowed to continue studies in the next year but he / she will have to pass the supple Examination with in 3 months after the regular examination. Failure in supple examination will cause revertion to the corresponding junior batch.

M.Sc. (Medical Physiology) Year - I
BASICS OF PHYSIOIJOGY

Course
Contents 1.

Cell Physiology

Cell Structure and membrane transport, Resting Membrane Potential, Composition of ECF and ICF, Nerst Equation, Equilibrium Potential, Gibbs-Donnan membrane equilibrium,Gold man equation

2. Nerve-Muscle and Biopotential

Neuron (structure, function and classification), Neuroglia, Action Potential, Neuromuscular junction, Skeletal Muscle (structure, mechanism of contraction and relaxation), Smooth Muscle (structure, mechanism of contraction and relaxation)

3. Blood

Function and Composition, Erythrocytes, Haemoglobin, Blood groups, Leucocytes, Thrombocytes, Immunity

4. Cardiovascular System

Cardiac Muscle, Physiological anatomy of heart and conduction system, Cardiac Action Potential, Normal ECG, Cardiac cycle, Heart sounds, Cardiac output and blood pressure, Coronary circulation, Effect of exercise on cardiovascular system.

5. Respiration

Functional anatomy of the respiratory system, Mechanism of breathing, Dead space, Surfactants Dynamic and static lung volumes and capacities, Transport of oxygen and carbon dioxide, Regulation of Respiration, Cyanosis, Hypoxia, Oxygen toxicity, Effect of exercise on respiratory system.

6. Gastrointestinal Tract

Functional anatomy, Salivary glands (secretion and function of saliva, deglutition), Stomach (composition, regulation of secretion and function of the gastric juice), Liver (secretion and function of bile), Pancreas (secretion and function), Intestines, Intestinal secretion (composition and function), Movements of Intestines, Hormones of GIT

7. Excretory System

Function of kidney, Structure of nephron, Juxta glomerular apparatus, Formation of urine Counter current mechanism, Acidification of urine & role of kidney in maintenance of acid base balance, Renal function tests, Micturition & applied aspects

8. Autonomic Nervous System

Organization of the ANS, neuro-transmitters, Effect of sympathetic and parasympathetic stimuli on different organ systems

9. Central Nervous System

General organization of CNS & PNS, synapse and properties, Sensory system :(General sensations, receptors, sensory pathways, sensory areas of brain)

Motor system: muscle spindle, Golgi tendon organ, reflex arc, descending pathway (corticospinal and extra-pyramidal tracts)

Brain: Functions of: Cerebellum, thalamus, hypothalamus, basal ganglia, limbic system, reticular activating system; Higher Function: Sleep, Speech

Tone & posture, Effect of lesions; Hemiplegia, complete and incomplete of transection of spinal cord, syringomyelia, Tabes Dorsalis.

10. Special Senses

Eye (functional anatomy, refractory indices of media, rods and cones, role of vitamin A, visual pathway), Ear (structure of internal ear, mechanism of hearing), Taste (distribution and structure of taste buds and taste papillae, primary taste modalities, taste pathway), Smell (olfactory epithelium and pathway)

11. Endocrine System

Mechanism of action of hormones, Functions of the following glands: Pituitary, thyroid, parathyroid, adrenal (cortex and medulla), pancreas

12. Reproductive System

General organization of male and female reproductive systems, Male: Spermatogenesis and actions of male sex hormones, Female: Sexual cycles and actions of female sex hormones, pregnancy, parturition and lactation, Family planning.

M.Sc. (Medical Physiology) Year-I
BASICS OF PHYSIOLOGY (PRACTICALS)

Course Contents

- Study of microscope
- Preparation and staining of blood film and identification of different blood cells
- Differential leukocyte count
- Determination of blood group
- Estimation of haemoglobin
- Haemin crystal
- Determination of bleeding and clotting time
- Total leukocyte count
- Platelet count
- ESR & PCV

M.Sc. (Medical Physiology) Year-II
PHYSIOLOGY - I

Course Contents

Cell

Definition, structure of cell, organelles, and biological membranes, Transport across biological membranes, Composition of ECF and ICF, Nerst equation, equilibrium potential, Goldman equation , Gibbs-Donnan membrane equilibrium

Nerve, Muscle and Biopotential

Nerve: Structure of neuron, Classification of neuron, Properties of nerves, Neuroglia and its functions, Monophasic and biphasic action potential, Saltatory conduction, factors affecting conduction velocity, Local response, catelectrotonic and a electrotonic potentials, Strength action curve: chronaxie and rheobase, Compound action potential, Classification of nerve injury; Degeneration and regeneration, Neuromuscular junction and synapse Skeletal Muscle: Structure of skeletal muscle, contractile and regulatory protein, sarcoplasmic reticulum, Properties of muscles, Excitation and contraction coupling, Relaxation of skeletal muscle, Rigor mortis, Isotonic and isometric contraction, Length tension relationship, Oxygen debt mechanism, Fast (white) and slow (red) muscle fibers and their differences

Smooth Muscle: Structure and types of smooth muscle, Innervation of visceral and multiunit smooth muscle including neuro-transmitters, Mechanism of contraction of smooth muscles Properties of smooth muscles

Blood

Function and composition of blood, Structure of RBC, bone marrow, erythropoiesis, erythropoietin and factors regulating maturation of RBCs; Reticulocytes and their importance Haemoglobin: Structure, function, synthesis; Abnormal hemoglobins and related diseases

Fate of hemoglobin, bilirubin metabolism, jaundice and their types, Iron metabolism Anemia: Definition and classification, Polycythemia, Absolute values of blood and RBC indices Blood groups (ABO & Rh systems), Erythroblastosis fetalis, blood transfusion, adverse reaction of mismatched transfusions, Leukocyte: Structure, types, functions of different types, leucopoiesis, Platelets: Blood Coagulation, Plasma Proteins, Immunity: Definition, types, immune response, immunoglobulins

Cardiovascular System

Cardiac Muscle: Structure and function, Physiological anatomy and structure of cardiac conduction system, activation sequence and conduction velocities, Cardiac potential: fast and slow type and their ionic bases, Effect of sympathetic and para-sympathetic stimulation on SA node; Action potential, chemotransmitters and ionic basis, Principles of ECG; Evolution of unipolar and bipolar lead system, Depolarization and repolarization sequence in single cardiac muscle fiber in volume conductor and reason

for upright wave for repolarization (T wave), Einthoven triangle Einthoven law, normal ECG (wave, interval, origin and duration).

Changes in configuration of ECG in 12 leads in a normal person, vector cardiography, principle vectors and vector loop generated during cardiac cycle, Mean electrical axis, method of its calculation, right and left axis deviation, physiological and pathological conditions for axis deviation, Conduction defects in heart and their ECG appearance, Atrial and ventricular arrhythmias, Cardiac cycle, Heart sounds, arterial pulse and jugular venous pressure changes during cardiac cycle, Cardiac output, its regulation and measurement, Peripheral circulation; Organization and innervations, Flow velocity and resistance (pre-capillary and post capillary Biophysical principle applicable to blood vessels, Venous and lymphatic circulation, Regulation of peripheral circulation, Heart rate, vagal tone, regulation of heart rate, Blood pressure, factors affecting BP and determinants of blood pressure, Regulation of BP, High and low blood, pressure, shock, Circulation through different regions: cerebral, coronary, pulmonary, fetal, splanchnic. Effect of exercise on cardiovascular system, Applied aspect; Congestive cardiac failure, Shock, Hypertension.

M.Sc. (Medical Physiology) Year-II
TEACHING METHODOLOGY

Course Contents

- Challenges for teachers in Medical Education
- Teaching strategies
    - Lecture method
    - Small group teaching
    - Inquiry and problem solving methods
    - Case study
    - Team projects
    - Presentation
    - Seminar
    - Field visit
    - Simulation
    - Computer based instructions
    - Bed side learning
    - One to one teaching
    - Self directed teaching

- Preparation of lesson
- Selection of teaching methods
- Identification and review of literature
- Identification of teaching resources
- Developing teaching aids for instructional activities that link research and theory to practice
- Contact development; key element of curriculum design and evaluation
- Implementation and monitoring of curriculum transaction and student's evaluation
- Student feedback: designing and implementation
- Research paper writing

M.Sc. (Medical Physiology) Year-II
Practical

List of Practical

1. Haematology Lab Practical

- Clinical Significance of DLC
- Arneth count
- Blood Typing & Cross matching
- Assessment of Anemic Patients
- Tests for Hemostasis\
- Clinical significance of TLC (Total leukocyte count) Clinical Lab Practical

2.Clinical & Human lab Practical

- Recording of normal blood pressure
- Recording of effect of posture on normal blood pressure
- Recording of effect of exercise on normal blood pressure
- Demonstration of cold pressor test
- Clinical examination of cardiovascular system
- Vitalography
- Lung function tests,
- Stethography and effect of deglutition, coughing, talking and hyperventilation on respiratory movements and determine breath holding time after normal respiration and hyperventilation
- Clinical examination of respiratory system
- Examination of abdomen

3. Amphibian Lab demonstration & Practical

- Study of apparatus and various connection used in experimental lab
- Demonstration of sciatic nerve-gastrocnemius muscle preparation and simple muscle twitch with
  its time relation
- Demonstration of effect of temperature on muscular contraction
- Demonstration of phenomenon of fatigue in a nerve muscle preparation
- Demonstration of effect of increasing strength of stimulus on muscular contraction
- Demonstration and determination of rate of transmission of nerve impulse
- Demonstration of effect of two successive and several successive stmuli on muscular contraction
- Demonstration of genesis of complete and incomplete tetanus
- Demonstration of effect of load on muscular contraction in free loaded and after loaded muscle

M.Sc. (Medical Physiology) Year-III
PHYSIOLOGY

Course Contents

Special Senses

The nature of receptors and modality of stimulation, the organs housing these receptors

Eye: Physiological anatomy, refractory indices of media, image formation, Diaopteric power of refractory surfaces, Details structure of retina, optic disc, and macula, Photochemistry of rods and cones, adaptation of rods and cones, Photopic and scotopic vision, role of vitamin A, Electrophysiology of retina, Visual pathway and its lesions, Field of vision- peripheral vision and central vision, Acuity of vision, stereoscopic vision and color vision

Ear: Physiological anatomy of external and middle ear, Function of external ear and middle ear ossicles, impedance matching, Detailed structure of internal ear (cochlea), Transmission of sound and traveling waves hypothesis, Endolymphatic and cochlear microphonic potentials, Acoustic stimulation, auditory pathway, Bells and decibel units, Hearing disorders- conduction and neural defect, audiometry, Organs of equilibrium, Structure of utricle, saccule and semicircular canal, Stimulation mechanism of otolith organ and semicircular canal, Vestibular pathways, linear and angular acceleration, nystagmus

Smell: Location and structure of olfactory epithelium, Olfactory pathway, Odoriferous substances, Mechanisms of receptors stimulation and impulse generation, Pathway of smell, Parosmia and anosmia, olfactory hallucination

Taste: Primary taste modalities, Chemical nature of taste evoking substances, Distribution and structure of taste papillae and taste buds, Physiology of taste arousal, Taste pathway

Skin and Temperature Regulation: Structure and function of skin, Body temperature-shell and core temperature and their variation Regulation of body temperature, Anterior and posterior hypothalamus, Adaptation to cold and hot weather, Heat stroke

Endocrine System: Introduction: neurocrine, paracrine and autocrine cells, Classification of hormones, Synthesis, storage and secretion of hormones, Transport and metabolism, Regulation of secretion of hormones- neural and feed back, Mechanism of action of hormones, Hypothalamic releasing and inhibiting hormones, **Anterior pituitary hormones, Posterior hormones**, **Thyroid hormones**, **Parathyroid hormones**, **Adrenal cortical and adrenal medulla hormones, Pancreas (Islets of Langerhans) hormones, Pineal hormones**

Reproductive System: Physiological anatomy of male and female reproductive system, Embryological differentiation of male female reproductive organs, Karyosome, male and female chromosomes and diseases due dysjuntion of sex chromosomes, Male sex hormones- secretion, transport, biological action and mechanism of action, regulation of secretion, Female hormones secretion, transport, biological action and mechanism of action, Hypophyseal- Pituitary-gonadal axis, ovarian and menstrual cycle, Physiology of pregnancy, parturition and lactation, Family planning-methods, indication and practice.

M.Sc. (Medical Physiology) Year-III
TEACHING PRACTICE

Objectives:

- Acquire competence to plan for instructions and delivery of curriculum
- Obtain feedback both about teaching as well as student learning
- To develop broad understanding of modem principles and procedures used in medical science education
- Development of essential skills for practicing modem medical science teaching

  For teaching practice student shall take classes as decided and allocated by the Department. For evaluation purpose, a board of three examiners comprising of two internal and two external examiners will be appointed by the Vice Chancellor from the pa el of examiners recommended by the Principal of the College. All the four examiners will assess the student separately and average of these marks shall be awarded as final marks to the student concerned. .

M.Sc. (Medical Physiology) Year-III
Practical

Course Contents

Haematology Lab Practical

- Haemoglobin
- Total red blood cell count
- Total WBC count
- DLC
- Platelet count-Direct & Indirect
- Absolute eosinophil count
- Reticulocyte count
- Osmotic fragility of RBC
- ESRand PCV
- Absolute values

Clinical & Human Lab Practical

- Examination of sensory nervous system
- Examination of motor nervous system
- Examination of cranial nerves
- I and II cranial nerve (perimetry)
- Visual acuity and color vision
- III, IV and VI cranial nerve along with light reflex and accommodation reflex
- V and VII cranial nerve
- VIII cranial nerve
- IX, X, XI, and XII cranial nerves
- NCV
- General examination of the body
- Mosso's ergography
- Electrocardiography(ECG)
- Pulmonary Function tests

Amphibian Lab Practicals

- Recording of normal cardiogram of frog's heart in situ
- Observation on extrasystole, compensatory pause and refractory period
- To observe effect of temperature on heart
- To observe the properties of heart : Stair case phenomenon, All or None Law, Extrasystole & Compensatory Pause
- To observe effect of stimulation of vagus nerve and WCL on heart
- To identify drugs by noting their action on frog's heart
- To observe the effect of ions (Na+, K+, Ca2+) on frog's heart

M.Sc. (Medical Physiology) Year-III
THESIS

Guidelines

Each M.Sc. Medical student will carry out research work under the supervision of a faculty member (Guide) with post-M.D.! Ph.D. teaching experience of three years or more in the subject. However, a teacher with M.D./Ph.D. degree in the subject or related subjects shall be qualified for being taken in as Co-guide.

The Guide will be allotted to each student at the commencement of second year. The student will prepare a Plan of Thesis under the supervision of the Guide, and submit it to the university within two months of commencement of second year. The university will convey approval/disapproval of the Plan within one month.

In case the Plan is disapproved, a fresh Plan must be submitted within one month. After approval of the Plan, the student will begin work on the thesis.

The progress of work will be monitored regularly by the Guide. The thesis not exceeding 100 pages typed on A4 paper on one side only in double spacing is to be submitted to the university through the Guide six months before the date of III year University examination.

It will be evaluated by a panel of examiners (2 external & 1 internal at least) approved by the Vice Chancellor. The approval of the thesis by the panel will be a pre-requisite for the candidate to appear in the written/practical examination of III year. If the thesis is returned for revision, the suggested revision must be done and the revised thesis submitted for evaluation to the examiner(s) who has / have suggested for the revision.

After approval of revised thesis, the candidate can appear in the next 3rd year examination provided the approval is received one month before the examination. If the thesis is disapproved, the entire process from submission of a new Plan to submission of Thesis is to be repeated. On approval of new thesis, the candidate can appear in the next 3rd year examination provided there is a one month gap between the receipt of approval and commencement of examination.

Note: A student is required to submit four hard copies of the thesis along with the soft copy in the prescribed format given by the college.

MSc Medical Pharmacology

Vision:-

- At the end of the course the students should be versed with the basic principles of Pharmacology and is up to date with the recent advances.
- Who shall have acquired the basic skills in teaching of the medical and paramedical professionals.

Mission:-

- *At the end of the training the student shall be able to:*
  - Demonstrate sufficient understanding of the concerned speciality.
  - Develop skills in using proper educational methods and techniques.

Programme outcome:-

- During training of M.Sc. students, emphasis is placed on obtaining a knowledge of pharmacology and its principles, as well as being experienced in selected experimental techniques commonly used in pharmacology.
- At the end of the course the students should be versed with the basic principles of Pharmacology and is up to date with the recent advances.
- To think critically about scientific issues and to develop a knowledge-base in pharmacology. Graduates must be able to formulate hypotheses in a specific area of pharmacological research and test them through active research.

Programme specific outcome:-

- *At the end of the course the student should be able to Possess a sound knowledge of the subject in the following areas:*
  - Basic principles of pharmacology
  - Clinical pharmacology (including clinical pharmacokinetics, individualization of drug therapy, drug use in special categories, adverse drug reactions and drug-drug interactions)
  - Systemic pharmacology
  - Research methodology (animal as well as clinical)
  - Biostatistics
  - Commonly used laboratory techniques, analytical methods and instrumentation
  - Teaching technology
  - Methods of Communication and medical writing
  - Develop the ability for continued self learning so as to update the knowledge of recent advances in the field of Pharmacology and allied fields
  - Be competent to teach and train undergraduate medical students
  - Plan and carry out both laboratory and clinical research with adherence to scientific methodology
  - Use teaching-learning media effectively (E.g. Computer, LCD etc
  - Be able to formulate and conduct problem based teaching/ learning exercises
  - Be capable of various managerial skills eg. Organization of workshops/training programmes etc.