

Study & Evaluation Scheme

of

M.Sc. (Medical Physiology)
[Applicable for the Batch 2013-14 till revised]



TEERTHANKER MAHAVEER UNIVERSITY
Delhi Road, Moradabad, Uttar Pradesh-244001

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TEERTHANKER MAHA VEER UNIVERSITY

(Established under Govt. of U. P. Act No. 30, 2008)

Delhi Road, Moradabad (U.P)

Study & Evaluation Scheme of M. Sc. (Medical Physiology)

SUMMARY

Programme	: M. Sc. (Medical Physiology)
Duration	: Three year full time (Annual System)
Medium	: English
Minimum Required Attendance	: 75 percent
Maximum Credits	: 90
Minimum credits required for the degree	: 90

Assessment	Internal		External		Total
	25		75		100
Internal Evaluation (Theory Papers)	Class Test-I	Class Test-II	Assignment(s)	Other Activity (including attendance)	Total
	7.5 Marks	7.5 Marks	5 Marks	5 Marks	25 Marks
Evaluation of Practical/Dissertations & Project Reports	Internal		External		Total
	50		50		100
Duration of Examination	External			Internal	
	3 hrs.			1 ½ hr.	

To qualify the course a student is required to secure a minimum of 50% marks in aggregate including the year-end examination and teachers continuous evaluation.(i.e. both internal and external).A candidate who secures less than 50% of marks in a course shall be deemed to have failed in that course.

A Candidate who has been placed under re-appear category in any of the subject shall be allowed to continue his/her studies in the next year but will have to appear in the supplementary examination to be conducted within three months after declaration of the result.

Students clearing all papers or having failure in not more than two subjects will be allowed to move to the next higher class. Students with failure in more than two subjects will have to re-appear in the said papers in the year end examination of the program in the subsequent year(s).

Note: For internal assessment purpose, there will be three Class Tests in a year and best two tests will be computed for the final result.

STUDY & EVALUATION SCHEME
Programme: M. Sc. (Medical Physiology)

Year-I

S. No.	Course Code	Subject	Periods				Credit	Evaluation Scheme		
			L	T	S	P		Internal	External	Total
1	MSC101	Basics of Anatomy	6	-	1	-	7	25	75	100
2	MSC102	Basics of Physiology	5	-	1	-	6	25	75	100
3	MSC103	Basics of Biochemistry	4	-	1	-	5	25	75	100
4	MSC104	Research Methodology	1	-	-	-	1	25	75	100
5	MSC151	Basics of Anatomy (Lab)				6	3	50	50	100
6	MSC152	Basics of Physiology (Lab)				6	3	50	50	100
7	MSC153	Basics of Biochemistry (Lab)				4	2	50	50	100
Total			16		3	16	27	250	450	700

Year-II

S. No.	Course Code	Subject	Periods				Credit	Evaluation Scheme		
			L	T	S	P		Internal	External	Total
1	MSF201	Physiology -I	3	2	1	-	5	25	75	100
2	MSF202	Physiology -II	3	2	1	-	5	25	75	100
3	MSC201	Teaching Methodology	2	1	1	-	3	25	75	100
4	MSF251	Physiology Practical I	-	-		24	12	50	50	100
5	MSC251	Fundamental of Computer (Lab)				2	1	50	50	100
Total			8	5	3	26	26	175	325	500

Year-III

S. No.	Course Code	Subject	Periods				Credits	Evaluation Scheme		
			L	T	S	P		Internal	External	Total
1	MSF301	Physiology - III	3	2	1	-	5	25	75	100
2	MSF302	Physiology - IV	3	2	1	-	5	25	75	100
3	MSC351	Teaching Practice	-	-	-	6	3	50	50	100
4	MSF351	Physiology Practical II	-	-	-	24	12	50	50	100
5	MSF352	Thesis	-	-	-	-	12	50	50	100
Total			6	4	2	30	37	200	300	500

L – Lecture T- Tutorial P- Practical S= Seminar C-Credits
1L = 1Hr 1T= 1 Hr 1P= 1 Hr 1S=1Hr 1C =1Hr of Lecture/Seminar
2 Hrs of Practical/Tutorial

Note: Presenting paper/poster at conferences/ preparing manuscripts for documentation and presenting seminar shall be given weight age in the internal assessment.

Question Paper Structure

- 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 Physiology) Year-I

BASICS OF ANATOMY

Course Code: MSC101

L-6, T-0, P-0, S-1 C-7

Course Contents

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,
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

Anatomy of each part including functional, sectional and radiological anatomy

Recommended Books

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

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

Course Code: MSC102

L-5, T-0, P-0, S-1 C-6

Course Contents

1. Cell Physiology

Cell Structure and membrane transport, Resting Membrane Potential, Composition of ECF and ICF, Nernst Equation, Equilibrium Potential, Goldman 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

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 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

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)

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

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

Reference Books (Latest Edition)

1. Guyton, A., *Text Book of Medical Physiology*, Elsevier Publication,
2. Ganong, W.F., *Reviews of Medical Physiology*, Lange Publication
3. Khurana, I., *Text Book of Physiology*, Elsevier Publication
4. Berne V, *Principles of Physiology*, Elsevier Mosby Publication.
5. Lippincott W &Wilkins, *Medical Physiology (Clinical Medicine)*, Rhodes &Bell.

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

Course Code: MSC103

L-4, T-0, P-0, S-1, C-5

Course Contents

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 Bio molecules – carbohydrate, 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.

Reference Books

1. Lubert Stryer (Ed.), *Biochemistry*, W.H. Freeman & Company, New York.
2. Lehninger, Nelson & Cox (Ed.), *Principles of Biochemistry*, CBS Publishers & Distributers.
3. Murray R.K. & P.A. Mayes (Ed.), *Harpers Biochemistry*, D.K. Granner,
4. Thomas M. Devlin (Ed.), *Textbook of Biochemistry with Clinical Correlations*, Wiley Liss Publishers.
5. Benjamin Lewin (Ed), *Genes VI*, Oxford University Press

M.Sc. (Medical Physiology) Year-I RESEARCH METHODOLOGY

Course Code: MSC104

L-1, T-0, P-0, S-0, C-1

Course Contents

Unit – 1

Methods of collection of data, classifications 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.

Recommended Books

1. Cooper & Schindler, *Business Research Methods*, 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*, Oliver & Boyd, Edinburgh.
5. Chow, *Statistical Design and Analysis of Stability Studies*, Marcel Dekker, New York.
6. Finney, D.J., *Statistical Methods in Biological Assays*, Hafner, New York.
7. Montgomery, D.C., *Introduction to Statistical Quality Control*, Willy.
8. Lipschutz, *Introduction to Probability and Statistics*, McGraw-Hill.

Note:

* Latest editions of all the suggested books are recommended.

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

Course Code: MSC151

L-0, T-0, P-6, S-0, C-3

Course Contents

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 Physiology) Year-I
BASICS OF PHYSIOLOGY (LAB)**

Course Code: MSC152

L-0, T-0, P-6, S-0, C-3

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

Recommended Books

1. Ghai, C.L., *Textbook of Practical Physiology*, Jaypee Bros.
2. Jain, A.K., *Manual of Practical Physiology*, Arya Publications

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

Course Code: MSC153
2

L-0, T-0, P-4, S-0, C-

Course Contents

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.

S. No.	Topic
1.	Introduction : Handling of chemicals, preparation of reagents Pipetting etc.
2	Colour reactions of carbohydrates
3	Colour reactions of Lipids
3.	Colour reactions of proteins
4.	Precipitation reactions of protein.
5.	Individual proteins -Albumin, Globulin , Casein & Gelatin.
6.	Unknown protein identification
7.	Milk Analysis
8.	Starch digestion by salivary amylase and products.
9.	Normal constituents of urine.
10.	Abnormal constituents of urine and Reporting of abnormal urine.
11.	pH determination and buffer preparation
12.	Demonstration : Spectroscopic examination of Blood
13.	Verification of Beer's Lambert Law: Colorimetry, Spectro photometry.
14	Estimation of serum glucose level and glucose tolerance test.
15	Estimation of total protein and albumin level and calculation of A/G Ratio.
16	Estimation of Serum Urea level and calculation of Urea clearance.
17	Estimation of Serum Uric Acid level.
18	Estimation of Serum Creatinine level and Calculation of Creatinine clearance.
19	Diagnostic Enzymology :- * Liver Enzymes * Cardiac Enzymes * Misc.
20	Estimation of Serum ALP Activity
21	Clinical problems involving organ function tests.
22	Demonstration : Electrophoresis.(Paper, agarose & PAGE)
23	Demonstration : Chromatography (Paper & HPLC)
24	Demonstration: Flame photometry.
25	Special Technique: - Bioluminescence, fluorometry, Chemiluminescence.
26	Quality Control.
27	Molecular Biology Practicals.

Reference Books

1. Burtis & Ashwood W.B (Ed), *Tietz Textbook of Clinical Chemistry*, Saunders Company.
2. Keith Wilson & John Walker (Ed), *Principles & Techniques of Practical Biochemistry*, Cambridge University Press.

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

Course Code: MSF201

L-3, T-2, P-0, S-1 C-5

Course Contents

Cell

Definition, structure of cell, organelles, and biological membranes, Transport across biological membranes, Composition of ECF and ICF, Nernst equation, equilibrium potential, Goldman field equation

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 anelectrotonic 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 neurotransmitters, 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, neurotransmitters 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 (precapillary 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.

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

Course Code: MSF202

L-3, T-2, P-0, S-1 C-5

Course Contents

Respiratory System, Environmental, and Exercise Physiology

Functional anatomy of respiratory passage, airways resistance, bronchodilators and bronchoconstrictors, clinical applications, Mechanism of breathing (inspiration and expiration)

Dead space, Alveolar ventilation, intra- pleural, intra-alveolar and trans-pulmonary pressures

Surfactant, work done during breathing, Compliance, Blood flow in different zones of the lungs

Principal governing diffusion of gases in lungs, Transport of oxygen, oxygen dissociation curve and factors affecting it carbon dioxide transport chloride shift Haldane effect Lung function test, Regulation of respiration: Neural and chemical, Hypoxia: types, causes, characteristic features of each type, Cyanosis, dyspnoea, Oxygen therapy, Effect of hypoxia on body at different altitudes, acute mountain sickness, periodic breathing, apnoea, eupnoea, hyperpnoea, tachypnoea, Acclimatization, Effect of high barometric pressure on body, decompression sickness, Exercise physiology.

Gastrointestinal Tract

General organization of GIT and its sphincters, Sympathetic and parasympathetic innervations, Meissnes's and Auerbach plexuses, Salivary glands : Types, secretion, composition and functions of saliva, Regulation of salivary secretion, Deglutition: Phases, mechanism of each phase, effect of lesion of cranial nerve and deglutition center in medulla, Gross division of stomach, Type of gastric glands: Histology and percentage distribution, Mechanism of HCI and enzyme secretion

Composition of gastric secretion, Regulation of gastric secretion: Psychic of neural, gastric phase (hormonal), Intestinal phase, Interdigestive phase, Hyperacidity, hypoacidity (achlorhydria)

Effect of partial gastrectomy (Dumping syndrome), Drugs used in hyperacidity rationale

Mechanisms of gastric emptying and their regulation, Migrating motor complex, Hunger contraction, Small intestines, Histology of intestinal mucosa, Leiberkuhn glands and Brunner's glands, Intestinal secretion and composition, Regulation of intestinal secretion (neural and hormonal mechanism), Movement of small intestines, Applied aspects, Pancreas: Histology and mechanism of pancreatic juice secretion and regulation, Liver: Function, histology, mechanism of bile secretion and their regulation, function of bile, Large intestines: Histology, functions, movement of large intestines, defecation reflex, Hirschsprung's disease, Dietary fiber, Gastrointestinal hormones.

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

Course Code: MSC201

L- 2, T-1, P-0, S-1 C-3

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 Physiology Practical I

Course Code MSF251

L-0, T-0, P-24, S-0, C-12

List of Practical

Haematology Lab Practical

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

Clinical 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
- 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

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 stimuli on muscular contraction (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-II
FUNDAMENTALS OF COMPUTER (LAB)

Course Code: MSC251

L-0, T-0, P-2, S-0 C-1

Course Contents

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 physiology and clinical studies.

Recommended Books

1. Sinha, R.K., *Computer Fundamentals*, BPB Publications.
2. Raja Raman, V, *Computer Programming in 'C'*, PHI Publication.
3. Hunt N & Shelley J., *Computers and Common Sense*, PHI Publication.

* Latest editions of all the suggested books are recommended.

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

Course Code: MSF301

L- 3, T-2, P-0, S-1 C-5

Course Contents

Excretory System

Functions of kidney, Structure of kidney, Nephrons: Type & parts, Juxtaglomerular apparatus, Glomerular filtration and mechanism of urine formation, Function of renal tubules – selective reabsorption and secretion, Counter current mechanism and concentration of urine, Acidification of urine and role of kidney in regulation of acid-base balance, Renal function tests Mechanism of micturition along with applied aspects.

Central Nervous System

General Considerations, General organization of CNS and PNS, General function of CNS: Higher function (speech, memory, sleep, learning), Sensory functions, Motor functions, Brain: thalamus, hypothalamus, basal ganglion, cerebellum, limbic system, reticular activating system, emotion and instinctive behavior

Sensory System

General sensations, stimuli evoking general sensations, cutaneous receptors and properties, Afferent pathways for individual sensation, Sensory areas in brain, Effect of lesions at different levels in sensory pathway, Brown sequard syndrome and syringomyelia

Motor System

Structure and innervations of muscle spindle and Golgi tendon organ, Reflex arc and its properties, reflex action, Corticospinal (pyramidal) and extra Pyramidal tracts and their lesions

Brain

Cerebellum, thalamus, hypothalamus, basal ganglion, limbic system, emotion and instinctual behaviour, reticular activating system

Higher Function

Speech, Learning and Conditioned reflexes, Memory, sleep (REM, NREM), EEG: types of waves, epilepsy

Autonomic Nervous System

General organization of ANS, Synthesis, storage and release of chemo transmitters, Sympathetic nervous system: organ innervations, types of receptors, Effect of sympathetic stimulation on organ system: receptors involved, parasympathetic nervous system: Organs innervated

Effect of parasympathetic stimulation on organ system and receptors involved.

M.Sc. (Medical Physiology) Year-III

PHYSIOLOGY- IV

Course Code: MSF302

L- 3, T-2, P-0, S-1 C-5

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, Diopter 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- T₄, T₃ and RT₃, Parathyroid hormones, Adrenal cortical and adrenal medulla hormones, Pancreas (Islets of Langerhans) 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 dysjunction 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, 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

Course Code: MSC351

L-0, T-0, P-6, S-0 C-3

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 modern principles and procedures used in medical science education
- Development of essential skills for practicing modern 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 one internal and two external examiners will be appointed by the Vice Chancellor from the panel of examiners recommended by the Principal of the College. 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 Physiology) Year-III Physiology Practical II

Course Code MSF351

L-0, T-0, P-24, S-0, C-12

Course Contents

Haematology Lab Practical

- Total red blood cell count
- Platelet count-Direct & Indirect
- Absolute eosinophil count
- Reticulocyte count
- Osmotic fragility of RBC
- ESR and PCV
- Absolute values

Clinical 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
- General examination of the body
- Mosso's ergography
- Electrocardiography (ECG)

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 effect of stannous ligature on heart and study of properties of heart muscle
- To observe Staircase phenomenon
- To observe all or none law
- 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

Course Code: MSF352

L-0, T-01, P-0, S- C-12

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 alongwith the soft copy in the prescribed format given by the college.