Program and Course Structure

School of Medical Science and Research

MSc(Medical Physiology)

Session:2020-22

1. Standard Structure of the Program at University Level

1.1 Vision, Mission and Core Values of the University

Vision of the University

To serve the society by being a global University of higher learning in pursuit of academic excellence, innovation and nurturing entrepreneurship.

Mission of the University

1. Transformative educational experience
2. Enrichment by educational initiatives that encourage global outlook
3. Develop research, support disruptive innovations and accelerate entrepreneurship
4. Seeking beyond boundaries

Core Values

- Integrity
- Leadership
- Diversity
- Community

Vision of the School

To serve the society by being a premier institute that promotes a comprehensive approach to human health through excellence inacademics, research and clinical care

Mission of the School

- Provide a transformative educational experience in Medical Science
- Develop skills and competencies to create global leaders in clinical care
- Promote innovative and collaborative research through intellectual and technological advancement
- Establish a center for excellence in preventive, promotive and curative health care

Core Values

- Integrity
- Leadership
- Ethics
- Community Health

1.3 Program Educational Objectives (PEO)

1.3.1 Writing Program Educational Objectives (PEO)

A post graduate student having qualified the MSc(Medical Physiology) examination should be able to:

PEO1. demonstrate comprehensive understanding of physiology as well as that of the applied disciplines.
PEO2. demonstrate adequate knowledge of the current developments in medical sciences as related to physiology;.
PEO3. teach undergraduates and postgraduates in physiology
PEO4. plan and conduct research; Interpret and evaluate research publications critically.
PEO5 plan educational programs in physiology utilizing modern methods of teaching and evaluation;
PEO6.organize and equip physiology laboratories.

1.3.2 Map PEOs with Mission Statements:

PEO Statements	School Mission 1	School Mission 2	School Mission 3	School Mission 4
PEO1. demonstrate comprehensive understanding of physiology as well as that of the applied disciplines.	3	"-"	2	2

PEO2. demonstrate adequate knowledge of the current developments in medical sciences as related to physiology;.	**3**	**2**	**3**	**3**
PEO3. teach undergraduates and postgraduates in physiology	**3**	**2**	**3**	**2**
PEO4. plan and conduct research; Interpret and evaluate research publications critically.	**3**	**‘‘-‘‘**	**3**	**1**
PEO5 plan educational programs in physiology utilizing modern methods of teaching and evaluation;	**3**	**2**	**3**	**3**
PEO6.organize and equip physiology laboratories	**2**	**‘‘-‘‘**	**3**	**3**

1.3.3 Program Outcomes (PO’s)

A. Cognitive Domain

A post graduate student having qualified the MSc (Physiology) examination should be able to

PO1. demonstrate comprehensive understanding of the structure, function and development of the human body as related to physiology.
PO2. demonstrate elementary understanding of the clinical applications of physiology.
PO3. critically evaluate the impact of the recent information on the genesis of current concepts related to various topics of physiology
PO4. recapitulate the information imparted to the undergraduate students in physiology
PO5. identify a research problem which could be basic, fundamental or applied in nature; define the objectives of the problem and give a fair assessment as to what is expected to be achieved at the completion of the project; interpret the observations in the light of existing knowledge and highlight in what way his observations have advanced scientific knowledge; write a scientific paper on the lines accepted by standard scientific journals.
PO6. demonstrate familiarity with the principles of medical education including definitions of objectives, curriculum construction, merits and merits of various tools used in the teaching-learning process; use of learning aids and learning settings, and methods of evaluation.

B Affective domain
A post graduate student having qualified the MSc (Medical Physiology) examination should be able to
PO7. Demonstrate self-awareness and personal development in routine conduct. (Self-awareness)
PO8. Communicate effectively with peers, students and teachers in various teaching-learning activities. (Communication)
PO9. Demonstrate

a. Due respect in handling human subjects (Ethics & Professionalism)
b. Humane touch while demonstrating living surface marking in subject/patient (Ethics & Professionalism)

PO10. Acquire capacity of not letting his/her personal beliefs, prejudices and limitations come in the way of duty.
PO11. Appreciate the issues of equity and social accountability while exposing students to early clinical exposure (Equity and social accountability)
C**. Psychomotor Domain** The student should acquire competencies in the following tasks:

PO12. perform and critically evaluate the practical exercises done by undergraduate students;
PO13. design, fabricate and use indigenous gadgets for experimental purposes;
PO14. share learning experiences with the undergraduate and postgraduate students using appropriate pedagogical skills and methods;
PO15. draw out meaningful curricula for teaching medical and paramedical courses; give lucid, interactive lectures, presenting the information in a logical, simple and comprehensive manner; generate interest and curiosity amongst the students during lectures; give practical demonstrations;

PO16. organize the laboratories for various practical exercises, substitute and fabricate some of the simpler equipment for teaching purposes.
PO17. handle and order for stores, draw up lists of equipment required to equip physiology laboratories.
PO18. design and carry out technical procedures required for a research study; record accurately and systematically the observations and analyze them objectively; effectively use statistical methods for analyzing the data.

1.3.4 Mapping of Program Outcome Vs Program Educational Objectives

	PEO1	PEO2	PEO3	PEO4	PEO5	PEO6
PO1	3	3	3	2	3	2
PO2	3	3	3	3	3	2
PO3	3	3	3	3	3	2
PO4	3	3	3	2	2	2
PO5	2	3	1	3	2	2
PO6	3	3	3	1	3	2
PO7	3	3	3	3	3	2
PO8	2	3	3	2	3	2
PO9	2	2	2	3	2	2
PO10	3	“-“	3	2	3	2
PO11	3	3	2	2	3	2

PO12	3	3	3	2	3	2
PO13	2	3	3	3	2	3
PO14	3	3	3	3	3	2
PO15	3	3	3	2	3	"-"
PO16	2	2	2	2	2	3
PO17	"-"	"-"	"-"	"-"	2	3
PO18	"-"	"-"	"-"	3	2	"-"

School: SMSR		**Batch: 2019-20**
Program: MSc MEDICAL PHYSIOLOGY		**Current Academic Year: 2019-20**
1	Programme Code	SMS0202

OBJECTIVES

The M.Sc. (Medical Physiology) program has the following broad and intermediate objectives:

Broad Objectives

The candidate qualifying for the award of M.Sc. (Medical 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.

Intermediate Objectives

The candidate qualifying for the award of M.Sc. (Medical Physiology) should be able to:
1. demonstrate comprehensive understanding of the structure, function and development of the humanbody as related to physiology,
2. demonstrate elementary understanding of the clinical applications of physiology,

3. critically evaluate the impact of the recent information on the genesis of current concepts related tovarious topics of physiology;
4. recapitulate the information imparted to the undergraduate students in physiology;
5. perform and critically evaluate the practical exercises done by undergraduate students;
6. identify a research problem which could be basic, fundamental or applied in nature; define the objectives of the problem and give a fair assessment as to what is expected to be achieved at the completion of the project; design and carry out technical procedures required for the study; recordaccurately and systematically the observations and analyze them objectively; effectively use statisticalmethods for analyzing the data; interpret the observations in the light of existing knowledge andhighlight in what way his observations have advanced scientific knowledge; write a scientific paperon the lines accepted by standard scientific journals;
7. design, fabricate and use indigenous gadgets for experimental purposes;
8. demonstrate familiarity with the principles of medical education including definitions of objectives,curriculum construction, merits and merits of various tools used in the teaching-learning process;use of learning aids and learning settings, and methods of evaluation;
9. share learning experiences with the undergraduate and postgraduate students using appropriate pedagogical skills and methods;
10. draw out meaningful curricula for teaching medical and paramedical courses; give lucid, interactivelectures, presenting the information in a logical, simple and comprehensive manner; generate interestand curiosity amongst the students during lectures; give practical demonstrations;
11. organize the laboratories for various practical exercises, substitute and fabricate some of the simplerequipment for teaching purposes; and
12. handle and order for stores, draw up lists of equipment required to equip physiology laboratories

DURATION

The duration of the course will be for 2 or 3 years, depending upon the background qualification of the candidate.For MBBS and BDS, the duration will be for 2 years.

SEMESTER WISE DISTRIBUTION OF ACADEMICS

Each year will be divided into TWO semesters.

First Year

Semester 1

1. Orientation to the department
2. Attending UG lectures and practicalsin the subjects of Anatomy, Physiology, and Biochemistry.

Semester 2

1. Attending UG lectures and practicalsin the subjects of Anatomy, Physiology, and Biochemistry.
2. First/Professional University examination

Second Year

Semester 3

1. Choosing the subject of thesis and assignment of guide
2. Submitting the thesis protocol
3. Seminars, Journal discussions
4. Postgraduate practicals-(Haematology, experimental physiology, Clinical physiology)
5. Microteaching
6. Conducting UG practical classes under the guidance of Senior faculty members
7. Self directed teaching learning activities

Semester 4

1. Active participation in all departmental activities
2. Seminars, Journal discussions
3. Postgraduate practicals-(Haematology, experimental physiology, Clinical physiology)
4. microteaching
5. Conducting UG practical classes under the guidance of Senior faculty members
6. Thesis work

Third Year

Semester 5

1. Active participation in all departmental activities
2. Seminars, Journal article presentation with critical reviews.
3. Postgraduate practicals-(Haematology, experimental physiology, Clinical physiology)
4. microteaching
5. Conducting UG practical classes under the guidance of Senior faculty members
6. Completion and submission of thesis

Semester 6

1. Active participation in all departmental activities
2. Seminars, Journal discussions
3. microteaching
4. Conducting UG practical classes under the guidance of Senior faculty members
5. Final university examination

SYLLABUS AND CURRICULUM COMPONENTS

(a) General & Cellular Physiology

- Cell as the living unit of the body
- The internal environment
- Homeostasis
- Control systems
- Organization of a cell
- Physical structure of a cell
- Transport across cell membranes
- Functional systems in the cells

- Genetic code, its expression, and regulation of gene expression
- Cell cycle and its regulation

(b) Hematology

- Erythrocytes
  - Erythropoiesis
  - Structure & function of RBCs
  - Formation of hemoglobin
  - Destruction & fate of RBCs
  - Anemias
  - Polycythemias
- Leucocytes
  - General characteristics
  - Genesis & life span of WBCs
  - Classification & functions of each type of WBC
  - Leukopenia
  - Leukemias
- Blood groups
  - Classification
  - Antigenicity
  - Agglutination
  - Blood typing
  - Principles of transfusion medicine
- Hemostasis
  - Components of hemostasis
  - Mechanisms of coagulation
  - Coagulation tests
  - Anticoagulants
- Immunity
  - Innate immunity
  - Acquired immunity
  - Allergy, hypersensitivity and immunodeficiency
  - Psychoneuroimmunology

(c) Renal Physiology & Fluid Balance

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

(d) Cardio-vascular Physiology

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

(e) Respiration

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

(f) Environmental Physiology

- Physiology of hot environment
- Physiology of cold environment
- High altitude
- Aviation physiology
- Space physiology
- Deep sea diving & hyperbaric conditions

(g) Nerve & Muscle Physiology

- Resting membrane potential
- Action potential
- Classification of nerve fibres

- Nerve conduction
- Degeneration and regeneration in nerves
- Functional anatomy of skeletal muscle
- Neuro-muscular transmission and blockers
- Excitation-contraction coupling
- Mechanisms of muscle contraction
- Smooth muscle

(h) General, Sensory & Motor Physiology

- General design of nervous system
- Interneuronal communication
- Classification of somatic senses
- Sensory receptors
- Sensory transduction
- Information processing
- Dorsal column & medial lemniscal system
- Thalamus
- Somatosensory cortex
- Somatosensory association areas
- Pain
- Organization of spinal cord for motor function
- Reflexes & reflex arc
- Brain stem & cortical control of motor function
- Cerebellum
- Basal ganglia
- Maintenance of posture and equilibrium
- Motor cortex

(i) Special Senses

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

- Olfactory pathways
- Olfactory perception

(j) Limbic System and Higher Nervous System

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

(k) Nutrition & Metabolism

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

(l) Gastro-intestinal System

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

(m) Endocrines & Reproduction

- Classification of Hormones
- Mechanism of Hormone action
- Measurement of hormones in Blood
- Endocrine functions of the hypothalamus
- Pituitary
- Thyroid
- Adrenals

- The endocrine pancreas
- Pathophysiology of diabetes
- Parathyroid, calcitonin, Vit D & calcium metabolism
- Pineal gland
- Testosterone & male sex hromones
- Spermatogenesis
- Hyper & hypogonadism
- Menstrual cycle
- Female sex hormones
- Pregnancy & Lactation
- Functions of Placenta
- Parturition
- Lactation

Apart from the above topics in general and systemic physiology, the students are introduced to:

1. Biophysics
2. Biochemistry
3. Biostatistics
4. Molecular Biology
5. Comparative Physiology
6. History of Medicine
7. Medical Education

The above topics are covered through a mix of self-learning and structured programs in the department as well as in collaboration with other allied departments of the university.

The structured program consists of:

1. Seminars every Thursday

The seminars are on a topic belonging to a system. The topic is presented indepth appropriate for postgraduates by one of the M.Sc. students and moderated by a facultymember.
The seminars represent only a small and somewhat arbitrary selection of topics. They are not intended to cover an entire system. Their aims are to:

(a) Introduce the system
(b) Tune the students to the system
(c) Cover recent advances
(d) Give students practice in the art of oral presentation

2. Journal clubs / Faculty presentations, every Tuesday

The journal clubs are on an article belonging to a system scheduled for the semester. The article ispresented by an M.Sc. student and moderated by a faculty member.
The aims of journal clubs are to:

(a) Highlight recent advances

(b) Discuss classical papers
(c) Critical appreciation of a research article
(d) Give students practice in the art of oral presentation

- Faculty presentations are usually on:
  (a) Medical education
  (b) Research methodology
  (c) An area of research in which the faculty member is involved

3. Practicals

Relevant practical exercises are conducted every semester exclusively for M.Sc. students. The results obtained in these exercises are presented in teaching meetings (see below). Besides specially designed P.G. practicals, M.Sc. students perform all undergraduate practicals andalso teach a few of these practicals to the undergraduates.

4. Teaching meetings, every alternate Saturday

Since M.Sc. students might opt for a teaching career, they are occasionally involved in teaching undergraduates. In the teaching meetings, the forthcoming practical exercises are discussed, and feedbackon recently held exercises is obtained. These discussions are designed to tune the M.Sc. students toteaching and related administrative responsibilities. In addition, teaching meetings are also utilized fordiscussion of P.G. practicals, research protocols of new P.G. students, presentation of thesis work byP.G. students prior to submission of the thesis, and any other items of interest to the teaching andresearch staff of the department.

5. **Term test will be held every six months for internal assessment in second and third year**

6. **Pre-University examination will be held one month prior to University examination**

THESIS DETAILS

i. Students shall have to submit the protocol of their dissertation to the Dean's office in the third semester

ii. Submission of thesis shall be in the 5th semester

PATTERN OF EXAMINATION

There will be TWO university examinations.

i. The first examination will be held at the end of first year after completion of the second semester. The course will include the Basic Science subjects
   a. Basic and applied Anatomy
   b. Basic and applied Physiology
   c. Basic and applied Biochemistry

   Both theory and Practical exams will be conducted

ii. The Final university examination will be held at the end of three years. There will be **four**theory papers of 3 hours duration each. The course content is as follows:

Paper I-

- General and Cellular Physiology, Comparative Physiology,

Paper II

- Haematology, Physiology of Gastrointestinal System, Cardiovascular System, Respiratory System, Excretory System, Nutrition, Environmental and Exercise Physiology

Paper III

- Endocrinology, Physiology of Reproduction, Central nervous System, Autonomic Nervous System and Special Senses

Paper IV

- Recent Advances in Physiology/Medicine, History of Medicine

CRITERIA FOR APPEARING IN FINAL UNIVERSITY EXAMINATIONS

1. A minimum attendance of 75% in Theory and Practical each.
2. Submission of Thesis by end of 5th Semester.
3. 6 monthly Performance Report from the Thesis Guide/HOD

ASSESSMENT AND EVALUATION SCHEME OF 3RD YEAR ANNUAL EXAMINATION

ASSESSMENT AND EVALUATION SCHEME OF 3RD YEAR ANNUAL EXAMINATIONS

- Regular internal evaluation is done in the form of written, practical and oral examinations in each semester.
- Thesis submission in the beginning of the fifth semester.
- University examination is conducted on completion of course.

Internal Assessment:

- Theory 50 Marks
- Practical 50 Marks

Total Marks **MM 100**

University Examination:

A. Theory: 4 papers

Paper -I: 100 Marks

- General and Cellular Physiology, Comparative Physiology,

Paper –II: 100 Marks

- Haematology, Physiology of Gastrointestinal System, Cardiovascular System, Respiratory System, Excretory System, Nutrition, Environmental and Exercise Physiology

Paper- III: 100 Marks

- Endocrinology, Physiology of Reproduction, Central nervous System, Autonomic Nervous System and Special Senses

Paper –IV: 100 Marks

- Recent Advances in Physiology/Medicine, History of Medicine

	Total Marks of Theory Papers	**MM 400**
B.	**Practical (200)&Viva-voce (100)**	**MM 300**
	Grand total (A+B+Int. Ass)	**MM 800**

Criteria for passing: 50%

RECOMMENDED BOOKS

	Authors
Physiological basis of Medical Practice	Best and Taylor
Understanding medical physiology	R.L. Bijlani& S. Manjunatha
Textbook of medical Physiology	Arthur C. Guyton
Review of medical Physiology	William F. Ganong
Textbook of Physiology (vol.I and II)	A.K.Jain