

**DEPARTMENT OF PHYSIOLOGY**  
***SYLLABUS FOR M Sc. MEDICAL PHYSIOLOGY***

**(1) GOAL**

The aim of the course is to prepare PG students in the subject of Physiology to enable the successful students to be awarded the M.Sc. degree. The course will empower the M.Sc. degree holder to: -

- 1.1 Teach and train future under-graduate medical students in Human Physiology in Medical Colleges and Research Institutions.
- 1.2 Undertake independent research & contribute to advancement of the subject.
- 1.3 Organize & manage administrative responsibilities for routine day-to-day departmental work.

**(2) LEARNING OBJECTIVES**

2.1 Cognitive domain

At the end of the training course the P.G. student should have a thorough knowledge of all organ systems of the body particularly about:-

- 2.1.1 Historical aspects
- 2.1.2 Evolution & development
- 2.1.3 Comparative physiology
- 2.1.4 Structure – gross & electron microscopic, & functions at cellular level.
- 2.1.5 Regulating mechanisms
- 2.1.6 Variation in physiological & pathological conditions.
- 2.1.7 Applied physiology
- 2.1.8 Recent advances.

2.2 Psychomotor domain

*The PG students should be able to:-*

- 2.2.1 Perform human experiments including those based on biophysical Principles and study amphibian experiments by simulation soft ware
- 2.2.2 Acquire history taking & clinical examination skills.

2.3 Affective domain

The PG students should develop communication skills to:-

- 2.3.1 Develop interaction with students, colleagues, superiors & other staff members.
- 2.3.2 Work as members of a team in teaching as well as research activities.
- 2.3.3 Nurture a positive attitude towards teaching as a profession.

### **(3) SELECTION OF CANDIDATES**

- 3.1 Those who hold a BSc (Zoology) degree will be eligible to apply.
- 3.2 Selection shall be through CET conducted by the University.
- 3.3 Duration of course shall be of 3 years inclusive of examination.

### **(4) COURSE CONTENT AND DESCRIPTION**

Since the students would be working in the department for 3 years, the time plan & division of course content will be the following. The lists given below are not exclusive and the PG guide and Head of Department may include any other new topic that they consider appropriate for the PG student to study.

### **(5) I Year (I & II terms) :-**

#### 5.1 Theory

The PG student will: -

- 5.1.1 Attend all UG lectures in Physiology and study in detail all aspects of systemic physiology.
- 5.1.2 attend PG lectures at other PG centers
- 5.1.3 deliver seminars periodically on topics allotted by the PG guide.

#### 5.2 Practicals

The PG student will:-

- 5.2.1 Attend all practicals and demonstrations taught by senior teachers to U.G. students.
- 5.2.2 *Learn basic techniques & instruments used for U.G. practicals.*

#### 5.3 Research

The PG student will:-

- 5.3.1 Decide upon a research topic for thesis and communicate it to the university within three months of registration. The topic should have the approval of institutional ethics committee.
- 5.3.2 Attend & present Journal club.
- 5.3.3 Visit the library to get acquainted with scientific journals.
- 5.3.4 Review the literature for the thesis in the 2<sup>nd</sup> half of 1<sup>st</sup> year.
- 5.3.5 Get acquainted with the basic concepts of biostatistics.

#### 5.4 Medical Education Technology

The PG student will:-

- 5.4.1 Familiarize himself/herself with concepts of medical education technology.
- 5.4.2 Understand evaluation techniques.
- 5.4.3 Attend a medical education technology workshop.

**(6) 2<sup>nd</sup> Year (III<sup>rd</sup> & IV<sup>th</sup> terms): -**

**6.1 Theory**

The PG student will:-

- 6.1.1 Study details of systemic physiology, comparative physiology and recent advances in all topics given below
- 6.1.2 Attend PG lectures and seminars at other PG centers.
- 6.1.3 Deliver seminars periodically on topics allotted by the PG guide.

**6.2 Practicals**

The PG student will:-

- 6.2.1 perform human experiments including those based on biophysical principles and study mammalian & amphibian experiments by simulation software (Expropharma)
- 6.2.2 Undertake a biochemistry posting in the III<sup>rd</sup> term and a clinical posting in the IV<sup>th</sup> term to acquaint with recent advances in both these fields.

**6.3 Research**

The PG student will:-

- 6.3.1 carry out research work related to the thesis.
- 6.3.2 attend local and national conferences of professional bodies to understand how research work is presented.

**6.4 Medical Education Technology**

The PG student will:-

- 6.4.1 learn in detail the teaching learning methods and the methods of the evaluation in practicals & theory.
- 6.4.2 undertake small group teaching in practicals, demonstrations and tutorials.
- 6.4.3 learn to use audiovisual aids.
- 6.4.4 undertake micro-teaching sessions for practicals & theory under supervision.

**(7) 3<sup>rd</sup> Year : -**

**7.1 Research**

The PG student will:-

- 7.1.1 complete & submit thesis to the University at least 6 months before the commencement of the university examination.
- 7.1.2 begin writing articles for publication.

**7.2 Teaching**

The PG student will:-

- 7.2.1 teach all practicals to U.G. students.
- 7.2.2 conduct microteaching sessions for 1<sup>st</sup> year P.G. students.
- 7.2.3 teach theory topics in small groups for U.G. students.

## **(8) DETAILED SYLLABUS**

*In Addition to the U. G. syllabus the P.G. student is expected to study in detail the following: -*

### 8.1 General Physiology

8.1.1 Biological membranes with details of membrane receptors.

8.1.2 Physiology of growth & aging.

8.1.3 Principles & applications – genetics.

### 8.2 Environmental Physiology

8.2.1 Physiology of deep sea diving.

8.2.2 Space physiology

8.2.3 High altitude physiology

8.2.4 Temp regulation – Hypothermia, hyperthermia.

8.2.5 Pollution – air, noise.

### 8.3 Nerve

8.3.1 Experimental techniques to study bioelectrical phenomena(voltage clamp technique, cathode ray oscilloscope, S.D.curve, nerve conduction studies)

### 8.4 Muscle

8.4.1 E.M.G..

8.4.2 Smooth muscle.

8.4.3 Pathophysiology of muscle disorders.

### 8.5 Blood :

8.5.1 Immunity – details .

8.5.2 Plasmin system

8.5.3 Tissue typing.

8.5.4 Blood transfusion and its applied aspects

### 8.6 Cardio Vascular system:

8.6.1 Echocardiography & vector cardiography .

8.6.2 Electrocardiography & Stress test.

8.6.3 Cardiac catheterisation & other invasive procedures.

8.6.4 Flowmeters.

### 8.7 Respiratory system :

8.7.1 Lung function tests – details.

8.7.2 Blood gas analysis.

8.7.3 Hyperbaric oxygen

8.7.4 Artificial respiration/Cardiopulmonary resuscitation

## 8.8 Endocrines

### 8.8.1 Radio-Immuno Assay

## 8.9 Reproductive System

### 8.9.1 In vitro Fertilization

### 8.9.2 Contraceptives – details

### 8.9.3 Neonatal & Foetal Physiology

## 8.10 Alimentary System

### 8.10.1 Gastro intestinal hormones – details

### 8.10.2 Gastro intestinal motility – details

### 8.10.3 Absorption of nutrients

### 8.10.4 Obesity

### 8.10.5 Metabolism in starvation

## 8.11 Renal Physiology

### 8.11.1 Artificial Kidney

### 8.11.2 Acid-base balance – details

### 8.11.3 Cystometry

### 8.11.4 Water and electrolyte balance

## 8.12 Central Nervous System

### 8.12.1 Higher functions ( Speech, memory, learning, thought & consciousness, behavioural physiology, sleep & wakefulness)

### 8.12.2 Voluntary movements

### 8.12.3 Details of the following topics covering physiological anatomy, connections, methods of study of functions, diagnostic techniques, functions & physiological basis of manifestation of diseases

#### (i) Cerebral Cortex

#### (ii) Basal ganglia

#### (iii) Cerebellum

#### (iv) Reticular formation

#### (v) Thalamus

#### (vi) Hypothalamus

#### (vii) A.N.S.

#### (viii) Limbic System

#### (ix) Electroencephalogram, MRI

#### (x) Neurotransmitters

## 8.13 Special Senses

### 8.13.1 Audiometry

### 8.13.2 Retinoscopy, funduscopy, Computerised perimetry, phakoscopy

### 8.13.3 Electrophysiology of retina, cochlea

## 8.14 Exercise Physiology

### 8.14.1 Concept of health fitness

### 8.14.2 Physical fitness, its components & evaluation

### 8.14.3 Physical conditioning & anaerobic threshold

### 8.15 Nutrition

#### 8.15.1 Relationship of diet & disease

### 8.16 Stress relaxation technique:

Principles of various stages of yoga, breathing exercise, meditation and Others

### 8.17 Applied Biochemistry, Biostatistics & Biophysics

## 8.18 PRACTICALS

In addition to U. G. Syllabus, the P.G. student will study and interpret the graphs recorded during various amphibian experiments.

### 8.18.1 Cardiac muscle experiments

Properties of cardiac muscle, nervous regulation of heart, effect of drugs, & effects of ions on isolated frog's heart.

#### **Skeletal muscle experiments**

Effect of various strength of stimuli, effect of load, genesis of tetanus & phenomenon of fatigue, velocity of nerve impulse & effect of temperature.

### 8.18.2 Study & interpret the recorded graph for perfusion of mammalian heart.

(i) Effects of various factors

### 8.18.3 Study of graphs recorded for smooth muscle activities & effects of various factors

### 8.18.4 Interpretation of Biochemical reports

## 8.19 TEACHING LEARNING METHODS

The teaching learning activities would consist of

8.19.1 Attending U. G. lectures.

8.19.2 Attending P. G. lectures.

8.19.3 Microteaching sessions

8.19.4 Journal clubs moderated by teachers.

8.19.5 Seminars, symposia, panel discussion of suitable topics moderated by teachers.

8.19.6 Lectures & Practicals prepared & presented by students under supervision

8.19.7 Attend & participates in conferences, workshops & share knowledge & experiences with others.

## (9) RECOMMENDED READING

### 9.1 Textbooks of Physiology

9.1.1 Guyton – Textbook of medical Physiology

9.1.2 Best & Taylor – Physiology basis of Medical Practice

9.1.3 Samson Wright's Applied Physiology

- 9.1.4 Ganong – Review of Physiology
- 9.1.5 Berne & Levy – Physiology
- 9.1.6 Vander’s human Physiology
- 9.1.7 Prosser & Brown Comparative Physiology-
- 9.1.8 Indu Khurana Text book of Medical Physiology
- 9.1.9 Biostatistics
- 9.1.10 Medical education Technology
- 9.1.11 Patton & fuchs - Text book of Physiology

## 9.2 Journals

- 9.2.1. Physiological Review
- 9.2.2. Indian Journal of Physiology & Pharmacology
- 9.2.3 Journal of applied Physiology
- 9.2.4 Acta physiologica Scandinavica
- 9.2.5 E-Journals in Physiology

## (10) EVALUATION OF STUDENT FOR PG DEGREE ( M.Sc.)

The evaluation of students for award of M.Sc. will consist of written examination practicals, viva and thesis work.

### 10.1 Distribution of marks

Written examination	- 400 marks
Viva & thesis	- 100 marks
Practicals -	- 300 marks

### 10.2 The marks allotment at the practical examination will be as follow as

Interpret the Mammalian recorded graph –	- 50 marks
Interpret the Amphibian recorded graph –	- 40 marks
Clinical Examination	- 40 marks
Haematology	- 50 marks
Human experiments & interpretation of clinical data	- 40 marks
Oration and Microteaching	- 40 marks
Biochemistry test reports	- 40 marks
Grand Viva	- 100 marks
<b>Total marks</b>	<b>- 400 marks</b>
<b>Grand Total marks (Theory + Practical)</b>	<b>– 800 marks</b>

### 10.3 Formative

The student will be assessed throughout the course on following lines.

- 1) Attendance
- 2) Knowledge as tested by written, practical & viva examination
- 3) Presentations in seminars
- 4) Relationship with colleagues, superiors, students & staff members.
- 5) Maintenance of student’s log book

The 5 – point scale will be used	Points
Unsatisfactory	1
Satisfactory but needs improvement	2

Satisfactory	3
Good	4
Outstanding	5

Regular feedback will be to the P.G. students noting their strength, weaknesses and measures to improve.

## 10.4 SUMMATIVE

### 10.4.1 Written Examination

This will consist of four papers of three hours duration and 100 marks each. There will be two questions of 25 marks each and five short answer questions of 10 marks each.

Paper I – General and cellular physiology, applied biochemistry, biophysics & Biostatistics, History and Comparative Physiology

Paper II – Blood, Cardiovascular System, Respiratory system, Alimentary system and Excretory system

Paper III – Endocrines, Special Senses, Nerve muscle physiology; nervous system and reproductive system.

Paper IV – Recent advances, Exercise physiology, Nutrition, Applied physiology, stress relaxation medical education Technology  
Medical ethics

Instruction regarding weightage given to each system will be communicated to paper setters and examiners.

### 10.4.2 Practical Examination –

Interpretation of mammalian & amphibian graphs, case discussion for applied physiology.

Human experiments and clinical examination.

Haematology experiment.

### 10.4.3 Viva voce examination

General viva

Viva thesis

Oration

10.5 Heads of Passing – A candidate will be declared successful only if 50% marks in written examination, viva voce and thesis and practical are obtained separately. The candidate should also obtain at least 50% marks out of the aggregate of 800 marks to be declared successful.

Dr. (Mrs.) NG Borade  
Professor & HOD