Dr. M.G.R. EDUCATIONAL AND RESEARCH INSTITUTE
Deemed to be University

Maduravoyal, Chennai – 600 095, Tamilnadu, India
(An ISO 2001:2018 Certified Institution)

University with Graded Autonomy Status

SYLLABUS & CURRICULUM
for
M.D. PHYSIOLOGY

2020 onwards

Sponsored by

Dr. M.G.R. EDUCATIONAL AND RESEARCH INSTITUTE TRUST

M.D. PHYSIOLOGY

INDEX

M.D. PHYSIOLOGY

1. GOALS

The purpose of this program is to train post graduate students in such a manner that they become competent physiologist who: -

- ❖ Is able to demonstrate comprehensive understanding of physiology (knowledge, attitude and skill) as well as that of applied disciplines
- ❖ Is able to demonstrate adequate knowledge of the current developments in medical sciences as related to physiology
- ❖ Has acquired skills in effective teaching and communicating with medical and paramedical students
- ❖ Is oriented to principles of research methodology and is thus able to plan and conduct research effectively
- ❖ Is able to plan educational programmes in physiology utilizing modern methods of teaching and evaluation
- ❖ Is able to organize and equip physiology labs.

2. OBJECTIVES

At the end of MD Course in Physiology, the student should be able to:

1. Understand and deal with all aspects of general, systemic and applied Physiology.
2. Acquires adequate knowledge of history and recent advances of human physiology.
3. Teach effectively the basic physiological mechanisms of human body with reference to their implications in the pathogenesis of diseases (pathophysiology) affecting various organ systems and the physiological basis of their management to undergraduate medical, paramedical and all other basic science students.
4. Has acquired skills in effectively communicating with the students and colleagues.

5. Perform and critically evaluate the practical exercises done by under graduate students.
6. Critically evaluate the impact of recent information on the genesis of current concepts related to various topics of physiology.
7. Organize the labs for various practical exercises, substitute and fabricate some of the simpler equipment for teaching purposes.
8. Interact with the allied departments and render services in advanced laboratory investigations.
9. Understand general principles of medical education (use of appropriate teaching techniques and resources).
10. Demonstrate competence in basic concepts of research methodology, effectively use the statistical methods and write a scientific paper on the lines accepted by standard scientific journals so as to have a significant bearing on human health and patient care.
11. Acquire skills in conducting collaborative research in the field of physiology with allied sciences, clinical sciences and biomedical engineering.
12. Design, fabricate and use indigenous gadgets for experimental purposes.
13. Interpret and evaluate research publications critically.
14. Function as a productive member of team engaged in research and education.
15. Use the library facilities (Literature database using computer, CD ROM, internet search and any other available newer techniques).
16. Acquire administrative skills to set up concerned department / laboratories and initiate purchase procedure and procure necessary items for running such laboratories.
17. Acquire knowledge about medical ethics, bioethics, moral and legal issues.

18. Carry out professional obligations ethically and keeping in view national health policy.
19. Develop skills as a self-directed learner, recognizes continuing educational needs.
20. Serve as interface with society at large.

3. SUBJECT SPECIFIC COMPETENCIES

After completing the three-year course in MD Physiology, the student should have acquired knowledge (cognitive domain), professionalism (affective domain) and skills (psychomotor domain) as given below:

A. Cognitive Domain

1. Able to teach the basic physiological mechanisms of human body with reference to their implications in the pathogenesis of diseases (pathophysiology) and their management to undergraduate medical and paramedical students.
2. Describe the principles of teaching - learning technology towards application and take interactive classroom lectures, prepare modules, organizes and conducts problem-based learning sessions, case discussions, small group discussions, Seminars, Journal club and research presentations.
3. Demonstrate knowledge about computer assisted learning (CAL) software and ability to use them efficiently to promote learning of physiology.
4. Apply and integrate knowledge of physiology in normal and disease states for clinical problem solving and research.
5. Conduct such clinical and experimental research, as would have a significant bearing on human health and patient care.
6. Acquires knowledge of basics of research methodology, develop a research protocol, analyse data using currently available statistical software, interpret results and disseminate these results and to have the

potential ability to pursue further specializations and eventually be competent to guide students.

7. Plan a research study and conduct basic and clinical systemic investigations.
8. Interact with other departments by rendering services in advanced laboratory investigations and relevant expert opinion.
9. Participate actively in various workshops/seminars/journal clubs/ demonstration in the allied departments, to acquire various skills for collaborative research.
10. Contribute to society by imparting physiological understanding of health problems.
11. Demonstrate knowledge about recent advances and trends in research in the field of physiology.
12. Acquires knowledge of administrative procedures and protocols.
13. Demonstrate knowledge about outline of comparative physiology and basic human evolution

B. Affective domain

1. Demonstrate self-awareness and personal development in routine conduct.(*Self-awareness*)
2. Communicate effectively with peers, students and teachers in various teaching-learning activities. (*Communication*)
3. Demonstrate
    a) Due respect in handling human body parts & cadavers during dissection (*Ethics &Professionalism*)
    b) Humane touch while demonstrating living surface marking in subject/patient (*Ethics & Professionalism*)
4. Acquire capacity of not letting his/her personal beliefs, prejudices and limitations come in the way of duty.

5. Appreciate the issues of equity and social accountability while exposing students to early clinical exposure (*Equity and social accountability*)
6. Acquire skills for self-directed learning to keep up with developments in the field and to continuously build to improve on skills and perpetual professional development.
7. Adopts ethical principles and maintain proper etiquette in dealings with students, peers, other health professionals and patients.

C. Psychomotor Domain

The student should be able to perform independently/under observation the following tasks:

I. Haematology Experiments

1. Estimation of haemoglobin
2. Determination of Total Erythrocyte (RBC) Count and RBC Indices (Blood Standards)
3. Determination of Total Leucocytes (WBC) Count: TLC
4. Preparation of a peripheral Blood Smear and Determination of Differential Leucocyte Count: DLC
5. Determination of Arneth Count
6. Determination of Bleeding Time (BT) and Clotting Time (CT)
7. Determination of Blood groups (A,B,O and Rh system)
8. Determination of Erythrocyte Sedimentation Rate (ESR) and Packed cell volume (PCV)
9. Determination of Osmotic Fragility of Red Blood Cells
10. Determination of Platelet Count
11. Determination of Reticulocyte Count
12. Determination of Absolute Eosinophil Count
13. Study of Haemopoietic Cells Present in the Bone Marrow

II. Animal Experiments (All animal experiments must be compliant with Govt. of India Regulations, notified from time to time). Experiments in Amphibian/Dog/Cat should be conducted by computer assisted simulation models/ facilities. Other experiments should be performed as permissible by CPCSEA guidelines.

A. **Amphibian (Frog) Experiments**

1. Effect of temperature on simple muscle twitch.
2. Effect of two successive stimuli (of same strength) on skeletal muscle.
3. Effect of increasing strength of stimuli on skeletal muscle.
4. Effect of increasing frequency of stimuli on skeletal muscle (genesis of tetanus).
5. Effect of free load and after load on skeletal muscle.
6. Effect of repeated stimuli on skeletal muscle (study of phenomenon of Fatigue).
7. Study of isometric contraction in skeletal muscle.
8. Determination of conduction velocity of sciatic nerve and effect of variables on it.
9. Properties of cardiac muscle – Refractory period, All-or-None Law, extra systole and compensatory pause, beneficial effect.
10. Regulation of Heart, Vagus dissection and effect of Vagal and WCL stimulation.
11. Effect of physiological and pharmacological variables on intact frog's heart.
12. Perfusion of isolated frog's heart-role of sodium, potassium, calcium ions and drugs.
13. Perfusion of blood vessels in the frog.
14. Capillary circulation (Frog Web).
15. Postural and protective reflex in the frog.

B. Mammalian Experiments (Dog/Rabbit/Guinea pig/Rat/Mice)

1. General management of mammalian experiments.
2. Recording of heart rate, blood pressure and respiration and study the effects of various factors; drugs; asphyxia; occlusion of common carotid artery.
3. Effect of stimulation of central and peripheral end of Vagus on arterial blood pressure and respiration after vagotomy.
4. Effect of stimulation and distension of carotid sinus on blood pressure and respiration.
5. Effect of stimulation of splanchnic nerve.
6. Effect of stimulation of peripheral somatic nerve (sciatic nerve).
7. Study of hypovolemic shock and its reversal.
8. Perfusion of isolated mammalian heart and study the effects of drugs and ions.
9. Recording of Isolated Intestinal movement and tone and studying the effect of drugs and ions.
10. Study of various stages of menstrual cycle, cervical smear and vaginal smear.

III. Human Physiology

Clinical Physiology

1. Physiological principles of clinical examination.
2. General Physical examination, physiological basis of some clinical symptom and signs.
3. General principles of Inspection/Palpation/Percussion/Auscultation.

Nerve muscle physiology

1. Ergography and hand grip spring dynamography and study of human fatigue.
2. Recording of electromyography (EMG) and its application.
3. Recording of nerve conduction.

Cardiovascular system (CVS)

1. Clinical examination of CVS.
2. Examination of arterial & venous pulses.
3. Measurements of arterial blood pressure and effect of head-up/head-down tilt.
4. Recording of 12 lead Electrocardiography (ECG) and its interpretation.
5. Measurement of blood flow.

Respiratory system

1. Clinical examination of respiratory system.
2. Stethography – study of respiratory movements and effect of various factors.
3. Assessment of respiratory functions (spriometry, vitalography, and gas analysis)
4. Measurement of BMR.
5. Cardio pulmonary resuscitation (CPR) and Artificial respiration.

Gastrointestinal system:

1. Clinical examination of abdomen.

Integrative Physiology / Excretory system

1. Recording of body temperature/effect of exposure to cold and hot environment
2. Studies in stimulated environment - microgravity; high altitude; hot and cold environment.
3. Human studies involving sweat, salivation and urine.

Reproductive system

1. Determination of ovulation time by basal body temperature chart and pregnancy diagnostic test - Immunological Tests.
2. Semen analysis: sperm count and motility.

Nervous System including Special senses

1. Clinical examination of the nervous system and its physiological basis.
2. Examination of higher mental functions.
3. Examination of cranial nerves.
4. Examination of sensory system.
5. Examination of motor system including reflexes.
6. Clinical examination of special senses:
    i. Smell and Taste
    ii. Test for hearing to deafness
    iii. Physiology of eye
        a) Clinical examination of the eye and pupillary reflex
        b) Visual acuity
        c) Perimetery – mapping out of visual field and blind spot
        d) Accommodation
        e) Fundoscopy
        f) Colour vision and colour blindness
7. Reaction (visual and auditory) and reflex time.
8. Electroencephalography (EEG) and Polysomnography
9. Autonomic Nervous System (ANS) Testing.
10. Neuro-electrodiagnostic techniques:
    i. Nerve conduction study.
    ii. Visual evoked potential (VEP).
    iii. Brainstem auditory evoked potential (B.A.E.P).
    iv. Somato-sensory evoked potential (SEP).
    v. Motor evoked potential (MEP).

Others

1. Construction of dietary chart for growing children, pregnant woman, elderly individuals, hypertensive patients, & diabetes mellitus patients.

2. Tests for physical fitness: Cardio – respiratory responses to steady state exercise using
    i. Harvard step test
    ii. Bicycle Ergometry
    iii. Treadmill test for determination of VO_2max

4. Syllabus

Course contents

Paper-I : General and Cellular Physiology including Genetic Basis and Historical perspectives:

1. Physiology of cell, various cellular mechanisms and genetic control mechanisms.
2. Various principles of Physics and Physical Chemistry involved in physiological phenomenon e.g. haemo-dynamics, bio-electrical potentials, body fluids, methods of measurements.
3. History of Physiology.
4. Biostatistics, Biophysics, Biochemistry, Micro-anatomy.
5. Growth and Development including aging.
6. Excretion, pH, water and Electrolyte balance.

Paper-II: Systemic Physiology (system providing transport, nutrition and energy)including comparative Physiology:

1. Blood and Immunity.
2. Cardiovascular System.
3. Respiratory System.
4. Gastro- Intestinal Tract (GIT) and dietary requirements.
5. Energy production/ metabolism

Paper-III: Systemic Physiology (system concerned with procreation, regulation and neural control)

1. Nerve-Muscle Physiology including muscle mechanics
2. Endocrine Physiology
3. Nervous System (Central, peripheral and autonomic)
4. Special Senses
5. Reproduction & family planning/foetal & neonatal Physiology
6. Integumentary System:-Skin, Sweat glands, thermoregulation and acclimatization

Paper-IV: ***Applied Physiology including recent advances***

1. Patho-physiology pertaining to systemic Physiology
2. Physiological basis of various clinical investigation tests
3. Interaction of human body in ambient environment- high altitude, space, deep sea, acclimatization and disorders of thermoregulation
4. Sports physiology
5. Yoga and Meditation
6. Recent advances relevant to Physiology

Departmental resources

The department should establish and develop the following laboratories. In addition to teaching, these laboratories should be involved in active research/patient care services in one or more well defined fields.

1. Clinical Neurophysiology Laboratory

The department should generate liaison with clinical department and provide routine services for health monitoring and diagnostics (disease).

i. Electroencephalography
ii. Evoked potential recording
iii. Electromyography

iv. Nerve conduction studies
v. Autonomic nervous system (ANS) testing
vi. Any other newer technology

2. Cardio-Respiratory Laboratory

The department should generate liaison with clinical department and provide routine services for health monitoring and diagnostics (disease).

i. Electrocardiography
ii. Blood-gas Analysis
iii. Computerized multifunctional spirometry
iv. Laboratory for measuring pulmonary diffusion capacity and functional residual capacity (FRC)
v. Whole-body plethysmography
vi. Laboratory for Blood flow measurements (Impedance plethysmograph/ Laser flow meter/ Doppler flow meter)

3. Exercise Physiology Laboratory

The department should generate liaison with sports authorities and clinical departments to provide services for testing and grading exercise and physical efficiency for health monitoring and diagnostics (disease). This should be done by using the following techniques:

i. Two step test exerciser
ii. Bicycle Ergometry
iii. Tread mill
iv. Respiratory gas analysis and measurement of basal metabolic rate (BMR)

4. Metabolic/Endocrinology/Reproductive Bio-medicine laboratory

This laboratory should perform various tests pertaining to gastrointestinal, renal, metabolic, endocrinal and reproductive bio-medicine. The department

should generate liaison with clinical departments and provide routine services for health monitoring and diagnostics (disease).

i. Spectrophotometer
ii. pH meter
iii. Elisa Reader/Washer
iv. Luminometer
v. Semi-autoanalyzer

Post graduate students should be posted in the above laboratories and extend the required services on routine basis, in addition routine practical laboratory work in accordance to meet their academic objectives.

The Department should be equipped with general facilities like PG resource room with internet access, and a departmental library with books especially those related to pertinent higher studies in Physiology and field of research. The college/department should make important journals available (at least four Indian journals and two international journals).

5. TEACHING AND LEARNING METHODS

Teaching methodology

Acquisition of practical competencies being the keystone of postgraduate medical education, postgraduate training is skills oriented.

Learning in postgraduate program is essentially self-directed and primarily drives from clinical and academic work. The formal sessions are merely meant to supplement this core effort.

Teaching sessions will be held in the form of seminars, journal clubs, microteaching, tutorials & discussions.

- There should be seminars (at least 30 per year) along with symposia, group discussions and weekly Journal clubs.

- Each Journal Club should run for 4 weeks (4 turns) and discuss articles published in indexed journals focusing on their new methodology, interesting results etc.
- PG student should attend at least six such journal clubs every year.
- The Post graduate student should attend at least, 2 symposia every year and weekly group discussions.
- The student should be trained to generate teaching resource material for UG and develop problem solving modules.
- Department should encourage e-learning activities.
- The postgraduate students shall be required to participate in the teaching and training programme of undergraduate students and interns.
- Log books shall be checked and assessed periodically by the faculty members imparting the training.

Based on the above laboratory facilities the department can prepare a list of post-graduate experiments pertaining to basic and applied physiology. Active learning should form the mainstay of postgraduate training.

6. Posting/rotation schedule

The department should generate liaison with clinical departments and provide routine services for health monitoring and diagnostics (disease) and for periodical posting of Physiology PGs in clinical settings.

The PG students should render special investigative services in their respective area of specialization.

The PG students should pay formal and scheduled visits to various hospital laboratories of interest for the purpose of learning.

In consultation with the concerned clinical departments a 3-month roaster should be made for the post-graduate students to attend the ward rounds of selected cases of pathophysiologic interest for PG teaching.

During the training programme, patient safety is of paramount importance, therefore, skills are to be learnt initially on the models, later to be performed under supervision followed by performing independently; for this purpose, provision of skills laboratories in medical colleges is mandatory.

Rotation

Each post graduate student should undergo minimum of six terms training spread over a period of 03 years. The postings should be as under: -

I Semester: Department of Physiology to cover (i) General aspects of UG teaching, (ii) Selection of thesis topics and collection of relevant references.
(iii) Student should undergo online course of research methodology. (iv) submission of thesis synopsis.

II Semester: (i) Thesis work (ii) Posting in departmental UG– PG laboratories

III semester: (i) Posting in clinical departments: Medicine and allied disciplines. (ii) Thesis work

IV, V & VI Semesters: (i) UG-PG teaching (ii) Thesis work

Note: (1) UG, PG teaching and thesis work to continue throughout the course
(2) 50% of time during III and IV Semester should be spent in the department of Physiology

Time schedule and Rotation postings for other departments

During the third semester of the course postings should be made to other clinical and Para clinical subjects in co-ordination with concerned departments, only in the forenoon sessions(except the postings which are deputed outside the college campus) as follows:

Sl. No.	Department	Procedures	Duration
1.	Cardiology dept.	Learn to operate ECG apparatus, Echo, Doppler, Cardiac monitor, Learn the methodology of cardiac catheterization. Resuscitation technique, interpretation of ECG & other records Assignments i. Cardiac stress testing ii. The ionic basis of antiarrhythmic drugs	2 weeks
2.	Neurology and Neurophysiology	Observe and understand Neuro - Physiological Techniques (EMG,EEG) (clinical Physiology) and its Interpretation and other investigation data. Assignments i. Physiological basis of EMG and its clinical application ii. Evoked potentials and its clinical application	3weeks
3.	Medical Gastroenterology	Clinical examination of the patient. To observe Endoscopic Techniques, Manometry Studies Assignments i. Oesophageal manometry and its application ii. Investigative methods of biliary tract	1week

4.	Clinical Biochemistry	To understand the principles of clinical biochemical tests and interpretation of data Liver function test. Renal function test Blood sugar estimation Assignments i. Methodology and principle of the working of auto analyser ii. Quality control in Biochemistry – Methods and standards	2 weeks
5.	Clinical Hematology including pathology	To make peripheral blood smear and bone marrow smear. To identify normal and abnormal blood cells. Blood Banking Pregnancy tests and its interpretation Semen analysis Assignments i. Fractions of whole blood and their clinical use ii. Blood donation – Donor criteria, storage precautions iii. Cross matching, changes during storage in Blood components v. Tests for Infertility	1 month (hematology-15 days Blood bank- 15 days)
6.	Anatomy	Histology laboratory; staining techniques, slide identification Assignments i) Completion of histology record ii) Seminar on staining of tissues	1 week

7.	sting in institute of aerospace medicine, Bangalore / Nephrology	i) Applied cardio-respiratory physiology ii) Thermal physiology iii) Space physiology iv) High altitude physiology and hyperbaric medicine v) Acceleration physiology or To understand the principles of dialysis, observe the dialysis techniques <u>Assignment: -</u> Presentation/ symposium	1 week
8.	OBG	i) Determination of ovulation time ii) Clinical examination during pregnancy including antenatal check-up and investigations <u>Assignment: -</u> Presentation/ symposium	2 weeks
9.	Chest medicine	Hands on training in lung function test and interpretation of results Sleep Lab <u>Assignment:-</u> i. Mechanics of respiration and lung functions in ii. Obstructive and restrictive lung disease	2 weeks
10.	General medicine	i) Clinical examination of a patient ii) Investigation procedures • Drawing of blood and storage • Lumbar puncture • Interpretation of data • X-ray	1 month

		• ECG • Biopsy report • Biochemical results • Endocrinology postings • Radio immuno assay techniques Assignment: - Presentation/ symposium	
11.	Ophthalmology	Fundoscopy, measurement of intraocular pressure, refractometry and perimetry Assignment: - Presentation/ symposium	1 week
12.	ENT	Evaluation of hearing (including audiometry and BERA) Assignment: - Presentation/ symposium	1 week

Attendance certificate has to be obtained from each department and should be submitted to the Physiology Department.

7. Dissertation work

During the course of study every candidate has to carry out a research project individually on a selected topic under the direct guidance and supervision of a recognised post graduate teacher as per MCI regulations. The project shall be written and submitted in the form of a Thesis. The suggested time schedule for dissertation work is:

- Student should undergo online course of research methodology.
- Identification and selection of topic for dissertation - in first 4 weeks
- Preparatory work of dissertation / synopsis including pilot study if necessary and submission of the synopsis to the University within first 6

months from the beginning of course or a per the dates notified by the University

- Data collection for dissertation. Writing the dissertation in the following 1 1/2 years.
- Submission of the dissertation six months prior to the final examination or as per the dates notified by the University.

The student will identify (i) a research question; (ii) conduct a critical review of literature; (iii) formulate a hypothesis; (iv) determine the most suitable studydesign; (v) state the objectives of the study; (vi) prepare a study protocol; (vii) obtain ethical clearance for the same; (viii) undertake the study according to the protocol; (ix) analyse and interpret the data obtained; (x) draw conclusions; (xi) bibliography and annexures

Work for writing the Thesis is aimed at contributing to the development of a spirit of enquiry, besides exposing the post graduate student to the techniques of research, critical analysis, acquaintance with the latest advances in medical science and the manner of identifying and consulting available literature.

Research activities-

A postgraduate student in broad specialities/super specialities would be required to present one poster presentation, to read one paper at a national/state conference and to present one research paper which should be published/accepted for publication/sent for publication during the period of his postgraduate studies so as to make him eligible to appear at the postgraduate degree examination.

ATTENDANCE : All the candidates joining the Post Graduate training programme shall work as 'Full Time Residents' during the period of training and shall attend not less than 80% (Eighty percent) of the imparted training

during each academic year including assignments, assessed full time responsibilities and participation in all facets of the educational process.

8. ASSESSMENT

All the PG residents are to be assessed daily for their academic activities and also periodically.

General Principles

- All the candidates joining the Post Graduate training programme shall work as 'Full Time Residents' during the period of training and shall attend not less than 80% (Eighty percent) of the imparted training during each academic year including assignments, assessed full time responsibilities and participation in all facets of the educational process.
- The assessment should be valid, objective and reliable.
- It should cover cognitive, psychomotor and affective domains.
- Formative, continuing and summative (final) assessment is also conducted in theory as well as practical / clinicals.
- In addition, thesis will be assessed separately.

FORMATIVE ASSESSMENT

- During the training Formative assessment should be continual as well as end-of-term.
    - The former is based on the feedback from the senior residents and the consultants concerned.
        - Feedback will be under following: -
            i) **Personal attributes:**
                - **Behaviour and Emotional Stability:** Dependable, disciplined, dedicated, stable in emergency situations shows positive approach.

- **Motivation and Initiative:** Takes on responsibility, innovative, enterprising, does not shirk duties or leave any work pending.
- **Honesty and Integrity:** Truthful, admits mistakes, does not cook up information, has ethical conduct, exhibits good moral values, loyal to the institution.
- **Interpersonal Skills and Leadership Quality:** Gets on well with colleagues and paramedical staff, is respectful to seniors, has good communication skills.

ii) **Practical Work:**

- **Availability:** Punctual, available continuously on duty, responds promptly on assignments and takes proper permission for leave.
- **Diligence:** Dedicated, hardworking, does not shirk duties, leaves no work pending, does not sit idle, competent in practical work.
- **Academic ability:** Intelligent, shows sound knowledge and skills, participates adequately in academic activities, and performs well in oral presentation and departmental tests.
- **Performance:** Proficient in presentations and discussion during academic sessions in the department.

iii) **Academic Activity:** Performance during presentation at Journal club/ Seminar/Case discussion/ Stat meeting and other academic sessions. Proficiency in skills as mentioned in job responsibilities.

- End-of-term assessment (internal assessment) should be held at the end of each semester.
- It should assess medical knowledge, procedural & academic skills, interpersonal skills, professionalism, self-directed learning, communication skills and ability to practice in the system.

❖ The Internal Assessment should be conducted in theory and clinical examination.

❖ Formative assessment will not count towards pass/fail at the end of the program, but will provide a constructive feedback to the candidate.

Quarterly Assessment during the MD training programme should be based on:

1. Journal based / recent advances learning
2. Patient based /Laboratory or Skill based learning
3. Self-directed learning and teaching
4. Departmental and interdepartmental learning activity
5. External and Outreach Activities / CMEs

The student to be assessed periodically as per categories listed in postgraduate student appraisal form (Annexure I).

SUMMATIVE ASSESSMENT i.e. assessment at the end of training

The post-graduate examinations should be conducted in 3 parts:

1. **Thesis**

- Every post graduate student shall carry out work on an assigned research project under the guidance of a recognised Post Graduate Teacher, the result of which shall be written up and submitted in the form of a Thesis.
- The thesis shall be examined by a minimum of three examiners; one internal and two external examiners, who shall not be the examiners for Theory and Clinical examination.

- A post graduate student shall be allowed to appear for the Theory and Practical/Clinical examination only after the acceptance of the Thesis by the examiners.

2. Theory Examination

- The examinations shall be organised on the basis of Marking system to evaluate and to certify post graduate student's level of knowledge, skill and competence at the end of the training.
- Obtaining a minimum of 50% marks in 'Theory' as well as 'Practical' separately shall be mandatory for passing examination as a whole.
- The examination for M.D. shall be held at the end of 3rd academic year.
- **Theory Examination (Total =400)**

There shall be four question papers, each of three hours duration. Each paper shall consist of 10 essay questions carrying 10 marks each .Total marks for each paper will be 100.

Paper I = 100 Marks
Paper II = 100 Marks
Paper III = 100 Marks
Paper IV = 100 Marks

Total 400 Marks

Details of distribution of topics for each paper will be as follows:

Paper No.	**Topics**	**Maximum marks**
Paper I	General Physiology including history of Physiology	100
Paper II	Systemic Physiology (system providing transport, nutrition and energy)	100
Paper III	Systemic Physiology (system concerned with regulation, neural control and procreation)	100
Paper IV	Applied Physiology including recent advances	100

3. **Practical and oral examination (300 marks)**
Marks allotment

Sl. No.	Items	Maximum Marks
1.	OSPE/ Spotters	20
2.	Two animal experiments (one long and one short)	*20 (15+5) Or **30 (20+10)
3.	Two Special laboratory investigations (haematology and biochemistry)	*40 (20+20) Or **30 (15+15)
4.	Two Clinical Physiology (one CNS and one CVS/RS)	40 (20+20)
5.	Two human experiments (one long and one short)	40 (25+15)
6.	Microteaching	40
7.	Oral	100

* Simulation animal experiments
**Animal Experiment is performed

- Practical examination should be spread over two days and include the following components:

i) Objective Structured Practical Exam (OSPE)/ Spotters

ii) Problem solving exercises pertaining to Clinical Physiology

iii) Performing and reporting two special laboratory investigations

iv) Two animal experiments (one long and one short) illustrating mechanisms, physiological concepts and their applications to humans. (Subject to current regulation of Government of India regarding animal usage). This is optional. It is advisable to use simulated experiments for this purpose.

v) Two human experiments (one long and one short), dealing with human physiology as would have significant bearing on human health and patient care.

vi) Micro-teaching session for assessing their teaching skills.

- Viva-voce examination should include the following components

i) Theoretical discussion (General and systemic Physiology)

ii) Teaching techniques

iii) Thesis

iv) Eminent Physiologists (Foreign/Indian)

v) Journals (Indian/Foreign)

vi) Recent advances

	Theory	Practical & Viva	Grand Total
Maximum marks for M.D. Physiology	**400**	**300 (Practical – 200 & Viva – 100)**	**700**

MARKS QUALIFYING FOR A PASS

Obtaining a minimum of 40% marks in each theory paper and not less than 50% cumulatively in all the four papers for degree examination. Obtaining of 50% marks in Practical examination shall be mandatory for passing the examination as a whole in the degree examination.

9. Recommended Reading

Books (latest edition)

1. A.C. Guyton – Text book of Medical Physiology
2. W.F. Ganong – Review of Medical Physiology
3. Medical Physiology - Walter Boron
4. Berne and Levy- Medical Physiology
5. Samson Wright's Applied Physiology
6. Vernon B. Mountcastle– Medical Physiology Vol. I & II
7. William's Textbook of Endocrinology
8. J.E. Cotes- Respiratory Physiology
9. D.T. Harris – Experimental Physiology
10. Wintrobe's – Clinical Hematology
11. Brown B.L. – Cell signaling, Biology and medicine of signal transudation
12. Best and Taylor's physiological basis of medical practice
13. Human physiology- an integrated approach, by DEE UNGLAUB Silver Thorn
14. Textbook of Medicine by Harrison
15. API Textbook of Medicine
16. Bedside Clinics in Medicine, By Arup Kumar Kundu
17. Mcleod's clinical examination.
18. Hutchison's Clinical Methods: An Integrated Approach to Clinical Practice
19. Practical Haematology – Dacie and Lewis
20. Textbook of practical physiology – V G Ranade
21. Research Methodology – C R Kothari

Journals

03-05 international Journals and 02 national (all indexed) journals

10. ANNEXURE I

POSTGRADUATE STUDENTS APPRAISAL FORM
DEPARTMENT OF PHYSIOLOGY

Name of the PG Student :

Period of Training : FROM……TO……

Sl. No.	Particulars	Not Satisfactory	Satisfactory	More Than Satisfactory	Remark
		1 2 3	4 5 6	7 8 9	
1.	Personal attributes				
2.	Journal based / recent advances learning				
3.	Patient based /Laboratory or Skill based learning				
4.	Self-directed learning and teaching				
5.	Departmental and interdepartmental learning activity				
6.	External and Outreach Activities / CMEs				
7.	Thesis / Research work				
8.	Log Book Maintenance				

Publications Yes/ No

Remarks*_____

_____

_____

*REMARKS: Any significant positive or negative attributes of a postgraduate student to be mentioned. For score less than 4 in any category, remediation must be suggested. Individual feedback to postgraduate student is strongly recommended.

Signature of Assessee Signature of Consultant Signature of HOD