



YENEPOYA

(DEEMED TO BE UNIVERSITY)

Recognized under Sec 3(A) of the UGC Act 1956

Accredited by NAAC with 'A' Grade

YENEPOYA (DEEMED TO BE UNIVERSITY)

Deralakatte, Mangaluru -575018

REGULATIONS AND CURRICULUM GOVERNING

POSTGRADUATE PROGRAM (MD) IN

PHYSIOLOGY

(REVISED CURRICULUM – AMENDED UP TO 2019)

ATTESTED

Dr.Gangadhara Somayaji K.S.
Registrar
Yenepoya(Deemed to be University)
University Road, Deralakatte
Mangalore- 575 018, Karnataka



YENEPOYA

(DEEMED TO BE UNIVERSITY)
Recognized under Sec 3(A) of the UGC Act 1956
Accredited by NAAC with 'A' Grade

NOTIFICATION - 34-ACM/2019 dtd. 20.02.2019

Sub:- Implementation of Competency Based Medical Education PG Curriculum
Ref. : Resolution of the Academic Council at its 34th Meeting held on 08.02.2019 vide
Agenda 33

The Academic Council at its 34th Meeting held on 08.02.2019 and subsequently the 45th meetings of Board of Management held on 09.02.2019 have accepted the proposal for implementation of Competency Based Medical Education (CBME) for the PG Curricula of the following programs as per the MCI Norms.

1. MD in Pathology
2. MD in General Medicine
3. MD in Anaesthesiology
4. MD in Paediatrics
5. MD in Respiratory Medicine
6. MD in Radio-diagnosis
7. MD in Anatomy
8. MD in Physiology
9. MD in Biochemistry
10. MD in Microbiology
11. MD in Pharmacology
12. MD in Forensic Medicine
13. MD in Psychiatry
14. MD in Dermatology
15. MD in Community Medicine
16. MS in General Surgery
17. MS in OBG
18. MS in Otorhinolaryngology
19. MS in Ophthalmology
20. MS in Orthopaedics

This revised curriculum shall come into effect from the academic year 2019-2020 onwards.

REGISTRAR

Yenepoya (Deemed to be) University,
University Road, Deralakatta
Mangalore 575 018

COMPETENCY BASED POSTGRADUATE TRAINING PROGRAMME FOR MD IN PHYSIOLOGY

Goal:

The goal is to have uniform standards in the teaching of Physiology at Postgraduate level throughout the country. The guidelines will help achieving such standards which will in ensure availability of competent physiologists equipped with required skills for teaching and applied research.

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

1. Understand and deal with all aspects of general, systemic and applied Physiology.
2. 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.
3. Understand general principles of medical education (use of appropriate teaching techniques and resources).
4. Explain how the knowledge of physiology can be effectively used in a various clinical settings to solve diagnostic and therapeutic problems.
5. Interpret and evaluate research publications critically.
6. Use the library facilities (Literature database using computer, CD ROM, internet search and any other available newer techniques).
7. Conduct relevant clinical/experimental research which may have significant bearing on human health and patient care.
8. Interpret the research findings in the light of its basic and applied significance.
9. Acquire skills in conducting collaborative research in the field of physiology with allied sciences, clinical sciences and biomedical engineering.
10. Interact with the allied departments and render services in advanced laboratory investigations.
11. Serve as interface with society at large.

-
12. Acquire administrative skills to set up concerned department / laboratories and initiate purchase procedure and procure necessary items for running such laboratories.
 13. Function as a member of a teaching or research team.

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. Conduct such clinical and experimental research, as would have a significant bearing on human health and patient care.
3. Interact with other departments by rendering services in advanced laboratory investigations and relevant expert opinion.
4. Participate actively in various workshops/seminars/journal clubs/demonstration in the allied departments, to acquire various skills for collaborative research.
5. Contribute to society by imparting physiological understanding of health problems.
6. Plan a research study and conduct basic and clinical systemic investigations.

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*)

C. Psychomotor Domain

The student should acquire competencies in the following tasks:

I. Hematology Experiments

-
1. Estimation of hemoglobin
 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
 5. Leucocyte Count: DLC
 6. Determination of Arneth Count
 7. Determination of Bleeding Time (BT) and Clotting Time (CT)
 8. Determination of Blood groups (A,B,O and Rh system)
 9. Determination of Erythrocyte Sedimentation Rate (ESR) and Packed cell volume (PCV)
 10. Determination of Osmotic Fragility of Red Blood Cells
 11. Determination of Platelet Count
 12. Determination of Reticulocyte Count
 13. Determination of Absolute Eosinophil Count
 14. 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.

HUMAN PHYSIOLOGY

Clinical Physiology

1. Physiological principles of clinical examination.
2. General Physical examination, physiological basis of some clinical symptoms 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 (spirometry, vitalography, and gas analysis).
4. Measurement of BMR.
5. Cardio pulmonary resuscitation (CPR) and Artificial respiration.

Gastrointestinal system: 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) Perimetry – 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_2 Max
-

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.

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

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 and deep sea
4. Sports physiology
5. Yoga and Meditation
6. Recent advances relevant to Physiology
7. Social responsibilities of physiologists

Departmental resources

It is to be mandatory for the department to establish and develop the following laboratories. In addition to teaching, these laboratories should be involved in active research and in 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-autoanalyser

Post graduate students should be posted in the above laboratories and extend the required services on routine basis.

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).

External postings

The candidates shall attend all the undergraduate theory and practical classes regularly in the first year (for one batch of students). During the second year of the course postings shall attend other clinical and para-clinical subjects in co-ordination with concerned Departments, only in the forenoon sessions as follows:

1. Cardiology Department, YMCH – 15 days

Learn to operate ECG apparatus, Echo, Doppler, Cardiac monitor. Learn the methodology of cardiac catheterization, resuscitation technique, interpretation of ECG & other records.

2. Neurology Department, YMCH – 15 days

Observe and understand Neuro – Physiological Techniques (clinical Physiology). Clinical examination of patients. Use of EEG, EMG and interpretation of EEG, EMG & other investigation data.

3. Medical Gastroenterology, YMCH – 15 days.

Clinical examination of patients and to observe endoscopic techniques.

4. Clinical Biochemistry, YMCH – 15 day

To understand the principles of clinical biochemical tests and interpretation of data. Liver function tests and renal function tests.

5. Hematology Department, YMCH – 15 days

To learn blood investigations.

6. Blood Bank – Blood grouping and cross matching, YMCH – 15 days

To learn collection, storage and transfusion of blood.

7. Department of Anatomy, YMC – 15 days.

(Histology Laboratory) Staining techniques, molding of specimens, slide identification characteristics.

8. Biostatistics and Research Methodology, YMCH – To attend workshop on research methodology - 3 days

9. OBG postings, YMCH – 15 days.

- i. Methods to determine ovulation time
 - Basal Body Temperature chart.
 - Cervical smear.
 - Vaginal smear.
- ii. Clinical examination of pregnant including antenatal checkup and investigations

10. Chest Medicine, YMCH – 15 days

To learn in laboratory – Lung function tests and interpretation of results.

The above topics would include hands-on training in spirometry, orthostatic stress test and evaluation of heat stress and heat strain. The students would be evaluated by means of presentation/symposium at the end of posting.

11. General Medicine, YMCH – 1 month.

- Clinical examination of a patient
- Investigation procedures:
- Drawing of blood and storage.
- Lumbar puncture.
- Interpretation of Data
- X – Ray
- ECG
- Biopsy report
- Biochemical results.
- Endocrinology Postings- Clinical Examination of patient. Radio Immuno Assay techniques.
- Ophthalmology for fundoscopy and measurement of Intraocular pressure, refractometry & Perimetry.

12. In addition to the topics recommended by the MCI, the following recent advances have been added as amendments

- Speech and audiology Department- Yenepoya (deemed to be University)-1 week
- Yoga center- Mangalore University- 1 week
- Sports Physiology, Yendurance zone, YMC-1 week
- Environmental cell, YMC-1 week

Total six months of clinical postings. At the end of these postings, a certificate has to be obtained from the concerned Heads of the Department about satisfactory learning or otherwise.

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

Training period	3 yrs	
I year	Learns the basics in Physiology in the Department of Physiology, Takes practical classes for UG s Training in teaching methods (attends a workshop) Computer training in Word Processing, Power point presentation & Internet Browsing	
II year	1st 6months: Posting in the clinical & other basic Science Department- Training in Research Methodology. Chooses topics for Dissertation & submits to the University	2nd 6 months: Works on the Dissertation
III year	Actively involves in U.G. teaching Prepare for the University Examinations	Completion of Dissertation

Note:

1. UG, PG teaching and thesis work to continue throughout the course.

Internal assessments

Internal Assessment should be frequent, cover all domains of learning and used to provide feedback to improve learning; it should also cover professionalism and communication skills. The Internal Assessment should be conducted in theory and clinical examination.

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.

SUMMATIVE ASSESSMENT ie, assessment at the end of training

The summative examination would be carried out as per the Rules given in Postgraduate

The post-graduate examinations should be conducted in 3 parts: Medical Education Regulations, 2000.

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. 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.

Thesis shall be submitted at least six months before the Theory and Clinical / Practical examination. 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 ‘Grading’ or ‘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. / MS shall be held at the end of 3rd academic year. An academic term shall mean six month's training period.

There should be 4 theory papers:

Paper I: General Physiology including history of Physiology

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

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

Paper IV: Applied Physiology including recent advances

3. Practical and oral examination:

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

1. Objective Structured Practical Exam (OSPE)/ Spotting

-
2. Problem solving exercises pertaining to Clinical Physiology
 3. Performing and reporting two special laboratory investigations
 4. 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.
 5. Two human experiments (one long and one short), dealing with clinical physiology as would have significant bearing on human health and patient care.
 6. Micro-teaching session for assessing communication 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

STUDENT 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/her postgraduate studies so as to make him/her eligible to appear at the postgraduate degree examination.

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. 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.

Recommended Reading

Books (latest edition)

1. A.C. Guyton – Text book of Medical Physiology
2. W.F. Ganong – Review of Medical Physiology
3. Vernon B. Mountcastle– Medical Physiology Vol. I & II
4. William’s Textbook of Endocrinology
5. J.E. Cotes- Respiratory Physiology
6. D.T. Harris – Experimental Physiology
7. Wintrobe’s – Clinical Hematology
8. Brown B.L. – Cell signaling, Biology and medicine of signal transduction
9. Berne and Levy- Medical Physiology
10. Textbook of Medicine by Harrison
11. API Textbook of Medicine

Journals

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

1. Physiology (News in Physiological Sciences)
2. Indian Journal of Physiology & Pharmacology
3. Indian Journal of Experimental Biology
4. Journal of Applied Physiology
5. Annual Review of Physiology
6. Experimental Physiology