



**YENEPOYA UNIVERSITY**

**Deralakatte, Mangalore - 575018**

**REGULATIONS AND CURRICULUM GOVERNING  
POSTGRADUATE PROGRAM (MD) IN  
PHYSIOLOGY**

**(CURRICULUM - EFFECTIVE FROM 2010-11)**

**ATTESTED**  


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Ref: No.YU/REG/ACA/4-ACM/2010

02.07.2010

**NOTIFICATION**

Sub: Curriculum for starting MD/MS in the departments of Anatomy,  
Biochemistry, Physiology, Pharmacology, Microbiology,  
and Forensic Medicine

Ref: Resolution of the Academic Council at its 4<sup>th</sup> Academic Council  
meeting held on 02.07.2010, supplementary agenda - 1

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The Academic Council at its 4<sup>th</sup> meeting and subsequently the Board of Management at its 11<sup>th</sup> meeting held on 02.07.2010 have resolved to approve the curriculum for starting the MD/MS in the departments of Anatomy, Biochemistry, Physiology, Pharmacology, Microbiology and Forensic Medicine.

This notification is issued for implementation with effect from the academic year 2010-2011.



**REGISTRAR**

To:

The Principal - YMC

Copy to:

1. Controller of Examinations
2. Academic Section

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## **MD Physiology**

### **I. Goals:**

The postgraduate course in M.D. Physiology should enable a medical graduate to be:

1. A competent Physiologist
2. A good medical teacher in Physiology, practicing the required skills of teaching.

### **II. Objectives:**

At the end of the course a post graduate student in Physiology should be able to:

1. Demonstrate comprehensive knowledge and understanding of general and systemic Physiology
2. Comprehend and understand physiological basis of health and disease affecting various organ systems.
3. Select and use appropriate teaching techniques and resources.
4. Critically evaluate published Journal literature and to effectively use the library facilities including computer, C.D.Rom and satellite search.
5. Carryout relevant research
6. Function as an effective member of teaching team or research team.
7. Carryout professional obligations ethically and keeping in view national health policy.

### **III. Outline of course contents:**

#### **Theory:**

1. History of Medicine with special reference of physiology
  2. Comparative physiology
  3. Systemic physiology
  4. General physiology at Cellular, sub Cellular and Molecular level.
  5. Clinical and Applied Physiology.
  6. Exercise and Sports Physiology
  7. Environmental Physiology, including effects of change in altitude temperature, humidity & space travel.
  8. Thermal and humidity changes
  9. Chrono Physiology – new born, adult and old age Physiology
  10. Effects of stress, a behavioral Physiology- yoga, Meditation
  11. Physiology of growth and development
  12. Laboratory animal's ethics-Guidelines for care and use of animals in scientific research.  
Breeding of and experiments on animals (control and supervision) rules, 1998 under prevention of cruelty to animals Act 1960.
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## Practical training

### A. Animal experiments

#### i. Amphibian experiments

##### (For demonstration only)

1. Freeload and after Load
2. Effect of continuous repeated stimulation ( study of phenomena of fatigue)
3. Length tension diagram
4. Properties of Cardiac Muscle: long refractory period, All or none Law.
5. Extrasystole and compensatory pause, Beneficial effect
6. Regulation of heart, vagus dissection and effect of vagal stimulation
7. Actions of acetylcholine, adrenaline and Nicotine on Heart (Langley's)
8. Perfusion of isolated frogs heart- role of  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Ca}^+$
9. Decerebrate and spinal frog.

#### ii. Mammalian

##### To be performed by students

1. Rat/ guinea pig ileum: Intestinal movement recording
2. Rabbit heart: Langendorff preparation

##### To be demonstrated if animals are available and have been procured as per CPCSEA guidelines:

3. General management of mammalian experiments.
4. Recording blood pressure and respiration on dog and also the effects of various factors.
5. Recording the effect of stimulation of vagus nerves on blood pressure and respiration on dog.
6. Stimulation of central and distal end of the vagus on arterial pressure after vagotomy.
7. Effect of drug- Adrenaline and Acetylcholine on blood pressure and respiration on dog.
8. Adrenal extract on intestinal movement and tone.
9. Effect of Occlusion of the carotid arteries on blood pressure and respiration.
10. Stimulation of splanchnic nerve (distal end) on arterial pressure.

### B. Human Physiology :

#### 1) Clinical Physiology

- i. Elementary principles of clinical examination
  - ii. Methods of inspection/ palpation/percussion/auscultation
  - iii. Plan of conduction and scheme of recording
  - iv. General examination
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- 2) Cardiovascular system
    - i. Clinical examination of circulatory system
    - ii. Examination of the pulse and measurements of blood pressure.
    - iii. Autonomic nervous system tests
  
  - 3) Respiratory system
    - i. clinical examination of respiratory system
  
  - 4) Gastro-intestinal system
    - i. Clinical examination of abdomen
  
  - 5) Central nervous system
    - i. Clinical examination of the central nervous system and autonomic nervous system and its physiological basis
    - ii. Examination of higher mental functions
    - iii. Clinical examination of the special senses. Outline of the examination of cranial nerves.
    - iv. Tests of hearing and deafness.
    - v. Motor functions
    - vi. Reflex functions
    - vii. Sensory function.
  
  - 6) Ophthalmology
    - i. Clinical examination of the eye and pupillary reflex
    - ii. Visual acuity
    - iii. Perimetry
    - iv. Accommodation
    - v. Color vision and colour blindness
    - vi. Fundoscopy
    - vii. Audiometry studies
    - viii. Pulmonary functions tests

**C. Laboratory procedures (Normal human subjects)**

**1. Haematology**

- i. Haemocytometry- different methods of evaluation of Hb
  - ii. Determination of reticulocyte count, platelet count, WBC count, RBC count and absolute eosinophil count in normal and diseased states.
  - iii. Differential count of WBC
  - iv. Hemoglobinometry , spectroscopy
  - v. Blood grouping and cross matching
  - vi. Determination of bleeding time, clotting time
  - vii. Hemolysis and fragility test, ESR
  - viii. Examinations of normal bone marrow aspiration smear.
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**2. Cardio vascular system:**

- i. Electrocardiography-ECG & its interpretation.

**3. Respiratory System:**

- i. Mechanical spirometry
- ii. Recording of lung function tests by computerized or electronic spirometer
- iii. Breath holding and endurance tests
- iv. Blood gas analysis,
- v. Monitoring of respiratory
- vi. Stethography
- vii. Resuscitation and artificial respiration

**4. Reproductive system :**

- i. Methods to determine ovulation time-
  - a. Basal body temperature chart,
  - b. Cervical smear
  - c. Vaginal smear
- ii. Pregnancy diagnostic test- Immunological test
- iii. Sperm count

**5. Gastro Intestinal System:**

- i. Endoscopy

**6. Nerve Muscle Physiology:**

- i. Ergography
- ii. Recording of EMG-nerve conduction, both sensory and motor, recording compound action potential.

**7. Others:**

- i. Construction of Dietary chart for –
  - a. Growing children
  - b. Hypertensive patients
  - c. CAD
  - d. Diabetes mellitus patients
- ii. Test for physical fitness-
  - a. Field 2km. walk
  - b. Lab Harvard step test
  - c. Bicycle ergometry
  - d. Treadmill protocols leading to determination of VO<sub>2</sub> max.
  - e. Cardio respiratory response to whole body exercise.

**D. Clinical Biochemistry :**

- i. Examination of normal and abnormal constituents of urine
  - ii. Other kidney function tests
  - iii. Qualitative & quantitative analyzed
  - iv. Estimation of blood sugar
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- v. Liver function test
  - vi. Glucose tolerance test

#### **IV. Time schedule and rotation postings**

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

1. Cardiology dept.-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-15 days  
Observe and understand Neuro-physiological techniques (clinical Physiology)
    - Clinical examination of patient.
    - Use of EEG.EMG and interpretation of, EEG & other investigation \data.
  3. Medical Gastroenterology-15 days  
Clinical examination of patients.  
To observe endoscopic techniques
  4. Clinical biochemistry- 15 days  
To understand the principal of clinical biochemical test and interpretation of data.
    - Liver function tests
    - Renal function tests.
  5. Heamatology Department -15 days  
To learn investigations
  6. Blood bank -15 days  
To learn blood grouping and cross matching, collection, storage and transfusion of blood.
  7. Department of Anatomy-15 days.  
(Histology Laboratory) staining techniques. Moulding of specimens, slide identification characteristics.
  8. **Biostatics and Research Methodology**-to attend workshop on research methodology -3 days
  9. Postings in institute of aerospace Medicine, Bangalore for applied physiology- 1 week training would include:
    - a. Applied cardio- respiratory physiology
    - b. Thermal Physiology
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- c. Space Physiology
  - d. High altitude Physiology and hyperbaric medicine
  - e. Acceleration Physiology  
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.
10. Obstetrics and Gynecology postings- 15 days.
    - i. Methods to determine ovulation time.
      - Basal body temperature chart.
      - Cervical smear
      - Vaginal smear.
    - ii. Clinical examination during pregnancy including antenatal check up and investigations.
  11. Chest medicine-15 days  
To learn in laboratory –lung function tests and interpretation of results.
  12. General medicine-1 month
    - Clinical examination of patients.
    - investigation procedures
    - Drawing of blood and storage
    - Lumbar puncture
    - Interpretation of: X-Ray, EGG, Biopsy report, Biochemical results.
    - Endocrinology postings: Clinical Examination of patient, Radio Immuno Assay techniques.
    - Ophthalmology for fundoscopy and measurement of intraocular pressure, Refractometry & perimetry.
  13. In addition to the topics recommended by the MCI, the following recent advances have been added as amendments
    - Speech and audiology Department- Yenepoya 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.

#### **V. Seminar & Journal reviews:**

The post graduate students should actively participate in department seminars and journal clubs. A record showing the involvement of these students shall be

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maintained. A diary should be maintained. Seminars and journal clubs are suggested to be conducted alternately once in every 15 days. See chapter for model check lists.

During three years of the course, postgraduate students shall participate in teaching undergraduate students in practical's, tutorials and group discussions.

## **VI. Dissertation work:**

During the course of study every candidate has to prepare s dissertation individually on a selected topic under the direct guidance and supervision of a recognized post teacher as per MCI regulations.

The suggested time schedule for dissertation work is:

Identification and select 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 as per the dates notified by the University. Data collection for dissertation. Writing the dissertation in the following 1 and half years. Submission of the dissertation six months prior to the final examination or as per the dates notified by the university.

### **Registration of dissertation topic**

Every candidate shall submit a synopsis in the prescribed of the University for Registration of dissertation topic/ subject of dissertation after it is scrutinized by the P.G. training cum research committee of the concerned institution. The synopsis shall be sent within first 6 months from the commencement of course as notified in the University calendar of events, to the Registrar (Academic).

### **Submission of dissertation:**

The dissertation shall be submitted to the registrar of the University six months before final examination or as per the dates notified by the university. Approval of the dissertation by the panel of examiners is a pre- requisite for a candidate to appear in the University examination.

## **VII. Maintenance of Record of Work Done, Periodical assessment and progress report.**

1. A diary showing each day's work has to be maintained by the candidate, which shall be scrutinized by the head of the Department once in every three months.
2. A practical record has to be maintained by the candidate and duly scrutinized by the student has to be maintained which should be scrutinized by the head of the department.
3. A practical record has to be maintained by every candidate and duly scrutinized and certified by the head of the department and to be submitted to the external examiner during the final examination.

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## VIII. Scheme of examination

### University examination:

#### A. Theory:

The written examination consists of four papers of 100 marks each. Each paper will be of three hours duration. Questions on recent advances may be asked in any or all papers.

#### Paper-I:

General Physiology, biopotential, transport across membrane, biophysical principles, comparative Physiology, History of medicine with special reference to physiology.

#### Paper-II:

systemic physiology including applied aspects of blood, respiratory Physiology, cardiovascular, digestive, excretory systems, Exercise and sports Physiology and Environmental Physiology.

#### Paper-III:

Systemic physiology including applied aspects of central Nervous system, Muscle & Nerve Physiology, Endocrines.

#### Paper-IV:

Reproductive Physiology, Special senses, Clinical Physiology, Chrono Physiology, and Behavioral Physiology with yoga & Meditation.

**The Topics assigned to the different papers are given as general guidelines. A strict division of subjects may not be possible. Some overlapping of topics is inevitable. Students should be prepared to answer the overlapping topics.**

Each theory paper will consist of: long easy type questions     -2X20 Marks=40  
Short Essay type questions   -6X10 Marks= 60

#### B. Practical                   200 marks

##### i)     **Laboratory Procedures**

- a. Human normal subjects   50 marks
- b. Rabbit/Rat/Guinea pigs   25 marks
- c. Heamatology   30 marks
- d. Histology   20 marks

##### ii)     **Clinical Physiology:**

Clinical examination of given subject, discussion on investigations, interpretation of laboratory findings and Physiological principles in diagnosis-50 marks

##### iii)     **Clinical Bio-chemistry**

**25 marks**

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### C. Viva Voce 100 marks

The Viva-Voce would be on all components of syllabus including discussion on dissertation 80 marks

Maximum marks for	Theory	Practical's	Viva-voce	Total
M.D. Physiology Examination	400	200	100	700

### IX. Recommended Text, Reference books and Journals

1. JB West, Best & Taylor, Physiological basis of Medical Practice. Williams & Wilkins.
2. Guyton, Text Book of Medical Physiology, Elsevier.
3. Ganong, Review of medical Physiology, Mc Graw hill
4. Campbell, Clinical Physiology, ELBS & Blackwell
5. John Bullock, Joseph Boyle, III Michael B. Wang, NMS, Physiology 3<sup>rd</sup> Edn, B.I. Waverly.
6. Sir. John V Dacie S M Lewis, Practical Hematology, Churchill Livingstone
7. Donald Emslie-Smith, Colin R Paterson, Thomas Ccatchers, Nicholas W. Read, text book of Physiology, ELBS/ Chrichill Livingstone
8. Vermon B mount Casle, Medical Physiology, vol.1 & vol.2, CV Mosby company
9. Robert M. Berne & Mathew N. Levy, Physiology, Mosby Year book
10. Carl J Wiggers, Physiology In health and disease, Lea Febiger
11. Williams ,text book of Endocrinology, W.B Saunders
12. Peters Dort, Adams Braunwald. Issel Bacher, Matir, Wilson, Harrison's principles of Internal Medicine, 16<sup>th</sup> edition, Mc Graw hill.
13. Harper, Biochemistry, Mc Graw-Hill
14. John Field, HW Magou, vol 1, 2, 3. Hand book of Neurophysiology, Williams & Wilkins
15. Wallance O Fem, Hand Book of reparatory Physiology, Vol 1, Williams & Wilkins
16. Wintrobe, **clinical Hematology**, Lea Febiger
17. **Kathryn L Mc. Cance Sue Huether** , **Text Book of Pathophysiology**, Mosby
18. Gyrila Keela & Eric Neli, Samson Wright's Applied Physiology, ELBS, Oxford University Press.

#### Journals:

1. Journal of Applied Physiology, by American Physiological Society
  2. Physiological reviews, By American Physiological Society
  3. Annual Review of Physiology , By American Physiological Society
  4. Advances in Physiological Education, By American Physiological Society
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5. Recent advances in Physiology , By American Physiological Society
  6. Journal of Physiology, British Publication
  7. Indian Journal of Physiology and Pharmacology
  8. Indian Journal of Medical Research
  9. New in Physiological Sciences
  10. New England Journal Medicine
  11. British Medical Journal
  12. Lancet

**Additional Readings:**

1. Compendium of recommendations of various committees on Health and Development (1943-1975).DGHS, 1985 Central Bureau Intelligence. Directorate General of Health Services, Min. of Health and Family Welfare, Nirman Bhawan, New Delhi.P-335.
2. National Health Policy, Min. of Health and Family Welfare, Nirman Bhawan, New Delhi, 1983.
3. Santhosh Kumar, The elements of Research .writing and edition 1994, Dept.of Urology, JIPMER, Pondicherry.
4. Srinivasa D K etal, Medical Education Principles and Practice, 1995. National Teacher Training Centre, JIPMER, Pondicherry.
5. Indian council of Medical research,"Policy statement of Ethical considerations involved in research on Human subjects"., 1982,I.C.M.R, New Delhi.
6. Code of Medical Ethics framed under section 33 of the Indian Medical Council Act, 1956.Medical Council of India, Kotla Road, New Delhi.
7. Francis C M, Medical Ethics, J P Publications, Bangalore, I edn. 2004
8. Indian National Science Academy, Guidelines for care and use of animals in Scientific Research, New Delhi, 1994.
9. International Committee of Medical Journal Editors, Uniform requirements for Manuscripts submitted to biomedical journals, N engl J Med 1991; 424-8.
10. Kirkwood B R, Essentials of Medical Statistics, 1<sup>st</sup> ED., Oxford: Blackwell Scientific publications 1988.
11. Mahajan B K, methods in Bio statistics for medical students, 5<sup>th</sup> Ed. New Delhi, Jaypee Brothers Medical Publishers, 1989.
12. Raveendran, B Gitanjali, A Practical approach to Pg dissertation, New Delhi, J P Publications,1998.