SCHOOL OF MEDICINE
D.Y. PATIL UNIVERSITY
(established under Section-3 of UGC Act. 1956 vide notification no. F. 9.21/2000. U.3
dated 20.06.2002 of the Govt. of India)

MD PHYSIOLOGY
3 YEARS FULL TIME PROGRAMME
CURRICULUM
2016-2017 onwards

Sector-7 Dr. D. Y. Patil Vidyanagar, Nerul, Navi Mumbai.
Tel: 91-22 27702218  Email.: schoolofmedicine@dypatil.edu Web:-www.dypatil.edu
PROGRAMME NAME : MD PHYSIOLOGY

Programme Objectives

The candidate qualifying for the award of M.D. (Physiology) should be able to:
1. Demonstrate comprehensive understanding of physiology as well as that of the applied disciplines;
2. Demonstrate adequate knowledge of the current developments in medical sciences as related to physiology.
3. Teach undergraduates and postgraduates in physiology;
4. Plan and conduct basic research work which would guide towards the development of healthcare system.
5. Plan educational programs in physiology utilizing modern methods of teaching and evaluation.
6. Organize and equip physiological research laboratories.
7. Develop communication skill and harmonious relationship with other members of the department and the Institution.
8. Understand the medical ethics while dealing with the experimental materials and human subjects.

Intermediate Objectives

The candidate qualifying for the award of M.D. (Physiology) should be able to:
1. Demonstrate comprehensive understanding of the structure, function and development of the human body as related to physiology, all the factors which might disturb these, mechanisms of such disturbances and the disorders of structure and function, which may result from the disturbances.
2. Critically evaluate the impact of the recent information on the genesis of current concepts related to various topics of physiology.
3. Perform and critically evaluate the practical exercises done by undergraduate students;
4. Identify a research problem which could be basic, fundamental or applied in nature; define the objectives of the problem and give a fair assessment as to what is expected to be achieved at the completion of the project; design and carry out technical procedures required for the study; record accurately and systematically the observations and analyze them objectively; effectively use statistical methods for analyzing the data; interpret the observations in the light of existing knowledge and highlight in what way his observations have advanced scientific knowledge; write a scientific paper on the lines accepted by standard scientific journals;
5. Design, fabricate and use indigenous gadgets for experimental purposes;
6. Practice regular documentation of the departmental activities.
7. Demonstrate familiarity with the principles of medical education including definitions of objectives, curriculum construction, merits and demerits of various tools used in the teaching-learning process; use of learning aids and learning settings, and methods of evaluation;

8. Share learning experiences with the undergraduate and postgraduate students using appropriate pedagogical skills and methods;

9. Draw out meaningful curricula for teaching medical and paramedical courses; give lucid, interactive lectures, presenting the information in a logical, simple and comprehensive manner; generate interest and curiosity amongst the students during lectures; give practical demonstrations;

10. Organize the laboratories for various practical exercises, substitute and fabricate some of the simpler equipment for teaching purposes.

11. Handle and order for stores, draw up lists of equipment required to equip physiology laboratories.

12. Practice horizontal and vertical integration with Anatomy, Biochemistry, paraclinical and clinical departments particularly Medicine, Pediatrics, Obstetrics and Gynaecology, Anaesthesiology.

**Programme Outcome**

At the end of training the student will be competent to impart education and to carry out research in Physiology, be able to serve the community as competent physiologists and render appropriate advice/service to the clinicians as and when it is required.

**Programme Specific Outcome**

1. Demonstrate comprehensive understanding of physiology as well as that of the applied disciplines;
2. Demonstrate adequate knowledge of the current developments in medical sciences as related to physiology.
3. Plan educational programs in physiology utilizing modern methods of teaching and evaluation.
4. Organize and equip physiological research laboratories.
5. Develop communication skill and harmonious relationship with other members of the department and the Institution.
6. Demonstrate comprehensive understanding of the structure, function and development of the human body as related to physiology, all the factors which
might disturb these, mechanisms of such disturbances and the disorders of structure and function, which may result from the disturbances.

7. Critically evaluate the impact of the recent information on the genesis of current concepts related to various topics of physiology.

8. Perform and critically evaluate the practical exercises done by undergraduate students;

9. Identify a research problem which could be basic, fundamental or applied in nature; define the objectives of the problem and give a fair assessment as to what is expected to be achieved at the completion of the project; design and carry out technical procedures required for the study; record accurately and systematically the observations and analyze them objectively; effectively use statistical methods for analyzing the data; interpret the observations in the light of existing knowledge and highlight in what way his observations have advanced scientific knowledge; write a scientific paper on the lines accepted by standard scientific journals;

10. Design, fabricate and use indigenous gadgets for experimental purposes;

11. Organize the laboratories for various practical exercises, substitute and fabricate some of the simpler equipment for teaching purposes.

12. Handle and order for stores, draw up lists of equipment required to equip physiology laboratories.
### TEACHING AND EXAMINATION SCHEME

**PROGRAMME STRUCTURE FOR -- MD PHYSIOLOGY**

**DURATION OF PROGRAMME - 3 YEARS**

<table>
<thead>
<tr>
<th>COURSE</th>
<th>Code</th>
<th>Semester/year</th>
<th>Didactic/ Clinical training</th>
<th>Practical / Clinical postings</th>
<th>Theory</th>
<th>Total</th>
<th>Practical headings</th>
<th>Total Marks</th>
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<tr>
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<td></td>
<td></td>
<td>Paper I</td>
<td>100</td>
<td>400</td>
<td>• Micro teaching</td>
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<td></td>
<td>1st year</td>
<td></td>
<td>PG Lectures</td>
<td>• Lab Orientation</td>
<td>Paper II</td>
<td>100</td>
<td>• Long case</td>
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<td></td>
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<td>UG teaching training</td>
<td>• Teaching training</td>
<td>Paper III</td>
<td>100</td>
<td>• Short case</td>
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<td>Allied posting</td>
<td>• Research proposal/Protocol submission</td>
<td>Paper IV</td>
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<td>• Practical</td>
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<td>Log Book</td>
<td>• Clinical postings</td>
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<td>• Viva/voce</td>
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<td>PG Lectures. UG teaching Training</td>
<td>• Microteaching</td>
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<td></td>
<td>Allied posting</td>
<td>• Poster / Paper Presentation</td>
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<td>Log Book</td>
<td>• Journal club</td>
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<td>• Thesis</td>
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<td>• Case studies</td>
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<td>• Oral Paper at National/state conference</td>
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<td>• Research Publication</td>
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<td>• CME/Conference (State /National /International Level)</td>
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<tr>
<td></td>
<td>3rd Year</td>
<td></td>
<td>PG Lectures. UG teaching Training</td>
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- The candidate must secure 50% and above in both Theory and Practical to Pass
- Dissertation
- 1 Poster presentation, 1 paper presentation at National/state conference and 1 research paper should be published or accepted/sent for publication during the period of post graduate studies
IV] TEACHING PROGRAMME PROFILE

To achieve the above objectives in three years, the registered PG student should work as per the following structured programme.

FIRST YEAR

1. Orientation to the department including duties and responsibilities
2. Choosing the subject of thesis and guide
3. Writing the protocol & submission
4. Recapitulation of undergraduate physiology through attending UG lectures
5. Dissertation work to be started
6. PG discussion sessions by senior faculty.
7. Attending PG lectures at other PG centers
8. Managing library sessions to understand the basics and scan physiological journals.
9. Attend workshops, orations, seminars, symposia held not only at parent Institution but also at other city colleges.
10. Attend journal clubs, discussion sessions in the department.

SECOND YEAR

1. Visits to various preclinical, paraclinical and clinical departments to gain the knowledge of various techniques used to study the functions of various systems
2. Collection of data related to dissertation and discussion of analysis on the basis of statistical principles.
3. Teaching small groups and demonstration of practical sessions along with instructions.
4. Attend local and National conferences,
5. Presentation in journal clubs and departmental seminars.
6. Understanding and integrating systemic physiology.

THIRD YEAR

1. Taking lectures for full batch of medical students by judiciously using audiovisual aids.
2. Design and demonstrate by using models illustrating examples.
3. Completion of dissertation work including printing and submission by middle of the third year.
4. Able to perform prescribed PG practicals thoroughly and independently.
5. Presentation of scientific papers in conferences.
6. Seminars and Symposia continue as per schedule.

V] Themes and Topics

a. General & Cellular Physiology
   _ Cell as the living unit of the body _ The internal environment
b. Nerve & Muscle Physiology
- Resting membrane potential
- Action potential
- Classification of nerve fibers
- Nerve conduction
- Degeneration and regeneration in nerves
- Multiple sclerosis
- Functional anatomy of skeletal muscle
- Neuro-muscular transmission and blockers
- Excitation-contraction coupling
- Mechanisms of muscle contraction
- Smooth muscle atrophy, hypertrophy and dystrophy.

c. Hematology
- Erythrocytes — erythropoiesis — structure & function of RBCs
  — formation of hemoglobin — destruction & fate of RBCs
- Anemias — polycythemias
- Leucocytes — general characteristics
- genesis & life span of WBCs — classification & functions of each type of WBC
- leucopenia — leukemias
- Blood groups — classification — antigenicity — agglutination — blood typing
- principles of transfusion medicine
- Hemostasis
- components of hemostasis — mechanisms of coagulation — coagulation tests — anticoagulants
- Immunity — Innate immunity — Acquired immunity
- Allergy, hypersensitivity and immunodeficiency — Autoimmune disorders.

d. Renal Physiology & Fluid Balance
- Body fluid compartments
- Water balance; regulation of fluid balance
- Renal circulation
- Urine formation
- Regulation of extracellular sodium & osmolarity
- Juxtaglomerular apparatus
- Renal mechanisms for the control of blood volume, blood pressure & ionic composition
- Regulation of acid-base balance
- Micturition
- Diuretics
- Renal failure
- Artificial kidney — dialysis.

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

e. Respiration
- Functional anatomy of respiratory system — pulmonary ventilation
- Alveolar ventilation
- Mechanics of respiration
- Pulmonary circulation
- Pleural fluid
- Pulmonary edema
- Principles of gas exchange
- Oxygen & carbon-dioxide transport
Regulation of respiration _ Hypoxia _ Oxygen therapy & toxicity _ Artificial respiration _ Environmental Physiology _ **Physiology of hot environment** _ Physiology of cold environment _ High altitude _ Aviation physiology _ Space physiology _ Deep sea diving & hyperbaric conditions

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

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

h. **Limbic System and Higher Nervous System**
   _ Autonomic nervous system _ Limbic system and hypothalamus _ EEG _ Sleep _ Emotions & Behaviour _ Learning & Memory _ Yoga Meditation & Pranayam – stress management

i. **Nutrition & Metabolism**

j. **Endocrines & Reproduction**
Apart from the above topics in general and systemic physiology, the students are introduced to:
1. Biophysics
2. Biochemistry
3. Biostatistics
4. Molecular Biology
5. Medical Education
6. History of Medicine

Updated :-

Recent advances, discoveries/inventions in physiology (Additional chapter + question in exam)

Use of technology in medicine

Molecular level physiology

Evolution any physiology.

The above topics are covered through a mix of self-learning and structured program. The structured program consists of:

1. Seminars
   The seminars are on a topic belonging to a system scheduled for the semester. The topic is presented in depth appropriate for postgraduates by one of the M.D. students and moderated by a faculty member. The seminars represent only a small and somewhat arbitrary selection of topics. They are not intended to cover an entire system. Their aims are to:
   a. introduce the system
   b. tune the students to the system
   c. cover recent advances
   d. give students practice in the art of oral presentation

2. Journal clubs and Faculty presentations,
   The journal clubs are on an article belonging to a system scheduled for the year. The article is presented by an M.D. student or senior demonstrator, and moderated by a faculty member.

   The aims of journal clubs are to:
   a. highlight recent advances
b. discuss classical papers  
c. inculcate the faculty of critical appreciation of a research article  
d. give students and senior demonstrators practice in the art of oral presentation  
Faculty presentations are usually on:  
a. medical education  
b. research methodology  
c. an area of research in which the faculty member is involved.  

3. Practicals  
The practical exercises are conducted for M.D. students  
on systems scheduled for the year. The results obtained in these experiments are  
presented in Microteaching sessions. Besides specially designed P.G. Practicals, M.D.  
students perform all undergraduate Practicals, and also teach some of these Practicals to  
the undergraduates.  

List of post graduate Practicals to be performed are as follows:--  

1. All UG haematology Practicals  
2. All UG human expts.  
3. Clinical Examination of the human subject  
4. Clinical examination and interpretation of physiological basis of patient’s  
symptoms  
5. Platelet count and Reticulocyte count  
6. ECG, EEG AND EMG  
7. Interpretation and discussion of charts and graphs of animal expts.  
8. Biochemical analysis of blood and urine  
9. Pregnancy test and Semen Analysis  

4. Microteaching Sessions  
Since M.D. students are also junior demonstrators, they are actively involved in teaching  
undergraduates. The forthcoming practical exercises are discussed, and feedback on  
recently held exercises is obtained. These discussions are designed to improve the  
performance of M.D. students  
in teaching and related administrative responsibilities. The presentation of thesis work by  
P.G. students and any other items of interest to the teaching and research staff of the  
department.  

5. Clinical postings  
During their last semester, M.D. students are posted for two weeks each in the  
Departments of Medicine, Anesthesia, Pediatrics, Obstetrics and Gynaecology,. In these  
postings, the students attend ward rounds and also observe the work going on in these  
departments, e.g. the pulmonary function test lab, cardiac catheterization lab, and  
radioimmunoassay lab. The aim of these postings is to:  
a. provide the students concrete living examples of the application of physiology in  
diagnosis and management of disease.  

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b. illustrate through some living examples how knowledge of physiology may grow through observations made on patients.

VI] ASSESSMENT STRATEGY

A | FORMATIVE ASSESSMENT

1. Percentage of semester-wise attendance.
2. Term test in written, practical and viva.
3. Periodic dissertation discussion
4. Presentation in seminars and journal clubs.
5. Practical instruction and demonstration to UG students.
6. Presentation of scientific papers in national conferences.

Each of the above listed components would be graded out of 10 marks except attendance (only % criteria for 36 months to be fulfilled). All the postgraduate activities should be entered in the logbook and practical journal is to be maintained. The performance of the candidates must be recorded with student’s and Guide’s signature periodically.

B | SUMMATIVE ASSESSMENT

University Examination Theory - 4 papers – each of 3 hrs duration 400 marks

<table>
<thead>
<tr>
<th>Practical</th>
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<tbody>
<tr>
<td>1. Haematology long -- 1</td>
<td>50</td>
</tr>
<tr>
<td>Short 1</td>
<td>25</td>
</tr>
</tbody>
</table>
| 2. Human expt. Ergography                                    25x2 = 50
| Spirometry                                                    |             |
| Stethography                                                  |             |
| Perimetry                                                     |             |
| Electrocardigraphy                                            |             |
| Assessment of cardio respiratory Efficiency                   |             |

3. Clinical physiology 25 x 2 = 50

Cvs, Rs, abdomen, Nervous system

4. Instruments & Circuits 25

5. Mammalian graphs 25

6. Amphibian graphs 25

7. Pedagogy 50

8. Grand Viva 100

GRAND TOTAL MARKS 800
Question Paper-wise distribution of topics:

Paper I ➔ Basic aspects of General Physiology, Biophysical Principles, comparative physiology, Applied Biochemistry, Biostatistics, History of Medicine with special reference to physiology

Paper II ➔ Systemic physiology including applied aspects of blood, RS, CVS, Digestive & Excretory systems, Exercise and Environmental Physiology, Nutrition.

Paper III ➔ Systemic Physiology including applied aspects of Nerve Muscle Physiology and Endocrines, Reproductive physiology.

Paper IV ➔ CNS, Special Senses, Yoga and Meditation Medical ethics, Medical education technology, Recent Advances in physiology.

PAPER PATTERN—ALL ARE COMPULSORY

Q 1 30 marks
Q. 2 30 marks
Q. 3 Write Notes On A,B,C,D
Four questions each carrying 10 marks------40

Total 100 marks

C | /DISSERTATION

- It is compulsory. Dissertation approval is a prerequisite for appearing University examination. If rejected, eligible to appear for exam after reapproval.
- Research work should be done by candidate under the supervision and guidance of recognized PG teacher by the University.
- The title of the topic with plan of the work written not exceeding 500 words in prescribed proforma under intimation to Dean should be submitted to the University with the recommendation of PG teacher within a period of 10 months from the date of registration.
- Five copies of dissertation certified by PG guide should be submitted to the UNIVERSITY through the Dean of the institution six months prior to the UNIVERSITY EXAMINATION.

VII | Recommended Texts, Reference books and Journals

1. Best and Taylor Physiological basis of Medical Practice
2. Guyton, T.B. of Medical Physiology
3. Ganong, Review of Medical Physiology
4. Campbell, Clinical Physiology
6. Sir John Dacie, S.M.Lewis Practical Haematology
7. Donald Emslie Smith T.B. of Physiology
8.  Vernon B. Mount Castle Medical Physiology vol. I & II
9.  Berne & Levy, Physiology
10. Carl J. Wiggers, Physiology in Health & Disease
11. Williams, T.B. of Endocrinology
12. John Field, H.W. Magou vol. 1,2,3 Hand book of Neurophysiology
13. Samson Wright’s Applied Physiology
14. Wintrobe, Clinical Haematology

Journals

1.  J. of Applied Physiology by American Physiological Society
2.  Physiological Reviews
3.  Annual Review of Physiology
4.  Advances in Physiology Education
5.  Recent Advances in Physiology
6.  IJPP
7.  IJMR
8.  J. of Physiology British Publication
9.  News in Physiological Sciences
10. New England J. of Medicine
11. British Medical Journal
12. Lancet

ADDITIONAL READING

1.  Santosh Kumar, Elements of Research, writing and editing, 1994,
2.  Srinivasa D. K. etal, Medical Education Principles and Practice, 1995,
3.  ICMR Policystatement of Ethical considerations involved in Research on Human subjects 1982
4.  Code of Medical Ethics framed under section 33 of the Indian Medical Act, 1956
5.  Francis C.M. Medical Ethics J.P. Publication B’lore I edn. 2004
6.  International Committee of Medical Editors, Uniform Requirement for manuscripts submitted to biomedical journals, NEJM 1991; 424-8