RAMAIAH UNIVERSITY OF APPLIED SCIENCES

M.S. Ramaiah University of Applied Sciences

Programme Structure and Course Details

Of

MD Physiology 2022 onwards

M.S. Ramaiah University of Applied Sciences

Ramaiah Medical College

Registrar
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Bangalore - 560 054

Shalini
Principal and Dean
M.S. Ramaiah Medical College & Hospital
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Dean - Academics
M.S. Ramaiah University of Applied Sciences

Approved by the Academic Council at Its 27th meeting held on 27th September 2022

RAMAIAH UNIVERSITY OF APPLIED SCIENCES

M.S. Ramaiah University of Applied Sciences

Programme Specifications

MD Physiology Programme 2022 onwards

Programme Code: MD128

M.S. Ramaiah University of Applied Sciences

Ramaiah Medical College

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University's Vision, Mission and Objectives

The M. S. Ramaiah University of Applied Sciences (MSRUAS) will focus on student-centric professional education and motivates its staff and students to contribute significantly to the growth of technology, science, economy and society through their imaginative, creative and innovative pursuits. Hence, the University has articulated the following vision and objectives.

Vision

MSRUAS aspires to be the premier university of choice in Asia for student centric professional education and services with a strong focus on applied research whilst maintaining the highest academic and ethical standards in a creative and innovative environment

Mission

Our purpose is the creation and dissemination of knowledge. We are committed to creativity, innovation and excellence in our teaching and research. We value integrity, quality and teamworkin all our endeavors. We inspire critical thinking, personal development and a passion for lifelonglearning. We serve the technical, scientific and economic needs of our Society.

Objectives

1. To disseminate knowledge and skills through instructions, teaching, training, seminars, workshops and symposia in Engineering and Technology, Art and Design, Management and Commerce, Health and Allied Sciences, Physical and Life Sciences, Arts, Humanities and Social Sciences to equip students and scholars to meet the needs of industries, business and society
2. To generate knowledge through research in Engineering and Technology, Art and Design, Management and Commerce, Health and Allied Sciences, Physical and Life Sciences, Arts, Humanities and Social Sciences to meet the challenges that arise in industry, business and society
3. To promote health, human well-being and provide holistic healthcare
4. To provide technical and scientific solutions to real life problems posed by industry, business and society in Engineering and Technology, Art and Design, Management and Commerce, Health and Allied Sciences, Physical and Life Sciences, Arts, Humanities and Social Sciences
5. To instill the spirit of entrepreneurship in our youth to help create more career opportunitiesin the society by incubating and nurturing technology product ideas and supporting technology backed business
6. To identify and nurture leadership skills in students and help in the development of our future leaders to enrich the society we live in
7. To develop partnership with universities, industries, businesses, research establishments, NGOs, international organizations, governmental organizations in India and abroad to enrichthe experiences of faculties and students through research and developmental programme

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Programme Specifications: MD Physiology

Faculty	Ramaiah Medical College
Department	Physiology
Programme	MD Physiology
Programme Code	MD128
Dean of Faculty	Dr Shalini Nooyi
Head of the Department	Dr Preethi B L

1. **Title of The Award:** MD in Physiology
2. **Modes of Study:** Full Time
3. **Awarding Institution /Body :** M.S. Ramaiah University of Applied Sciences
4. **Joint Award:**Not Applicable
5. **Teaching Institution:** Ramaiah Medical College
6. **Programme Approved date by the Academic Council of MSRUAS:** 27th September 2022
7. **Rationale for the Programme**

The purpose of PG education is to create specialists who would provide high quality health care and advance the cause of science through research & training. The purpose of the training in Physiology is to produce experts with necessary knowledge, skills and attitude 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. The purpose of this document is to provide teachers and learners illustrative guidelines to achieve defined outcomes through learning and assessment. This document was prepared by various subject-content specialists. The Reconciliation Board of the Academic Committee has attempted to render uniformity without compromise to purpose and content of the document. Compromise in purity of syntax has been made in order to preserve the purpose and content. This has necessitated retention of "domains of learning" under the heading "competencies".

This document guides the teachers and learners to achieve defined outcomes through learning and assessment.

Ramaiah medical college is recognized worldwide for its infrastructure and innovative teaching learning methodologies. We have a strong medical education unit which helps the post graduates to improve on their teaching and communication skills. The division of research and patents will guide the post graduate student to carry out research projects effectively.

Shalini With competent faculty we will help the post graduate to be a best teacher and a researcher.

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Educational Aims of the Programme

The Goal of MD Physiology is to train a doctor to become a competent teacher and researcher in Physiology who:

1. is aware of *contemporary advances and developments* in the field of Physiology.
2. has *acquired the competencies* pertaining to the subject of Physiology that are required to be practiced at all levels of health system.
3. is able to discharge responsibilities and participate in National Health Education Programme.
4. is oriented to the *principles of research methodology*.
5. has acquired *skills in educating* medical and paramedical professionals.
6. has acquired *skills in effectively communicating* with the students and colleagues from various medical and paramedical fields.
7. has acquired skills of integrating Physiology with other disciplines as and when needed.
8. has acquired qualities of a good teacher capable of innovations in teaching methodology.
9. has been able to demonstrate adequate management skills to function as an effective leader of the team engaged in teaching and research.

9. Aims and Objectives

At the end of three years course in MD Physiology the student should have achieved following competencies:

1. Knowledge of Physiology

1.1 Acquire competencies in General Physiology, Blood and immunity, Cardiovascular and respiratory system, Nerve muscle, Endocrine, reproductive, Renal Gastrointestinal Physiology and Nervous system, applied aspects and recent advances of the above-mentioned branches of Physiology to clinical practice. These are given in detail in subsequent sections.

2. Practical and Procedural skills

2.1 Acquire mastery in Hematology experiments, Human experiments, Skills of Clinical Examinations and Animal experiments.

3. Training skill in Research Methodology

3.1 Acquire skills in teaching, research methodology, epidemiology & basic information technology.

3.2 Acquire knowledge in the basic aspects of Biostatistics and research methodology.

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3.3 Develop knowledge to plan the protocol of a thesis, carry out review of literature, execution of research project and preparation of report.

3.4 To be able to use computer applications Microsoft office (Microsoft word, excel, power point), Internet, Searching scientific databases (e.g. PubMed, Medline, Cochrane reviews).

3.5 Acquire skills in paper & poster preparation, writing research papers and thesis.

4. Professionalism, attitude and communication skills:

4.1 Develop honest work ethics and empathetic behavior with students and colleagues.

4.2 Acquire capacity of not letting his/her personal beliefs, prejudices, and limitations come in the way of duty.

4.3 Acquire attitude and communication skills to interact with colleagues, teachers and students.

5. Teaching Physiology

5.1 Practicing different teaching-learning methodologies.

5.2 Making presentations of the subject topics and research outputs.

6. Problem Solving

6.1 Demonstrate the ability to identify applied implications of the knowledge of Physiology and discuss information relevant to the problem, using consultation, texts, archival literature and electronic media.

6.2 Demonstrate the ability to correlate the clinical conditions on Physiological basis.

6.3 Demonstrate the ability to evaluate scientific/clinical information and critically analyze conflicting data and hypothesis.

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Programme Objectives (PO) of MD Physiology

At the end of the program the students should

PO1: Be a competent Physiologist and have thorough knowledge of the body all the systems of the body including historical aspect, evolution, comparative physiology, mechanisms maintaining homeostasis, applied physiology and recent advances.(C)

PO2 : Teach the basic physiological concepts of human body, pathophysiology of diseases and the physiological basis of management to undergraduate medical and paramedical students.(C)

PO3: Acquire skills in conducting and demonstrating the hematology practicals, human experiments, clinical examinations and experiments based on biophysical principles.(P,C)

PO4: Be able to critically evaluate published journal literatures and be capable of conducting research independently, participate in academic events like conferences, workshops etc.(C)

Programme Specific Outcome (PSO) MD Physiology

At the end of the Program, the students should be able

PSO1: Teach competently the physiological concepts governing the maintenance of homeostasis in various organ systems to medical and paramedical courses.(C)

PSO2: Conduct the electrodiagnostic tests like EEG, AFT, ECG etc and interpret the results for research and diagnostic needs.(P)

PSO3: Understand the physiological response of the body to yoga, high altitude and in sports and its application in research.(C)

PSO4: Conduct research, including collaborative research and publish the articles in indexed journals. (C,P)

PSO5: Function as an effective team member / leader of teaching and research team with good communication skills and ethical principles.(A)

Note: A- Affective Domain, C- Cognitive Domain & P- Psychomotor Domain

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Course –PO-PSO mapping

Course Code and name	Program Outcomes (PO)				Program Specific Outcomes (PSO)				
	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5
MDC505A Basic Sciences as applied to Physiology	3	3	3	3	3	3	2	2	2
MDC506A Systemic physiology I	3	3	3	3	3	3	3	2	2
MDC507A Systemic physiology II	3	3	3	3	3	3	3	2	2
MDC508A Recent Advances in Physiology	3	3	2	3	2	2	3	2	2
MDP502A Thesis-Physiology	3	3	3	3	3	2	2	3	2

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B. SUBJECT SPECIFIC COMPETENCIES

At the end of the course, the student should have acquired following competencies:

A. Cognitive domain

1. 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

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 patients / standardized patients. (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.Provide leadership and get the best out of his team in a congenial working atmosphere.

7.Apply high moral and ethical standards while carrying out human or animal research.

8. Be humble and accept the limitations in his knowledge and skill and to ask for help from colleagues when needed.

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C. Psychomotor domain

At the end of the course the student should be able to:

1.The student should be able to perform the clinical examination of the system in normal subjects.
2. The perform hematology experiments, identify cells and interpret the values in normal subjects.
3.To perform general physical examination and interpret the physiological basis of some clinical symptoms and signs.
4. Follow the general principles of Inspection/Palpation/Percussion/Auscultation.
5. To perform and interpret animal experiments using computer assisted lab and graphs.

Specific practice based competencies:

Name/Description of practice based competencies
1. Haematology:
1.1 Estimation of Hemoglobin
1.2 Determination of Total Erythrocyte (RBC) Count and RBC Indices (Blood Standards)
1.3 Determination of Total Leucocytes (WBC) Count: TLC
1.4 Preparation of a peripheral Blood Smear and Determination of Differential Leucocyte Count: DLC
1.5 Determination of Arneth Count
1.6 Determination of Bleeding Time (BT) and Clotting Time (CT)
1.7 Determination of Blood groups (A, B, O and Rh system)
1.8 Determination of Erythrocyte Sedimentation Rate (ESR) and Packed cell volume (PCV)
1.9 Determination of Osmotic Fragility of Red Blood Cells
1.10 Determination of Platelet Count
1.11 Determination of Reticulocyte Count
1.12 Study of Haemopoietic Cells Present in the Bone Marrow
2. Animal experiments
A. Amphibian (Frog) experiments
2.1 Effect of temperature on simple muscle twitch.
2.2 Effect of two successive stimuli (of same strength) on skeletal muscle.
2.3 Effect of increasing strength of stimuli on skeletal muscle.
2.4 Effect of increasing frequency of stimuli on skeletal muscle (genesis of tetanus).
2.5 Effect of free load and after load on skeletal muscle.
2.6 Effect of repeated stimuli on skeletal muscle (study of phenomenon of Fatigue).
2.7 Study of isometric contraction in skeletal muscle.
2.8 Determination of conduction velocity of sciatic nerve and effect of variables on it.

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2.9 Properties of cardiac muscle – Refractory period, All-or-None Law, extra- systole and compensatory pause, beneficial effect.

2.10 Regulation of Heart, Vagus dissection and effect of Vagal and WCL stimulation.

2.11 Effect of physiological and pharmacological variables on intact frog's heart.

2.12 Perfusion of isolated frog's heart-role of sodium, potassium, calcium ions and drugs.

2.13 Perfusion of blood vessels in the frog.

2.14 Capillary circulation (Frog Web).

2.15 Postural and protective reflex in the frog.

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

2.16 General management of mammalian experiments.

2.17 Recording of heart rate, blood pressure and respiration and study the effects of various factors; drugs; asphyxia; occlusion of common carotid artery.

2.18 Effect of stimulation of central and peripheral end of vagus on arterial blood pressure and respiration after vagotomy.

2.19 Effect of stimulation and distension of carotid sinus on blood pressure and respiration.

2.20 Effect of stimulation of splanchnic nerve.

2.21 Effect of stimulation of peripheral somatic nerve (sciatic nerve).

2.22 Study of hypovolemic shock and its reversal

2.23 Perfusion of isolated mammalian heart and study the effects of drugs and ions.

2.24 Recording of Isolated Intestinal movement and tone and studying the effect of drugs and ions.

2.25 Study of various stages of menstrual cycle, cervical smear and vaginal smear.

3. Human Physiology

A. Clinical Physiology

3.1 Physiological principles of clinical examination.

3.2 General Physical examination, physiological basis of some clinical symptoms and signs.

3.3 General principles of Inspection/Palpation/Percussion/Auscultation.

B. Nerve muscle physiology

3.4 Ergography and hand grip spring dynamography and study of human fatigue.

3.5 Recording of electromyography (EMG) and its application.

3.6 Recording of nerve conduction.

C. Cardiovascular system (CVS)

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3.7 Clinical examination of CVS.

3.8 Examination of arterial & venous pulses.

3.9 Measurements of arterial blood pressure and effect of head-up/head-down tilt (effect of posture).

3.10 Recording of 12 lead Electrocardiography (ECG) and its interpretation

3.11 Measurement of blood flow.

D. Respiratory system

3.12 Clinical examination of RS

3.13 Stethography – study of respiratory movements and effect of various factors.

a) effect of hyperventilation, effect of breath. holding and effect of deglutition

3.14 Assessment of respiratory functions Computerised Spriometry

Vitalography

Gas analysis

3.15 Measurement of BMR

3.16 Cardio pulmonary resuscitation (CPR) and Artificial respiration.

E. Gastrointestinal system:

3.17 Clinical examination of abdomen.

F. Integrative Physiology / Excretory system

3.18 Recording of body temperature/effect of exposure to cold and hot environment

3.19 Studies in stimulated environment - microgravity; high altitude; hot and cold environment.

3.20 Human studies involving sweat, salivation and urine.

G. Reproductive system

3.21 Determination of ovulation time by basal body temperature chart and pregnancy diagnostic test - Immunological Tests.

3.22 Semen analysis: sperm count and motility.

H. Nervous System including Special senses

3.23 Examination of higher mental functions.

3.24 Examination of cranial nerves

3.25 Examination of sensory system.

3.26 Examination of motor system including reflexes.

3.27 Clinical examination of special senses:

i.Smell and Taste

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ii.Test for hearing

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

3.28 Reaction (visual and auditory) and reflex time

3.29 Electroencephalography (EEG) and Polysomnography

3.30 Autonomic Nervous System (ANS) Testing.

a) Timed deep breathing

b) Sustained isometric contraction

c) Valsalva manoeuvre

d) Effect of posture

e) Compare the contrasting effect of cold on heart rate by the -

Ice cold pressor test

Diving reflex (head immersion)

3.31 Neuro-electrodiagnostic techniques:

a.Nerve conduction study.

b.Visual evoked potential (VEP).

c. Brainstem auditory evoked potential (B.A.E.P).

d.Somato-sensory evoked potential (SEP).

e.Motor evoked potential (MEP).

4. Others

4.1 Construction of dietary chart for growing children, pregnant woman, elderly individuals, hypertensive patients, & diabetes mellitus patients and case histories-problem based learning.

4.2 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 VO2 max

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C. Syllabus

A post graduate student, after three years of training in M.D. (Physiology) should have acquired knowledge in the following aspects of Physiology:

General Physiology

1. Describe Physiology of cell.
2. Explain various Cellular mechanisms.
3. Describe the principles of Physics and Physical Chemistry involved in haemodynamics.
4. Explain principles of Physics and Physical Chemistry involved in bioelectrical potentials.
5. Describe the fluid compartments of the body, its ionic composition & measurements.
6. Describe Excretion, pH, water and Electrolyte balance.
7. Discuss Biophysics, Biochemistry, Micro-anatomy relevant to Physiology.

Cellular Physiology including Genetic Basis and Historical perspectives

1. Explain cellular genetic control mechanisms.
2. Discuss history of Physiology.
3. Describe and discuss physiology of growth, development and aging.

Biostatistics

1.Describe Biostatistics principles relevant to research methodologies.

Blood and Immunity

1. Describe the origin, variations and functions of plasma proteins, RBC, hemoglobin, WBC and platelets.
2. Discuss the physiological basis of hemostasis.
3. Describe different blood groups and their clinical importance.
4. Discuss the types of immunity and their applications.

Cardiovascular System

1. Describe the properties of cardiac muscle including its morphology, electrical, mechanical and metabolic functions.
2. Describe the physiological basis of electrocardiogram (E.C.G), its applications.
3. Describe & discuss regional circulation including microcirculation, lymphatic circulation, coronary, cerebral, capillary, skin, foetal, pulmonary and splanchnic circulation.
4. Describe the factors affecting heart rate, regulation of cardiac output & blood pressure and their applications.

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Respiratory System

1. Describe the mechanics of normal respiration, pressure changes during ventilation, lung volume and capacities, alveolar surface tension, compliance, airway resistance, ventilation, V/P ratio, diffusion capacity of lungs.
2. Describe and discuss the transport of respiratory gases: Oxygen and Carbon dioxide and pathophysiology of dyspnoea, hypoxia, cyanosis asphyxia; drowning, periodic breathing.
3. Describe and discuss the physiology of high altitude and deep sea diving and principles of artificial respiration.
4. Discuss neural and chemical regulation of respiration.

Gastro- Intestinal Tract (GIT) and dietary requirements

1. Describe the composition, mechanism of secretion, functions, and regulation of saliva, gastric, pancreatic, intestinal juices and bile secretion, function test and disorders.
2. Describe GIT movements, regulation and functions including defecation reflex and disorders.

Nerve-Muscle Physiology including muscle mechanics

1. Describe the structure, functions and properties of nerve fibre, neuron and neuroglia.
2. Describe the structure, transmission and pathophysiology, management of disorders of neuromuscular junction.
3. Describe types of muscle fibres, properties including action potential.
4. Describe the molecular basis of muscle contraction in skeletal and in smooth muscles.
5. Discuss types of contractions, energy source and muscle metabolism, gradation of muscular activity and muscular dystrophy.

Endocrine Physiology

1. Describe the synthesis, secretion, transport, physiological actions, regulation, effect of altered (hypo and hyper) secretion and function tests of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, hypothalamus, thymus & pineal gland.
2. Describe the metabolic and endocrine consequences of obesity & metabolic syndrome, Stress response.

Nervous System (Central, peripheral and autonomic)

1. Describe and discuss the functions and properties of synapse, reflex, receptors.
2. Discuss sensory tracts and somatic sensations, motor tracts, mechanism of maintenance of tone, posture and equilibrium.
3. Describe connections and functions of spinal cord, cerebral cortex, basal ganglia, thalamus, hypothalamus, cerebellum and limbic system, reticular formation, autonomic nervous system and their lesions and abnormalities.

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4. Discuss the physiological basis of memory, learning, speech, behaviour, sleep and EEG and related disorders.

Special Senses

1. Discuss physiology of image formation, physiology of vision including colour vision, refractive errors, colour blindness, physiology of pupil and light reflex, lesions in visual pathway and visual evoked potentials.

2. Describe auditory pathways, physiology of hearing, pathophysiology of deafness, hearing tests and auditory evoked potentials.

3. Describe perception of smell and taste sensations and their pathophysiology.

Reproduction & family planning/foetal & neonatal Physiology

1. Discuss sex determination and differentiation, puberty and their abnormities and outline psychiatry and practical implications.

2. Describe male reproductive system: functions of testis and control of spermatogenesis & factors modifying it and interpret normal semen analysis report.

3. Describe female reproductive system: (a) functions of ovary and its control; (b) menstrual cycle - hormonal, uterine and ovarian changes and hormonal changes and their effects during perimenopause and menopause.

4. Discuss the physiology of pregnancy, parturition & lactation. Tests for pregnancy, causes and management of infertility

5. Discuss the effects of removal of gonads on physiological functions and contraceptive methods in males and females.

Patho-physiology pertaining to systemic Physiology / Integrated Physiology

1. Describe the physiological basis, diagnosis and management of related disorders pertaining to various systems.

Physiological basis of various clinical investigation tests / Integrated Physiology

1. Describe the normal values of clinical investigation tests and their alterations in various disorders.

Interaction of human body in ambient environment- high altitude, space and deep sea

1.Describe the adjustments of different organ systems to high altitude, space and deep sea.

Sports Physiology

1. Describe and discuss cardio-respiratory and metabolic adjustments during exercise and physical training effects.

2. Describe physiological consequences of sedentary lifestyle.

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Yoga and Meditation

1. Describe the physiological effects of yoga and meditation on different organ systems.

Recent advances relevant to Physiology/Artificial intelligence in Physiology

1. Discuss about discoveries and recent advances relevant to Physiology.
2. Discuss the applications of artificial intelligence in Physiology.

Social responsibilities of physiologists

1. Enumerate the 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.

1. Clinical Neurophysiology Laboratory

1. Electroencephalography
2. Evoked potential recording
3. Electromyography
4. Nerve conduction studies
5. Autonomic nervous system (ANS) testing
6. Any other newer technology

2. Cardio-Respiratory Laboratory

1. Electrocardiography
2. Blood-gas Analysis
3. Computerized multifunctional spirometery
4. Laboratory for measuring pulmonary diffusion capacity and functional
5. residual capacity (FRC)
6. Whole-body plethysmography
7. Laboratory for Blood flow measurements (Impedence plethysmograph/Laser flow meter/ Doppler flow meter)

3. Exercise Physiology Laboratory

1. Two step test exerciser
2. Bicycle Ergometery
3. Tread mill
4. Respiratory gas analysis and measurement of basal metabolic rate (BMR)

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4. Metabolic/Endocrinology/Reproductive Bio-medicine laboratory

1. Spectrophotometer
2. pH meter
3. Elisa Reader/Washer
4. Luminometer
5. Semi-autoanalyser

D. YEAR WISE ACTIVITIES

	ACADEMICS/RESEARCH/PROFESSIONALISM
1st year	a) Orientation to the subject and departmental activities b) Understand the competency, syllabus and assessment of the PG curriculum in physiology as per the requirement c) Attend regular M. B. B. S theory and practical classes d) Start taking undergraduate small group teaching under supervision e) Start taking seminars and journal reviews f) Attend the PG research methodology training program and mandatory to complete NMC/MCI Prescribed online research methodology course g) Attend the postgraduate medical education training program (PG MET) h) Selection of topic for dissertation—synopsis i) Preparation and submission of the synopsis j) Maintain logbook entry of all activities k) Topic test / Internal assessment I—theory, practical and viva-voce l) Data collection of dissertation and review m) Attend CME/ Conferences / workshops n) Preparation paper presentation in state / National / international conference o) Feedback from guide and HOD p) Submission of first year log book to HOD for signature
2nd year	a) Continue academic activities of teaching undergraduate medical students b) Plan for Rotational postings c) Seminar and journal clubs d) Complete record book e) Plan and preparation paper presentation in state / national / international conferences f) Submission of Log book entry to HOD signature with all entries of all activities g) Topic test / Internal assessment II—both theory, practical and viva-voce h) Review dissertation preparation i) Feedback from guide and HOD

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3rd year	a) Continue academic activities of teaching undergraduate medical students b) Complete dissertation work c) Presentation of dissertation d) Complete Log book e) Practice pedagogy sessions f) Topic tests / Preliminary examination (III IA-theory, practical and viva-voce) g) Feedback from guide and HOD

E. TEACHING AND LEARNING METHODS

During the course, students should have formal training in teaching and research. The sessions should be in the form of:

1. **Didactic Teaching**

   Topics in General Physiology, Blood and immunity, Cardiovascular and respiratory system, Nerve muscle, Endocrine, reproductive, Renal, Gastrointestinal Physiology and Nervous system, applied aspects and recent advances taught by faculty members with integration with respective clinical departments.
2. **Training in** communication skills - journal club, seminars, pedagogy, demonstrations, tutorials, lectures, quizzing.
3. **Hands-on experience** - techniques in Hematology experiments, Human experiments, Skills of Clinical Examinations and Animal experiments.
4. **Teaching**: participate in the teaching and training programme of undergraduate students and interns.
5. Participate in seminars, symposia, group-discussions and journal clubs.
6. **Educational technology** - preparation of AudioVisual aids for teaching, posters/manuscripts for presentation in conferences/workshops and publication in journals.
7. Participation in formulating evaluation methods: Setting objective questions, Short Answer Questions, Multiple Choice Questions and Objective Structured Practical Examination (OSPE).
8. Prepare teaching modules.
9. Participation in organization of symposia/workshops
10. Comprehend ethical aspects of biomedical research.
11. Comprehend the basis of disposal of biomedical waste.
12. Comprehend horizontal integration of various subdivisions of Physiology with Anatomy and Biochemistry.

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13. **Log Book:** Every student should maintain a logbook in which a record of the practical exercises completed should be entered. The Log books shall be checked and assessed periodically by the faculty members imparting the training.
14. **Basic Research Methodology Course:** It is mandatory to complete the NMC prescribed online Basic research methodology course during first academic year. This is to introduce the student to basic research methods and to facilitate the completion of dissertation work in partial fulfilment of the course requirements.
15. A postgraduate student 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 during the period of his postgraduate studies so as to make him eligible to appear at the postgraduate degree examination.
16. Department encourages e-learning activities.
17. **Rotation -**

During the second year of the course postings may be made to other pre, para and clinical subjects in co-ordination with concerned departments and district hospital (DRP) as follows:

Sl No	Department	Procedures	Duration
1	**Cardiology**	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	15 days
2	**Neurology**	Observe and understand Neuro - Physiological Techniques (ENMG, EEG) (clinical Physiology) and its Interpretation and other investigation data. ASSIGNMENTS i. Physiological basis of ENMG and its clinical application ii. Evoked potentials and its clinical application	15 days
3	**Medical Gastroenterology**	To observe Endoscopic Techniques, Manometry Studies ASSIGNMENTS i. Oesophagealmanometry and its application ii. Investigative methods of biliary tract	1 week
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	15 days

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5	**Clinical Hematology including pathology and blood bank**	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 iv. Blood components v. Tests for Infertility	15 days
6	**Anatomy**	i. Histology lab – Slide identification and characteristics	15 days
7	**Obstetrics and Gynaecology**	i. Methods to determine ovulation time • Basal body temperature chart • Cervical/ Vaginal smear ii. Clinical examination during pregnancy including antenatal checkups and investigations iii. Infertility	1 week
8	**Ophthalmology**	i. Tests for field of vision ii. Fundoscopy iii. VEP interpretation	1 week
9	**ENT**	i.Tests for hearing including audiometry ii. BERA interpretation	1 week
10	**General Medicine**	Clinical Examination of patient, ECG X-ray, Lumbar puncture	15 days
11	**Chest Medicine**	Pulmonary Function Tests, Sleep Lab ASSIGNMENTS i. Mechanics of respiration and lung functions in ii. Obstructive and restrictive lung disease	1 week
12	**Endocrinology**	ASSIGNMENTS i. Diabetes – types and monitoring ii. Thyroid and other endocrine disorders	15 days
13	**Nephrology**	Dialysis – Techniques Interpretation of RFT, Cystometrogram Acid-Base balance	1 week
14	**Electives**	i.Yoga (AYUSH/ S-VYASA) ii. Aerospace medicine (Institute of Aerospace Medicine, Bengaluru) • Applied cardiorespiratory physiology • Thermal physiology • High altitude physiology and hyperbaric medicine • Space physiology • Acceleration physiology iii. NIMHANS • Neurophysiology • AFT • Sleep and EEG iv. Sports physiology (Sports Authority of India)	1 month

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F. ASSESSMENT

FORMATIVE ASSESSMENT:

Formative assessment should be continual and should assess medical knowledge, procedural & academic skills, interpersonal skills, professionalism, self-directed learning and ability to practice in the system.

During the three year training period,

- There will be periodical examinations (Part completion tests) during the course of training.
- Internal assessments – Theory, Practicals and Viva at the end of each academic year.
- The pre- final theory and practical examination will be conducted.

General Principles

Internal Assessment covers all domains of learning and used to provide feedback to improve learning; it also covers professionalism and communication skills.

Quarterly assessment during the MD training will 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 VII).

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SUMMATIVE ASSESSMENT:

The summative examination will be carried out as per the University Regulations as amended from time to time.

The Post Graduate examination will be in three 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. 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 all the examiners.

2. Theory

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.

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Scheme of Examination

A. Theory (Written Paper) 400 marks

There shall be four question papers, each of three hours' duration. Each paper shall consist of 10 short essay questions each carrying 10 marks. Total marks for each paper will be 100. Questions on recent advances may be asked in any or all the papers. Details of distribution of topics for each paper will be as follows.

Name of the Course	Course Code	Topics	Marks
Basic Sciences as applied to Physiology	MDC505A	General Physiology including history of Physiology	100
Systemic Physiology 1	MDC506A	Systemic Physiology (system providing transport, nutrition and energy)	100
Systemic Physiology 2	MDC507A	Systemic Physiology (system concerned with regulation, neural control and procreation)	100
Recent advances in Physiology	MDC508A	Applied Physiology including recent advances	100
Thesis – Physiology	MDP502A	Approval 6 months before final examination.	

A. Practical: 200marks

B. Viva Voce: 100 marks

1) Viva-Voce Examination: (80Marks)

2) Pedagogy Exercise:(20Marks)

3)

A topic be given to each candidate in the beginning of clinical examination. He/she is asked to make a presentation on the topic for 8-10 minutes.

C. Total Marks Distribution:

Maximum marks for M.D degree course	Theory	Practical	Viva	Grand Total
	400	200	100	700

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Theory Papers

Paper I: General physiology including history of physiology

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 (systems providing transport, nutrition and energy)

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

Paper III: Systemic physiology (systems concerned with regulation Neural control And procreation)

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 / Integrated 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 and Artificial Intelligence relevant to Physiology
7. Social responsibilities of physiologists

3. Practicals: spread over a minimum of 2 days

1. Objective structured practical exam (OSPE)

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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 experiment (one long and one short), dealing with clinical physiology as would have significant bearing on human health and patient care

6. Hematology

Oral/Viva-Voce Examination

(i) Theoretical discussion (General and systemic Physiology)

(ii) Teaching techniques

(iii) Thesis

(iv) Eminent Physiologists (Foreign/Indian)

(v) Journals (Indian/Foreign)

(vi) Recent advances

(vii) Dissertation

(viii) Micro-teaching session for assessing communication skills.

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J. Annexures

1. Evaluation of Journal Review Presentations
2. Evaluation of Pedagogy
3. Evaluation of Seminar Presentations
4. Dissertation Presentation
5. Continuous Evaluation of Dissertation work by Guide / Co-Guide
6. Log book
7. Post Graduate student Appraisal Form

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Annexure – I

CHECK-LIST FOR EVALUATION OF JOURNAL REVIEW PRESENTATIONS

Date:

Name of the Student:

Name of the Faculty/Observer:

Sl. No.	Items for observation during presentation	Poor 0	Below Average 1	Average 2	Good 3	Very Good 4
1.	Article chosen was					
2.	Extent of understanding of scope & objectives of the paper by the candidate					
3.	Whether cross references have been consulted					
4.	Whether other relevant publications consulted					
5.	Ability to respond to questions on the paper /subject					
6.	Audio-Visual aids used					
7.	Ability to discuss the paper					
8.	Clarity of presentation					
9.	Any other observation					
	Total Score					

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Annexure – II

EVALUATION OF PEDAGOGY

Name of the candidate: Date:

Register No.:

Centre:

Topic: Max. Marks: 20

Skills		Marks
Marks Set induction (1.5marks)	• Aroused interest in the beginningby relating to previous learning, throwing a new idea, questioning, etc. • Specified the objectives of presentation	
Planning (5 marks)	• Organized material in a logical sequence • Used relevant content matter	
Presentation(5 marks)	• Changed the pace of presentationby shifting emphasis, joke, etc • Used specific example to • illustrate main Ideas • Used non-verbal cues, eye contact, etc	
Pupil participation (5 marks)	• Allowed questions from students • Asked question • Solicited/Raised questions • Rewarded pupil effort	
Use of AV aids (2.5 marks)	• Used proper AV aids • used the aid(s) effectively	
Closure (1 mark)	• Summarized most important points at the end of the session Overall marks	
____(out of 20)		

Signature

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Annexure – III

CHECK-LIST FOR EVALUATION OF SEMINAR PRESENTATIONS

Date:

Name of the Student:

Name of the Faculty/Observer:

Sl. No.	Items for observation during presentation	Poor 0	Below Average 1	Average 2	Good 3	V.Good 4
1.	Whether other relevant publications consulted					
2.	Whether cross references have been consulted					
3.	Completeness of Preparation					
4.	Clarity of Presentation					
5.	Understanding of subject					
6.	Ability to answer questions					
7.	Time scheduling					
8.	Appropriate use of Audio-Visual aids					
9.	Overall Performance					
10.	Any other observation					
	Total					

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Annexure – IV

CHECK LIST FOR DISSERTATION PRESENTATION

Name: Faculty/Observer: Date:

Sl. No.	Points to be considered divine	Poor 0	Below Average 1	Average 2	Good 3	Very Good 4
1.	Interest shown in selecting a topic					
2.	Appropriate review of literature					
3.	Discussion with guide & other faculty					
4.	Quality of protocol					
5.	Preparation of proforma					

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Annexure – V

CONTINUOUS EVALUATION OF DISSERTATION WORK BY GUIDE / CO-GUIDE

Name: Faculty/Observer: Date:

Sl. No.	Items for observation during presentation	Poor 0	Below Average 1	Average 2	Good 3	Very Good 4
1.	Periodic consultation with guide/co-guide					
2.	Regular collection of case material					
3.	Depth of analysis / discussion					
4.	Departmental presentation of findings					
5.	Quality of final output					
6.	Others					
	Total Score					

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Annexure VI

LOG BOOK

Table 1: Academic activities attended by the student

Name: Admission Year:

College:

Date	Type of Activity Seminar/ Journal Club/ Presentation/ UG teaching	Particulars

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Annexure VI

LOG BOOK

Table 2: Academic presentation made by the Student

Name: Admission Year:

College:

Date	Topic	Specify type of presentation Seminar/ Journal Club presentation/ UG teaching etc.

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Annexure – VII

POSTGRADUATE STUDENTS APPRAISAL FORM

PRE-CLINICAL DISCIPLINES **Date:**

Name of the Department:

Name of the Student:

Period of Training: From ..... To .....

0: Poor, 1: Average, 2: Good, 3: Very good, 4: Exceptional

Sl. No.	Particulars	Poor 0	Below Average 1	Average 2	Good 3	VeryGood 4
1.	Ability to teach UG students and Juniors					
2.	Knowledge of Subject in PG course					
3.	Performance in JournalClub					
4.	Performance in Seminar					
5.	Punctuality at work					
6.	Ability to work in a team					
7.	Attitude towards colleagues/Faculty					
8.	Ability to communicate with students					
9.	Departmental and interdepartmental activity initiatives					
10.	Thesis /Research work					
11.	Logbook maintenance					
12.	IA eligibility	Yes/No				
13.	Publications	Yes/No				
14.	Paper/Poster presentations	Yes/No				
15.	Remarks					

***REMARKS: Any significant positive or negative attributes of a postgraduate student to be mentioned.For score less than 3 in any category, remediation must be suggested. Individual feedback to postgraduate student is strongly recommended.**

SIGNATURE OF ASSESSEE **SIGNATURE OF HOD**

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Course Specifications MD Physiology

2022 onwards

Course Code: MDC505A

Course Specifications

Course Title	**Basic Sciences as applied to Physiology**
Course Code	**MDC505A**
Department	**Physiology**
Faculty	**Ramaiah Medical College**

Course summary:

This course is designed in such a way that the student will master the complete understanding of cellular mechanisms, biopotentials, water and electrolyte balance, biostatistics and history of Physiology

Course Outcomes:

CO 1: Achieved comprehensive knowledge of cellular mechanisms, biopotentials, water and electrolyte balance, biostatistics and history of Physiology.(C,P)

CO 2: Interacted effectively with other paraclinical, clinical and allied health sciences departments to develop integrated modules in basic sciences and teach competencies related to the same.(C,A,P)

Course Content:

General Physiology

1. Describe Physiology of cell.
2. Explain various Cellular mechanisms.
3. Describe the principles of Physics and Physical Chemistry involved in haemodynamics.
4. Explain principles of Physics and Physical Chemistry involved in bioelectrical potentials.
5. Describe the fluid compartments of the body, its ionic composition & measurements.
6. Describe Excretion, pH, water and Electrolyte balance.
7. Discuss Biophysics, Biochemistry, Micro-anatomy relevant to Physiology.

Cellular Physiology including Genetic Basis and Historical perspectives

1. Explain cellular genetic control mechanisms.
2. Discuss history of Physiology.
3. Describe and discuss physiology of growth, development and aging.

Biostatistics

Describe Biostatistics principles relevant to research methodologies.

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Course Mapping (CO-PO-PSO Mapping)

Course Code and name	Course Outcome (CO)	Program Outcomes (PO)				Program Specific Outcomes (PSO)				
		PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5
MDC505A General physiology	CO-1	3	3	3	3	3	3	2	2	2
	CO-2	2	2	2	2	3	2	2	2	3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution										

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Course Specifications MD Physiology

2022 onwards

Course Code: MDC506A

Course Specifications

Course Title	Systemic Physiology -I
Course Code	MDC506A
Department	Physiology
Faculty	Ramaiah Medical College

Course Summary:

This course is designed in such a way that student will get complete the knowledge of Blood and Immunity, Cardiovascular System, Respiratory System, Gastro- Intestinal system and how Physiology can be effectively applied in diagnostic and therapeutic clinical settings.

Course Outcomes:

CO 1: Acquired the knowledge of Blood and Immunity, Cardiovascular System, Respiratory System, Gastro- Intestinal system and how Physiology can be effectively applied in diagnostic and therapeutic clinical settings (C,P)

CO 2: Interacted and integrated with the allied departments for basic and advanced laboratory investigations. (C,P)

CO 3: Be conversant with the skills in conducting and demonstrating the hematology practicals, human experiments, clinical examinations.
(A,P)

Course Content:

Blood and Immunity

1. Describe the origin, variations and functions of plasma proteins, RBC, hemoglobin, WBC and platelets.
2. Discuss the physiological basis of hemostasis.
3. Describe different blood groups and their clinical importance.
4. Discuss the types of immunity and their applications.

Cardiovascular System

1. Describe the properties of cardiac muscle including its morphology, electrical, mechanical and metabolic functions.
2. Describe the physiological basis of electrocardiogram (E.C.G), its applications.
3. Describe & discuss regional circulation including microcirculation, lymphatic circulation, coronary, cerebral, capillary, skin, foetal, pulmonary and splanchnic circulation.
4. Describe the factors affecting heart rate, regulation of cardiac output & blood pressure and their applications.

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Respiratory System

1. Describe the mechanics of normal respiration, pressure changes during ventilation, lung volume and capacities, alveolar surface tension, compliance, airway resistance, ventilation, V/P ratio, diffusion capacity of lungs.
2. Describe and discuss the transport of respiratory gases: Oxygen and Carbon dioxide and pathophysiology of dyspnoea, hypoxia, cyanosis asphyxia; drowning, periodic breathing.
3. Describe and discuss the physiology of high altitude and deep sea diving and principles of artificial respiration.
4. Discuss neural and chemical regulation of respiration.

Gastro- Intestinal Tract (GIT) and dietary requirements

1. Describe the composition, mechanism of secretion, functions, and regulation of saliva, gastric, pancreatic, intestinal juices and bile secretion, function test and disorders.
2. Describe GIT movements, regulation and functions including defecation reflex and disorders.

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Course Mapping (CO-PO-PSO Mapping)

Course Code and name	Course Outcome (CO)	Program Outcomes (PO)				Program Specific Outcomes (PSO)				
		PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5
MDC506A Systemic physiology I	CO 1	3	3	3	3	3	3	3	2	2
	CO 2	3	3	2	3	3	3	2	3	3
	CO 3	2	3	3	2	3	3	2	2	2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution										

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Course Specifications MD Physiology

2022 onwards

Course Code: MDC507A

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Course Specifications

Course Title	**Systemic Physiology -II**
Course Code	**MDC507A**
Department	**Physiology**
Faculty	**Ramaiah Medical College**

Course Summary:

The course is designed in such a way that the student will understand the knowledge of Nerve-Muscle Physiology, Endocrine Physiology, Nervous System, Special Senses, Reproductive Physiology and teach competencies related to the same.

Course Outcomes:

CO1: Acquired the knowledge of Nerve-Muscle Physiology, Endocrine Physiology, Nervous System, Special Senses, Reproductive Physiology and teach competencies related to the same. (C, P)

CO2: Conduct the electrodiagnostic tests, Interacted and integrated with the allied departments for basic and advanced laboratory investigations, interpret the results for research and diagnostic needs. (C, P)

CO3: Acquired the skills in conducting and demonstrating clinical examinations of central nervous and related systems.

Course Content:

Nerve-Muscle Physiology including muscle mechanics

1. Describe the structure, functions and properties of nerve fibre, neuron and neuroglia.
2. Describe the structure, transmission and pathophysiology, management of disorders of neuromuscular junction.
3. Describe types of muscle fibres, properties including action potential.
4. Describe the molecular basis of muscle contraction in skeletal and in smooth muscles.
5. Discuss types of contractions, energy source and muscle metabolism, gradation of muscular activity and muscular dystrophy.

Endocrine Physiology

1. Describe the synthesis, secretion, transport, physiological actions, regulation, effect of altered (hypo and hyper) secretion and function tests of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, hypothalamus, thymus & pineal gland.
2. Describe the metabolic and endocrine consequences of obesity & metabolic syndrome, Stress response.

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Nervous System (Central, peripheral and autonomic)

1. Describe and discuss the functions and properties of synapse, reflex, receptors.
2. Discuss sensory tracts and somatic sensations, motor tracts, mechanism of maintenance of tone, posture and equilibrium.
3. Describe connections and functions of spinal cord, cerebral cortex, basal ganglia, thalamus, hypothalamus, cerebellum and limbic system, reticular formation, autonomic nervous system and their lesions and abnormalities.
4. Discuss the physiological basis of memory, learning, speech, behaviour, sleep and EEG and related disorders.

Special Senses

1. Discuss physiology of image formation, physiology of vision including colour vision, refractive errors, colour blindness, physiology of pupil and light reflex, lesions in visual pathway and visual evoked potentials.
2. Describe auditory pathways, physiology of hearing, pathophysiology of deafness, hearing tests and auditory evoked potentials.
3. Describe perception of smell and taste sensations and their pathophysiology.

Reproduction & family planning/foetal & neonatal Physiology

1. Discuss sex determination and differentiation, puberty and their abnormities and outline psychiatry and practical implications.
2. Describe male reproductive system: functions of testis and control of spermatogenesis & factors modifying it and interpret normal semen analysis report.
3. Describe female reproductive system: (a) functions of ovary and its control; (b) menstrual cycle - hormonal, uterine and ovarian changes and hormonal changes and their effects during perimenopause and menopause.
4. Discuss the physiology of pregnancy, parturition & lactation. Tests for pregnancy, causes and management of infertility
5. Discuss the effects of removal of gonads on physiological functions and contraceptive methods in males and females.

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M.S. Ramaiah Medical College and Hospital
M.S. Ramaiah University of Applied Sciences
Bangalore-560054

Dean - Academics
M.S. Ramaiah University of Applied Sciences

Course Mapping (CO-PO-PSO Mapping)

Course Code and name	Course Outcome (CO)	Program Outcomes (PO)				Program Specific Outcomes (PSO)				
		PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5
MDC507A Systemic physiology II	CO 1	3	3	3	3	3	3	3	2	2
	CO 2	3	3	2	3	3	3	2	3	3
	CO 3	2	3	3	2	3	3	2	2	2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution										

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Course Specifications MD Physiology

2022 onwards

Course Code: MDC508A

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Course Specifications

Course Title	Recent advances in Physiology
Course Code	MDC508A
Department	Physiology
Faculty	Ramaiah Medical College

Course Summary:

The course is designed in such a way that the student will acquire knowledge of physiological responses of the body to yoga, high altitude, sports and their application in research.

Course Outcomes:

CO 1: Acquire knowledge of physiological responses of the body to yoga, high altitude, sports and their application in research.(C,P)

CO 2: Be conversant with applied, integrated, clinical investigation tests, recent advances relevant to Physiology and Social responsibilities of physiologists. (C,A,P)

CO 3: Apply legal aspects with respect to radiation treatment for cancers.(A,C)

Course Content:

Patho-physiology pertaining to systemic Physiology / Integrated Physiology

2. Describe the physiological basis, diagnosis and management of related disorders pertaining to various systems.

Physiological basis of various clinical investigation tests / Integrated Physiology

2. Describe the normal values of clinical investigation tests and their alterations in various disorders.

Interaction of human body in ambient environment- high altitude, space and deep sea

1.Describe the adjustments of different organ systems to high altitude, space and deep sea.

Sports Physiology

1. Describe and discuss cardio-respiratory and metabolic adjustments during exercise and physical training effects.

2. Describe physiological consequences of sedentary lifestyle.

Yoga and Meditation

2. Describe the physiological effects of yoga and meditation on different organ systems.

Recent advances relevant to Physiology/Artificial intelligence in Physiology

3. Discuss about discoveries and recent advances relevant to Physiology.
4. Discuss the applications of artificial intelligence in Physiology.

Social responsibilities of physiologists

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2. Enumerate the social responsibilities of physiologists.

Course Mapping (CO-PO-PSO Mapping)

Course Code and name	Course Outcome (CO)	Program Outcomes (PO)				Program Specific Outcomes (PSO)				
		PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5
MDC508A Recent Advances in Physiology	508A.1	3	3	2	3	2	2	3	2	2
	508A.2	2	3	3	3	2	3	3	2	2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution										

Registrar
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Course Specifications MD Physiology

2022 onwards

Course Code: MDP502A

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Course Specifications

Course Title	**Thesis- Physiology**
Course Code	**MDP502A**
Department	**Physiology**
Faculty	**Ramaiah Medical College**

Course Summary:

The course is designed in such a way that the student will master the science of research in terms of designing, conducting and interpreting the results.

Course Outcome:

CO1: Participated actively in seminars/journal clubs, basic research methodology workshop and pedagogy to acquire skills for research, thesis writing and publication and understand the general principles of medical education (C,P)

CO2: Gained the skills required to be an efficient leader, administrator, member of academic, research and health care team with adopting ethical principles.(C,A,P)

Course Content:

Every candidate pursuing MD Physiology degree course is required to carry out work on a selected research project under the guidance of a recognised post graduate teacher. The results of such a work shall be submitted in the form of a dissertation.

The dissertation is aimed to train a post graduate student in research methods and techniques. It includes identification of a problem, formulation of a hypothesis, search and review of literature, getting acquainted with recent advances, designing of a research study, collection of data, critical analysis, comparison of results and drawing conclusions.

Every candidate shall submit to the Registrar (Academic) of the University in the prescribed proforma, a synopsis containing particulars of proposed dissertation work within six months from the date of commencement of the course on or before the dates notified by the University. The synopsis shall be sent through the proper channel.

Such synopsis will be reviewed and the dissertation topic will be registered by the University. No change in the dissertation topic or guide shall be made without prior approval of the University. The dissertation should be written under the following headings:

1. Introduction
2. Aims or Objectives of study
3. Review of Literature
4. Material and Methods
5. Results
6. Discussion
7. Conclusion
8. Summary
9. References (Vancouver style)

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10. Tables
11. Annexures

Course Mapping (CO-PO-PSO Mapping)

Course Code and name	Course Outcome (CO)	Program Outcomes (PO)				Program Specific Outcomes (PSO)				
		PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5
MDP502A Thesis-Physiology	502A.1	3	3	3	3	3	2	2	3	2
	502A.2	2	2	2	3	2	2	2	3	3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution										

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Course Materials: Recommended Books and Journals

Books (latest edition)

1. A.C. Guyton – Text book of Medical Physiology
2. W.F. Ganong – Review of Medical Physiology
3. Misra Kalitha - Clinical Neurophysiology
4. Vanders Human Physiology
5. Silverthorn Human Physiology An integrated approach
6. Boron Boulpaep Medical Physiology
7. Exercise Physiology Mc Ardle Katch/Katch
8. Costanzo Physiology
9. Samsung Wrights Applied Physiology
10. Dacie& Lewis Practical Hematology
11. Vernon B. Mountcastle– Medical Physiology Vol. I & II
12. William's Textbook of Endocrinology
13. J.E. Cotes- Respiratory Physiology
14. D.T. Harris – Experimental Physiology
15. Wintrobe's – Clinical Hematology
16. Brown B.L. – Cell signaling, Biology and medicine of signal transudation
17. Berne and Levy- Medical Physiology
18. Textbook of Medicine by Harrison
19. API Textbook of Medicine

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Journals

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

1. Indian journal of physiology and pharmacology—IJPP by association of physiologist and pharmacologist of India
2. International journal of physiology
3. Indian journal of clinical anatomy and physiology
4. International journal of basic and applied physiology
5. International journal of physiology, pathophysiology and pharmacology
6. Journal of applied physiology by American physiological society
7. Physiological reviews by American physiological society
8. Annual review of physiology by American physiology society
9. Journal of physiology British publication
10. Indian journal of medical research by Indian of medical council of Medical Research
11. News in physiological sciences
12. New England journal of medicine

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