MANIPAL
ACADEMY of HIGHER EDUCATION
(Deemed to be University under Section 3 of the UGC Act, 1956)

Department of Physiology
KMC, Manipal/ Mangalore

Manipal Academy of Higher Education, Manipal

Outcomes Based Education (OBE) Framework

Two Year full time Postgraduate Program

M.Sc. Physiology (Medical)

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1. NATURE AND EXTENT OF THE PROGRAM

Physiology deals with the study of mechanisms governing the functioning of the human body.

MSc. Physiology or Master of Science program aims to create competent physiologists having advanced knowledge, of a subject that is relevant to several specialized areas of medical sciences. The purpose of this program is to systematize content involved in understanding Physiology and promote basic insights to scientific research to fulfil the increasing demand for teachers and basic scientists having knowledge of mechanistic control of living things. A post graduate in physiology is eligible to pursue their doctoral studies in different areas of physiology.

To be eligible for admission into the program, the student must possess a B.Sc degree from a recognized University, with at least one of the subject being biological science. M.Sc. in Physiology (medical) is a two year, four semester post graduate program with each semester lasting for 5-6 months and ending in a university exam. The enrolled student is required to complete a mandatory project work by the end of the fourth semester. The course follows a credit based system. Students can opt for electives of their choice in other subjects (Anatomy/ Biochemistry/ Microbiology/Pharmacology) in the second and third semester of the program.

During the course of training, students will be exposed to a variety of learning strategies that include student directed learning, case based learning, seminar presentations, faculty discussions and journal clubs. Extensive training in teaching, research methodology and biostatistics prepare students for career either in academics or research.

2. PROGRAM EDUCATION OBJECTIVE (PEO)

The overall objectives of the Learning Outcomes-based Curriculum Framework (LOCF) for **M.Sc. Physiology (Medical) program are as follows.**

PEO No	Education Objective
PEO 1	Application of advanced theoretical and practical knowledge of various physiological mechanisms involved in maintaining body homeostasis
PEO 2	Imparting the knowledge of physiology to solve diagnostic and therapeutic problems critically analyse scientific data, draw objective conclusions and apply this knowledge for human welfare.
PEO 3	Practice lifelong learning and innovative teaching methods in training undergraduate student training
PEO 4	Promoting innovative research in multidisciplinary field of research in Physiology for the advancement of medical sciences
PEO 5	Execute leadership qualities , effective communication skills, professionalism and team skills

3. GRADUATE ATTRIBUTES:

S No.	Attribute	Description
1	**Disciplinary Knowledge**	Apply the theoretical knowledge , practical skills and the basic training in scientific research in their professional carrier
2	**Measurable skills and industry – ready professionals**	Implicating the importance and variations of various physiological mechanisms in clinical scenario and promoting novel innovations in research when in profession
3	**Effective and Influencing communication**	Effective communication skills with colleagues and stake holders for the progress of the professional career
4	**Leadership readiness/ Qualities**	Promoting resourceful leadership attributes in the learners so that they can go forward to set realistic aims in academics and research with efficient time management skills and use of resources.
5	**Critical/ Reflective thinking & language efficiency**	Ability of reflective thinking, helping develop insights and application of learnt facts. Communicate (writing/ speaking) effectively with wide range of audiences using various audio visual presentation aids
6	**Technologically Efficient Professional**	Upgrading and skillful usage of wide range of IT software for the advancement of novel techniques in physiological science, encouraging learning and research
7	**Ethical Awareness**	The postgraduates should be aware of professional ethics and responsibilities.
8	**Lifelong Learning**	Continue to be an lifelong learner so that they consistently update their current knowledge, skills and techniques aiming to develop novel innovation
9	**Research-related Skills**	Create, design and explore a research question in a specialized area and promote new ideas in the field of research with appropriate justification and effective methods of data analysis. Promoting research publications adding new scientific information.
10	**Cooperation/ Team work**	Building and working as a team, promoting effective teaching and initiating collaborative research with extreme efficiency.

4. QUALIFICATIONS DESCRIPTORS

Post graduate Degree of MSc In Medical Physiology is awarded to the student who exhibits competency in the following:

1. Ability to of correlate various basic sciences in general and ability to explain the working of various systems of body needed for maintenance of body homeostasis in health and disease, associating its applications in various field of medical sciences.
2. Specific practical skills in clinical and experimental physiology.
3. Knowledge of ethics and professionalism, skills of team work and communication
4. Use of the various teaching-learning and research methodologies
5. Critical thinking, identify existing gaps in knowledge and mitigating them through research.
6. Publishing the results of their study/work undertaken accurately and reliably, and with structured and coherent argument.
7. Identifying and addressing their own learning needs to remain relevant in their chosen profession.

PROGRAM OUTCOMES: After successful completion of M.Sc. in Physiology (Medical), Students will be able to:

PO No	Attribute	Competency
PO 1	**Domain knowledge**	Apply the theoretical & practical knowledge of various physiological mechanisms involved in maintenance of homeostasis
PO 2	**skills and Problem analysis**	Identification and scrutinising the various clinical case scenarios drawing appropriate conclusion using theoretical/practical knowledge
PO 3	**Design/develop solutions**	Designing and Development of innovative teaching method and research experimentation techniques
PO 4	**Conduct investigations of complex problems**	Effective knowledge of altered physiological mechanisms and critical approach to problem solving methods.
PO 5	**Modern tool usage**	Usage of advanced technical methods in teaching and research
PO 6	**Business and society**	Proper management of professional responsibilities
PO 7	**Environment and sustainability**	Recognize the significance and impact of new developments on society and environment
PO 8	**Ethics**	Understanding and obeying the professional ethics and its management
PO 9	**Individual / Team work**	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**	Communicate effectively to meet the expectations with the peers/ seniors/ teachers / students and all stakeholders
PO 11	**Project management and finance**	Demonstrate budgeting skills and prompt implementation of financial management principles in the academics and research
PO 12	**Life-long learning**	Life-long learning capacity to update with current knowledge of skills and research techniques to apprise with the professional development

FIRST YEAR

Semester 1						Semester 2					
Subject Code	**Subject Title**	**L**	**T**	**P**	**C**	**Subject Code**	**Subject Title**	**L**	**T**	**P**	**C**
MCC601	Common Core: Basic sciences (A+B+P)	4	0	0	**4**	MCC602	Common Core: introduction to research methodologies, ethics statistics, Publishing paper, teaching methodologies	2	2	0	**4**
MPY603	Blood	3	1	0	**4**	MPY604	Central nervous system	3	1	0	**4**
MPYC605	General Physiology and Nerve muscle	3	1	0	**4**	MPY606	Special senses	3	1	0	**4**
MPY607	Practical 1: Hematology	0	0	8	**4**	MPY608	Practical's- CNS and Special senses	0	0	8	**4**
MPY609	Practical 2: Nerve Muscle – Amphibian Experiments	0	0	8	**4**	MEL610	**Elective 1 (**Basic cardiovascular Examination)	0	2	4	**4**
	Total	**10**	**2**	**16**	**20**		**Total**	**8**	**6**	**12**	**20**

SECOND YEAR

Semester 3						Semester 4					
Subject Code	**Subject Title**	**L**	**T**	**P**	**C**	**Subject Code**	**Subject Title**	**L**	**T**	**P**	**C**
MPY701	Cardio vascular System	3	1	0	**4**	MPY 702	Endocrinology	3	1	0	**4**
MPY703	Renal Physiology	3	1	0	**4**	MPY704	GIT and Reproduction	3	1	0	**4**
MPY705	Respiratory Physiology	3	1	0	**4**	MPY 706	Practicals	0	0	4	**2**
MPY707	Practicals – CVS & Respiratory	0	0	8	**4**	MPY 798	Project	0	0	20	**10**
MEL709	**Elective 2** (Neurophysiology)	0	2	4	**4**						
	Total	**9**	**5**	**12**	**20**		**Total**	**6**	**2**	**24**	**20**

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Name of the Institution / Department: DEPARTMENT OF Physiology

Name of the Program:	**MSc Physiology (Medical)**
Course Title:	**Common Core 1** – Basic Sciences
Course Code: MCC 601	**Course Instructor: Faculty Department of Anatomy, Physiology and Biochemistry**
Academic Year: 2020-2021	**Semester:** First Year, Semester 1
No of Credits: 4	**Prerequisites:** Nil
Synopsis:	This course deals with imparting knowledge of basic science subjects namely, Anatomy, physiology and biochemistry, so that the students acquire sound knowledge of basic subjects that form foundation to all other medical subjects. This course will run during the first 8 weeks in the first semester.
Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	Apply the knowledge of basic science subjects and develop understanding of human body structure and functioning.

Mapping of COs to POs

COs	*PO 1*	*PO 2*	*PO 3*	*PO 4*	*PO 5*	*PO 6*	*PO 7*	*PO 8*	*PO 9*		
CO 1	X										

Course content and outcomes:

Content	*Competencies*	*No of Hours*
Unit 1: Anatomy		
• General anatomy • Introduction to systems of the body	• Explain the history of anatomy and Subdivision/branches of the anatomy and their functions in brief (1 hr) • Describe the nomenclature, subdivisions, terms and arrangements of anatomical structures (1 hr) • Describe different types of skin, fascia and connective tissue, epithelium and cartilage (1 hr) • Describe the nomenclature, types, parts, attachments and mechanics of muscles (1hr) • Describe the types, growth, blood supply, functions and ossification of bones (1 hr) • Classify the joints with structure & examples (1hr) • Identify major muscles and bones in the body along with their location (4 hrs) • Describe the different types of blood vessels, capillaries and sinusoids, components and functions of lymphatic system and structure of lymph node (1 hr)	32

	• Enumerate the components of cardiovascular system and briefly describe the external features of heart, its blood supply and interior of the chambers (2 hrs) • Enumerate the major blood vessels in the body along with its location (2 hr) • Describe the location, parts and function of organs belonging to Respiratory system (3 hrs) • Describe the structure and types of neurons, neuroglia cells, cranial and spinal nerves (2 hr) • Enumerate the parts of brain and brain stem and briefly describe major parts (2 hrs) • Describe the location, parts and function of organs belonging to Gastro intestinal system (4 hr) • Describe the location, parts and function of organs belonging to Renal and reproductive systems (4 hr) • Describe the location, parts and function of organs belonging to endocrine system and special senses (2 hrs)	
Unit 2: Physiology		
Blood and body fluids	• Describe the body fluid compartments; composition of body fluids, Transport mechanisms with examples, composition and functions of blood; Plasma Proteins – functions • Describe the functions, types, normal values of Haemoglobin and anemia, life span and destruction of RBC and Jaundice • Describe the functions, normal value, variations in Platelets, Hemostasis, blood coagulation, Bleeding disorders, tests for clotting, anticoagulants- actions and uses, WBC Immunity • Determination of RBC, WBC, Hemoglobin count, PCV, ESR Bleeding time, Clotting time	24
Kidney, skin and temperature regulation	• Describe the functions of kidney, Functional anatomy of kidney, renal blood flow, Glomerular filtration rate Tubular functions, Micturition	

	• Describe the functions of skin; body temperature regulation	
Cardiovascular system	• Describe the design of systemic and pulmonary circulation, anatomy of heart and blood vessels, innervation to heart and blood vessels • Describe the Cardiac cycle, ECG and heart sounds, Cardiac output: determinants, variations, regulation • Describe the Arterial blood pressure and regulation, shock Coronary circulation	
Endocrine system	• Describe the actions and disorders of Anterior pituitary hormones, Posterior pituitary hormones, Thyroid hormones, Adrenal cortical hormones, Adrenal medullary hormones, Hormones of endocrine pancreas • Describe Calcium homeostasis – Functions of calcium, hormones regulating plasma calcium level, parathyroid hormone, calcitonin and vitamin D_3	
Reproductive system	• Overview of Male reproductive system- Female reproductive system – Menstrual cycle and regulation • Describe the Concept of Pregnancy and parturition, Lactation and family planning	
Gastrointestinal system	• Describe the Composition, function of saliva, gastric juice, pancreatic juice, Bile. • Describe the Deglutition, Gastric emptying, movements of small intestine • Explain the functions of large intestine: movements of colon and defecation	
Central nervous system	• Describe Receptors, synapse, reflexes • Explain the Ascending and descending pathways	

	• Describe the Functions and effect of lesions of cerebellum, basal ganglia, Functions of hypothalamus • Describe the Cerebral cortex, functional area, cerebrospinal fluid, EEG, sleep	
Special senses	• Describe the Physiology of taste and smell, Structure and function of external, middle and internal ears • Describe the Structure of eye, functions of different components, accommodation of eye, common errors of refraction, Visual pathway, colour vision	
Respiratory system	• Mechanism of respiration, Intra-pleural and Intrapulmonary pressure lung volumes and capacity, regulation of respiration, hypoxia, surfactant, Physiology of acclimatization, Decompression sickness	
Nerve-muscle physiology	• RMP, Action potential, Classification of nerve fibres, Neuromuscular junction, Sarcomere, mechanism of contraction in skeletal , smooth and cardiac muscle	
Unit 3: Biochemistry		
• Amino acids and proteins	• Brief outline of Classification, properties and structural organization and biomedical significance of Proteins, carbohydrates, lipids and nucleic acids.	24
• Enzymes	• Brief account of general characteristics, kinetics and Inhibition of enzymes	

• Blood glucose regulation & diabetes mellitus • Vitamins & Minerals • Nutrition	• Enumerate the hypoglycemic and hyper glycemic hormones with their action in regulation of blood glucose and note on diabetes mellitus • Discuss the classification, functions and associated disorders of Vitamins & Minerals • Discuss the general aspects of nutrition by defining SDA, BMR, nutritional significance of macromolecules and PEM	

Learning strategies, contact hours and student learning time

Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	60	180
Tutorial	10	30
Small Group Discussion (SGD)	10	30
Revision	10	10
Assessment	10	10
TOTAL	**100**	**260**

Assessment Methods:

Formative:	**Summative:**
Class tests /Quiz	Sessional examination
Assignments	End semester examination

Mapping of assessment with Cos

Nature of assessment	CO 1	CO 2	CO 3	CO 4	CO 5	CO 6
Sessional Examination 1	X					
Sessional Examination 2	X					
Quiz/ class test	X					
Assignment	X					
End Semester Examination	X					

Feedback Process	• Mid-Semester feedback • End-Semester Feedback
Reference Material	1. Text book of general anatomy by Vishram Singh 2. Manipal manual of physiology 3. Essentials of biochemistry by Sathyanarayana

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Name of the Institution / Department: DEPARTMENT OF PHYSIOLOGY

Name of the Program:	**MSc Physiology (Medical)**
Course Title:	Blood
Course Code: MPY 603	**Course Instructor: Faculty Department of Physiology**
Academic Year: 2020-2021	**Semester:** First Year, Semester 1
No of Credits: 4	**Prerequisites:** Nil
Synopsis:	This course deals with the different components of Blood, its functions. Learning this course will help students to understand the body fluid compartments, composition of body fluids, Plasma proteins, Hemopoiesis- RBCs, WBCs, Platelets, Blood grouping .
Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	Explain the Body fluid compartments; composition of body fluids., Composition and functions of blood; Plasma Proteins – Types, Normal values, origin, functions, RBC, WBC, Platelets and Blood grouping
CO 2:	To determine volume of body fluids, get the knowledge about normal count and variations

Mapping of COs to POs

COs	*PO 1*	*PO 2*	*PO 3*	*PO 4*	*PO 5*	*PO 6*	*PO 7*	*PO 8*	*PO 9*			
CO 1	X	X	X	X	X							
CO 2	X	X	X	X	X							

Course content and outcomes:

Content	*Competencies*	*No of Hours*
Unit 1: Blood		
Blood RBc WBC Platelets	• Explain Body fluid compartments; composition of body fluids. Principle of determining volume of body fluids (5 hours) • Explain Composition and functions of blood; Plasma Proteins – Types, Normal values, origin, functions (5 hours) • Describe Erythropoiesis. Sites, stages and regulation, Red cell morphology, functions, normal values, variations. PCV, ESR (10 hours) • Explain Haemoglobin –functions, types, normal values, Anemia (5 hours) • Explain Life span and destruction of RBC. RE system-functions. Jaundice (5 hours) • Describe Platelets – Structure and functions, normal value, variation, Haemostasis and blood coagulation-clotting factors, mechanism of clotting, clot retraction, Fibrinolysis, bleeding disorders, tests for clotting, anticoagulants- actions and uses (15 hours) • Explain Leucocytes - Morphology of different types of leucocytes, functions, count, variations, Immunity (15 hours)	80 hrs

	• Explain Blood groups – ABO system and Rh factor, blood typing, blood transfusion – erythroblastosis foetalis (15 hours) • Explain Blood volume, Reticuloendothelial system , Lymphatic system and Lymph, Tissue Fluid and Edema (5 hours)	

Learning strategies, contact hours and student learning time

Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	60	180
Tutorials	5	15
Seminar	5	15
Small Group Discussion (SGD)	5	15
Self-directed learning (SDL)	5	5
Revision	10	10
Assessment	10	10
TOTAL	**100**	**250**

Assessment Methods:

Formative:	**Summative:**
Class tests	Sessional examination
Seminars	End semester examination
Assignments	

Mapping of assessment with Cos

Nature of assessment	CO 1	CO 2				
Sessional Examination 1	X	X				
Sessional Examination 2	X	X				
Class test	X	X				
Assignment	X	X				
End Semester Examination	X	X				

Feedback Process	• Mid-Semester feedback • End-Semester Feedback
Reference Material	1. Text book of Physiology- Guyton 2. Review of Medical Physiology- Ganong 3. Text book of Physiology- Samson Wright

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Name of the Institution / Department: DEPARTMENT OF PHYSIOLOGY

Name of the Program:	**MSc Physiology (Medical)**
Course Title:	General Physiology and nerve Muscle
Course Code: MPY 605	**Course Instructor: Faculty Department of Physiology**
Academic Year: 2020-2021	**Semester:** First Year, Semester 1
No of Credits: 4	**Prerequisites:** Nil
Synopsis:	This course will deal with the different types of transport mechanisms across the cell membrane, structure and function of nerve system. It also deals with glial cells, types, neuron , conduction of impulse in the form of action potential, properties of a neuron, The students will get the knowledge about types of muscles , structure of a sarcomere, types of skeletal muscle, excitation contraction coupling , Neuromuscular junction, neuromuscular blockers, applied aspects of nerve and muscle, autonomic nerve system
Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	Explain the different mechanisms of transport across the cell membrane
CO 2:	Explain excitability, conductivity, structure of a neuron, skeletal muscle, different types of muscles, neuromuscular junction and excitation contraction coupling in skeletal and smooth muscle. Explain Difference between parasympathetic and sympathetic nervous system

Mapping of COs to POs

COs	*PO 1*	*PO 2*	*PO 3*	*PO 4*	*PO 5*	*PO 6*	*PO 7*	*PO 8*	*PO 9*			
CO 1	X	X	X	X	X							
CO 2	X	X	X	X	X							

Course content and outcomes:

Content	*Competencies*	*No of Hours*
Unit 1: General Physiology and Nerve muscle		
	• Describe Cell Physiology, Transport across cell membrane, Homeostatic mechanisms (10 hours) • Explain Bioelectric potentials, Types of neurons, Glia cells, structure of multipolar neuron and functions of each part, Degeneration and Regeneration of Nerve fiber (15 hours) • Explain Resting membrane potential, Action potential, ionic basis, Properties of action potential, Conduction of action potential in myelinated and non-myelinated nerve, Factors affecting velocity of conduction, Classification of nerve fibers (15 hours) • Explain Classification of muscles; structure of skeletal muscle fiber, Types of skeletal muscle fibers, Properties of skeletal muscle, Factors affecting force of contraction of skeletal muscle, Isometric and	80

	isotonic contraction, Energy sources for muscle Contraction, Neuromuscular transmission (15 hours) • Explain excitation contraction coupling in Smooth muscles- classification, properties Smooth muscle contraction (15 hours) • Explain Autonomic nervous system (10 hours)	

Learning strategies, contact hours and student learning time

Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	60	180
Seminar	5	15
Small Group Discussion (SGD)	5	15
Self-directed learning (SDL)	5	5
Case Based Learning (CBL)	5	15
Revision	10	10
Assessment	10	10
TOTAL	**100**	**250**

Assessment Methods:

Formative:	**Summative:**
Class tests	Sessional examination
Assignments	End semester examination

Mapping of assessment with Cos

Nature of assessment	CO 1	CO 2				
Sessional Examination 1	X	X				
Sessional Examination 2	X	X				
class test	X	X				
Assignment	X	X				
End Semester Examination	X	X				

Feedback Process	• Mid-Semester feedback • End-Semester Feedback
Reference Material	1. Text book of Physiology- Guyton 2. Review of Medical Physiology- Ganong 3. Text book of Physiology- Vander, Sherwood

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Name of the Institution / Department: DEPARTMENT OF PHYSIOLOGY

Name of the Program:	**MSc Physiology (Medical)**
Course Title:	Lab 1: Practical I
Course Code: MPY 607	**Course Instructor: Faculty Department of Physiology**
Academic Year: 2020-2021	**Semester:** First Year, Semester 1
No of Credits: 4	**Prerequisites:** Nil
Synopsis:	This course will help students to identify different types of blood cells and demonstrate estimation of different types of blood cells, Osmotic fragility, Hemoglobin estimation, Packed cell volume, Erythrocyte sedimentation rate estimation. To Determine different types of blood grouping, importance of cross matching , test for hemostasis
Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	To identify and perform RBCs, WBCs and different types of blood cells, Hemoglobin estimation, Erythrocyte sedimentation Rate, .Determination of blood grouping,
CO 2:	To calculate blood indices and to classify anemia based on blood indices. Perform the test for hemostasis

Mapping of COs to POs

COs	*PO 1*	*PO 2*	*PO 3*	*PO 4*	*PO 5*	*PO 6*	*PO 7*	*PO 8*	*PO 9*			
CO 1	X	X	X	X	X							
CO 2	X	X	X	X	X							

Course content and outcomes:

Content	*Competencies*	*No of Hours*
Unit 1: Lab: Blood		
Blood experiments	1. Study of compound microscope (5 hours) 2. Describe the principle of manual hemocytometry (5 hours) 3. Determination of Total Red Blood Cell Count (10 hours) 4. Determination of Total Leucocyte Count (10 hours) 5. Estimation of haemoglobin concentration (10 hours) 6. Demonstration of Hematocrit (Packed Cell Volume)- (10 hours) 7. Demonstration of erythrocyte sedimentation rate- (10 hours) 8. Determination of bleeding time and clotting time (10 hours) 9. Blood Grouping (10 hours) 10. Preparation and staining of a peripheral blood smear (10 hours) 11. Determination of Differential Leucocyte Count (10 hours) 12. Determination of arneth count (10 hours) 13. Determination of absolute eosinophil count. (10 hours) 14. Determination of blood indices (10 hours) 15. Determination of reticulocyte count (10 hours) 16. Determination of platelet count (10 hours)	160

	17. Determination of osmotic fragility (10 hours)	

Learning strategies, contact hours and student learning time		
Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	----------	---------
Seminar	----------	---------
Small Group Discussion (SGD)	30	90
Self-directed learning (SDL)	30	30
Practical	100	200
Revision	20	20
Assessment	10	10
TOTAL	**190**	**350**

Assessment Methods:	
Formative:	**Summative:**
Table test/ OSPE	Sessional examination
Viva – voce	End semester examination

Mapping of assessment with Cos						
Nature of assessment	CO 1	CO 2	CO 3	CO 4	CO 5	CO 6
Sessional Examination 1	X	X				
Sessional Examination 2	X	X				
OSPE	X	X				
Viva – voce	X	X				
End Semester Examination	X	X				

Feedback Process	• Mid-Semester feedback • End-Semester Feedback
Reference Material	1. Practical Physiology- AK Jain 2. Practical Physiology- GK Pal

Name of the Institution / Department: DEPARTMENT OF Physiology

Name of the Program:	**MSc Physiology (Medical)**
Course Title:	Lab 2: Nerve muscle- Amphibian experiments
Course Code: MPY 609	**Course Instructor: Faculty Department of Physiology**
Academic Year: 2020-2021	**Semester:** First Year, Semester 1
No of Credits: 4	**Prerequisites:** Nil
Synopsis:	This course will help students to get a knowledge about performing nerve muscle experiments in a frog and demonstrate how the skeletal muscle contract on stimulation, effect of temperature, to show the change in force of contraction to a change in strength of stimulation . The student will also know the physiological basis of EMG and its application and genesis of fatigue
Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	Explain the Effect of different kind of stimuli, strength of stimulus, effect of temperature and to explain the effect of multiple successive stimuli on skeletal muscle
CO 2:	To understand the Physiological basis EMG and its clinical application and to learn the demonstration of muscle fatigue with the help of Mosso' s ergograph

Mapping of COs to POs

COs	*PO 1*	*PO 2*	*PO 3*	*PO 4*	*PO 5*	*PO 6*	*PO 7*	*PO 8*	*PO 9*			
CO 1	X	X	X	X	X							
CO 2	X	X	X	X	X							

Course content and outcomes:

Content	*Competencies*	*No of Hours*
Unit 1: Lab 2: Nerve Muscle		
• Nerve muscle experiments	• Physiological basis of EMG and its clinical application(15hours) • To study muscle fatigue with the help of Mosso' s ergograph(15 hours) • To study the effect of single muscle twitch -Simple Muscle curve (15 hours) • Effect of temperature on skeletal muscle contraction (15 hours) • Effect of Increase in the strength of stimulus on muscle contraction (20 hours) • Effect of two successive stimuli on muscle contraction (20 hours) • To study the effect of fatigue on muscle nerve preparation in skeletal muscle (20 hours) • To study the effect of genesis of tetanus on muscle nerve preparation in skeletal muscle (10 hours) • Effect of load on contraction of the muscle (10 hours)	160

	• Effect of recording of velocity of nerve conduction (10 hours) • Effect of chemicals and drugs on smooth muscle contraction (10 hours)	

Learning strategies, contact hours and student learning time

Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	----------	---------
Seminar	----------	---------
Small Group Discussion (SGD)	50	150
Self-directed learning (SDL)	40	40
Practical	70	140
Revision	20	20
Assessment	20	20
TOTAL	**200**	**370**

Assessment Methods:

Formative:	**Summative:**
Table test/ OSPE	Sessional examination
Viva - voce	End semester examination

Mapping of assessment with Cos

Nature of assessment	CO 1	CO 2				
Sessional Examination 1	X	X				
Sessional Examination 2	X	X				
Table test/ OSPE	X	X				
Viva - voce	X	X				
End Semester Examination	X	X				

Feedback Process	• Mid-Semester feedback • End-Semester Feedback
Reference Material	1. Textbook of Physiology- vander, Sherwood 2. Practical Physiology- GK pal

Name of the Program:	**MSc Physiology (Medical)**
Course Title:	Common core: Introduction to research
Course Code: MCC 602	**Course Instructor: Faculty Department of Community Medicine**
Academic Year: 2020-2021	**Semester:** First Year, Semester 2
No of Credits: 4	**Prerequisites:** Nil
Synopsis:	This course sensitises students towards research and help them to acquire knowledge in the basic aspects of biostatistics and research methodology. Also helps to gain knowledge to use computer application for searching scientific database.

Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	Explain the processes involved in basic research
CO 2:	Explain the importance of ethics in research & misconduct in research

Mapping of COs to POs

COs	*PO 1*	*PO 2*	*PO 3*	*PO 4*	*PO 5*	*PO 6*	*PO 7*	*PO 8*	*PO 9*			
CO 1	X	X										
CO 2	X				X							

Course content and outcomes:

Content	*Competencies*	*No of Hours*
Unit 1: Introduction to research		
	• Describe Selection of a research topic, framing of hypothesis, research objectives and their outcomes • Familiarize with Literature survey and write a research protocol • Describe the steps of designing study involving both humans and animal models • Understand the Importance of statistics in research and introduction to basic statistics and usage of statistical software • Describe the format of Thesis and scientific articles for publication • Explain Ethics & responsible conduct in research • Describe the Process of publication of scientific papers • Familiarize with indexing sources, impact factors and citations of journal articles	80

Learning strategies, contact hours and student learning time

Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	40	120
Seminar	---------	----------
Small Group Discussion (SGD)	30	90
Self-directed learning (SDL)	10	10
Case Based Learning (CBL)	10	30
Revision	10	10
Assessment	10	10

TOTAL	**110**			**270**		
Assessment Methods:						
Formative:				**Summative:**		
Class tests				Sessional examination		
Assignments				End semester examination		
Mapping of assessment with Cos						
Nature of assessment	CO 1	CO 2				
Sessional Examination 1	X					
Sessional Examination 2	X	X				
class test	X	X				
Assignment	X					
End Semester Examination	X	X				
Feedback Process	• Mid-Semester feedback • End-Semester Feedback					
Reference Material	Parks Text book of Community medicine					

Name of the Institution / Department: DEPARTMENT OF PHYSIOLOGY

Name of the Program:	**MSc Physiology (Medical)**
Course Title:	Central nervous system
Course Code: MPY 604	**Course Instructor: Faculty Department of Physiology**
Academic Year: 2020-2021	**Semester:** First Year, Semester 2
No of Credits: 4	**Prerequisites:** Nil
Synopsis:	This course emphasises on the Central nerve system including synapse, receptors, Reflexes, Ascending and descending pathways, cerebellum, basal ganglion, Hypothalamus, ascending reticular activating system, Electroencephalogram, different types of sleep and abnormalities
Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	•Describe the classification and properties of receptors, synapse, reflexes, Ascending pathways, descending pathways, Spinal cord, spinal shock, lesion in Upper motor and lower motor neuron
CO 2:	To explain the different parts of the brain, functions, abnormalities

Mapping of COs to POs

COs	*PO 1*	*PO 2*	*PO 3*	*PO 4*	*PO 5*	*PO 6*	*PO 7*	*PO 8*	*PO 9*			
CO 1	X	X	X	X	X							
CO 2	X	X	X	X	X							

Course content and outcomes:

Content	*Competencies*	*No of Hours*
Unit 1: Central Nervous system		**80**
• Receptors • Synapse • Reflexes • Pathways	• Describe and discuss the properties of Receptors (2 hours) • Explain the process of Synaptic transmission and properties (5 hours) • Trace and explain the ascending tracts (5 hours) • Explain the effect of Lesion of Ascending tracts (5 hours) • Explain the reflex arc, its components and their significances (5 hours) • Explain the -Properties of Reflexes (5hours) • Trace and explain pyramidal and extrapyramidal tracts (5 hours) • Effects of upper motor neuron and lower motor neuron lesion (4 hours) • Explain briefly the causes, types and consequences of injury to spinal cord (4hours)	40 hours
Unit : 2 Higher centres of Brain		
• Cerebellum • Basal Ganglion • Hypothalamus • Limbic system	• Describe components of vestibular apparatus (4 hours) • Discuss the major connections , functions and effects of lesions of cerebellum (4 hours) • Discuss the components, major connections , functions and lesions (Parkinson's disease) of Basal ganglia (4 hours)	40 hours

• EEG • Reticular formation • Cerebral cortex • Cerebrospinal fluid	• Draw and describe the organization of thalamic nuclei and functional areas and explain the causes and clinical features of thalamic syndrome (4 hours) • Discuss the various components of reticular formation (4hours) • Explain the various hypothalamic nuclei and the functions in detail (4 hours) • Describe the organization and functions limbic structures and associated nuclei (4 hours) • Discuss EEG in detail (2 hours) • Discuss the functional areas of cerebellum (4 hours) • Discuss Posture and equilibrium (4 hours) • Explain the Formation, composition, circulation and functions of cerebrospinal fluid (2hours)	

Learning strategies, contact hours and student learning time

Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	60	180
Seminar	5	15
Small Group Discussion (SGD)	5	15
Self-directed learning (SDL)	5	5
Case Based Learning (CBL)	5	15
Revision	10	10
Assessment	10	10
TOTAL	**100**	**250**

Assessment Methods:

Formative:	**Summative:**
Class tests	Sessional examination
Assignments	End semester examination

Mapping of assessment with Cos

Nature of assessment	CO 1	CO 2				
Sessional Examination 1	X	X				
Sessional Examination 2	X	X				
class test	X	X				
Assignment	X	X				
End Semester Examination	X	X				

Feedback Process	• Mid-Semester feedback • End-Semester Feedback
Reference Material	1.Text book of Physiology- Guyton 2. Review of Medical Physiology- Ganong 3.Text book of Physiology- Vander, Sherwood

MANIPAL ACADEMY of HIGHER EDUCATION
(Deemed to be University under Section 3 of the UGC Act, 1956)

Name of the Institution / Department: DEPARTMENT OF PHYSIOLOGY

Name of the Program:						**MSc Physiology (Medical)**			
Course Title:						Special Senses			
Course Code: MPY 606						**Course Instructor: Faculty Department of Physiology**			
Academic Year: 2020-2021						**Semester:** First Year, Semester 2			
No of Credits: 4						**Prerequisites:** Nil			
Synopsis:	This course insights into the structure of eye, ear, taste buds and olfactory mucous membrane. To know about the structure of Retina, organ of corti, taste buds and functions. it imparts knowledge about the photochemistry of vision, colour vision , pupillary reflexes, ossicular conduction in the middle ear, sound transmission in the inner ear, pathways of hearing, vision, taste and olfactory, abnormalities of taste and smell ,refractive errors								
Course Outcomes (COs):	On successful completion of this course, students will be able to								
CO 1:	Describe the structure and functions of eye , its different layers, structure of retina, visual pathway, pupillary reflexes, photochemistry of vision, refractive errors and colour blindness								
CO 2:	Describe the functions of ossicles, organ of corti, pathway of hearing, taste modalities, pathway, olfactory pathway and abnormalities								
Mapping of COs to POs									
COs	*PO 1*	*PO 2*	*PO 3*	*PO 4*	*PO 5*	*PO 6*	*PO 7*	*PO 8*	*PO 9*
CO 1	X	X	X	X	X				
CO 2	X	X	X	X	X				

Course content and outcomes:

Content	*Competencies*	*No of Hours*
Unit 1: Eye		**80**
	• Discuss the functional anatomy of the eye: outline of functions of cornea, sclera, iris, lens, retina and intraocular muscles (5 hours) • Discuss visual process and field of vision (5 hours) • Explain the Visual Pathway (5 hours) • Explain the lesion - visual pathway (5 hours) • Describe pupillary reflexes (5 hours) • Discuss the errors of refraction (5 hours)	30 hours
• **Unit 2: Ear**		
	• Describe and discuss the structure and function of the ear Auditory Pathway (10 hours) • Explain mechanisms of hearing (10 hours)	30 hours

	• Explain in detail the theories of hearing (10 hours)	
Unit 3 – taste		
	• Describe and discuss perception of taste sensation (5 hours) • Describe and discuss the pathophysiology of altered smell and taste sensation (5 hours)	10 hours
Unit 4 – Smell		
	• Describe and discuss the perception of smell sensation (5 hours) • Describe and discuss the patho-physiology of altered smell sensation (5 hours)	10 hours

Learning strategies, contact hours and student learning time

Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	60	180
Seminar	5	15
Small Group Discussion (SGD)	5	15
Self-directed learning (SDL)	5	5
Case Based Learning (CBL)	5	15
Revision	10	10
Assessment	10	10
TOTAL	**100**	**250**

Assessment Methods:

Formative:	**Summative:**
Class tests	Sessional examination
Assignments	End semester examination

Mapping of assessment with Cos

Nature of assessment	CO 1	CO 2	CO 3	CO 4	CO 5	CO 6
Sessional Examination 1	X	X				
Sessional Examination 2	X	X				
Quiz/ class test	X	X				
Assignment	X	X				
End Semester Examination	X	X				

Feedback Process	• Mid-Semester feedback • End-Semester Feedback
Reference Material	1.Text book of Physiology- Guyton 2. Review of Medical Physiology- Ganong 3.Text book of Physiology- Vander, Sherwood

Name of the Institution / Department: DEPARTMENT OF PHYSIOLOGY

Name of the Program:	**MSc Physiology (Medical)**
Course Title:	Lab 3: Practical -3
Course Code: MPY 608	**Course Instructor: Faculty Department of Physiology**
Academic Year: 2020-2021	**Semester:** First Year, Semester 2
No of Credits: 4	**Prerequisites:** Nil
Synopsis:	This course emphasises on conducting the examination of central nervous system and test for special senses
Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	Conduct the test for sensory system, motor system and reflexes
CO 2:	Conduct the test of visual acuity, visual field, visual reflexes, Test for hearing and test for taste and smell

Mapping of COs to POs

COs	*PO 1*	*PO 2*	*PO 3*	*PO 4*	*PO 5*	*PO 6*	*PO 7*	*PO 8*	*PO 9*			
CO 1	X	X	X	X	X							
CO 2	X	X	X	X	X							

Course content and outcomes:

Content	*Competencies*	*No of Hours*
Unit 1: Lab: central nervous system		
CNS	• Demonstrate the clinical Examination of Sensory system (20 hours) • Demonstrate the clinical Examination of cranial nerves (20 hours) • Demonstrate the clinical Examination of motor system (20 hours) • Demonstrate the Clinical Examination of reflexes (20 hours)	80
Unit 2: Lab: Special senses		
Test for Vision Hearing Taste Smell	• Demonstrate Perimetry- test for visual field (20 hours) • Demonstrate tests of visual acuity and color vision (20 hours) • Demonstrate the test for visual reflexes (20 hours) • Demonstrate Tests of hearing (10 hours) • Demonstrate the examination of taste and smell (10 hours)	80

Learning strategies, contact hours and student learning time

Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	-----	-------
Seminar	------	-------
Small Group Discussion (SGD)	40	120
Self-directed learning (SDL)	40	40
Practical	80	160
Revision	10	10

Assessment	10	10
TOTAL	**180**	**340**

Assessment Methods:	
Formative:	**Summative:**
OSPE	Sessional examination
Viva Voce	End semester examination

Mapping of assessment with Cos						
Nature of assessment	CO 1	CO 2	CO 3	CO 4	CO 5	CO 6
Sessional Examination 1	X	X	X			
Sessional Examination 2	X	X	X			
Table test/ OSPE	X	X	X			
Viva Voce	X	X	X			
End Semester Examination	X	X	X			

Feedback Process	• Mid-Semester feedback • End-Semester Feedback
Reference Material	Practical Physiology- Gk pal

Name of the Institution / Department: DEPARTMENT OF PHYSIOLOGY

Name of the Program:	**MSc Physiology (Medical)**
Course Title:	Elective 1*
Course Code: MEL 610	**Course Instructor: course coordinator of elective**
Academic Year: 2020-2021	**Semester:** First Year, Semester 2
No of Credits: 4	**Prerequisites:** Nil
Synopsis:	This exposure to multidisciplinary courses will help them develop interests and abilities that will help them further their career skills. Students can choose any one of the electives, listed below in the respective campuses. There should be a minimum of 3 students opting for a particular elective for it to be offered. The electives will be assigned depending on the number of slots available based on previous semester CGPA. Each elective runs for a period of 4 weeks. 75% attendance is mandatory and at the end of each elective there is assessment, the scores will help boast CGPA.
Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	Explore their interests and develop desirable career skills and abilities that will help professional development

COs	*PO 1*	*PO 2*	*PO 3*	*PO 4*	*PO 5*	*PO 6*	*PO 7*	*PO 8*	*PO 9*			
CO 1	X	X	X	X					X			

Course content and outcomes:

Content	*Competencies*		*No of Hours*
MEL 610.1	Tissue Processing	ANATOMY	Both campuses
MEL 610.2	Basic cardiovascular Examination	PHYSIOLOGY	Both campuses
MEL 610.3	Photometric Techniques	BIOCHEMISTRY	Both campuses
MEL 610.4	BA/BE studies	PHARMACOLOGY	Not offered in both campus since May 2017
MEL 610.5	Serological diagnosis of infectious diseases	MICROBIOLOGY	At Mangalore campus only
MEL 610.6	Microbiological analysis of water	MICROBIOLOGY	At Manipal campus only
MEL 610.7	Drug development	PHARMACOLOGY	Both campuses
MEL 610.8	IEM screening	Biochemistry	At Manipal campus only
MEL 610.9	Basics of andrology techniques	Clinical embryology	At Manipal campus only
MEL 610.10	Forensic toxicology	Forensic medicine	At Manipal campus only

• MEL 610.1- Tissue Processing	• Explain the aims and effects of tissue fixation • Enumerate the precautions to be taken during tissue fixation • Name the commonly used fixatives and to explain their merits and demerits • Name the different types of embedding methods available and to give their applications	120

	• Describe the detailed procedure involved in paraffin embedding method • Demonstrate the paraffin embedding method for variety of tissues • Name the different types of microtomes and to explain their applications • Describe the detailed procedure of section cutting using rotary microtome • Demonstrate the experience in using rotary microtome for section cutting • Explain the water bath method of flattening and mounting of sections	
• MEL 610.2-Basic cardiovascular Examination	• Demonstrate the basic use of stethoscope • Demonstrate how to measure the pulse • Demonstrate the recording of blood pressure using sphygmomanometer • Describe the basic approach to the Physical examination of cardiovascular system including inspection, palpation, percussion and auscultation • Explain the basic heart sounds • Record ECG • Understand the basic principle and record heart rate variability • Perform the basic cardiovascular examination independently	120
• MEL 610.3-Photometric Techniques	• To know the principle, instrumentation and functioning of colorimeter & spectrophotometer • Understand the Beer's law, on which the photometric techniques are based for measuring the concentration of a substance in solution. • Describe the operation and component parts of the colorimeter/ spectrophotometer • Operate the colorimeter /spectrophotometer and measure the concentration of an analyte • To know the principle and clinical applications of atomic absorption spectrophotometer, flame photometer, fluorometer, nephelometer • To understand the principle of ELISA and its use • To know the working of a semiautoanalyzer • To select an appropriate technique for measuring an analyte based on the requirements	120
• MEL 610.5-Serological	• List the different types of serological tests used in diagnosis of infectious diseases and principles of the	120

diagnosis of infectious diseases	routine serological procedures performed in the clinical laboratory · • Acquire knowledge about the applications of different serological tests · • Understand and analyse the various concepts involved in serological diagnosis of infectious diseases	
• MEL 610.6- Microbiological analysis of water	• Enumerate different Water borne infectious diseases • Describe the source and reservoirs of the water borne pathogens in the community and healthcare facilities • Narrate different strategies for Controlling Waterborne Microbial Contamination • Describe and demonstrate collection, transportation, and various methods of bacteriological analysis of water with respect to community and hospital settings (dialysis water, RO) and interpretation of results • Investigate waterborne outbreak in the community and hospital	120
• MEL 610.7- Drug development	• To explain pre-clinical phases of drug development • To explain the clinical phases of drug development • To understand the basic concepts of Ethical Guidelines for Biomedical Research and Ethical Issues in Clinical Research • To learn Roles & responsibilities of the investigator / sponsor / CRO / Site coordinator / Site manager and Auditor • To explain the process of Informed consent and submission dossier to IEC • To understand the Role of regulatory bodies: FDA/ DCGI and IRB/IEC and Updates in the regulatory requirements in India • To be aware and understand the Good Clinical Practice Guidelines • To understand and demonstrate Adverse event reporting: ADR reporting Form and Serious adverse events and reporting and Collection of ADRs from hospital	120
• MEL 610.8- IEM screening	• To know the biochemical basis of different disorders of inborn errors of metabolism • To be able to prepare chemical solutions required to perform the qualitative tests in IEM lab • To be able to perform and interpret the basic screening tests of IEM. • To be able to perform and interpret thin layer chromatography (TLC) of organic acids • To know the principle and application of HPLC • To observe the new born screening tests done in DBS samples	120

• MEL 610.9- Basics of andrology techniques	• Identify the basic instruments in Andrology laboratory • Communicate instructions to the patient about semen collection • Analyse semen - macrosocopic and microscopic evaluations • Demonstrate sperm preparation methods for therapeutic insemination • Assess sperm DNA damage	120
• MEL 610.10- Forensic toxicology	• To be able to identify the poisons • To identify the poisons based on their physical forms • To classify poisons based on systems on which they act • To know various poisons based on classification • To know general management of the poisons • To know and identify the common household poisons and their management • To be aware of medico-legal aspects of poisoning • To have knowledge about substances that may affect a person's performance or behaviour and ability to make rational judgement; and • To have knowledge about substances that are not compliant with employment regulations or classified as substances of abuse. • To have knowledge about evidentiary materials.	120

Learning strategies, contact hours and student learning time		
Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	20	60
Tutorial- SGT	10	30
SDL	10	10
Practical	80	160
Assessment	10	10
TOTAL	**130**	**270**

Assessment Methods:	
Formative:	**Summative:**
Practical assessment	End of elective examination

Mapping of assessment with Cos						
Nature of assessment	CO 1					
Practical assessment	X					
End of elective examination	X					

Feedback Process	• End elective Feedback
Reference Material	Based on elective- departments will specify

Name of the Institution / Department: DEPARTMENT OF PHYSIOLOGY

Name of the Program:					**MSc Physiology (Medical)**							
Course Title:					Cardiovascular system							
Course Code: MPY 701					**Course Instructor: Faculty Department of Physiology**							
Academic Year: 2020-2021					**Semester:** Second Year, Semester 3							
No of Credits: 4					**Prerequisites:** Nil							
Synopsis:	This course give insight into the properties of cardiac muscle, cardiac cycle, Electrocardiogram, heart sounds, murmurs, cardiac output, venous return, Blood pressure and applied aspects											
Course Outcomes (COs):	On successful completion of this course, students will be able to											
CO 1:	•Describe the structure of heart and blood vessels, general and pulmonary system, electrical and mechanical properties of cardiac muscle, phases of Cardiac cycle, Normal heart rate, nerve supply , Cardiac output, factors regulating cardiac output and venous return											
CO 2:	Explain hemodynamics, blood pressure, factors regulating blood pressure, cardiovascular shock , regional circulation and applied aspects											
Mapping of COs to POs												
COs	*PO 1*	*PO 2*	*PO 3*	*PO 4*	*PO 5*	*PO 6*	*PO 7*	*PO 8*	*PO 9*			
CO 1	X	X	X	X	X							
CO 2	X	X	X	X	X							

Course content and outcomes:

Content	*Competencies*	*No of Hours*
Unit 1: Heart		
•	• Discuss the basic understanding to cardiovascular system (5 hours) • Explain the properties of cardiac muscle (5 hours) • Discuss the events occurring during the cardiac cycle (5 hours) • Discuss the generation of heart sounds (5 hours) • Explain the pathophysiology of Cardiac murmurs (5 hours) • Explain in detail the ECG and its abnormalities (10 hours) • Explain in detail Cardiac output , factors regulating cardiac output. Describe the measurement of cardiac output (5 hours)	40 hours
Unit 2: Vascular system		
•	• Describe and discuss haemodynamics of circulatory system (5 hours) • Discuss blood pressure and cardiovascular regulatory mechanisms (15hours) • Describe & discuss regional circulation including microcirculation, lymphatic circulation, coronary,	40 hours

	cerebral, cutaneous , fetal and splanchnic circulation (10 hours) • Describe the pathophysiology of shock, syncope and heart failure, Applied aspects of cardiovascular system (10 hours)	

Learning strategies, contact hours and student learning time		
Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	60	180
Seminar	5	15
Small Group Discussion (SGD)	5	15
Self-directed learning (SDL)	5	5
Case Based Learning (CBL)	5	15
Revision	10	10
Assessment	10	10
TOTAL	**100**	**250**

Assessment Methods:	
Formative:	**Summative:**
Class tests/ Quiz	Sessional examination
Assignments	End semester examination

Mapping of assessment with Cos

Nature of assessment	CO 1	CO 2	CO 3	CO 4	CO 5	CO 6
Sessional Examination 1	X	X				
Sessional Examination 2	X	X				
Quiz/ class test	X	X				
Assignment	X	X				
End Semester Examination	X	X				

Feedback Process	• Mid-Semester feedback • End-Semester Feedback
Reference Material	1. Text book of Physiology- Guyton 2. Review of Medical Physiology- Ganong

Name of the Institution / Department: DEPARTMENT OF PHYSIOLOGY

Name of the Program:	**MSc Physiology (Medical)**
Course Title:	Excretory system
Course Code: MPY 703	**Course Instructor: Faculty Department of Physiology**
Academic Year: 2020-2021	**Semester:** Final Year, Semester 3
No of Credits: 4	**Prerequisites:** Nil
Synopsis:	This course gives knowledge about the structure of kidney, renal blood flow, glomerular filtration rate, functions of nephrons. counter current mechanism, acid bas balance, water and electrolyte balance, Micturition and skin and temperature
Course Outcomes (COs):	On successful completion of this course, students will be able
CO 1:	•To describe the functions of kidney, structure of a nephron, filtering membrane, glomerular filtration , auto-regulation, Counter current mechanism, acid base balance, applied aspects
CO 2:	•To describe types of skin, thermoregulatory mechanism of skin, applied aspects

Mapping of COs to POs

COs	*PO 1*	*PO 2*	*PO 3*	*PO 4*	*PO 5*	*PO 6*	*PO 7*	*PO 8*	*PO 9*			
CO 1	X	X	X	X	X							
CO2	X	X	X	X	X							

Course content and outcomes:

Content	*Competencies*	*No of Hours*
Unit 1: Kidney		
Kidney	• Describe the functional anatomy of the kidney , structure of the nephron and the types of the nephron (5 hours) • Describe the structure and functions of juxtaglomerular apparatus and its regulatory mechanisms (5 hours) • Explain in detail the peculiarities of the renal blood flow , measurement and the auto regulatory mechanisms (5 hours) • Discuss in detail the glomerular filtration , its measurement and the factors regulating the glomerular filtration rate(10 hours) • Describe the mechanism of urine formation involving processes of filtration, tubular reabsorption and secretion(10 hours) • Discuss in detail the counter current mechanisms (10 hours) • Explain the regulatory mechanisms of ECF volume, osmolality and electrolytes (10 hours) • Discuss in detail the acid base balance (5 hours) • Describe the neural control of micturition and discuss normal cystometrogram (5 hours) • Describe and discuss the significance & implication of Renal function tests (5 hours)	70 hours

Unit 2: Skin		
	• Describe and discuss the role of skin in the regulation of body temperature (10 hours)	10 hours

Learning strategies, contact hours and student learning time		
Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	60	180
Seminar	5	15
Small Group Discussion (SGD)	5	15
Self-directed learning (SDL)	5	5
Case Based Learning (CBL)	5	15
Revision	10	10
Assessment	10	10
TOTAL	**100**	**250**

Assessment Methods:	
Formative:	**Summative:**
Class tests / Quiz	Sessional examination
Assignments	End semester examination

Mapping of assessment with Cos						
Nature of assessment	CO 1	CO 2				
Sessional Examination 1	X	X				
Sessional Examination 2	X	X				
Quiz/ class test	X	X				
Assignment	X	X				
End Semester Examination	X	X				

Feedback Process	• Mid-Semester feedback • End-Semester Feedback
Reference Material	1. Text book of Physiology- Guyton 2. Review of Medical Physiology- Ganong

Name of the Institution / Department: DEPARTMENT OF PHYSIOLOGY

Name of the Program:	**MSc Physiology (Medical)**
Course Title:	Respiratory system
Course Code: MPY 705	**Course Instructor: Faculty Department of Physiology**
Academic Year: 2020-2021	**Semester:** Final Year, Semester 3
No of Credits: 4	**Prerequisites:** Nil
Synopsis:	This course will help the students to understand the functions of lungs, structure of respiratory membrane, Oxygen and carbon dioxide transport, neural and chemical regulation of respiration, types of hypoxia, acclimatization.
Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	• Explain the functions of lungs- respiratory and non respiratory, functions of upper respiratory tract, structure of alveoli, features of pulmonary circulation, forms of oxygen and carbon dioxide and forms of transport, Haldanes effect, bohr effect
CO 2:	• To explain regulation of respiration, Types of hypoxia, acclimatization, applied aspects

Mapping of COs to POs

COs	*PO 1*	*PO 2*	*PO 3*	*PO 4*	*PO 5*	*PO 6*	*PO 7*	*PO 8*	*PO 9*			
CO 1	X	X	X	X	X							
CO 2	X	X	X	X	X							

Course content and outcomes:

Content	*Competencies*	*No of Hours*
Unit 1: lungs		
Lungs	• Describe the functional anatomy and functions of respiratory tract and Explain the mechanisms of respiration (10 hours) • Discuss lung volume, capacities measurement with its clinical importance (15 hours) • Discuss pulmonary ventilation, alveolar ventilation and dead space (5 hours) • Describe the process of diffusion of gases across the respiratory membrane and diffusion capacity of gases (5 hours) • Discuss in detail the pulmonary circulation (5 hours) • Describe and discuss the transport of respiratory gases: Oxygen and Carbon dioxide (10 hours) • Describe the mechanics of pressure changes during ventilation, pressure volume relationship, surfactant , compliance, airway resistance, V/P ratio, work of breathing (5 hours)	60 hours

	• Explain the regulation of respiration in normal and abnormal conditions and discuss periodic breathing (5 hours)	
Unit 2: Hypoxia		
	• Describe and discuss the pathophysiology of hypoxia , high altitude physiology, acclimatization, asphyxia , cyanosis, oxygen therapy and toxicity (5hours). • Discuss the effects of increased barometric pressure –nitrogen narcosis , high pressure nervous syndrome and Caissons disease (5 hours) • Describe and discuss the principles of artificial respiration (5 hours) • Describe and discuss lung function tests and their clinical significance (5 hours)	20 hours

Learning strategies, contact hours and student learning time

Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	60	180
Seminar	5	15
Small Group Discussion (SGD)	5	15
Self-directed learning (SDL)	5	5
Case based learning	5	15
Revision	10	10
Assessment	10	10
TOTAL	**100**	**250**

Assessment Methods:

Formative:	**Summative:**
Seminars, OSPE	Sessional examination
Viva voce	End semester examination

Mapping of assessment with Cos

Nature of assessment	CO 1	CO 2				
Sessional Examination 1	X	X				
Sessional Examination 2	X	X				
Quiz/ class test	X	X				
Assignment	X	X				
End Semester Examination	X	X				

Feedback Process	• Mid-Semester feedback • End-Semester Feedback
Reference Material	1. Text book of Physiology- Guyton 2. Review of Medical Physiology- Ganong

Name of the Institution / Department: DEPARTMENT OF PHYSIOLOGY

Name of the Program:	**MSc Physiology (Medical)**
Course Title:	Lab 4: Cardiovascular system and respiratory system
Course Code: MPY 707	**Course Instructor: Faculty Department of Physiology**
Academic Year: 2020-2021	**Semester:** Final Year, Semester 3
No of Credits: 4	**Prerequisites:** Nil
Synopsis:	This course help students to learn how to record arterial pulse, blood pressure, to perform cardiovascualr examination, respiratory examination and able to compare and apply the knowledge of amphibian heart experiments to understand cardiovascular physiology
Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	Perform recording of arterial pulse, blood pressure, effect of exercise on blood pressure, cardiovascular examination
CO 2:	Perform clinical examination of respiratory system
CO 3:	Explain heart experiments and its application

Mapping of COs to POs

COs	*PO 1*	*PO 2*	*PO 3*	*PO 4*	*PO 5*	*PO 6*	*PO 7*	*PO 8*	*PO 9*			
CO 1	X	X	X	X	X							
CO 2	X	X	X	X	X							
CO 3	X	X	X	X	X							

Course content and outcomes:

Content	*Competencies*	*No of Hours*
Unit 1: Lab: cardiovascular system		**160**
Pulse Blood Pressure	**PRACTICAL 4:** **Cardiovascular system (80 hours)** • Recording of Arterial pulse (10 Hours) • Recording to Blood pressure(10 Hours) • Recording of cardiovascular responses to graded exercise and changes in posture (10 Hours) • Clinical examination of cardiovascular system (10 Hours) • Recording of ECG(20 Hours) • Evaluation of Autonomic Function test(20 Hours)	80
Unit 2: Lab: respiratory system		
	Respiratory system (50 hours) • Clinical examination of respiratory system (10 hours) • Pulmonary function tests, recording of normal spirogram, measurement of FEV1 (10 Hours) • Recording of chest movements by a stethography and to study the effects speech, swallowing,	50

	coughing , breath-holding and voluntary hyperventilation (20 hours) • Artificial respiration and cardio pulmonary resuscitation (10 hours)	
Unit 3: Animal experiments- Heart experiments		
	Animal experiments : Cardiac Physiology (30 hours) • Recording of Normal cardiogram in frog's heart (3 hours) • Effect of cold and warm saline on sinus venous and ventricles of frogs heart (3 hours) • Effect of I and II stannius ligature on frogs heart (3 hours) • Demonstration of properties of cardiac muscle in frogs heart (5 hours) • Refractory period in the beating heart (3 hours) • Demonstration of the effects of vagus and white crescentic line on frogs heart (3 hours) • Fixation of autonomic pathway to the frogs heart (5 hours) • Perfusion of isolated frogs heart – effect of ions and drugs on frogs heart (5 hours)	30

Learning strategies, contact hours and student learning time		
Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	---	---
Seminar	---	----
Small Group Discussion (SGD)	30	90
Self-directed learning (SDL)	20	20
Practical	100	200
Revision	10	10
Assessment	10	10
TOTAL	**170**	**330**

Assessment Methods:	
Formative:	**Summative:**
test/ OSPE	Sessional examination
Viva voce	End semester examination

Mapping of assessment with Cos						
Nature of assessment	CO 1	CO 2	CO 3			
Sessional Examination 1	X	X	X			
Sessional Examination 2	X	X	X			
Table test/ OSPE	X	X	X			

Viva voce	X	X	X			
End Semester Examination	X	X	X			
Feedback Process	• Mid-Semester feedback • End-Semester Feedback					
Reference Material	Practical Physiology- GK Pal					

Name of the Institution / Department: DEPARTMENT OF PHYSIOLOGY

Name of the Program:	**MSc Physiology (Medical)**
Course Title:	Elective 2*
Course Code: MEL 709	**Course Instructor: Faculty Department of Anatomy**
Academic Year: 2020-2021	**Semester:** Final Year, Semester 3
No of Credits: 4	**Prerequisites:** Nil
Synopsis:	This exposure to multidisciplinary courses will help them develop interests and abilities that will help them further their career skills. Students can choose any one of the electives, listed below in the respective campuses. There should be a minimum of 3 students opting for a particular elective for it to be offered. The electives will be assigned depending on the number of slots available based on previous semester CGPA. Each elective runs for a period of 4 weeks. 75% attendance is mandatory and at the end of each elective there is assessment, the scores will help boast CGPA.
Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	Explore their interests and develop desirable career skills and abilities that will help professional development

Mapping of COs to POs

COs	*PO 1*	*PO 2*	*PO 3*	*PO 4*	*PO 5*	*PO 6*	*PO 7*	*PO 8*	*PO 9*			
CO 1	X	X	X	X	X				X			

Course content and outcomes:

Content	*Competencies*		*No of Hours*
MEL 709.1	Staining Techniques	ANATOMY	Both campuses
MEL 709.2	Basic genetic techniques and tissue culture	ANATOMY	At Manipal campus only- **Not offered since MAY 2017**
MEL 709.3	Neurophysiology tests	PHYSIOLOGY	Both campuses
MEL 709.4	Orientation to Clinical Biochemistry	BIOCHEMISTRY	Both campuses
MEL 709.5	Preclinical Drug Screening	PHARMACOLOGY	Both campuses- **not offered since MAY 2017**
MEL 709.6	Isolation, identification and antimicrobial sensitivity testing-conventional & automated methods	MICROBIOLOGY	At Mangalore campus only
MEL 709.7	Detection of food borne pathogens	MICROBIOLOGY	At Manipal campus only- **not offered since NOV 2019**
MEL 709.8	Basics of animal research	PHARMACOLOGY	Both campuses

MEL 709.9	Analytical toxicology	BIOCHEMISTRY	At Manipal campus only
MEL 709.10	SEMEN CRYOPRESERVATION	CLINICAL EMBRYOLOGY	At Manipal campus only
MEL 709.11	Fungi in health and disease	MICROBIOLOGY	At Manipal campus only
MEL 709.12	Clinical Forensic medicine	FORENSIC MEDICINE	At Manipal campus only

MEL 709. 1 - staining techniques	• To name variety of staining techniques with their applications • To explain the principle and procedure of Hematoxylin & Eosin (H&E) staining technique in detail • To demonstrate the Hematoxylin & Eosin staining procedure • To explain some special staining techniques with their principles and procedures (e.g. Van Giessen's stain, Masson's Trichrome stain & Mallory's stain)	120
MEL 709. 3- Neurophysiology tests	• Demonstrate the sensory function test • Demonstrate the motor function test • Demonstrate the clinical examination of cranial nerves • Basic techniques used in neurophysiological research using animal models • Perform the basic clinical examination of the central nervous system and to perform techniques used in neurophysiology studies independently	120
MEL 709. 4 - Orientation to Clinical Biochemistry	• Understand the basic workflow in a clinical/ medical testing laboratory: Sample collection & transport, Sample acceptance & rejection criteria • Understand the use of automation • Rationale for selection of test panels/organ specific tests – LFT, RFT, TFT, Diabetes, Lipid profile, MI and tumour markers • Know the preanalytical, analytical and post-analytical phases and their significance; A typical lab report format; instrument flags and their corrective actions, the significance of auto verification • Understand the total quality management of the lab: Use of IQC, EQAS, ILQC, handling of feedback, complaints, errors in laboratory reports • Appreciate the significance of laboratory accreditation as per the regulatory bodies	120

MEL 709. 6- Isolation, identification and antimicrobial sensitivity testing- conventional & automated methods	• Acquire knowledge regarding the basic concepts of isolation and identification of Infectious agents from clinical specimen • Describe the process to determine antimicrobial susceptibility of pathogenic bacteria • Acquire knowledge on the automated methods employed for isolation, identification & antimicrobial susceptibility testing of pathogenic bacteria • Understand the basic concepts of Serological techniques used in the diagnosis of Infectious diseases	120
MEL 709. 8- Basics of animal Research	• Demonstrate animal handling & drug administration techniques • Explain Preclinical toxicity studies • Understand and observe the spontaneous behavior in laboratory animals • Explain the principles and demonstrate the screening of analgesics using hot plate and tail flick method • Explain the principles and demonstrate the screening of antiepileptics in MES and PTZ models • Explain the principles and demonstrate the test for screening of anti-inflammatory activity • Explain the principles and demonstrate the screening of antidepressants using tail suspension methods and forced swim test • Explain the principles and demonstrate the screening of anxiolytics using elevated plus maze and light & dark box	120
MEL 709. 9- Analytical toxicology	• Description and demonstration of various tests related to the panels: drug abuse panel; pesticide panel; alcohol panel; narcotic panel and heavy metal panel • Identification and quantification of unknown chemical/ poisons assessment by using a GC-MS (Gas chromatography- mass spectrometry) • Description and demonstration of conducting systematic studies regarding use and hazards of various chemicals, used in agriculture. • Developing information leaflets regarding guidelines and hazards of pesticide use to all needy farmers across all districts of our state	120
MEL 709. 10- SEMEN CRYOPRESERVATION	• Discussions on basics of semen analysis • Demonstration of semen cryopreservation and thawing	120

	• Assessing the post-thaw competence of spermatozoa - motility and viability assessment • Preparation of frozen-thawed spermatozoa for therapeutic insemination	
MEL 709. 11- Fungi in health and disease	• Understand the diverse pathogenic fungi involved in disease. • Familiarize the laboratory skills for diagnosis of fungal infections. • Comprehend the beneficial role of fungi and their applications.	120
MEL 709. 12- Clinical Forensic medicine	• Description on to handle medico-legal cases in the hospital • Procedure to make a case medico-legal • Documentation in a medico-legal cases • Procedure on legal protocol that includes police intimation, collection of evidentiary material, preparation of certificates • Examination of sexual assault & drunkenness cases • About medico-legal consultation • Recording of dying declaration	120

Learning strategies, contact hours and student learning time

Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	20	60
Tutorial- SGT	10	30
SDL	10	10
Practical	80	160
Assessment	10	10
TOTAL	**130**	**270**

Assessment Methods:

Formative:	**Summative:**
Practical assessments	End elective examination

Mapping of assessment with Cos

Nature of assessment	CO 1					
Practical Assessment	X					
End Elective Examination	X					

Feedback Process	• End-Elective Feedback
Reference Material	Depending on the elective, departments will specify the reference books

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Name of the Institution / Department: DEPARTMENT OF PHYSIOLOGY

Name of the Program:	**MSc Physiology (Medical)**
Course Title:	Endocrinology
Course Code: MPY 702	**Course Instructor: Faculty Department of Physiology**
Academic Year: 2020-2021	**Semester:** Final Year, Semester 4
No of Credits: 4	**Prerequisites:** Nil
Synopsis:	This course gives knowledge about different types of endocrine glands , their actions, applied aspects
Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	Explain the structure, connections of hypothalamus with pituitary glands, actions regulation and applied aspects of hormones of pituitary glands
CO 2:	Describe the biosynthesis, transport, actions , regulation and applied aspects of all other endocrine glands

Mapping of COs to POs

COs	*PO 1*	*PO 2*	*PO 3*	*PO 4*	*PO 5*	*PO 6*	*PO 7*	*PO 8*	*PO 9*			
CO 1	X	X	X	X	X							
CO 2	X	X	X	X	X							

Course content and outcomes:

Content	*Competencies*	*No of Hours*
Unit 1: Endocrinology- Hypothalamus		**80 hours**
	• Classify different classes of hormones, and describe the mechanisms of action of each (5 hours) • Describe the connections between pituitary and hypothalamus (5 hours)	10 hours
Unit 2: Pituitary gland		
	• Describe the various hormones secreted by anterior pituitary gland and its mechanism of actions , abnormalities in secretion of these hormones (10 hours) • Describe the various hormones secreted by posterior pituitary gland and its mechanism of actions, abnormalities in secretion of these hormones (10 hours)	20 hours
Unit 2: Thyroid gland		
	• Describe the synthesis, secretion, transport, actions, regulation and altered secretion of thyroid hormone (10 hours)	10 hours
Unit 3: Adrenal Cortex		
	• Describe the synthesis, secretion, transport, actions, regulation and altered secretion of Adrenocortical hormone (10 hours)	20 hours

	• Describe the synthesis, secretion, transport, actions, regulation and altered secretion of Adrenal medullary hormone (10 hours)	
Unit 4: Blood glucose regulation- Pancreas		
	• Describe the role of the hormones secreted by the pancreas , Applied aspects (10 hours)	10 hours
Unit 5: Plasma Calcium Regulation		
	• Explain the source, actions, and regulation of secretion of hormones regulating calcium homeostasis (Vitamin D, Parathyroid hormone , and Calcitonin)- (10 hours)	10 hours

Learning strategies, contact hours and student learning time

Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	60	180
Seminar	5	15
Small Group Discussion (SGD)	5	15
Self-directed learning (SDL)	5	5
Case Based Learning (CBL)	5	15
Revision	10	10
Assessment	10	10
TOTAL	**100**	**250**

Assessment Methods:

Formative:	**Summative:**
Class tests/ Quiz	Sessional examination
Assignments	End semester examination

Mapping of assessment with Cos

Nature of assessment	CO 1	CO 2				
Sessional Examination 1	X	X				
Sessional Examination 2	X	X				
Quiz/ class test	X	X				
Assignments	X	X				
End Semester Examination	X	X				

Feedback Process	• Mid-Semester feedback • End-Semester Feedback
Reference Material	1. Text book of Physiology- Guyton 2. Review of Medical Physiology- Ganong

Name of the Institution / Department: DEPARTMENT OF PHYSIOLOGY

Name of the Program:	**MSc Physiology (Medical)**
Course Title:	**Reproduction & Gastro Intestinal System**
Course Code: MPY 704	**Course Instructor: Faculty Department of Physiology**
Academic Year: 2020-2021	**Semester:** Final Year, Semester 4
No of Credits: 3	**Prerequisites:** Nil
Synopsis:	• This course emphasises on the Sex differentiation and development of Reproductive system, Aberrant sexual differentiation, chromosomal abnormalities, developmental abnormalities ,Male reproductive system, Female reproductive system, contraceptive methods, nerve supply to gastrointestinal tract, secretory and motile functions of gastrointestinal tract and applied aspects
Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	• Explain Sex differentiation and development of Reproductive system • Aberrant sexual differentiation, chromosomal abnormalities, developmental abnormalities
CO 2:	• Explain Spermatogenesis, endocrine functions of testis, abnormalities of testicular function, cryptorchidism, male hypogonadism, sterility, ovary, oogenesis, ovulation, corpus luteum, ovarian hormones – oestrogen, progesterone, relaxin, control of ovarian functions by hypothalamic and pituitary hormones, Menstrual cycle: ovarian cycle, uterine cycle, hormonal basis, abnormalities of menstruation, infertility • Pregnancy: Fertilization, implantation, placental hormones, pregnancy tests, parturition and lactation ,Contraception
CO 3:	• Explain the composition, functions and regulation of salivary glands, stomach, pancreas, small intestine, liver and gall bladder , movements of GI tract: Mastication deglutition, gastric motility and emptying, intestinal motility with reference to BER, small bowel wave, peristalsis, paralytic ileus defecation, G.I. Hormones and applied aspects

Mapping of COs to POs

COs	*PO 1*	*PO 2*	*PO 3*	*PO 4*	*PO 5*	*PO 6*	*PO 7*	*PO 8*	*PO 9*			
CO 1	X	X	X	X	X							
CO2	X	X	X	X	X							
CO3	X	X	X	X	X							

Course content and outcomes:

Content	*Competencies*	*No of Hours*
Unit 1: Reproduction physiology		
	• Explain the basis of sex determination and sex differentiation (3 hours) • Explain Aberrant sexual differentiation and chromosomal abnormalities (3 hours)	30 hours

	• Describe male reproductive system: functions of testis and control of spermatogenesis & factors effecting with the applied physiological aspects (5 hours) • Describe female reproductive system - functions of ovary and its control, menstrual cycle – hormonal, uterine and ovarian changes and the abnormal regulation of the female sex hormones (8 hours) • Describe the various stages of fertilization and implantation. (2hours) • Explaining the various pregnancy test and the physiological basis (2hours) • Describing parturition reflex (2 hours) • Different methods of contraception (5 hours)	
Unit 2: Gastrointestinal Physiology		
	• Explain the neural control of gastrointestinal tract (2 hours) • Explain the composition, functions and control of salivary secretion and its applied physiology (2 hours) • Explain the composition , functions and regulation of gastric juice secretion and its applied physiology (2 hours) • Explain the composition , functions and regulation of pancreatic juice secretion and its applied physiology (4 hours) • Explain the composition , functions and regulation of bile juice and its applied physiology (2hours) • Explain liver function test (2 hours) • Explain the composition , functions and regulation of Intestinal juice secretion and its applied physiology (5 hours) • Describe the functions of large intestine (2 hours) • Describe in detail the digestion and absorption of fats, proteins and carbohydrates (3 hours) • Explain in detail the motility of gastrointestinal tract with its regulatory mechanisms (3 hours) • Explain the role of various gastrointestinal hormones (3hours)	30 hours

Learning strategies, contact hours and student learning time

Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	60	180

Seminar	5	15
Small Group Discussion (SGD)	5	15
Self-directed learning (SDL)	5	5
Revision	5	5
Assessment	10	10
TOTAL	**90**	**230**

Assessment Methods:	
Formative:	**Summative:**
Tests / OSPE	Sessional examination
Viva voce	End semester examination

Mapping of assessment with Cos						
Nature of assessment	CO 1	CO 2	CO 3			
Sessional Examination 1	X	X	X			
Sessional Examination 2	X	X	X			
Quiz/ class test	X	X	X			
Assignment	X	X	X			
End Semester Examination	X	X	X			

Feedback Process	• Mid-Semester feedback • End-Semester Feedback
Reference Material	1. Text book of Physiology- Guyton 2. Review of Medical Physiology- Ganong

Name of the Institution / Department: DEPARTMENT OF PHYSIOLOGY

Name of the Program:	**MSc Physiology (Medical)**
Course Title:	LAB 5: Charts/Case History
Course Code: MPY 706	**Course Instructor: Faculty Department of Physiology**
Academic Year: 2020-2021	**Semester:** Final Year, Semester 4
No of Credits: 3	**Prerequisites:** Nil
Synopsis:	• This course helps students the students to link the basic science with the molecular physiology and clinical application in normal and disordered status
Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	Interprete and analyses the given clinical cases

Mapping of COs to POs

COs	*PO 1*	*PO 2*	*PO 3*	*PO 4*	*PO 5*	*PO 6*	*PO 7*	*PO 8*	*PO 9*			
CO 1	X	X	X	X	X							

Course content and outcomes:

Content	*Competencies*	*No of Hours*
Unit 1: Lab: Human experiments		
	Clinical cases/ Charts –related to **GIT** **Endocrine** **Reproduction.**	120 hrs

Learning strategies, contact hours and student learning time

Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture		
Seminar/ workshop		
Small Group Discussion (SGD)	60	180
Self-directed learning (SDL)	20	20
chart/case history	40	120
Assessment	10	10
TOTAL	**130**	**330**

Assessment Methods:

Formative:	**Summative:**
Teaching/ evaluation assignments under supervision	Sessional examinations
Microteaching sessions	End semester examination

Mapping of assessment with Cos

Nature of assessment	CO 1					
Sessional Examination 1	X					
Sessional Examination 2	X					

Feedback Process	• Mid-Semester feedback • End-Semester Feedback
Reference Material	Practical physiology GK pal

Name of the Institution / Department: DEPARTMENT OF PHYSIOLOGY

Name of the Program:						**MSc Physiology (Medical)**						
Course Title:						Project*						
Course Code: MPY 798						**Course Instructor: Faculty Department of Physiology**						
Academic Year: 2020-2021						**Semester:** Final Year, Semester 4						
No of Credits: 10						**Prerequisites:** Nil						
Synopsis:	In course students, under guidance will conduct independent literature review, designing the experiments, conducting experiments, Data collection, tabulation, analysis and interpretation, Discussion and possible publication.											
Course Outcomes (COs):	On successful completion of this course, students will be able to											
CO 1:	Conduct independent relevant research, under guidance and develop skills to prepare project report, present the findings in conference and prepare manuscript in publishable format following research ethics											
Mapping of COs to POs												
COs	*PO 1*	*PO 2*	*PO 3*	*PO 4*	*PO 5*	*PO 6*	*PO 7*	*PO 8*	*PO 9*			
CO 1	X	X	X	X	X	X	X	X	X			

Course content and outcomes:

Content	*Competencies*	*No of Hours*
Unit 1: Project		
•	• Identify the field of interest to conduct the research • Identify a topic on which research will be conducted • Conduct literature review and determine the relevance of the topic and discuss with guide and finalize • Frame a research question • Design the materials and methods of the experiment to be conducted • Develop skills to use the instruments and process involved in research • Determine the statistical analysis that needs to be applied in consultation with the statistician • Prepare protocol and standardize the intervention tools/ dosage of drugs or process of estimations, consent forms if any etc • Prepare a protocol and seek clearance from scientific and ethics committee, animal ethics committee, biomedical research committee • Conduct the experiment • Collate the findings, apply statistical tests and formulate the results • Discuss the results citing evidence from earlier reports and your new findings (both positive and negative)	400 hrs

	• Prepare project report and pass it through plagiarism check software (acceptable level - Similarity index less than 10%) • Submit to university with relevant approval of guide, HOD and HOI • Present the research findings in conference if possible • Prepare a research manuscript in publishable format following ethical guidelines and send for publication preferably.	

Learning strategies, contact hours and student learning time		
Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Project work	400	400
Assessment	10	10
TOTAL	**410**	**410**

Assessment Methods:	
Formative:	**Summative:**
Monthly updates to guide	End semester examination

Mapping of assessment with Cos						
Nature of assessment	CO 1					
Regular Updates to guide	X					
End Semester Examination	X					

Feedback Process	• Monthly feedback from guide • End-Semester Feedback
Reference Material	Journals indexed in reputed indexing agencies.

2. PROGAM OUTCOMES (POS) AND COURSE OUTCMES (COS) MAPPING												
S.No.	**Course Code**	**Course Name**	**Credits**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
1	MCC 601	Common Core 1 : Basic sciences	4	CO1								
2	MPY603	Blood	4	CO1 CO2	CO1 CO2	CO1 CO2	CO1 CO2	CO1 CO2				
3	MPY605	General Physiology and nerve muscle	4	CO1 CO2	CO1 CO2	CO1 CO2	CO1 CO2	CO1 CO2				
4	MPY607	Lab 1: Haematology	4	CO1 CO2	CO1 CO2	CO1 CO2	CO1 CO2	CO1 CO2				
5	MPY609	Lab 2: Amphibian nerve muscle	4	CO1 CO2	CO1 CO2	CO1 CO2	CO1 CO2	CO1 CO2				
6	MPY 602	Common Core 2 : Introduction to research	4	CO1 CO2	CO1			CO2				
7	MPY604	Central nerve system	4	CO1 CO2	CO1 CO2	CO1 CO2	CO1 CO2	CO1 CO2				
8	MPY606	Special senses	4	CO1 CO2	CO1 CO2	CO1 CO2	CO1 CO2	CO1 CO2				
9	MPY608	Lab 3: CNS and special senses	4	CO1 CO2	CO1 CO2	CO1 CO2	CO1 CO2	CO1 CO2				
10	MEL610	Elective1*	4	CO 1	CO 1	CO 1	CO 1					CO 1
11	MPY702	Cardiovascular system	4	CO1 CO2	CO1 CO2	CO1 CO2	CO1 CO2	CO1 CO2				
12	MPY704	Excretory system	4	CO1 CO2	CO1 CO2	CO1 CO2	CO1 CO2	CO1 CO2				
13	MPY706	Respiratory system	4	CO1 CO2	CO1 CO2	CO1 CO2	CO1 CO2	CO1 CO2				
14	MPY707	Lab 3: practical –CVS and respiratory examination	4	CO1 CO2 CO3	CO1 CO2 CO3	CO1 CO2 C03	CO1 CO2 CO3	CO1 CO2 C03				
15	MEL709	Elective 2*	4	CO 1	CO 1	CO 1	CO 1	CO 1				CO 1
16	MPY702	Endocrine	4	CO1 CO2	CO1 CO2	CO1 CO2	CO1 CO2	CO1 CO2				
17	MPY704	Reproduction and Gastrointestinal physiology	3	CO1 CO2 CO3	CO1 CO2 CO3	CO1 CO2 C03	CO1 CO2 CO3	CO1 CO2 CO3				
18	MPY706	Charts and Case Histories	3	CO1	CO1	CO1	CO1	CO1				
19	MPY798	Project	10	CO1	CO1	CO1	CO1	CO1	CO1	CO1	CO1	CO1

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