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

Department of Anatomy
KASTURBA MEDICAL COLLEGE, Manipal/Mangalore

Manipal Academy of Higher Education, Manipal

Outcomes Based Education (OBE) Framework

Two Year full time Postgraduate Program

MSc Anatomy (Medical)

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1. NATURE AND EXTENT OF THE PROGRAM

This two-year postgraduate program in the discipline of human anatomy aims to prepare a competent anatomist with ample knowledge in human gross and clinical anatomy, histology, Embryology, Genetics and basics of imaging. The courses in the program are designed to equip the postgraduate with skills of dissection, basic histological and embalming techniques, research methodologies and pedagogical skills. The program also addresses the ethical aspects which are integral to the profession such as cadaveric ethics, research ethics and bioethics.

The program is structured into 4 semester of 5-6 months each, that culminates in a university examination. Each semester consists of 3-4 courses. M.Sc. Anatomy (Medical) is open for any graduate with biological science stream/combination having 60% of marks in qualifying examination. A successful student of this program is likely to get placement in Medical/dental college or allied health streams or he/she may choose to register for doctoral studies.

2. PROGRAM EDUCATION OBJECTICE (PEO)

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

PEO No	Education Objective
PEO 1	Demonstrate competency in teaching both theory and practical anatomy based on their knowledge and skills of various disciplines of anatomy.
PEO 2	Demonstrate understanding of the framework of code of ethics and legal boundaries applicable to the discipline.
PEO 3	Develop an ability to critically analyze scientific data, draw objective conclusions and apply this knowledge for human welfare.
PEO 4	Practice lifelong learning to meet the advances in professional field by developing interest in multidisciplinary fields.
PEO 5	Exhibit professionalism, communication, inter personal and team skills.

3. GRADUATE ATTRIBUTES:

S No.	Attribute	Description
1	**Disciplinary Knowledge**	Apply the knowledge of the basic sciences and Anatomy in routine practice
2	**Measurable Skills and Industry-ready Professionals**	Acquiring and enhancing the skills so that they can confidently provide ethical, legal and other related guidance to others when in profession.
3	**Effective and Influencing communication**	Well versed in communicating ideas, thoughts and solutions related to the discipline with colleagues and fellow researchers.
4	**Leadership readiness/ Qualities**	Cultivating leadership attributes so that in future they turn out to be able leaders and visionaries.
5	**Critical/ Reflective thinking & language efficiency**	Capable of critical and reflective thinking and be able to translate thoughts to paper.
6	**Technologically Efficient Professional**	Apply knowledge gained in technology to the create teaching learning materials that will help students to easily understand the subject
7	**Ethical Awareness**	Awareness of the ethics pertaining to the discipline and related fields.
8	**Lifelong Learning**	Consistently update themselves with the knowledge, skills, materials and technology pertaining to the discipline.
9	**Research-related Skills**	Apply the knowledge gained to put forth effective research questions and further add to the existing literature.
10	**Cooperation/ Team work**	Building and working as a team with immense cooperation and utmost efficiency.

4. QUALIFICATIONS DESCRIPTORS

Typically, holders of the qualification will be able to:

1. Demonstrate comprehensive knowledge about the basic sciences in general and Anatomy in particular including current research in the field and effectively teach Anatomy
2. Demonstrate knowledge of ethics, legal framework and biomedical waste disposal.
3. Demonstrate skills in teaching practical anatomy and techniques required in the field.
4. Demonstrate team work and professionalism and be a role model.
5. Demonstrate critical thinking, identify existing gaps and mitigate them through research.
6. Publish the results of their study/work undertaken accurately and reliably, and with structured and coherent argument.
7. Identify and address their own learning needs to remain relevant in their chosen profession.

PROGRAM OUTCOMES: After successful completion of MSc in Anatomy (Medical) program, Students will be able to:

PO No	Attribute	Competency
PO 1	**Domain knowledge**	Exhibit comprehensive knowledge about the basic sciences in general and Anatomy in particular including current research in the field and effectively teach Anatomy
PO 2	**Skills and Problem analysis**	Demonstrate skills required to be an efficient guide/ demonstrator/ facilitator in a professional college teaching human anatomy
PO 3	**Communication**	Communicate effectively with peers, seniors, teachers and students
PO 4	**Individual / Team work**	Demonstrate skills in individual capacity and while working in team.
PO 5	**Ethics and professionalism**	Display ethical values, professionalism and be able to work respecting the legal framework
PO 6	**Conduct investigations of complex problems**	Demonstrate ability to critically think, identify gaps and mitigate them through research.
PO 7	**Modern tool usage**	Appraise and apply current scientific information and techniques in Anatomy
PO 8	**Project management and finance**	Display managerial and budgeting skills during project execution
PO 9	**Life-long learning**	Display skills of lifelong learner and continue professional development

FIRST YEAR:

Semester: 1 **Semester: 2**

Subject Code	Subject Title	L	T	P	C	Subject Code	Subject Title	L	T	P	C
MCC 601	Common Core 1 : Basic sciences	3	1	0	**4**	MCC 602	Common Core 2 : Introduction to research	2	2	0	**4**
MAN603	Upper limb and Lower limb	2	2	0	**4**	MAN604	Thorax, abdomen and pelvis-1	2	2	0	**4**
MAN605	General embryology and general histology	2	2	0	**4**	MAN606	Thorax, Abdomen and pelvis-2	1	3	0	**4**
MAN607	Lab 1: Upper and lower limbs	0	0	8	**4**	MAN608	Lab 3: Thorax, Abdomen and pelvis	0	0	8	**4**
MAN609	Lab 2: General embryology and histology	0	0	8	**4**	MEL610	Elective1*	1	1	4	**4**
	Total	**7**	**5**	**16**	**20**			**6**	**8**	**12**	**20**

SECOND YEAR (FINAL YEAR):

Semester: 3 **Semester: 4**

Subject Code	Subject Title	L	T	P	C	Subject Code	Subject Title	L	T	P	C
MAN701	Head and neck -1	2	2	0	**4**	MAN702	Neuroanatomy and Basics of Genetics	2	2	0	**4**
MAN703	Head and neck-2	1	3	0	**4**	MAN704	Lab 6: Neuroanatomy and genetics	0	0	6	3
MAN705	Lab 4: Techniques: Embalming, Museum and	0	0	8	**4**	MAN706	Lab 7: Pedagogy and evaluation skills	0	0	6	3
MAN707	Lab 5: Head and neck	0	0	8	**4**	MAN798	Project	0	0	20	**10**
MEL709	Elective 2*	1	1	4	**4**	----------	----------	--	--	--	----
	Total	**4**	**6**	**20**	**20**		Total	**2**	**2**	**32**	**20**

**Electives are allotted to the students based on their GPA*

**Students cannot opt for electives offered by their parent department.*

**Additional Electives/Courses would be added to the list of electives from time to time as recommended by MSc Academic review committee.*

Name of the Institution / Department: DEPARTMENT OF ANATOMY

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) • Enumerate the components of cardiovascular system and briefly describe the external features of	32

	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	

Special senses	• Describe the Functions and effect of lesions of cerebellum, basal ganglia, Functions of hypothalamus • Describe the Cerebral cortex, functional area, cerebrospinal fluid, EEG, sleep • 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 • Enzymes • Blood glucose regulation & diabetes mellitus	• Brief outline of Classification, properties and structural organization and biomedical significance of Proteins, carbohydrates, lipids and nucleic acids. • Brief account of general characteristics, kinetics and Inhibition of enzymes • Enumerate the hypoglycemic and hyper glycemic hormones with their action in regulation of blood glucose and note on diabetes mellitus	24

• Vitamins & Minerals • Nutrition	• 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

Name of the Institution / Department: DEPARTMENT OF ANATOMY

Name of the Program:	**MSc Anatomy (Medical)**
Course Title:	Upper limb and Lower limb
Course Code: MAN 603	**Course Instructor: Faculty Department of Anatomy**
Academic Year: 2020-2021	**Semester:** First Year, Semester 1
No of Credits: 4	**Prerequisites:** Nil
Synopsis:	This course deals with the gross anatomy of the upper limb and lower limb. Learning this course will help students understand the actions of the muscle on the various limb joints, attachments of these muscle, its innervation, basis of injury to the structures and their clinical manifestations. It also details the vessels in this region and their applied importance.
Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	Describe the normal disposition, clinically relevant interrelationships, functional and cross sectional anatomy of the various structures in the upper and lower limb.
CO 2:	Correlate the effects of injury to a structure with its functional 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											
CO 2	X	X										

Course content and outcomes:

Content	*Competencies*	*No of Hours*
Unit 1: Upper limb		
Pectoral region Back and shoulder Axilla Arm and forearm Hand	• Describe the extent of pectoral region, Cutaneous innervation, muscles of this region and the clavipectoral fascia (2 hrs) C1 • Describe the location, extent, mammary bed, structure, blood supply, lymphatic drainage of Mammary gland. (2 hrs) C1, C2, C3 • Describe the muscles of the back and shoulder, intermuscular spaces and rotator cuff (4 hrs) C1, C2, C3 • Describe the boundaries of axilla and enumerate the contents (2 hr) C1, C2, C3 • Describe the axillary artery, vein and axillary group of lymph nodes (2 hrs) C1, C2, C3 • Describe in detail the brachial plexus along with its applied aspects (2 hrs) C1, C2, C3 • Outline the compartments of the arm and forearm and describe in detail the muscles of both front and back of arm (6 hrs) C1, C2 • Describe the arrangement of structures in palm, the muscles, palmar aponeurosis, carpal tunnel. and	40 hrs

Nerves and vessels Joints Ebryology	fascial spaces of hand and dorsum of hand (3 hrs) C1, C2, C3 • Describe the axillary, musculocutaneous, Ulnar, median, radial nerve along with applied anatomy. (4 hrs) C1, C2, C3, C4 • Describe the Major arteries of upper limb, collateral circulation, anastomosis around scapula and elbow, palmar arches. (4 hrs) C1, C2, C3 • Describe the segmental innervation of skin and muscles, venous and lymphatic drainage of upper limb along with axillary group of lymph nodes (2 hrs) C1, C2, C3 • Describe the Joints of upper limb (Shoulder joint, Wrist joint, radioulnar joints, elbow joint, first carpometacarpal joint) (4 hrs) C1, C2, C3, C4 • Development of upper limb (1 hr) C1, C2	
Unit 2: Lower limb		
Thigh Gluteal region Popliteal fossa Leg Foot Vessels and nerves Joints Embryology	• Describe the Deep fascia, compartments of thigh, muscle groups, their attachments actions, femoral triangle and contents, adductor canal, applied anatomy. (6 hrs) C1, C2, C3, C4 • Describe the Gluteal region muscles, structures under cover of gluteus maximus, arterial anastomoses. (3 hrs) C1, C2, C3 • Describe the Popliteal fossa, anastomoses around knee joint. (2 hr) C1, C2, C3 • Describe the Leg - retinacula, compartments, their contents, actions of muscle groups (4 hrs) C1, C2, C3 • Describe the Dorsum of foot and sole of foot (3 hrs) C1, C2 • Describe in detail the Arches of the foot. (2 hrs) C1, C2, C3 • Describe the Segmental innervation and lymphatic drainage of lower limb, superficial and deep veins, applied aspects, surface anatomy. (4 hrs) C1, C2, C3, C4 • Describe the Vessels of lower limb including collateral circulation and surface anatomy. (5 hrs) C1, C2, C3 • Describe the Nerves of lower limb with applied aspects. (5 hrs) C1, C2, C3, C4 • Describe the Joints of lower limb (Hip joint, Knee joint, Ankle joint tibiofibular joints, subtalar and mid-tarsal joints). (5 hrs) C1, C2, C3, C4 • Describe the Development of lower limb (1 hr) C1, C2	40 hrs

Learning strategies, contact hours and student learning time		
Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	40	120
Tutorials	10	30
Seminar	8	24
Small Group Discussion (SGD)	8	24
Self-directed learning (SDL)	10	10
Case Based Learning (CBL)	4	12
Revision	10	10
Assessment	10	10
TOTAL	**100**	**240**

Assessment Methods:	
Formative:	**Summative:**
Class tests/ Quiz	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				
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 Anatomy Upper limb and lower limb -Vishram Singh 2. Text book of Clinical anatomy- Keith L Moore 3. Text book of clinical anatomy- Neeta kulkarni

Name of the Institution / Department: DEPARTMENT OF ANATOMY

Name of the Program:	**MSc Anatomy (Medical)**
Course Title:	General embryology and general histology
Course Code: MAN 605	**Course Instructor: Faculty Department of Anatomy**
Academic Year: 2020-2021	**Semester:** First Year, Semester 1
No of Credits: 4	**Prerequisites:** Nil
Synopsis:	This course will deal with the microscopic structure of the general tissues and correlation of function with structure of these tissues. It also deals with general developmental process of embryo from conception till third trimester. The students will get an in depth understanding of the human development and will be able to correlate congenital anomalies with stages of development.
Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	Identify the microscopic structure and correlate elementary ultra-structure of various organs and tissues and correlate the structure with the functions as a prerequisite for understanding the altered state in various disease processes
CO 2:	Demonstrate knowledge of the basic principles and sequential development of the organs and systems; recognize the critical stages of development and the effects of common teratogens, genetic mutations and environmental hazards.

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: General Histology		
	• Describe the Microscope- parts, function, working and types (4 hrs) C1, C2 • Describe the microscopic features of the following tissue and correlate its structure with function (36 hrs) C1, C2, C3 1. Epithelia and Connective tissue. 2. Cartilage 3. Bone- TS and LS 4. Nervous tissue. 5. Muscle tissue. 6. Vascular tissue. 7. Lymphatic system. 8. Skin. 9. Glandular tissue, classification. 10. Umbilical cord, placenta.	40
Unit 2: General Embryology		
	• Introduction to general embryology, history, stages of embryo (4 hrs) C1, C2 • Describe the cell division and Gametogenesis- spermatogenesis and oogenesis (4 hrs) C1, C2	40

	• Explain the uterine and ovarian cycle and correlate between the two (3 hrs) C1, C2, C3 • Describe the process of Fertilization, cleavage, morula, blastocysts and twinning. (4 hrs) C1, C2, C3 • Describe the process of Implantation, placenta, formation of amnion, yolk sac, allantois, umbilical cord, extra embryonic coelom. (6 hrs) C1, C2, C3 • Describe the formation and fate of Primitive streak, notochord, neural tube. (4 hrs) C1, C2, C3 • Describe the formation of somites and their importance (2 hrs) C1, C2, C3 • Describe the formation and fate of germ layers, folds of embryo (4 hrs) C1, C2, C3 • Describe the teratogens and its effect on embryo. (4 hrs) C1, C2, C3 • Describe the prenatal diagnostic techniques and their basis (2 hrs) C1, C2, C3 • Describe the principles of contraception and different types of contraceptives. (3 hrs) C1, C2, C3	

Learning strategies, contact hours and student learning time

Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	40	120
Seminar/ tutorials	10	30
Small Group Discussion (SGD)	15	45
Self-directed learning (SDL)	10	10
Case Based Learning (CBL)	5	15
Revision	10	10
Assessment	10	10
TOTAL	**100**	**240**

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				
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 embryology – Langman 2. Text book of embryology – Inderbir singh 3. Text book of embryology- Vishram singh

Name of the Institution / Department: DEPARTMENT OF ANATOMY

Name of the Program:	**MSc Anatomy (Medical)**
Course Title:	Lab 1: Upper and lower limbs
Course Code: MAN 607	**Course Instructor: Faculty Department of Anatomy**
Academic Year: 2020-2021	**Semester:** First Year, Semester 1
No of Credits: 4	**Prerequisites:** Nil
Synopsis:	This course will help students identify and demonstrate the bony land marks of the limbs, various fascial disposition and their modification with functional significance. It also helps students to learn the gross anatomic features within the compartments and their bones, attached muscles, nutrition, actions, nerve supply and related applied anatomy.
Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	To dissect the entire upper and lower limb using appropriate ethical guidelines and be able to demonstrate the muscles, bones, joints, nerves, blood vessels, lymph nodes of the limbs to undergraduate students.
CO 2:	To demonstrate relevant surface markings, normal and abnormal images (X-ray, CT, MRI etc..) and clinical anatomy of the region.

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							
CO 2		X	X	X								

Course content and outcomes:

Content	*Competencies*	*No of Hours*
Unit 1: Lab: Upper limb		
• Introduction • Superficial fascia • Pectoral region	● Awareness of cadaveric ethics, Dissection hall etiquettes, Profession behaviour and general understanding of biomedical waste disposal. • Demonstrate the terms of position, terms of movement. ● Appreciate the structures met in dissection (superficial fascia, blood vessels, nerves, brief note of spinal nerve, deep fascia, note on muscles, joints, bones) of the upper limb. ● Identify the superficial veins of upper limb (cephalic, basilic and median cubital veins). ● Identify the cutaneous nerves of upper limb. ● Appreciate the deep fascia and its modifications in the upper limb. ● Identify the muscles, vessels and nerves of pectoral region. ● Appreciate the attachments and structures piercing the Clavipectoral fascia.	80

• Axilla	● Demonstrate the boundaries and contents of axilla.	
• Back	● Identify the muscles that attach the scapula to the trunk, movements of scapula and the muscles which produce them ● Locate the triangle of auscultation: its boundaries and significance.	
• Shoulder region	● Demonstrate the muscles attaching humerus to the scapula, i.e. deltoid, supraspinatus, infraspinatus, teres minor, teres major, subscapularis: Attachments, nerve supply and actions. ● Demonstrate quadrangular and triangular spaces, their boundaries and structures passing through them. ● Identify the origin, course, branches, and distribution of the axillary nerve.	
• Posterior compartment of the arm	● Demonstrate the attachments, nerve supply and actions of Triceps brachii muscle. ● Describe the origin, course and distribution of the Profunda brachii artery. ● Demonstrate the radial nerve: Origin, course and distribution.	
• Cubital fossa and Front of Arm	● Identify the boundaries and contents of cubital fossa. ● Demonstrate the muscles - biceps, coracobrachialis, brachial is - their attachments, nerve supply and actions. ● Appreciate the extent course and branches of the brachial artery. ● Recognize the Musculocutaneous nerve, its course and distribution. ● Demonstrate the median and ulnar nerves, their course and relations in arm.	
• Front of the forearm	● Identify the cutaneous nerves, superficial & deep flexor muscles (attachments, nerve supply and actions), radial & ulnar arteries (extent, course and branches), median nerve, ulnar nerve, superficial branch of radial nerve (course, branches, distributions and applied anatomy).	
• Hand	● Identify the Cutaneous nerves with area of supply. ● Show the attachments of palmar aponeurosis. ● Demonstrate the flexor retinaculum, its attachments, relations and appreciate the boundaries and contents of the carpal tunnel. ● Identify thenar and hypothenar muscles, lumbricals with their attachments, nerve supply and actions.	

• Extensor compartment of forearm and hand • Joints of upper limb • Surface anatomy	● Demonstrate the situation, formation and branches of the superficial and deep palmar arches. ● Demonstrate the branches and distribution of the Median and Ulnar nerves in hand. ● Demonstrate the superficial & deep extensor muscles (attachments, nerve supply and actions). ● Appreciate the Posterior interossesous artery (extent, course and termination), Posterior interosseous nerve (course, branches, distribution and applied anatomy). ● Identify the cutaneous nerves (area of supply) of the dorsum of hand. ● Identify the attachments and relations of the extensor retinaculum. ● Mention the boundaries of the anatomical snuff box. ● Demonstrate the articular surfaces, ligaments, relations, nerve supply, movements and muscles responsible for each movement of the shoulder, elbow, Radioulnar joints, Wrist joint and joints of hand. ● Identify the bones and appreciate the features of bones of collar, shoulder, arm, forearm, wrist and hand. ● Clavicle, jugular notch, sternal angle, nipple, infraclavicular fossa, axilla, Scapula, spines of vertebra, iliac crest. ● Bones of upper limb, their parts and bony landmarks at places where they are readily palpable and nature of joints between them and movements taking places at these joints.	
Unit 2: Lab: Lower limb		
Thigh Gluteal region	• Appreciate the Deep fascia of thigh and its modifications, note the compartments of thigh, muscle groups, their attachments • Identify the muscles forming the boundaries of femoral triangle and contents • Identify the muscles forming the boundaries of adductor canal and their contents • Identify the muscles of the Gluteus maximus, medius and minimus muscles and their attachments • Appreciate the structures under cover of gluteus maximus and medius with the vessels and nerve related to them	80

Popliteal fossa Leg Foot Vessels and nerves Joints	• Identify the boundaries of the Popliteal fossa and their contents • Identify the compartments of Leg - retinacula, compartments, their contents • Identify the cutaneous nerves supplying the Dorsum of foot and sole of foot • Demonstrate the layer of muscles of the foot • Identify the Arches of the foot and their components • Identification of the origin, course, tributaries and termination of small and great saphenous veins • Identification of the sciatic nerve and their branches in back of thigh, relations of tibial nerve with contents of popliteal vessels, identify the course and branches of tibial and common peroneal nerve • Identify the articular surfaces and ligaments of Joints of lower limb (Hip joint, Knee joint, Ankle joint tibiofibular joints, subtalar and mid-tarsal joints)	

Learning strategies, contact hours and student learning time

Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	----------	---------
Seminar	----------	---------
Small Group Discussion (SGD)	----------	---------
Self-directed learning (SDL)	40	40
Practical	120	240
Revision	10	10
Assessment	10	10
TOTAL	**180**	**300**

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					
Sessional Examination 2	X	X				
Table test/ OSPE	X					
Viva - voce	X	X				
End Semester Examination	X					

Feedback Process	• Mid-Semester feedback

	• End-Semester Feedback
Reference Material	1. Text book of Anatomy – Vishram Singh 2. Cunninghams' practical Anatomy Vol. I 3. Text book of Osteology- Poddar

Name of the Institution / Department: DEPARTMENT OF ANATOMY

Name of the Program:	**MSc Anatomy (Medical)**
Course Title:	Lab 2: General embryology and general histology
Course Code: MAN 609	**Course Instructor: Faculty Department of Anatomy**
Academic Year: 2020-2021	**Semester:** First Year, Semester 1
No of Credits: 4	**Prerequisites:** Nil
Synopsis:	This course will help students to identify and demonstrate the microscopic structure of the general tissues with functions as a prerequisite for understanding the altered state in various disease processes. The students will get an in depth understanding of the human development and will be able to correlate congenital anomalies with stages of development.
Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	Explain the process of development in gestation period: Pre-embryonic period, embryonic period and fetal period and correlate with developmental anomalies using models and charts
CO 2:	Identify under the microscope the different type of epithelium, connective tissue and its different components, tissues of different systems i.e skeletal, muscular, nervous, vascular, lymphatic system and glandular tissue and demonstrate their microscopic features

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: Lab 2: General embryology		
• Demonstration of embryology models	Demonstration of embryology models and charts with explanations of the following; • Stages of spermatogenesis and oogenesis • Structure of Blastocyst • formation of bilaminar embryonic disc • formation of yolk sac and its fate • development and fate of primitive streak • development and fate of notochord • formation and derivatives of neural crest cells and neural tube defects • formation of head, tail and lateral folds and formation of gut • Twining • Placenta and its anomalies	80
Unit 2: Lab 2: General histology		

• Microscope and Epithelia	• Identify different types of epithelia microscopically.	80
• Connective tissue	• Identify different type of connective tissue microscopically.	
• Cartilage	• Identify different types of cartilages microscopically.	
• Bone	• Identify the bone microscopically. • Draw neat labeled diagram for bone TS & LS.	
• Nervous tissue	• Identify different types of myelinated and non-myelinated nerve fibers, Optic nerve, sympathetic and spinal ganglion microscopically. Differentiate between sympathetic and spinal ganglia.	
• Muscle tissue	• Identify different types of muscles microscopically. • Differentiate between types of muscle fibers i.e. smooth, skeletal and cardiac muscles with a neat labeled diagram for each.	
• Vascular system	• Identify different types of blood vessels microscopically. • Differentiate between the types of blood vessels i.e. arteries and veins and their subtypes.	
• Lymphatic system	• Identify different types of spleen, thymus, palatine tonsil, and lymphnode microscopically and differentiate.	
• Skin	• Identify different types of skin microscopically and differentiate between them with respect to each layers.	
• Glandular tissue, classification	• Identify different types of glandular tissue microscopically. Differentiate types of glandular tissue i.e. mucous, serous and mixed salivary glands.	

• Umbilical cord and Placenta	• Identify placenta at term pregnancy and umbilical cord microscopically.	

Learning strategies, contact hours and student learning time		
Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	----------	---------
Seminar	----------	---------
Small Group Discussion (SGD)	-------	----------
Self-directed learning (SDL)	40	40
Practical	120	240
Revision	10	10
Assessment	10	10
TOTAL	**180**	**300**

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. Di Fiore's Histology Atlas – Victor Eroschenko 2. Text book of Histology – Inderbir Singh 3. Text book of embryology – Langman 4. Text book of embryology – Inderbir Singh

Name of the Institution / Department: DEPARTMENT OF ANATOMY

Name of the Program:	**MSc Anatomy (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

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

Name of the Institution / Department: DEPARTMENT OF ANATOMY

Name of the Program:	**MSc Anatomy (Medical)**
Course Title:	Thorax, Abdomen and Pelvis -1
Course Code: MAN 604	**Course Instructor: Faculty Department of Anatomy**
Academic Year: 2020-2021	**Semester:** First Year, Semester 2
No of Credits: 4	**Prerequisites:** Nil
Synopsis:	This course emphasises on the normal disposition of gross structure of thorax, abdomen and pelvis, their relations, blood supply, nerve supply, functions, and their interrelationship in the body. Also, it helps to analyse the integrated functions and locate the gross lesions according to deficits encountered.
Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	•Describe the anatomy of the thoracic, abdominal and pelvic cavity; location, dimensions, external and internal features, relations, blood supply, lymphatic drainage, nerve supply and applied anatomy of the various thoracic, abdominal & pelvic organs.
CO 2:	Apply this knowledge in problem solving to locate the organ involved according to signs and symptoms encountered.

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											
CO 2		X										

Course content and outcomes:

Content	*Competencies*	*No of Hours*
Unit 1: Thorax -1		
• Gross anatomy of the thorax and its contents	• State the extent and surface land marks of the thorax. Enlist the constituents of the thoracic wall. • Describe the anatomy of the thoracic cavity, the pleura, its reflections, the mediastinum, and their applied anatomy. • Describe the location, dimensions, external and internal features, relations, blood supply, lymphatic drainage, nerve supply and applied anatomy of the various thoracic organs. • Mention the attachments, openings, blood supply, nerve supply, development and applied anatomy of the diaphragm. • State the major blood vessels and describe their origin, course, termination, relations, branches/ tributaries and area of supply/drainage. • Describe the cross sectional anatomy of the thorax at various vertebral levels.	25
Unit 2: Abdomen -1		
•Gross anatomy of the abdomen and its contents	• State the extent, surface land marks and regions of the abdomen. • Enlist the constituents of the anterior and posterior abdominal walls and applied aspects. Description of	35

	Anterior abdominal wall- general arrangement of muscles, rectus sheath • Describe the anatomy of the abdominal cavity, Peritoneum, omentum, mesentery, greater and lesser sac with cross sectional anatomy • Describe the location, dimensions, external and internal features, relations, blood supply, lymphatic drainage, nerve supply and applied anatomy of the following organs. 1. Stomach 2. small and large intestines 3. Duodenum 4. Caecum and appendix 5. Pancreas, 6. Liver 7. Gall bladder and extra biliary apparatus 8. spleen 9. Kidney and suprarenal glands • Enlist the major blood vessels and describe their origin, course, termination, relations, branches/tributaries and area of supply/ drainage. 1. Superior and inferior mesenteric vessels 2. portal vein and portocaval anastomosis 3. abdominal aorta and its branches 4. inferior venacava and its tributaries	
Unit 3: Pelvis -1		
Gross anatomy of the pelvis and its contents	● Describe the location, dimensions, external and internal features, relations, supports, blood Supply, lymphatic drainage, nerve supply and applied anatomy of the following pelvic organs. 1. Urinary bladder 2. urethra 3. prostate 4. rectum and anal canal 5. uterus and fallopian tube 6. perineum ●Outline the boundaries and contents of the ischioanal fossa and its clinical relevance. ●Mention the boundaries and contents of the perineal pouches and to list the actions of perineal muscles. ●State the parts of the pelvic diaphragm its attachment and its role in supporting the pelvic viscera.	20

	● Describe the location, branches and distribution of major pelvic vessels and nerves and their clinical implications.	

Learning strategies, contact hours and student learning time		
Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	50	150
Seminar	8	24
Small Group Discussion (SGD)	6	18
Self-directed learning (SDL)	10	10
Case Based Learning (CBL)	6	18
Revision	10	10
Assessment	10	10
TOTAL	**100**	**240**

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 anatomy – Vishram singh, Vol 1 & 2 2. Text book of anatomy – Chaurasia, Vol 1 and 2 3. Snell's Clinical Anatomy 4. Regional & Applied anatomy by R J Last

Name of the Institution / Department: DEPARTMENT OF ANATOMY

Name of the Program:	**MSc Anatomy (Medical)**
Course Title:	Thorax, Abdomen and Pelvis - 2
Course Code: MAN 606	**Course Instructor: Faculty Department of Anatomy**
Academic Year: 2020-2021	**Semester:** First Year, Semester 2
No of Credits: 4	**Prerequisites:** Nil
Synopsis:	This course gives insights into the microscopic structure of thoracic, abdominal and pelvis viscera and correlate the functions as a prerequisite for understanding the altered state in various disease processes. Also, it imparts knowledge about the development of thoracic, abdominal and pelvic viscera along with its congenital anomalies
Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	Describe the histological features of the various organs of thorax, abdomen and pelvis and correlate it with function.
CO 2:	Describe the sequential development of the respiratory, cardiovascular systems, GIT, genitourinary systems and its correlation with the congenital anomalies.

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: Thorax -2		
	• Describe the microscopic features of the trachea and lungs and correlate its structure with function • Describe the development of heart tube, chambers of hearts and septations of heart. Correlate the developmental sequence with related congenital anomalies • Describe the development of arteries, veins and foetal circulation and related congenital anomalies.	15
Unit 2: Abdomen -2		
	• Describe the microscopic features of the following tissue and correlate its structure with function 1. Oesophagus and stomach 2. Duodenum, jejunum, ileum 3. Large intestine and appendix 4. Liver, gall bladder and pancreas 5. Kidney, suprarenal gland, ureter, Testis	40

	Describe and demonstrate the development of the following structures and Correlate the developmental sequence with related congenital anomalies 1. Diaphragm 2. Development of GIT including Liver, Spleen, Gall bladder and Pancreas 3. Development of Urinary system ●Osteology - Lumbar vertebrae ● X-rays and surface marking	
Unit 3: Pelvis -2		
	Describe the microscopic features of the following tissue and correlate its structure with function 1. urinary bladder, epididymis 2. Vas deferens, prostate 3. Ovary, fallopian tube 4. Uterus, placenta Describe and demonstrate the Development of Male and female genital system with major anomalies and Correlate the developmental sequence with related congenital anomalies	25

Learning strategies, contact hours and student learning time

Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	40	120
Seminar	----	----
Small Group Discussion (SGD)	20	60
Self-directed learning (SDL)	10	10
Case Based Learning (CBL)	10	30
Revision	10	10
Assessment	10	10
TOTAL	**100**	**240**

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 Histology by Inder Bir Singh 2. Di Fiore's Histology Atlas – Victor Eroschenko 3. Langmans text book of embryology 4. Text book of embryology- inderbirsingh 5. Text book of osteology- Poddar

Name of the Institution / Department: DEPARTMENT OF ANATOMY

Name of the Program:	**MSc Anatomy (Medical)**
Course Title:	Lab 3: Thorax, Abdomen and Pelvis
Course Code: MAN 608	**Course Instructor: Faculty Department of Anatomy**
Academic Year: 2020-2021	**Semester:** First Year, Semester 2
No of Credits: 4	**Prerequisites:** Nil
Synopsis:	This course emphasises on the demonstration of the disposition of gross structure, microscopic structure and embryological development of structures and organs in the thorax, abdomen and pelvis, their relations, blood supply, nerve supply and their applied importance.
Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	Dissect and demonstrate the anatomy of the thoracic, abdominal and pelvic cavity; location, dimensions, external and internal features, relations, blood supply, lymphatic drainage, nerve supply of the various thoracic, abdominal & pelvic organs
CO 2:	Identify under microscope the histological features of the various organs of thorax, abdomen and pelvis.
CO 3:	Demonstrate in model and charts the sequential development of the respiratory, cardiovascular systems, GIT, genitourinary systems and their related congenital anomalies.
CO 4:	

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								
CO 2		X	X	X								
CO 3		X	X	X								

Course content and outcomes:

Content	*Competencies*	*No of Hours*
Unit 1: Lab: Thorax		
• Dissection and demonstration of thorax and their contents	●Appreciate the extent and surface land marks of the thorax. To identify the structures which constitute the thoracic wall. ●Identify the anatomy of the thoracic cavity, pleura, its reflections and the structures present in the mediastinum. ●Appreciate the location, dimensions, external and internal features, relations, blood supply, lymphatic drainage and nerve supply of heart and lungs. ●Recognize the attachments, openings, blood supply and nerve supply of the diaphragm. ●Identify the major blood vessels -their origin, course, termination, relations, branches/tributaries and area of supply/drainage.	50

	●Appreciate the cross sectional anatomy of the thorax at various vertebral levels. ●Identify the bone(s) and appreciate its parts, features and attachments. ●Identify the radiographs both plain and contrast pertaining to the thorax and identify the structures present in it. ●Demonstrate the surface marking of the various organs and structures of the thoracic cavity.	
Unit 2: Lab: Abdomen		
•Dissection and demonstration of abdomen and their contents	● To identify the extent, surface land marks and regions of the abdomen. ● To recognize the constituents of the anterior and posterior abdominal wall. ● To appreciate the anatomy of the abdominal cavity, peritoneum, its reflections and various spaces in the abdomen. ● To identify the location, dimensions, external and internal features, relations, blood supply, lymphatic drainage and nerve supply of following organs of the abdomen. 1. Stomach 2. small and large intestines 3. Duodenum 4. Caecum and appendix 5. Pancreas, 6. Liver 7. Gall bladder and extra biliary apparatus 8. spleen 9. Kidney and suprarenal glands ● To recognize the major blood vessels and appreciate their origin, course, termination, relations, branches/tributaries and area of supply/ drainage. 1. Superior and inferior mesenteric vessels 2. portal vein and portocaval anastomosis 3. abdominal aorta and its branches 4. inferior venacava and its tributaries ● To identify the bone(s) and appreciate its parts, features and attachments. ● To recognize the radiographs, both plain and contrast pertaining to the abdomen and identify the structures present in it.	80

	● To demonstrate the surface marking of the various organs and structures of the abdominal cavity and planes of the abdomen.	
Unit 3: Lab: Pelvis		
Dissection and demonstration of pelvis and their contents	● Identify the peritoneal investment on pelvic viscera and their clinical implications. ● Demonstrate the location, dimensions, external and internal features, relations, supports, Blood supply, lymphatic drainage, nerve supply of the following pelvic organs. 1. Urinary bladder 2. urethra 3. prostate 4. rectum and anal canal 5. uterus and fallopian tube 6. perineum ● Appreciate the boundaries and contents of the Ischiorectal fossa and perineal pouches ● Locate the parts of the pelvic diaphragm its attachment and its role in supporting the pelvic viscera. ● Demonstrate the location, branches and distribution of major pelvic vessels and nerves and their clinical implications. ● Identify gender of bony pelvis with the emphasis on major sex differences. ● Appreciate radiographs, both plain and contrast pertaining to the pelvis.	30

Learning strategies, contact hours and student learning time

Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	-----	-------
Seminar	------	-------
Small Group Discussion (SGD)	-----	-------
Self-directed learning (SDL)	40	40
Practical	120	240
Revision	10	10
Assessment	10	10
TOTAL	**180**	**300**

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	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	As specified under MAN 604 and MAN 606					

Name of the Institution / Department: DEPARTMENT OF ANATOMY

Name of the Program:	**MSc Anatomy (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	120

	• Name the different types of embedding methods available and to give their applications • 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	120

	• To select an appropriate technique for measuring an analyte based on the requirements	
• MEL 610.5- Serological diagnosis of infectious diseases	• List the different types of serological tests used in diagnosis of infectious diseases and principles of the 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	120
• 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	120

	• 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	
• 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 ANATOMY

Name of the Program:	**MSc Anatomy (Medical)**
Course Title:	Head and neck -1
Course Code: MAN 701	**Course Instructor: Faculty Department of Anatomy**
Academic Year: 2020-2021	**Semester:** Second Year, Semester 3
No of Credits: 4	**Prerequisites:** Nil
Synopsis:	This course give insight into the anatomical details of head and neck structures and helps to correlate the clinical conditions to the anatomical details
Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	•Describe the gross anatomy of the head and neck region and location, dimensions, external and internal features, relations, blood supply, lymphatic drainage, nerve supply and applied anatomy of the various structures located
CO 2:	Apply this knowledge in problem solving to locate the structure involved according to signs and symptoms encountered.

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											
CO 2		X										

Course content and outcomes:

Content	*Competencies*	*No of Hours*
Unit 1: Head -1		
• Scalp	• State the layers, blood supply, nerve supply and applied anatomy	50 hrs
• Face	• To enlist the facial muscles and describe in detail about Orbicularis oculi, Orbicularis oris, Buccinator. • To mention the blood supply of face and describe the origin, course, branches, termination of Facial artery. • To state the venous drainage and nerve supply (motor and sensory innervation) of face. • To mention the lymphatic drainage of face and its applied anatomy. • To describe the lacrimal apparatus and mention the parts, relations, nerve supply of lacrimal gland; lacrimal canaliculi, lacrimal sac, nasolacrimal duct.	
• Cranial cavity- dural folds, dural venous sinuses	• To enlist the meninges and mention about arachnoid villi and granulations. • To describe about dural folds (Falx Cerebri, Falx cerebelli, Tentorium cerebelli, diaphragma sellae) with their attachments.	

• Pituitary gland, blood supply, development and applied anatomy	• To enlist the dural venous sinuses. Define and classify them. And describe their location, boundaries, extent, relations, structures passing through, tributaries, communications and applied anatomy. ● To mention the situation, presenting parts and describe the relations, development, Blood supply, nerve supply and applied anatomy of the pituitary gland. ●To state the boundaries and contents of orbit.	
• Orbit	• To mention the structures passing through the superior and inferior obital fissures ● To describe the fascia bulbi ●To mention the extra ocular muscles and describe their attachments, nerve supply and actions. ●To enlist the nerves of the orbit and describe the Optic nerve, Oculomotor nerve, trochlear nerve, abducent nerve, branches of ophthalmic nerve; Ciliary ganglion. ●To describe the ophthalmic artery and veins.	
• Parotid gland	●To state the coverings of parotid gland, mention the parts and describe the relations and structures passing through the Parotid gland its Nerve supply, Blood supply, lymphatic drainage and Applied anatomy.	
• Infratemporal fossa	●To enlist the boundaries and contents of the infratemporal fossa ●To state the origin and describe the course, relations and branches of mandibular nerve and otic ganglion. ●To mention the origin and describe the course, relations and branches of maxillary artery. ●To enlist the muscles of mastication and describe their attachments and actions. ●To state the articular surfaces and ligaments of temporomandibular joint and describe the relations, blood supply, nerve supply, movements and its applied anatomy.	

• Submandibular region	●To describe the maxillary nerve and its branches and mention the location, relations, connections and branches of pterygopalatine ganglion. ●To mention the origin, insertion, relations, nerve supply of muscles of the region. ● To state the neurovascular structures in the submandibular area. ●To describe the situation, surface marking, parts, relations, duct, blood supply and applied anatomy of submandibular gland, ●To enlist the tracings and connections of submandibular ganglion.	
• Pharynx, Soft palate, Tonsil	●To mention the location, extension, boundaries, parts, blood supply, innervation and applied aspects of the pharynx ●To enlist the structures seen in lateral wall of the nasopharynx and describe the parts, relations and applied aspects of the auditory tube. ●To describe the Palatine tonsil in oropharynx and mention about pharyngeal isthmus and Waldeyer's ring. ●To mention the boundaries and contents of piriform fossa in the laryngopharynx and its importance. ●To enlist the muscles of pharynx and describe their attachments, actions, nerve supply and structures passing between the pharyngeal muscles. ●To describe the muscular components of the soft palate, their action and nerve supply.	
• Nasal cavity and Paranasal air sinuses	●To state the composition, gross features, blood and nerve supply of the medial and lateral walls of the nasal cavity in detail. ●To describe the paranasal sinuses.	
• Tongue	●To state the external features and parts of the tongue and to describe the papillae, muscles of tongue, nerve supply, lymphatic drainage and applied aspects	

• External Ear, Middle ear • Eyeball	●To enlist the parts of the ear and describe about tympanic membrane and middle ear ●To mention in brief about external and internal ear. ●To state the course and relations of facial nerve in relation to middle ear ●To describe the layers, cavities, chambers of eyeball and applied aspects.	
Unit 2: Neck -1		
• Cervical fascia, Posterior triangle • Anterior triangle	• To state the general arrangement of neck structures and describe the deep cervical fascia its layers, attachments, tracings and applied anatomy. • To mention the posterior triangle its boundaries, subdivisions, contents and applied anatomy. • To describe the sternocleidomastoid muscle its origin, insertion, action and applied significance. • To state the boundaries, sub divisions, contents of anterior triangle. • To mention the boundaries and contents of carotid triangle • To describe the carotid sheath; Common carotid artery, internal jugular vein; Ansa cervicalis and their applied anatomy.	30 hrs
• Thyroid and parathyroid glands • Great vessels of the neck	●To describe the situation, extent, coverings, parts, relations, blood supply, innervation and applied aspects of the thyroid gland. ●To state the location and relations of parathyroid glands. ●To mention the origin, course and branches of great vessels like Common carotid artery, External carotid artery, Subclavian artery and Internal jugular vein with its tributaries and applied aspects. ●To state the origin, course, distribution and applied aspects of 9, 10, 11,12th cranial nerves. ●To describe the formation, situation and number of ganglion of the cervical part of the sympathetic chain	

• Larynx	●To mention the salient features of the cartilages, extrinsic and intrinsic membranes & ligaments of larynx, intrinsic muscles, interior of larynx, nerve supply and its applied aspects	

Learning strategies, contact hours and student learning time

Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	44	132
Seminar	8	24
Small Group Discussion (SGD)	10	30
Self-directed learning (SDL)	10	10
Case Based Learning (CBL)	8	24
Revision	10	10
Assessment	10	10
TOTAL	**100**	**240**

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 Anatomy – B.D. Chaurasiya's Human Anatomy Regional and Applied, 5th Edition Vol. III 2. Snell's Clinical Anatomy - Richard Snell 3. Text book of anatomy – Vishram singh Vol III

Name of the Institution / Department: DEPARTMENT OF ANATOMY

Name of the Program:	**MSc Anatomy (Medical)**
Course Title:	Head and neck -2
Course Code: MAN 703	**Course Instructor: Faculty Department of Anatomy**
Academic Year: 2020-2021	**Semester:** Final Year, Semester 3
No of Credits: 4	**Prerequisites:** Nil
Synopsis:	This course imparts demonstration and identification of various microstructural data of the head and neck structures to correlate the microstructure with their functions. Also, this course gives in-depth information on the development of head and neck structures with related anomalies from the developmental basis.
Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	•To describe the histological features of the various tissues of head and neck and Correlate structure with function
CO 2:	•To understand the development of various structures of head and neck and correlate it with relevant congenital anomalies.

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										
CO2	X	X										

Course content and outcomes:

Content	*Competencies*	*No of Hours*
Unit 1: Head -2		
• Eye and ear • Development of the face, nose, palate, Ear, Eyeball	• Describe and correlate the functions with Layers, epithelium and structure of cornea Retina - Layers, functions of all cells, pigment epithelium, retinal detachment. Sclerocorneal junction eyelid lacrimal gland Cochlea • Describe the development of Face and nose • Relate embryonic development to the normal and abnormal structures such as cleft palate, cleft lip, and facial cleft. • Describe the development of Ear and eyeball and relate to the congenital anomalies	40
Unit 2: Neck -2		
• Thyroid and parathyroid glands	• Describe Microstructural details of follicular cells, parafollicular cells, principal and oxyphil cells, functional mechanisms of T3, T4, disorders - hypo and hyper secretion of hormones	40

• Pituitary gland • Tongue, tooth, salivary gland • Development Of pharyngeal arches	• Describe the Histological Difference between Chromophobes and chromophils, cell type's secretion and their functions, hypophyseal portal circulation, common endocrine disorders • Differentiate the Lining epithelium, different types of papillae, taste buds, muscles, glands on the dorsum of tongue, Salivary gland • Describe Histological features of tooth and epiglottis • Describe Derivatives of pharyngeal arches - arch cartilage, arch muscle, arch artery, arch nerve ?¾ Derivatives of Pharyngeal pouches, clefts. • Derivatives arising from ventral wall of pharynx giving rise to tongue and thyroid gland	

Learning strategies, contact hours and student learning time

Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	40	120
Seminar	---	-----
Small Group Discussion (SGD)	20	60
Self-directed learning (SDL)	10	10
Case Based Learning (CBL)	10	30
Revision	10	10
Assessment	10	10
TOTAL	**100**	**240**

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. Di Fiore's Histology Atlas – Victor Eroschenko 2. Histology – Text book of Histology by Inderbirsingh 3. Bailey's text book of histology

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Name of the Institution / Department: DEPARTMENT OF ANATOMY

Name of the Program:	**MSc Anatomy (Medical)**
Course Title:	Lab 4: Techniques: Embalming, Museum and Histology
Course Code: MAN 705	**Course Instructor: Faculty Department of Anatomy**
Academic Year: 2020-2021	**Semester:** Final Year, Semester 3
No of Credits: 4	**Prerequisites:** Nil
Synopsis:	This course will help the students to acquire mastery in dissection skills, preservation of cadavers for teaching programme, tissue preparation, and staining and museum preparation.
Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	• Prepare a stained slide right from the first step of procuring tissue
CO 2:	• Embalm the entire human body using appropriate guidelines keeping in mind the ethical and legal framework of anatomy act
CO 3:	• Dissect the entire human body and mount the same for display in the museum using appropriate guidelines and procedures

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								
CO 2	X	X	X	X	X							
CO 3		X	X	X								

Course content and outcomes:

Content	*Competencies*	*No of Hours*
Unit 1: Lab: Embalming techniques		
	• Procurement and preservation of cadavers by 10% formalin • Preparation of different types of embalming fluid, injection and drainage technique • Methods of embalming • Awareness of ethical and legal guidelines as per anatomy act • Biomedical Waste disposal guidelines	50
Unit 2: Lab: Museum techniques		
	• Steps of mounting the dissected specimens for display in the museum using appropriate guidelines and procedures • Preparing different anatomical models for display in the museum • Knowledge regarding alternate methods of preservation – corrosion cast and plastination	30
Unit 3: Lab: Histology techniques		
	• To explain the procedure to collect the appropriate tissue • To explain the procedure for fixation of tissue using suitable fixatives	80

	• To describe the method of preparation of paraffin blocks, paraffin sections, H & E staining and special staining, mounting using appropriate mounting media • To describe the principles and operation techniques of various instruments	

Learning strategies, contact hours and student learning time		
Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	---	---
Seminar	---	---
Small Group Discussion (SGD)	----	---
Self-directed learning (SDL)	40	40
Practical	120	240
Assessment	20	20
TOTAL	**180**	**300**

Assessment Methods:	
Formative:	**Summative:**
Practical examination	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. Histological techniques by D R Singh 2. Text book for Embalming by M L Ajmani 3. Cunninghams' practical Anatomy Vol. I, III

Name of the Institution / Department: DEPARTMENT OF ANATOMY

Name of the Program:	**MSc Anatomy (Medical)**
Course Title:	Lab 5: Head and Neck
Course Code: MAN 707	**Course Instructor: Faculty Department of Anatomy**
Academic Year: 2020-2021	**Semester:** Final Year, Semester 3
No of Credits: 4	**Prerequisites:** Nil
Synopsis:	
Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	Dissect and identify the structures in Head and neck region
CO 2:	Identify under the microscope the histological features of various tissues of head and neck region
CO 3:	Demonstrate the development of head and neck structures and recognise the congenital anomalies

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									
CO 3		X	X									

Course content and outcomes:

Content	*Competencies*	*No of Hours*
Unit 1: Lab: Head		
• Scalp • Face	• Identify the layers, blood supply, nerve supply of scalp • To identify the muscles - Orbicularis oculi, Orbicularis oris, Buccinator. • To identify and demonstrate the course, branches, termination of Facial vessels on the face. • To recognise the components of lacrimal apparatus: lacrimal gland; lacrimal canaliculi, lacrimal sac, nasolacrimal duct.	80
• Cranial cavity- dural folds, dural venous sinuses • Pituitary gland, blood supply, development and applied anatomy	• To identify the meninges and arachnoid villi and granulations. • To recognize the dural folds (Falx Cerebri, Falx cerebelli, Tentorium cerebelli, diaphragma sellae) with their attachments. • To identify the dural venous sinuses. ● To identify the situation, presenting parts and describe the relations of the pituitary gland.	

• Orbit	●To identify the boundaries and contents of orbit. ●To recognise the extra ocular muscles and their attachments, Optic nerve, Oculomotor nerve, trochlear nerve, abducent nerve, branches of ophthalmic nerve, Ciliary ganglion, ophthalmic artery and veins.	
• Parotid gland	●To demonstrate the borders and surfaces, relations and structures passing through the Parotid gland.	
• Infratemporal fossa	●To appreciate the boundaries and contents of the infratemporal fossa ●To identify the course, relations and branches of mandibular nerve and otic ganglion. ●To identify the origin and describe the course, relations and branches of maxillary artery. ●To identify the muscles of mastication and their attachments ●To appreciate the articular surfaces and ligaments of temporomandibular joint ●To identify the maxillary nerve and its branches and mention the location, relations, connections and branches of pterygopalatine ganglion.	
• Submandibular region	●To mention the origin, insertion, relations, nerve supply of mylohyoid and hyoglossus. ● To appreciate the neurovascular structures in the submandibular area.	
• Pharynx, Soft palate, Tonsil	●To identify the location, extension, boundaries of the pharynx and its structures ●To recognise the boundaries and contents of piriform fossa in the laryngopharynx ●To identify the muscular components of the soft palate,	
• Nasal cavity and Paranasal air sinuses	●To recognise the gross features of the medial and lateral walls of the nasal cavity in detail.	

• Tongue	●To identify the external features and parts of the tongue and to describe the papillae, muscles of tongue	
Unit 2: Lab: Neck		
• Posterior triangle • Anterior triangle • Thyroid and parathyroid glands • Great vessels of the neck • Larynx	• To identify the posterior triangle its boundaries, subdivisions, contents • To identify the sternocleidomastoid muscle its origin, insertion, and relations • To identify the boundaries, sub divisions, contents of anterior triangle. • To identify the carotid sheath and its contents; Common carotid artery, internal jugular vein; Ansa cervicalis ●To identify the situation, extent, parts, relations, blood supply of the thyroid and parathyroid glands. ●To identify the origin, course and branches of great vessels like Common carotid artery, External carotid artery, Subclavian artery and Internal jugular vein with its tributaries ●To identify the situation and the number of ganglion of the cervical part of the sympathetic chain ●To identify the salient features of the cartilages, extrinsic and intrinsic membranes & ligaments of larynx, intrinsic muscles, interior of larynx	50
Histology and Embryology	• Identify under microscope the features cornea, eyelid, Retina, Sclerocorneal junction, lacrimal gland Cochlea • Demonstrate with model and charts the development of Face, nose, palate, lip and anomalies Salivary gland Histology • Identify the slide and Histological features of tongue, tooth, salivary glands, epiglottis, pituitary, thyroid	30

	• Demonstrate the derivatives of pharyngeal arches and tongue, thyroid etc with the help of charts and models	

Learning strategies, contact hours and student learning time		
Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	---	---
Seminar	---	----
Small Group Discussion (SGD)	---	---
Self-directed learning (SDL)	40	40
Practical	120	240
Revision	10	10
Assessment	10	10
TOTAL	**180**	**300**

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			
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	As prescribed for MAN 701, 703 Cunnigham's dissection manual – vol 3

Name of the Institution / Department: DEPARTMENT OF ANATOMY

Name of the Program:	**MSc Anatomy (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	• Acquire knowledge regarding the basic concepts of isolation and identification of Infectious agents from clinical specimen	120

sensitivity testing- conventional & automated methods	• 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	
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 • Assessing the post-thaw competence of spermatozoa - motility and viability assessment	120

	• 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

Name of the Institution / Department: DEPARTMENT OF ANATOMY

Name of the Program:	**MSc Anatomy (Medical)**
Course Title:	Neuroanatomy and Basics of Genetics
Course Code: MAN 702	**Course Instructor: Faculty Department of Anatomy**
Academic Year: 2020-2021	**Semester:** Final Year, Semester 4
No of Credits: 4	**Prerequisites:** Nil
Synopsis:	
Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	Explain the basic structure, connections and functions of the central nervous system and correlate lesion with functional deficits
CO 2:	Describe the principles of karyotyping, basis and features of genetic aberrations.

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: Neuroanatomy		
• Spinal cord • Brainstem • Cerebellum • Ventricles	●Describe the external and internal features of spinal cord, position, spinal segments, relative position of different tracts. ●Elaborate on Ascending and Descending tracts, blood supply, clinical importance. ●Mention external and internal structure of Medulla at different levels of transverse section, cranial nerve nuclei, clinical importance ●State external and internal structure of Pons at different levels of transverse section, cranial nerve nuclei, auditory pathway, clinical importance ●State external and internal features of midbrain, Cranial nerve nuclei, Important Connections, Blood supply, and the clinical importance ●Describe external features and location of Cerebellum, subdivisions, nuclei, connections, function, blood supply, clinical importance ●Mention boundaries, features and situation of 4th ventricle, choroid plexus of 4th ventricle, clinical importance ●Enumerate parts, boundaries of different parts, and describe choroid plexus and choroid fissure, clinical importance of Lateral ventricle. ● Describe boundaries, communications, recesses, choroid plexus and tela choroidea, clinical importance of Third ventricle. CSF formation and its circulation.	60

• Cerebrum	●Mention external features, sulci, gyri and cortical areas of cerebrum, homunculus, insula, blood supply, Discuss the clinical importance ● Classify white matter of cerebrum with examples. Describe Corpus callosum, Association fibres, Corona radiata. Describe Internal capsule in detail with arterial supply and clinical importance ● Define basal nuclei. Enumerate the components. Describe external features and parts of each components. Mention afferent and efferent connections, functions and clinical importance of basal nuclei. ● Define diencephalon. Enlist major subdivisions of diencephalon. State external features and internal features, nuclei, connections, functions, clinical importance of Thalamus. ● Describe Boundaries, subdivisions, connections, functions, clinical importance of Hypothalamus. Subthalamic nucleus, zona incerta, Mention structure, nerve supply, functions, development of pineal body.	
• Blood supply of brain and spinal cord	● Describe the Internal carotid arteries, Vertebral system of arteries, Arterial Circle of Willis, Arterial supply of different surfaces of cerebral hemispheres, venous drainage, and clinical importance.	
Unit 2: Basics of Genetics		
	• Chromosomal structure, types and abnormalities of chromosomes • Karyotyping, sex chromatid, chromosomal abnormalities. • Screening tests for chromosomal disorders • Disorders of chromosomal aberrations • Mode of inheritance, signs and symbols of pedigree analysis • Procedures of genetic counselling	20

Learning strategies, contact hours and student learning time

Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	44	132
Seminar	8	24
Small Group Discussion (SGD)	10	30
Self-directed learning (SDL)	10	10
Case Based Learning (CBL)	8	24
Revision	10	10

Assessment	10	10
TOTAL	**100**	**240**

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					
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. Clinical Neuroanatomy by Richard S Snell 2. Text book of Neuroanatomy – Inderbir Singh 3. Neuroanatomy by Carpenter 4. Text book of genetics – Thompson & Thompson

Name of the Institution / Department: DEPARTMENT OF ANATOMY

Name of the Program:	**MSc Anatomy (Medical)**
Course Title:	LAB 6: Neuroanatomy and Genetics
Course Code: MAN 704	**Course Instructor: Faculty Department of Anatomy**
Academic Year: 2020-2021	**Semester:** Final Year, Semester 4
No of Credits: 3	**Prerequisites:** Nil
Synopsis:	This course emphasises on the dissection of brain and spinal cord, appreciation of different components of nervous system, their blood supply, and details of external and internal organisation of each of the brain structures. This helps to build anatomical explanation for the clinical problems related to the neurological disorders.
Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	Identify the parts and structures related to neuroanatomy
CO 2:	Identify under microscope the histological features of various tissues related to the given region
CO 3:	Interpret and discuss the related embryological models and genetic charts

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								
CO2		X	X	X								
CO3		X	X	X								

Course content and outcomes:

Content	*Competencies*	*No of Hours*
Unit 1: Lab: Neuroanatomy		
	● Identify Different parts of Brain, its situation, membranes and spaces in relation to them. ● Demonstrate external and internal features of spinal cord and its meninges. ● Appreciate the base of the brain with interpeduncular fossa, internal carotid arteries & its branches, Vertebral system & its branches, blood supply of different surfaces of cerebral hemispheres. ● Identify external and internal features of Medulla, pons and midbrain and cranial nerves emerging. ● Identify parts of Cerebellum, its nuclei, and connections. ● Locate and identify the boundaries of 4th ventricle, its different areas and its choroid plexus. ● Appreciate external and internal features of midbrain, Cranial nerves emerging. ● Demonstrate external features, sulci, gyri and cortical areas of cerebrum, blood supply. ● Identify major example of white matter of brain, Corpus callosum, Internal capsule and relationship.	80

	● Study of median sagittal section of cerebrum, Pineal body, Boundaries, recesses and communications of lllrd ventricle ● Identify different parts, boundaries of lateral ventricles ● Appreciate deep dissection of cerebral hemisphere, internal capsule, basal nuclei, and thalamus: its parts and relations, hypothalamus: its parts and relations, Study of Sections-Horizontal & Coronal. • Demonstrate the microscopic structure of the following and correlate the structure with their functions 1. Spinal cord 2. Medulla oblongata 3. Pons 4. Midbrain 5. Cerebral cortex 6. Cerebellar cortex 7. Pineal gland • Demonstrate the development of structures of nervous system and related congenital anomalies • Interpret normal and abnormal images (X-ray, CT and MRI) of brain	
Unit 2: Lab: Genetics		
	• To interpret and discuss the genetic charts	40

Learning strategies, contact hours and student learning time		
Learning strategy	*Contact hours*	*Student learning time (Hrs)*
Lecture	--	--
Seminar	--	--
Small Group Discussion (SGD)	---	----
Self-directed learning (SDL)	40	40
Practical	80	160
Revision	10	10
Assessment	10	10
TOTAL	**140**	**220**

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			
Sessional Examination 1	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. Clinical Neuroanatomy by Richard S Snell 2. Text book of Neuroanatomy – Inderbir Singh 3. Neuroanatomy by Carpenter 4. Text book of genetics – Thompson & Thompson					

Name of the Institution / Department: DEPARTMENT OF ANATOMY

Name of the Program:	**MSc Anatomy (Medical)**
Course Title:	LAB 7: Pedagogy and evaluation skills
Course Code: MAN 706	**Course Instructor: Faculty Department of Anatomy**
Academic Year: 2020-2021	**Semester:** Final Year, Semester 4
No of Credits: 3	**Prerequisites:** Nil
Synopsis:	This course helps students to build on prior learning and develop skills and attitudes; and for educators to devise and present curriculum in a way that is relevant to students, aligning with their needs and cultures. Also, it helps to acquire evaluation skills to make a judgment about the quality or worth of an educational program, or proficiency of a student's attainments.
Course Outcomes (COs):	On successful completion of this course, students will be able to
CO 1:	Compose the learning materials for lectures or demonstrations
CO 2:	Effectively use the various teaching aids and deliver content in a manner that makes it easy for students to understand the subject
CO 3:	Develop communication skills to discuss the subject contents in small group or teams
CO 4:	Acquire skills of assessments that is unbiased and objective and exhibit ethical and professional behaviour
CO 5:	Update knowledge, skill and technology regularly so as to stay relevant with changing times.

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											
CO 2		X										
CO 3			X	X								
CO 4		X			X							
CO 5					X		X		X			

Course content and outcomes:

Content	*Competencies*	*No of Hours*
Unit 1: Lab: Pedogogy and evaluation skills		
	• To acquire skills in teaching by making power point presentation, chalk board and other modalities of teaching available in the institution • Communicate effectively in students and teachers in various teaching – learning activities • Deliver lectures • engage in small group teaching • develop assessment skills • update subject knowledge by participating in discussions, workshop, reading journal, • Update with newer technologies in the field	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)	---	---
Self-directed learning (SDL)	40	40
Practical	80	160
Assessment	10	10
TOTAL	**130**	**210**

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	CO 2	CO 3	CO 4	CO 5	
Sessional Examination 1	X	X	X			
Sessional Examination 2	X	X	X			
Teaching/ evaluation assignments under supervision	X	X	X	X	X	
Microteaching sessions	X	X	X			

Feedback Process	• Mid-Semester feedback • End-Semester Feedback
Reference Material	All reference materials mentioned under various courses/ journals and reading material from internet sources

Name of the Institution / Department: DEPARTMENT OF ANATOMY

Name of the Program:	**MSc Anatomy (Medical)**
Course Title:	Project*
Course Code: MAN 798	**Course Instructor: Faculty Department of Anatomy**
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)*
SDL	100	100
Project work	300	600
Assessment	10	10
TOTAL	**410**	**710**

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	MAN603	Upper limb and Lower limb	4	CO1	CO1 CO2							
3	MAN605	General embryology and general histology	4	CO1 CO2	CO1 CO2							
4	MAN607	Lab 1: Upper and lower limbs	4		CO1 CO2	CO1 CO2	CO1 CO2	CO1				
5	MAN609	Lab 2: General embryology and histology	4		CO1 CO2	CO1 CO2						
6	MCC 602	Common Core 2 : Introduction to research	4	CO1								
7	MAN604	Thorax, abdomen and pelvis-1	4	CO1	CO 2							
8	MAN606	Thorax, Abdomen and pelvis-2	4	CO1 CO2	CO1 CO2							
9	MAN608	Lab 3: Thorax, Abdomen and pelvis	4		CO1 CO2 CO3	CO1 CO2 C03	CO1 CO2 CO3					
10	MEL610	Elective1*	4	CO 1	CO 1	CO 1	CO 1	CO 1				CO 1
11	MAN701	Head and neck -1	4	CO1	CO 2							
12	MAN703	Head and neck-2	4	CO1 CO2	CO1 CO2							
13	MAN705	Lab 4: Techniques: Embalming, Museum and Histology	4	CO1 CO2	CO1 CO2 CO3	CO1 CO2 CO3	CO1 CO2 CO3	CO2		CO1 CO2 CO3		
14	MAN707	Lab 5: Head and neck	4		CO1 CO2 CO3	CO1 CO2 C03	CO1 CO2 CO3					
15	MEL709	Elective 2*	4	CO 1	CO 1	CO 1	CO 1	CO 1				CO 1

16	MAN702	Neuroanatomy and Basics of Genetics	4	CO1 CO2	CO1 CO2							
17	MAN704	Lab 6: Neuroanatomy and genetics	3		CO1 CO2 CO3	CO1 CO2 C03	CO1 CO2 CO3					
18	MAN706	Lab 7: Pedagogy and evaluation skills	3		CO1 CO2 CO3	CO1 CO2	CO1 CO2	CO1 CO2		CO4		CO4
19	MAN798	Project	10	CO1	CO1	CO1	CO1	CO1	CO1	CO1	CO1	CO1