BODY ARCHITECTURE SYLLABUS

GENERAL INFORMATION

Academic year: 2022-2023
First year, second semester
Mandatory
Language: English
Disciplines: Anatomy, Radiology
Credits: 10 Anatomy, 1 Radiology
Associated credits of professionalizing activities*: 1 Radiology, 1 Internal Medicine, 1 Orthopedics

*The introductory professionalizing activity of the second semester of the first year is associated to the course of Body Architecture for organizational and evaluation purposes.

Faculty
Coordinator: Isabella Barajon
Anatomy lectures: Isabella Barajon, Cristina D'Agostino, Armando De Virgilio, Mattia Loppini, Silvia Oldani, Valeriano Vinci
Radiology lectures: Daniela Bernardi, Marco Francone, Letterio Politi
Practical classes (anatomy and radiology): Isabella Barajon, Francesco Colotta, Marco Francone, Letterio Politi, Radiology residents
Basis of Orthopedic examination: Mattia Loppini, Cristina D'Agostino
Basis of Physical examination: Giovanni Capretti, Giovanni Lughezzani
Blood sampling: Barbara Maraggia, Alessandro Rossi, Martina Sena

GENERAL LEARNING GOALS

Knowledge and understanding

This course addresses a) the organization of the human body from the regional point of view, underlining the close relation of the knowledge of anatomy with the clinical practice and b) the development and organization of the central and peripheral nervous system.

The first part of the course is focused on the general anatomical nomenclature and on a morpho-functional approach to the locomotor system as to allow the student a self-guided study of bones, joints and muscles.

In the second part of the course, a clinically oriented approach is used to describe the regional anatomy of the human body: the boundaries and compartments of the body regions will be analyzed as well as the organization of the organs they contain, their relationships, vascularization, and innervation. Special attention will be given to surface anatomy and its relevance for the physical examination. The content of this part of the course builds on the knowledge acquired in the course of Building Bodies and is fundamental for most of the courses of the following years.

The general learning goal of the neuroanatomy module is to provide students, starting from a phylogenetic and developmental perspective, with a basic understanding of the structural organization of the human central nervous system (macroscopic anatomy and internal architecture) and peripheral nervous system. The content of this module is a fundamental prerequisite for the courses of Body at work 1 and 2 of the second year where the pathways and higher functions of the nervous system will be discussed.

The course also includes a module of radiology as part of a living anatomy approach and to introduce students to the basic aspects of this discipline.

An important aspect of the knowledge of anatomy is its relationship to the ability to perform and understand the outcome of the physical examination. For this reason, a learning goal of the course is to introduce students to some basic aspects of this fundamental clinical skills as to provide the foundation for further training that will take place in subsequent years.

Applying knowledge and understanding

By the end of the course students will be able to

- Apply the knowledge of anatomy to the understanding and solution of basic clinical and surgical problems
- Apply the knowledge of anatomy to perform the basic steps of the physical examination
- Apply their knowledge of anatomy to recognize the basic aspects of radiological images

Making judgements; Communication skills; Learning skills.

By the end of the course students will have

- developed some abilities to communicate and work in team
- acquired some learning skills such as study in a group, organize knowledge, revise and retain information, select information.

Important

This syllabus contains all the topics that students need to prepare for the final evaluation.
Not all of them will be necessarily dealt with during the course.

Slides used during the lectures and made available to students are a teaching support. They do not include everything the student needs to know and therefore they are not intended as a substitute of the syllabus or of the textbooks.

TEACHING METHODS

Lectures: the main purpose of lectures is to transfer knowledge to students by guiding them through the most relevant subjects of the disciplines included in the course of Body Architecture Students are expected to participate to lectures in a proactive manner and to take notes as part of the learning process.
All lectures will be held synchronously.

Practical activities: the general purpose of these practicals is to activate and solidify knowledge acquired during lectures and independent study, in a collaborative learning setting.
The class will be divided into 4 groups and each group will be divided in 4 subgroups.
During the activity, students will be asked to recall, identify, recognize, describe, and apply anatomical knowledge following a guideline and/or working on small clinical scenarios/questions.
During the practical classes there will always be a tutor but the activity is not supposed to be a lecture and is based on a positive proactive attitude, effort, and work of students that encourages and supports learning.
Besides the practical classes, the activities of the course intended as collaborative are Problem Based Learning (PBL), and Priority Presenting Problem Portfolio Activities.

Professionalizing activities: the purpose of these activities is to introduce students to the basic elements of the physical examination and the technique of blood sampling based on the anatomical knowledge and the use of checklists. These activities will be tutored by clinicians and nurses. For each of the professionalizing activities students will be divided in 4 groups.

ATTENDANCE

Per regulation, students are expected to attend at least 75% of all scheduled learning activities (lectures and practical classes). Please note that absences due to illness or misadventure will be factored into the 25% of allowable absences.
Students that will fall short of the due attendance will have to undergo to an additional evaluation process to pass the exam (see assessment session of the syllabus).

If the deficiency in attendance is excessive (below 50%), the situation of the student will be reported to the Teaching Council and may entail repetition of the year.

ASSESSMENT OF LEARNING

The Italian university system allows students to take a specific exam multiple times per academic year.
Each exam session requires organizational aspects (e.g. adequate number of rooms and supervisors) and some administrative back-office work.
Students that enroll to the exam but for any reason decide not to participate are therefore kindly asked to inform the Student Office as soon as possible and in any case within 24 hours before the exam session. Students that fall short of this rule will have to skip the next exam session.
It is a student responsibility to be aware of the deadline to enroll to the exams and check if the procedure was successful. Students who are not present on the registration list provided by the Student Office on the day of the exam will not be admitted.

The exam of Body Architecture is divided in two parts

Part 1 consists of a written test
Part 2 consists of an evaluation of the knowledge acquired during the professionalizing activities

Final grade

100% of the final grade is determined by part1
Part 2 consists in a pass or fail evaluation

While part 1 can be taken every time there is an exam date in a session, part 2 can be taken only once in the summer session, once in the autumn session and once in the winter session in a specific date.

The exam will be registered only when both parts have been passed

Part 1 Written test

Duration: 120 minutes

Content: 82 questions. Part I, neuroanatomy (22 qs); Part II, general and regional anatomy (46 qs); Part III, radiology (14 qs)

Questions may include: Multiple choice questions with one or more than one correct answer, True and False questions, Drag and drop onto a background image, Drag and drop into text, Matching, Select missing words, Short answers.
A multiple choice question that has more than one corrects answer will be considered valid only if all the correct answers have been identified.

Evaluation: each question, 0.375 points.

To pass the test you need to answer correctly to at least 48 questions (grade 18/30).
80 correct answers: grade 30
81 or 82 correct answers: grade 30 e lode
A minimum of 11 correct answers in Part I, a minimum of 23 corrects answers in Part II, and a minimum of 7 correct answers in part III is required.

Part 2. Evaluation of the performance of students on the checklists of the physical examinations and blood sampling.

Content: students will be asked to observe images or short videos with segments of the physical examinations (thorax, heart, abdomen, orthopedic) and blood sampling and to show their understanding and knowledge, by being able to:

1) recognize which part of a checklist is shown in the video or image
2) correlate a specific maneuver to its anatomical substrate
3) chose a specific maneuver/part of a checklist

Assessing tool: short answers, MCQs, true or false, ordering, matching
Evaluation: pass or fail.
To pass, at list 70% of the items of the evaluation need to be answered correctly

Measures for students that have not attended 75% of the teaching activities
Besides the evaluation specified above, these students will have to undergo to an additional evaluation to pass the exam: 2 open written questions and an oral exam

Textbooks

Gray's Anatomy for Students
Churchill Livingstone;

Moore & Dalley

Clinically Oriented Anatomy
Lippincott Williams & Wilkins

Treatise of Human Anatomy 5 volumes (Topographic approach, Systematic approach, Atlas)
edi-ermes

Gray's Anatomy The Anatomical Basis Of Clinical Practice
Churchill Livingstone

Available resources provided by the University
Complete Anatomy _3d Anatomy platform Elsevier
Access will be provided to students

SPECIFIC LEARNING GOALS

GENERAL ANATOMY

Topic 1: Introduction and generalities
Learning goals:

- Illustrate the different anatomical approaches to the study of the human body
- Define and demonstrate the following basic terms relative to the anatomical position: medial, median, lateral, proximal, distal, superior, inferior, deep, superficial, palmar, plantar, anterior/ventral, posterior/dorsal, cephalic/cranial, rostral, caudal.
- Describe and identify the body axes and the following basic anatomical planes: axial/transverse/horizontal, sagittal and coronal.
- Define and demonstrate the basic terms used to describe movement: flexion, extension, lateral flexion, pronation, supination, abduction, adduction (radial/ ulnar/deviation), medial/internal and lateral/external rotation, inversion, eversion, plantar flexion, dorsiflexion, protraction, retraction and circumduction.
- Describe and identify the ventral and dorsal body cavities

Topic 2: The musculoskeletal system: bones, joints and skeletal muscles
Learning goals:

- Describe the general structure and classification of the bones, joints and muscles.

- Integrate the knowledge of histology into the macroscopic structure of bones, joints and muscles considered as organs composed by different tissues and with their own vascularization and innervation.
- Illustrate how the various bones and muscles contribute to the general framework and construction of human body
- Describe the anatomical bases of bone, joint and muscle functions
- Describe how joints can link bones and together with muscles permit and/or limit their reciprocal movements
- Describe the connective tissues integrated with bones, joints and muscles.
- Illustrate how to perform a systematic description of bones and muscles
- Illustrate the general principles of biomechanics
- Describe the biomechanical characteristics of the different tissues of the muscular-skeletal system
- Illustrate the biomechanical bases of support and movement

PPP portfolio: Trauma

Topic 3: The integumentary system

Learning goals:

- Define and describe the skin, its appendages and their regional characteristics
- Illustrate the anatomical bases of skin function

PPP portfolio: Rush

Topic 4: The vascular Layout

Learning goals:

- Define the general organization of body vascularization
- Describe systemic and pulmonary vascularization
- Illustrate the deep and superficial arterial and venous supply of the human body
- Illustrate the general organization of lymphatic drainage

REGIONAL/CLINICAL ANATOMY

Topic 1. Head and Neck

Learning goals:

Overview

Students should be able to demonstrate the position of the palpable and imaging landmarks of the major bones of the skull, including the frontal, parietal, temporal, occipital, maxilla, mandible, nasal, sphenoid, zygoma and ethmoid bones. Demonstrate the palpable position of the hyoid

bone, thyroid and cricoid cartilages, lateral mass of the atlas and the spine of C7. Demonstrate the major sutural joints of the skull and describe the fontanelles of the neonatal skull.

- Describe the general architecture of the skull (neurocranium and splanchnocranium)
- Describe the embryological origin of the bones of the skull and their progressive ossification
- Describe the position and main characteristics of the bones of the skull
- Describe the joints of the skull
- Describe the boundaries, walls and floors of the endocranial fossae and exocranial fossae and their communications
- Describe the relationships between the structures of the brain and the anterior, middle and posterior cranial fossae.
- Identify the major foramina of the skull, both internally and externally, and list the structure(s) that each transmits.
- Describe the arrangement of the pia, arachnoid and dura mater within the cranial cavity and in relation to the brain. Describe the reflections of the dura mater and the formation of the venous sinuses.
- Describe the anatomy of the dural venous sinuses. Explain the entrance of cerebral veins into the superior sagittal sinus in relation to subdural haemorrhage. Explain how connections between sinuses and extracranial veins may permit intracranial infection.
- Describe the anatomy of the individual layers ofthe scalp. Describe the significance of its blood supply, particularly in relation to laceration injuries.
- Describe the main muscles of the face and summarise their nerve supply and the consequences of injury to their nerve supply.
- Describe the anatomy of the eyelid, conjunctiva and lacrimal gland. Explain their importance for the maintenance of corneal integrity.
- Describe the boundaries of the orbit, *(the globe of the eye and the location, actions and nerve supply of the intrinsic and extraocular muscles. Explain the consequences of injury to their nerve supply. To be completed in Body at Work1)*
- Describe the bones of the nasal cavity, in particular the major features of the lateral wall of the nasal cavity. Describe the arteries that supply the lateral wall and nasal septum in relation to epistaxis.
- Name the paranasal sinuses. Describe their relationship to the nasal cavity and their sites of drainage through its lateral wall. Explain their innervation in relation to referred pain.
- Describe the intracranial and intrapetrous course of the facial nerve and the relationships of its major branches to the middle ear in relation to damage of the nerve within the facial canal.
- Describe the anatomy of the temporomandibular joint. Explain the movements that occur during mastication and describe the muscles involved and their innervation.

- Describe the course and major branches of the maxillary artery, including the course and intracranial relations of the middle meningeal artery and its significance in extradural haemorrhage.
- Describe the anatomy of the sensory and motor components of the trigeminal nerve, including how their integrity is tested clinically.
- Describe the functional anatomy of the auricle, external auditory meatus, tympanic membrane, auditory ossicles and pharyngotympanic tube. *To be completed in Body at Work 1*
- Describe the anatomy of the parotid, submandibular and sublingual salivary glands, the course of their ducts into the oral cavity and their autonomic secretomotor innervation.
- Describe the boundaries and major features of the oral cavity and summarise its sensory innervation.
- Describe the anatomy of the tongue, including its motor and sensory innervation and the role of its extrinsic and intrinsic muscles. Explain the deviation of the tongue on protrusion following hypoglossal nerve injury.
- Describe the anatomical arrangement of the lymphoid tissue in the pharyngeal and posterior nasal walls.
- Describe the subdivision of the pharynx, Describe the anatomy, function and innervation of the muscles of the pharynx and soft palate. Describe the components of the gag reflex and how they are tested.
- Demonstrate the boundaries of the anterior and posterior triangles of the neck defined by the sternum, clavicle, mandible, mastoid process, trapezius, sternocleidomastoid and the midline.
- In the posterior triangle, demonstrate the position of the spinal accessory nerve, the roots and trunks of the brachial plexus, the phrenic nerve, the external jugular vein and subclavian vessels in relation to penetrating neck trauma.
- In the anterior triangle, demonstrate the position of the common, internal and external carotid arteries, the internal jugular vein and vagus nerve, the trachea, thyroid cartilage, larynx, thyroid and parathyroid glands. Explain their clinical significance in relation to carotid insufficiency, central venous line insertion and emergency airway management.
- Describe the hyoid bone and cartilages of the larynx. Explain how these are linked together by the intrinsic and extrinsic laryngeal membranes.
- Describe the intrinsic and extrinsic laryngeal muscles responsible for closing the laryngeal inlet and controlling vocal cord position and tension.
- Describe the origin, course and functions of the motor and sensory nerve supply of the larynx and the functional consequences of their injury.
- Describe the position and anatomy of the thyroid and parathyroid glands, their blood supply and the significance of the courses of the laryngeal nerves.

- Demonstrate the origin, course and major branches of the common, internal and external carotid arteries and locate the carotid pulse.
- Describe the courses of the accessory, vagus and phrenic nerves in the neck.
- Describe the anatomy of the major structures passing between the neck, and the thorax and the upper limb. Describe the courses and important relationships of the subclavian arteries and veins.
- Describe the anatomy of the motor and sensory nerves to the head and neck and apply this knowledge to a neurological assessment of the cranial and upper cervical spinal nerves.
- Describe the sympathetic innervation of the head and neck including the features and main causes of Horner's syndrome.
- Demonstrate the positions of the external and internal jugular veins and the surface landmarks that are used when inserting a central venous line.
- Describe the anatomy of the major groups of lymph nodes in the head and neck and the potential routes for the spread of infection and malignant disease.
- Interpret standard diagnostic images, e.g. CT, MRI, X-ray and ultrasound of the head and neck, and be able to recognise common abnormalities.

PPP portfolio: Trauma

Topic 2: Back

Learning goals:

Overview. Students should be able to recognise the characteristic features of the vertebral column, including the curvatures of the spine, its osteology, musculature and innervation. They should have sufficient knowledge to be able to perform an examination of the back, understand pathologies, e.g. back pain and whiplash injuries, and to be able to perform procedures such as lumbar puncture.

- Describe the main anatomical features of typical and atypical vertebrae. Identify the atlas, axis, other cervical, thoracic, lumbar, sacral, and coccygeal vertebrae and recognise their characteristic features.
- Describe the anatomy of intervertebral joints. Explain the role of intervertebral discs in weight-bearing, give examples of common disc lesions and how they may compress adjacent neurological structures.
- Describe the regions and functions of the vertebral column. Describe the range of movement of the entire vertebral column and its individual regions. Explain the anatomical bases of common spinal injuries.

- Identify the principal muscles, ligaments and surface features of the vertebral column in order to be able to perform an examination of the back. Discuss their functional roles in stability and movement of the vertebral column.
- Describe the anatomical relationships of the meninges to the spinal cord and dorsal and ventral nerve roots, particularly in relation to root compression and the placement of epidural and spinal injections. Describe the anatomy relevant to performing a lumbar puncture.
- Describe the anatomy of a typical spinal nerve, including its origin from dorsal and ventral spinal roots, its main motor and cutaneous branches and any autonomic component.
- Interpret standard diagnostic images, e.g. CT, MRI, X-ray and ultrasound of the vertebral column.

PPP portfolio: Back pain, Trauma

Topic 3: Thorax

Learning goals:

Overview. Students should be able to appreciate the bony arrangement of the thoracic cavity, the clavicle, sternum and ribs. They should be able to describe and demonstrate the divisions and contents of the mediastinum. They should be familiar with the anatomy of the respiratory and cardiovascular system in the thorax (heart, lungs and great vessels) and the structure of the diaphragm. They should be able to describe the anatomy of the breasts, and the arterial supply, venous and lymphatic drainage and innervation of the thoracic organs and walls of the thoracic cavity.

- Demonstrate the main anatomical features and surface landmarks of the thoracic vertebrae, ribs and sternum.
- Describe the anatomy of the joints between the ribs, vertebrae, costal cartilages and sternum. Explain their contribution to the movements of ventilation.
- Describe the anatomy of the intercostal muscles. Describe a neurovascular bundle in a typical intercostal space and outline the structures its components supply.
- Describe the attachments and relations of the diaphragm and the structures that pass through and behind it. Explain the movements of the diaphragm, its motor and sensory innervation and pleural and peritoneal coverings.
- Explain the movements involved in normal, vigorous and forced ventilation and describe the muscles responsible for these movements.
- Describe the boundaries of the thoracic inlet and outlet and the structures that pass through them and their relations.
- Describe the arrangement and contents of the superior, anterior, middle and posterior parts of the mediastinum.

- Summarise the anatomy of the bronchial tree and bronchopulmonary segments and explain their functional and clinical significance.
- Describe the blood supply, innervation and venous and lymphatic drainage of the lungs. Describe the structures in the hilum of the lung and their relationships to each other and to the mediastinum.
- Demonstrate the surface markings of the heart and great vessels, the margins of the pleura and the lobes and fissures of the lungs and explain their clinical relevance.
- Demonstrate the arrangement of the fibrous and serous layers of the pericardium and relate it to conditions such as cardiac tamponade and pericarditis.
- Describe the origin, course and main branches of the left and right coronary arteries and discuss the functional consequences of their obstruction in conditions such as ischaemic heart disease.
- Identify the major anatomical features of each chamber of the heart and explain their functional significance.
- Demonstrate the surface markings of the heart and the position and site of auscultation of its four major valves.
- Describe the course of the ascending aorta, the arch of the aorta and the descending thoracic aorta. Name their major branches and the structures they supply.
- Describe the origins, courses and relationships of the brachiocephalic veins, inferior and superior venae cavae and the azygos venous system.
- Describe the origin, course and distribution of the vagus and phrenic nerves.
- Describe the distribution and function of the sympathetic chains and thoracic splanchnic nerves. Explain the mechanism of referred pain from T1-5 sympathetic afferents to the chest wall and relate it to the thoracic viscera.
- Describe the course, major relations and neurovascular supply of the oesophagus within the thorax.
- Describe the course and major relations of the thoracic duct. Explain the lymph drainage within the thorax and its clinical significance.
- Describe the anatomy of the breast including its neurovascular supply. Explain the lymphatic drainage of the breast and its clinical relevance to metastatic spread.
- Identify major thoracic structures on standard diagnostic images e.g. CT, MRI, X-ray and ultrasound.

PPP portfolio: Chest pain, Trauma

Topic 4: Abdomen, pelvis and perineum

Abdomen learning goals:

Overview. Students should understand the musculature of the abdominal walls and the structure of the inguinal canal. They should be able to explain the three-dimensional arrangement of the

viscera within the abdominal and the pelvic cavities. They should be able to understand the arrangement of the peritoneum, the greater and lesser sacs and the mesenteries. They should be familiar with the anatomy of the gastrointestinal tract in the abdomen (stomach, duodenum, jejunum, ileum, caecum and colon) and the hepatobiliary system (liver, gallbladder), endocrine system (suprarenal glands and the endocrine components of the pancreas) and the urinary system (kidneys and ureters) and haematopoietic organs (spleen). They should be able to describe the arterial supply, venous and lymphatic drainage and innervation of the abdominal viscera and the abdominal wall.

- Demonstrate the bony and cartilaginous landmarks visible or palpable on abdominal examination and explain their clinical significance.
- Demonstrate the surface projections of the abdominal organs onto the four quadrants and nine descriptive regions of the abdomen.
- Describe the anatomy, innervation and functions of the muscles of the anterior, lateral and posterior abdominal walls. Discuss their functional relationship with the thoracic and pelvic diaphragms and their roles in posture, ventilation and voiding of abdominal/pelvic/thoracic contents.
- Describe the anatomy of the inguinal ligament and inguinal canal in the male and female. Explain the contents of the canal and how inguinal hernias develop, including the anatomy and clinical presentation of such hernias.
- Describe the relationship between the femoral canal and the inguinal ligament and the anatomy of femoral hernias.
- Demonstrate the surface projections of the liver, gallbladder, pancreas, spleen, kidneys, stomach, duodenum, jejunum, ileum. Describe the caecum, appendix, ascending, transverse, descending and sigmoid parts of the colon.
- Describe the organization and clinical significance of the parietal and visceral peritoneum, the greater and lesser sacs, mesenteries and peritoneal ‘ligaments’. Explain the significance of the attachments of the ascending and descending colon to the posterior abdominal wall.
- Describe the functional anatomy of the small and large bowel mesenteries; their structure, location and their vascular, lymphatic and neural contents.
- Explain the nerve supply of the parietal and visceral peritoneum and the role of the visceral peritoneum in referred pain.
- Describe the position and functional anatomy of the stomach, its position, parts, sphincters, vascular, lymphatic and nerve supply and key relations to other abdominal organs.
- Describe the duodenum, its parts, position, secondary retroperitoneal attachment; vascular, lymphatic and nerve supply and key relations to other abdominal organs.

- Describe the regions and positions of the small and large intestine and their vascular, lymphatic and nerve supply. Describe the anatomical variations in the position of the appendix and explain their significance in relation to appendicitis.
- Describe the position and functional anatomy of the liver, its lobes, segments and their key anatomical relations. Explain the peritoneal reflections of the liver and its movement during ventilation. Summarise the functional anatomy of the portal vein, the portal venous system, porto-systemic anastomoses and their significance in portal hypertension.
- Describe the position, functional anatomy and vasculature of the gall bladder and biliary tree; explain their relations in the abdomen and the clinical significance of inflammation of the biliary system and biliary (gall) stones.
- Describe the position and form of the pancreas and its relations to other abdominal organs. Discuss the significance of these relations to pancreatitis and biliary stone disease.
- Describe the position and functional anatomy of the kidneys and ureters. Demonstrate their relations to other abdominal and pelvic structures. Discuss the clinical significance of renal and ureteric anatomy in relation to urinary stones.
- Describe the position and relations of the suprarenal (adrenal) glands and their functional anatomy.
- Describe the anatomy of the spleen, including its position, blood supply, surface markings, relations and peritoneal attachments. Explain the significance of these relations in trauma, chronic infection and haematopoietic disorders.
- Describe the origins, courses and major branches of the abdominal aorta, coeliac axis, superior and inferior mesenteric, renal and gonadal arteries. Describe the clinical significance of the blood supply to the abdomen for example in relation to abdominal aneurysm repair. Describe the origin and course of the inferior vena cava and its major tributaries.
- Describe the anatomy of the lymph nodes draining the abdominal viscera and their significance in relation to metastatic spread.
- Interpret standard diagnostic images, e.g. CT, MRI, X-ray and ultrasound of the abdomen, and recognise common abnormalities.

Pelvis and perineum learning goals:

Overview. Students should be able to appreciate the arrangement of the bony pelvis and describe its sexual dimorphism. They should understand the three-dimensional arrangement of the pelvic cavity, its continuity with the abdominal cavity and its peritoneal relationships. They should be able to understand the structures that support the pelvic viscera, including the muscles of the pelvic diaphragm. They should be familiar with the anatomy of the urinary and gastrointestinal system in the pelvis (ureters, bladder, urethra, rectum and anal canal) and the reproductive system in males (scrotum, testis, vas deferens, seminal vesicles, ejaculatory ducts, prostate, and penis) and females (ovaries, uterine tubes, uterus, cervix, vagina, labia, and clitoris). They should

be able to describe the arterial supply, venous and lymphatic drainage and innervation of the pelvic organs and perineum.

- Describe the skeletal and ligamentous components of the pelvis, the anatomy of the pelvic inlet and outlet and recognize their normal orientation. Explain sexual differences in pelvic skeletal anatomy.
- Demonstrate the palpable anatomical landmarks of the ilium, ischium and pubis.
- Describe the anatomy and functional importance of the pelvic diaphragm, its midline raphe, perineal body, attachment points and the structures passing through it in males and females. Describe the clinical significance of the pelvic diaphragm, e.g. in relation to continence, prolapse and episiotomy.
- Describe the anatomy of the bladder, its base and ureteric openings and its relationship to the overlying peritoneum. Explain how the position of the bladder changes with filling and during pregnancy.
- Describe the anatomy of the urethra; explain the anatomy of its different parts in males and females in relation to continence and catheterization.
- Describe the innervation of the bladder, its sphincters and the mechanism of micturition.
- Describe the anatomy of the scrotum, testis and epididymis and their normal features on clinical examination. Explain the significance of the vascular supply of the testis in relation to torsion and varicocele and the lymphatic drainage in relation to tumor spread.
- Describe the structure and course of the spermatic cord and ductus (vas) deferens.
- Describe the anatomy and relations of the prostate gland and seminal vesicles. Describe the normal form of the prostate when examined per rectum and how this changes in relation to hypertrophy and malignancy.
- Describe the anatomy and relations of the ovary, uterine tubes, uterus, cervix and vagina, including their peritoneal coverings. Describe the changes that occur in the uterus and cervix with pregnancy.
- Describe the origin, course and relations of the ovarian, uterine, vaginal and testicular arteries.
- Describe the anatomy and neurovascular supply of the penis, scrotum, the clitoris, vulva and vagina. Explain the anatomy of the urogenital diaphragm and perineal ‘pouches’.
- Describe the origin, course and distribution of the pudendal nerves and the sites of pudendal nerve block.
- Describe the innervation of and mechanisms involved in the erection of cavernous tissue in males and females and in emission and ejaculation in the male.

- Describe the anatomy, relations and peritoneal coverings of the sigmoid colon, rectum and anal canal. Explain the functional anatomy of puborectalis, the anal sphincters and their role in faecal continence.
- Describe the blood supply and venous drainage of the distal bowel; the supply from superior rectal (from inferior mesenteric), middle rectal (from internal iliac) and inferior rectal arteries (from internal pudendal to anal canal only), and porto-systemic venous anastomoses. Explain the clinical significance of the blood supply and venous drainage of the distal bowel, e.g. in continence, haemorrhoids and anal fissures.
- Describe the anatomy of the ischio-anal fossa and explain its clinical significance, e.g. in relation to abscesses and fissures.
- Describe the lymphatic drainage of the pelvic and perineal organs.
- Interpret standard diagnostic images, e.g. CT, MRI, X-ray and ultrasound of the pelvis and perineum, and recognise common abnormalities.

PPP: Abdominal pain, Pelvic pain, Jaundice

Topic 5: Pectoral and pelvic girdles, upper and lower limb

Upper Limb Learning goals:

Overview. Students should be able to describe the innervation, arterial supply, venous and lymphatic drainage of the structures of the upper limb. They should be able to explain the factors that influence the stability of the joints of the upper limb. They should have a working knowledge of surface anatomy (including the site of major pulse points, e.g. radial), dermatomes and peripheral nerve distribution. They should be aware of the organization of the deep fascia of the upper limb and its clinical relevance to compartment syndromes.

- Describe and demonstrate the main anatomical landmarks of the clavicle, scapula, humerus, radius and ulna. Identify the bones of the wrist and hand and their relative positions, identify those bones that are commonly injured, e.g. scaphoid.
- Describe the neurovascular structures lying in close relation to the bones and joints of the upper limb which are at risk of injury following fracture or dislocation. Predict what the functional effects of such injury might be.
- Describe the origin, course and distribution of the major arteries and their branches that supply the shoulder, arm, forearm and hand in relation to common sites of injury. Explain the importance of anastomoses between the branches. Identify those sites where neurovascular structures are at particular risk of damage from musculoskeletal injuries.
- Demonstrate the sites at which pulses of the brachial, radial and ulnar arteries may be located.

- Describe the course of the main veins of the upper limb and contrast the functions of the deep and superficial veins. Identify the common sites of venous access and describe their key anatomical relations.
- Describe the anatomy of the brachial plexus from its origin in the neck to its terminal branches. Recognise brachial plexus injuries and explain their clinical presentation.
- Describe the origin, course and function of the axillary, radial, musculocutaneous, median and ulnar nerves in the upper limb.
- Name the major muscles and muscle groups that the axillary, radial, musculocutaneous, median and ulnar nerves supply, together with their sensory distribution. Predict the consequences of injury to these nerves and describe how to test their functional integrity.
- Describe the anatomy of the pectoral girdle, explain the movements of the pectoral girdle; identify the muscles and joints responsible for these movements. Name the main attachments and nerve supply of these muscles.
- Describe the factors that contribute to the movement and stability of the gleno-humeral joint and explain the functional and clinical consequences of its dislocation.
- Describe the boundaries and contents of the axilla, including the major vessels and relevant parts of the brachial plexus.
- Describe the anatomy of the axillary lymph nodes and explain their importance in the lymphatic drainage of the breast and skin of the trunk and upper limb and in the spread of tumors.
- Describe the anatomy of the elbow joint. Demonstrate the movements of flexion and extension. Identify the muscles responsible for these movements. Name the main attachments and nerve supply of these muscles.
- Describe the anatomy of the radio-ulnar joints. Explain the movements of supination and pronation; identify the muscles responsible for these movements, name the main attachments and describe the nerve supply of these muscles.
- Describe the anatomy of the wrist. Describe and demonstrate movements at the wrist joints and name and identify the muscle groups responsible for the movements. Describe the relative positions of the tendons, vessels and nerves in the region of the wrist in relation to injuries.
- Name and demonstrate the movements of the fingers and thumb. Describe the position, function and nerve supply of the muscles and tendons involved in these movements, differentiating between those in the forearm and those intrinsic to the hand.
- Describe the main types of grip (power, precision and hook) and the role of the muscles and nerves involved in executing them.
- Describe the position and function of the retinacula of the wrist and the tendon sheaths of the wrist and hand in order to explain carpal tunnel syndrome and the spread of infection in tendon sheaths.

- Describe the anatomical basis of assessment of: cutaneous sensation in the dermatomes of the upper limb, motor function, tendon reflexes, and muscle power in the upper limb. (Discussed in Neuroanatomy Lectures)
- Describe the fascial compartments enclosing the major muscle groups of the upper limb; explain the functional and clinical importance of those compartments and their contents. Introduce the compartment syndrome.
- Interpret standard diagnostic images, e.g. CT, MRI, X-ray and ultrasound of the upper limb, and recognise common abnormalities.

Lower Limb Learning goals:

Overview. Students should be able to describe the innervation, arterial supply, venous and lymphatic drainage of the structures of the lower limb. They should be able to explain the factors that influence the stability of the joints of the lower limb. They should have a working knowledge of surface anatomy (including major pulse points e.g. femoral), dermatomes and peripheral nerve distribution, and the functions of major muscle groups and their innervation in order to perform clinical procedures such as a basic neurological examination of the lower limb and intramuscular injections. They should be aware of the organization of the deep fascia of the lower limb and its clinical relevance to compartment syndromes.

- Describe the osteology and surface landmarks of the pelvis, femur, tibia, fibula and foot. Demonstrate their palpable and imaging landmarks. Explain how the bones, joints and related structures are vulnerable to damage and what the consequences of such damage could be.
- Demonstrate the origin, course and branches of the major arteries that supply the gluteal region, hip, thigh, leg, ankle and foot. Explain the functional significance of anastomoses between branches of these arteries at the hip and knee.
- Demonstrate the locations at which the femoral, popliteal, posterior tibial and dorsalis pedis arterial pulses can be palpated.
- Demonstrate the course of the principal veins of the lower limb. Explain the role of the perforator veins between the superficial and deep veins and the function of the 'muscle pump' for venous return to the heart. Describe the surface landmarks for sites of venous access that can be used for 'cut-down' procedures in emergencies.
- Outline the origin of the lumbosacral plexus and the formation of its major branches.
- Describe the origin, course and function of the femoral, obturator, sciatic, tibial, common fibular (peroneal), sural and saphenous nerves and summarise the muscles and muscle groups that each supplies, as well as their sensory distribution.
- Describe the anatomy of the gluteal region and the course of the sciatic nerve through it. Explain how to avoid damage to the sciatic nerve when giving intramuscular injections.
- Describe the anatomy and movements of the hip joint. Summarise the muscles responsible for these movements, their innervation and attachments.

- Describe the structures responsible for stability of the hip joint.
- Describe the structures at risk from a fracture of the femoral neck or dislocation of the hip and explain the functional consequences of these injuries.
- Describe the boundaries and contents of the femoral triangle with particular regard to arterial blood sampling and catheter placement.
- Describe the anatomy and movements of the knee joint. Summarise the muscles responsible for these movements, their innervation and main attachments.
- Identify the factors responsible for maintaining the stability of the knee joint. Describe the locking mechanism that occurs in full extension. Explain the anatomical basis of tests that assess the integrity of the cruciate ligaments.
- Describe the boundaries and contents of the popliteal fossa.
- Describe the close relations of the knee joint, including major bursae and explain which of these structures may be injured by trauma.
- Describe the anatomy of the ankle and subtalar joints. Explain the movements of plantar flexion, dorsiflexion, inversion and eversion. Summarise the muscles responsible for these movements, their innervation and their attachments.
- Describe the factors responsible for stability of the ankle joint, especially the lateral ligaments, and explain the anatomical basis of 'sprain' injuries.
- Describe the arches of the foot and the bony, ligamentous and muscular factors that maintain them.
- Describe the fascial compartments enclosing the major muscle groups and explain the functional importance of these compartments and their contents in relation to compartment syndrome.
- Describe the anatomical bases (nerve root or peripheral nerve) for loss of movements and reflexes at the knee and ankle resulting from spinal injuries, disc lesions and common peripheral nerve injuries. Describe the dermatomes of the lower limb and perineum that can be used to assess spinal injuries.
- Describe the lymphatic drainage of the lower limb and its relationship to infection and tumour spread.
- Interpret standard diagnostic images, e.g. CT, MRI, X-ray and ultrasound of the lower limb, and recognise common abnormalities.

The content of the regional anatomy lectures that deals with autonomic innervation of viscera, formation of plexuses, course and territory of innervation of peripheral nerves and the clinical implications related to these topics will be complemented by the Neuroanatomy lectures.

NEURONATOMY

Overview. By the end of the module, students should be able to describe the features of development of the nervous system and to understand how and why common malformations occur in the nervous system. They should have gained a good knowledge of the topography and structural organisation of the brain and spinal cord, and of the peripheral nervous system. They should be able to apply this knowledge to the understanding of the clinical outcomes of lesions of the nervous system and of neuroradiological images. They should be able to use this knowledge as a foundation for the topics covered in the course of Body at Work 1.

Topic 1: Phylogenesis and general organization of the Nervous System
Learning goals:

- Describe the phylogenesis of nerve cells and primitive neural circuits
- Describe the process of centralization and cephalization of nerve cells
- Describe the formation of the tubular nervous system and brain vesicles
- Illustrate the general morpho/functional organization of the nervous system in relation to its phylogenesis
- Describe the general organization of the gray and white matter
- List most common neurotransmitters/neuromodulators

Topic 2: Development of the nervous system
Learning goals

- Describe the different phases of neurulation
- *Developmental defects: dysraphism, spina bifida, cyclopia, holoprosencephaly, fetal alcohol spectrum disorders*
- Describe the process of histogenesis in the neural tube
- *Developmental defects: lissencephaly*
- Describe the fundamental cross-sectional organization of the developing neural tube
- Describe the process of myelination
- *Functional drops: development of the most important reflexes*
- Describe the derivatives of the neural crest and the placodes
- *In the clinic: neurocristopathies*
- Describe the fundamental cross-sectional organization of the developing neural tube: the plates
- Describe the development of the spinal nerve and the difference between the somatic and visceral pattern of innervation
- Describe the relation between the development of the spinal cord and somites
- Describe the “ascent” of the spinal cord
- Describe the basic macroscopic events through which the rostral portion of the neural tube undergoes and the formation of the ventricular System

- Describe the development of the brainstem and of the 4th ventricle and compare the composition of the spinal nerves with the composition of the cranial nerves
- Describe the development of the cerebellum
- Illustrate the events that lead to the organization of the gray and white matter in the different portions of the central nervous system: spinal cord, brainstem and brain
- *Developmental defect: medulloblastoma, Arnold-Chiari malformations, Dandy-Walker malformatios, hydrocephalus*
- Describe the development of the diencephalic and telencephalic vesicles
- *Developmental defects: Hydranencephaly, Craniopharyngioma*
- Describe the basic prenatal and postnatal steps characterizing the morpho-functional maturation of the nervous system
- *Developmental defects: lissencephaly*

PPP portfolio: headache

Topic 3: Spinal cord, spinal roots

Learning goals:

- Describe the relation of the spinal cord with the vertebral canal
- Describe the organization of the meninges in the vertebral canal
- Describe the spinal segment, the ventral and dorsal roots and their level of exit
- *In the clinic: spinal roots compression and simple maneuvers for clinical evaluation*
- Describe the meninges, the meningeal spaces and their content
- *In the clinic: vertebral metastases*
- *In the clinic: meningitis, signs and symptoms and some of the maneuvers for clinical evaluation*
- Describe the lumbar cistern and the composition of the cerebrospinal fluid
- *In the clinic: tapping the cerebrospinal fluid*
- Describe the macroscopic aspect of the spinal cord
- Describe the laminar and columnar organization of the gray matter
- Describe the main cell types of the gray matter
- *Functional drops: spinal reflexes*
- Describe the organization of the white matter and the position of the most important ascending and descending pathways

PPP portfolio: back pain

Topic 4: Brainstem and cerebellum

Learning goals:

- Illustrate the content and organization of the posterior cranial fossa
- Describe the organization of the meninges in relation to the suvratentorial and infratentorial compartments of the neurocranium and to the formation of the venous

sinuses

- Describe the innervation of the meninges
- Describe the most important aspects of meningeal vessels
- *Clinical drops: epidural and subdural hemorrhages*
- *Clinical drops: herniations*
- *Clinical drops: meningiomas*
- Describe the internal organization of the brainstem with respect to cranial nerve nuclei, specific nuclei, and ascending and descending pathways
- Highlight the most important anatomical, neurochemical and functional aspects of the reticular formation
- Describe the surface anatomy of the brainstem, the origin of the cranial nerves and their exit points with respect to the skull foramina
- Illustrate the sensory and motor organization of the cranial nerves
- Describe the surface anatomy of the cerebellum and its division in lobes
- Describe the relation of the cerebellum to the brainstem and 4th ventricle
- Describe the morphology of the 4th ventricle and its communications
- Describe the structure of a choroid plexus and the formation and circulation of the cerebrospinal fluid
- *In the clinic: hydrocephalus*
- Illustrate the organization of the cerebellar gray and white matter and introduce the organization of the cerebellar cortex

PPP portfolio: Loss of consciousnees, Altered mental status, Disorders of Mood

Topic 5: Autonomic nervous system

Learning goals

- Describe the general organization of the autonomic nervous system
- Describe the neurochemical organization of the autonomic nervous system
- *Functional drops: fight and flight vs rest and digest*
- Describe the specific organization of the parasympathetic outflow: brainstem nuclei and cranial nerves components, sacral spinal cord and pelvic splanchnic nerves
- Describe the specific organization of the orthosympathetic (sympathetic) outflow: thoracolumbar spinal cord, paravertebral chain, visceral and splanchnic nerves, autonomic plexuses
- Describe the specific organization of the sympathetic and parasympathetic outflow pathways
- Describe the position of viscerosensory neurons and the destiny of viscerosensory fibers
- Introduce and discuss the characteristics of visceral pain
- Explain and describe the anatomical bases for visceral referred pain

- Describe the organization of the enteric nervous system
- *In the clinic: visceral pain*

PPP portfolio: chest pain, pelvic pain, abdominal pain

Topic 6: Telencephalon and diencephalon

Learning goals:

- Discuss the developmental aspect of the prosencephalic vesicle most relevant to understand the organization and reciprocal relationship of the telencephalic hemispheres and diencephalon
- Describe the surface anatomy of the telencephalon and its subdivision in lobes and gyri
- Describe the position of the primary and secondary motor and sensory areas in the lobes and gyri
- Describe the organization of the white matter of the cerebral hemispheres into projecting, association, and commissural fibers
- Describe the organization and topography of the basal ganglia
- *In the clinic: Introduce the concept of cerebral contusion and diffuse axonal injury in response to head trauma*

PPP portfolio: trauma

- Describe the organization of the cerebral cortex with special reference to the neocortex and its layers and cell types
- *In the clinic: disruption of inhibitory circuits in the brain and disease*
- Describe the morphology of the lateral ventricles
- Describe the diencephalon and the third ventricle
- *In the clinic: hydrocephalus*
- Describe the thalamus and its subdivisions and nuclei in relation to their function
- Describe the subthalamus
- Describe the hypothalamus and its most important nuclei in relation to their function

PPP portfolio: obesity, fever

- Describe the position and function of circumventricular organs
- *In the clinic: vomiting*

Topic 7. Peripheral nervous system: spinal plexuses

Learning goals

- Describe the formation of the spinal nerve and the destiny of its terminal and collateral branches
- Illustrate the formation of spinal plexuses
- Describe the origin, composition, and topography of the cervical, brachial, lumbar, sacral, and coccygeal spinal plexuses and their territory of innervation
- Describe the relevant features of the course and territory of innervation of the most

important nerves (collaterals and terminal branches) originating from the plexuses

- *In the clinic: discuss the most relevant functional problems derived from injuries of spinal plexuses*
- *In the clinic: discuss the most relevant functional problems derived from injuries of the main nerves originating from the spinal plexuses*
- Describe the origin, course, and territory of innervation of thoracic nerves

RADIOLOGY

The purpose of this module is to introduce students to the basic concepts of radiology as to highlight the important relationship between the knowledge of anatomy and the ability to understand and interpret medical images in everyday practice.
Furthermore, the inclusion of radiology in a first-year course of anatomy supports and substantiate the learning process of anatomy itself by integrating the living anatomy approach

After explaining the basic principles of image formation and the different techniques used in radiology, a specific lecture will be devoted to the different region of the body underlining the key interpretative elements of normal body structures versus examples of pathological conditions.

Knowledge acquired during these lectures will be integrated in the anatomy practical classes.

Topics and learning goals:

1) **Introduction to radiology**
Students should be able to:
describe pros and cons (together with the underlying general physical principle) of the various radiological techniques utilized in the anatomy modules, namely ultrasound, computed tomography, nuclear medicine techniques and magnetic resonance.

2) Introduction to Radiology of the Brain
Students should be able to:
- Distinguish between xRay of the skull, CT and MRI of the brain
- Identify ventricles
- Distinguish between grey and white matter
- Identify the brainstem, cerebellum, diencephalic and telencephalic structures
- Recognise deep brain nuclei
- Recognise cerebral lobes
- Identify main basal cisterns and cerebral fissures
- Identify main intracranial arteries and veins

***3)* Introduction to Radiology of the Back**

Students should be able to:

- Distinguish between xRay of the spine, CT and MRI of the spine
- Distinguish among cervical, dorsal and lumbar vertebrae
- Identify the vertebral body, pedicles, laminae, spinous and transverse processes, intervertebral joints
- Being able to count the vertebrae on Xray, CT and MRI
- Recognise intervertebral disk
- Identify spinal cord and CSF
- Identify main arterial and venous vessels

***4)* Introduction to Radiology of the Neck**

Students should be able to:

- Distinguish between xRay, CT and MRI of the neck
- Distinguish among buccal cavity, pharynx and larynx
- Identify the different neck spaces
- Recognise the main neck vessels
- Identify neck lymph nodes

***5)* Introduction to radiology of the thorax**

Students should be able to:

- describe how to approach chest x-ray execution and which artefacts may impact the evaluation of cardio-mediastinal anatomy (respiration, over- and under-exposure, patient's rotation).
- Recognize x-ray anatomy of cardio-mediastinal arches and pulmonary lobes both latero-lateral and posterior-anterior projections of chest x-ray.
- Identify pulmonary segments and cardiovascular structures from MR and CT sectional images.

6) Introduction to radiology of abdomen and pelvis

Students should be able to:

- Recognize x-ray anatomy of abdominal structures and significance of air-fluid distribution in normal and pathological conditions
- Recognize abdominal parenchymatous and hollow organs, arterial and venous vascular structures from MR and CT sectional images.

7) Introduction to radiology of upper and lower limb

Students should be able to:

- Recognize x-ray anatomy of upper and lower limbs bones on the various radiological projections.

- Recognize MR and CT sectional images of the bony structures, main ligaments and tendons of the following joints of the upper limbs: shoulder, elbow, wrist and hand.
- Recognize MR and CT sectional images of the bony structures, main ligaments and tendons of the following joints of the lower limbs: hip, knee, ankle and feet.

ANATOMY and Radiology PRACTICAL CLASSES

Practical classes are considered an integral part of the course of Body Architecture. Attendance is mandatory.
Topics:
1) Bones of the skull 2) Back and spinal cord 3) Thorax 4) Abdomen and pelvis 5) Upper limb 6) Lower limb 7) Skull and brain
Organization: see section on “Teaching methods”

PROFESSIONALIZING ACTIVITIES ASSOCIATED TO THE COURSE
Practicals on general and orthopaedic physical examination

These practical activities will introduce students to the basis of the general physical examination (thorax, heart, and abdomen) and of the orthopedic physical examination
Material needed
For the practicals on the bases of the physical examination, a stethoscope is needed.
Organization: see section on “Teaching methods”

Practical on blood sampling

This practical will introduce students to the procedure of blood sampling using manikin training arms .