This booklet contains two sections: the first section serves to inform and assist you in your preparation for lectures and practical as well as giving you an outline of possible questions and what they would require as an answer.

The second section consists of the outline for the course.

PLEASE NOTE: This booklet serves to guide students with regards to approaching the various parts of the human body. Additional information could be added by the lecturer in charge of any topic during lectures, dissections, tutorials or practical. This additional information could be tested in your tests or exams. It is thus your responsibility to attend all sessions in anatomy that is required of you. Please approach a staff member of the School of Anatomical Sciences if you find any error or need clarity on certain aspect of this booklet.
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### B. STUDY COMPONENT: Gross anatomy

**Block 1:**

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1. **COURSE BRIEF**

1.1 Purpose of course

The purpose of this course is to provide knowledge of anatomical sciences and develop multiple skills as a foundation for prospective health care professionals.

1.1.1 Morphological (gross) anatomy

This is a course in morphological anatomy, and consists of regional dissection of most of the human body. Those regions not dissected will be studied by using prosected human specimens. The basic aspects of the central nervous system, head and neck, thorax, abdomen, pelvis, perineum, back, upper and lower limbs will be covered.

1.2. Competencies

This is an outline for morphological anatomy of the competencies a student should be able to fulfil at the end of ANAT2033 & ANAT4013. Specific and comprehensive objectives are provided in this section to direct student learning. The student is expected to know the contents of all gross anatomy lectures, practicals as well as tutorials/problem solving exercises given during the year.

   **Primary Competencies:**
   - Gain an appreciation of general body form and structure.
   - Obtain critical knowledge of anatomical structures / regions.
   - Understand the implications of normal anatomical variations.
   - Gain sufficient structural knowledge to appreciate the anatomical basis of physical examination and pathological conditions.

   **Secondary Competencies:**
   - Develop skills to work in a team within a social and medical context.
   - Cultivate a fundamental ability to integrate anatomical information with clinical data.
   - Develop self-directed and problem-solving learning skills.
   - Acquire dexterity skills.

   **Tertiary Competencies:**
   - Recognise the cadaver as a person with psycho-social, ethical and medical concerns.
   - Integrate the core concepts of life and death.

1.3 Critical course outcomes

- Identifying and solving problems that require decisions involving critical and creative thinking processes.
- Working effectively with others as a member of a team, group, organisation or community.
- Organising and managing oneself and one’s activities responsibly and effectively.
- Collecting, analysing, organising and critically evaluating information.
- Communicating effectively using visual, and language skills in the modes of oral and/or written persuasion.
- Using science and technology effectively and critically, showing responsibility towards the environment and health of others.
2  COURSE OUTLINE
2.1  MORPHOLOGICAL (GROSS) ANATOMY

The aims and objectives of the morphological anatomy component of this course are to give the second year physiotherapy, occupational therapy and honours student a basic understanding of the structure and function of the entire human body. In this section of the course, the students will be introduced to the basic and applied anatomical structure and function of body on macroscopic level. Reference will be made to clinical application in order to highlight the importance of structures. As a result, the student should be able to apply this knowledge to corresponding anatomical structures and provide explanations for relevant clinical scenarios. In general, students are required to identify, name, describe, discuss and provide well labelled diagrams. In addition, students will be required to explain the anatomy underlying specific clinical scenarios. These scenarios are included in the objectives list.

Morphological anatomy will be directed in the regional approach. Each region of the body is studied separately and all aspects, namely the bones, musculature, vasculature, innervation and all other structures and organs located in that region are studied at the same time. The course comprises of lectures, tutorials (including Problem Solving Exercises), practicals and dissection of most areas of the human body and study by means of prospected specimens of those areas not dissected. Attendance at practicals, dissection sessions and tutorials is COMPULSORY and failure to attend these sessions without a valid medical certificate or an acceptable written report will result in the refusal of an SP (Satisfactory Performance) certificate.

ALL OF THE MATERIAL DEALT WITH IN PRACTICAL SESSIONS, DISSECTION, TUTORIALS AND LECTURES WILL BE EXAMINED.

3  TEXTBOOKS
There are a number of anatomy textbooks that can be used to study anatomy. Due to learning objectives set for this course, we recommend that you use the textbooks listed below. **Students are expected to bring their prescribed textbooks with them for practical, tutorial and dissection sessions.**

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A number of prescribed and/or recommended textbooks for the Faculty of Health Sciences are available from: [http://libguides.wits.ac.za/whsl-fhsrecommendedtextbooks](http://libguides.wits.ac.za/whsl-fhsrecommendedtextbooks)

It is however imperative to note that **no cell phones or electronic devices are allowed in the laboratories.**
4 PREPARING FOR LECTURES AND TUTORIALS
Before attending ANY lecture, tutorial, practical or dissection, look through this booklet and your prescribed textbooks for notes and tips on what is important for the session. When studying Anatomy, preparation is the key!

Before attending any anatomy sessions please read through Chapter 1 in the prescribed textbook – Gray’s Anatomy for Students (international version), 3rd edition.

5 STUDYING ANATOMY
Before attempting to study anything in anatomy one must understand that all structures in the human body are three dimensional. When studying anatomy, there are a few basic principles that one needs to understand and apply. One can call these rules; however, as always there are exceptions to these rules. If one knows the rules and remembers the exceptions anatomy becomes easy. Here are some of the rules that can be used:

- Bones (except the hyoid bone) are always connected to each other by joints e.g. the bones of the skull form a unit but are connected by immobile sutures which are a form/type of joint.
- Muscles have their origin proximal to their insertion (there are a number of exceptions here) and always contract towards the origin.
- Arteries, veins and nerves travel together and commonly in sheaths of fascia (neurovascular bundles) and as such are usually named similarly.
- Nerves that travel on or pierce muscles usually supply them.
- Hiltons law: a sensory nerve supplying a joint also supplies the muscles moving the joint and the skin overlying the insertion of these muscles.
- If there is a structure that has the term anterior in its name, there is almost always a similar structure posterior.

There are often terms used in anatomy that have slightly different meanings to those used in English, for example; a triangle in English is a structure with three sides and three corners. When describing / referring to a triangle in anatomy one uses the following criteria:

- Borders / walls: there will be three or four of these and can consist of anything.
- Margin: a boundary, such as the edge of a structure
- An apex: this is the narrowest / sharpest point.
- A base: this is the flat broadest part of the triangle.
- Floor: that part which is posterior / deep to and can be seen inside the borders, it is also closest to the body in most cases and usually consists of muscles or bone.
- Roof: the “surface” opposite the floor usually consisting of fascia or skin and is usually the part furthest from the body.
- Contents: structures that can be seen passing through the triangle but do not form part of the floor; most often consists of blood vessels and nerves.

In this case the anatomical triangle is in fact a three-dimensional pyramid.
6 ANSWERING QUESTIONS

There are two levels of questions and they require different depths of knowledge:

Lower level or superficial questions:

- Define: write down, in the least amount of words, what a term refers to; e.g. a peduncle is defined as a pillar of white fibres (when referring to the cerebral or cerebellar peduncles).
- List: write down a number of structures that fits the criteria given in the question. Order is important; write the most important structure first.
- Classify: how is something subdivided or grouped, usually one needs to give or state criteria; e.g. the classification of the knee joint is a modified synovial hinge.

Higher level questions:

- Explain: how you would go about relaying information to help someone else understand a concept.
- Compare and contrast: look for and give differences and similarities of two things. Always remember, if it is done in a table format the comparable attributes must be in the same row or column.
- Describe: give a factual description of something. This needs to follow a logical order in the case of describing a process. There are many ways to answer such a question.

Other questions:

- Tabulate: this type of question can take two forms:
  - When asked to tabulate information regarding a certain organ or set of organs, it is a simple list of answers with relating information. Examples of this will be given in the next section.
  - When asked to tabulate the differences between two structures or organs you are required to list the features that are to be compared in the first column and state the appearance of each feature in the two structures in separate columns. Be aware that if you swap the structures around you cannot get marks.

- Draw: this can be asked in multiple ways:
  - Draw a fully labelled diagram: draw as anatomically correct as you are able, the structure requested, then write the names of all parts of the structure that can be seen.
  - Draw a line / flow diagram: this entails sequencing of events. The correct order is important.
  - Draw an annotated diagram: this is similar to drawing a fully labelled diagram except that you need to write a paragraph describing what was drawn.
o Explain, with the aid of a well labelled diagram: this requires both an explanation of how you would go about relaying information to help someone else understand a concept, as well as draw (as described above). The drawing usually carries fewer marks than the explanation.

Use a systematic approach and supplement your answers with correct and relevant diagrams wherever possible.

A. Bones
   a. position in the body (vertebrae - region)
   b. classification (long, flat, irregular, etc.)
   c. articulations
   d. side where applicable
   e. borders, surfaces, etc.
   f. special features (tubercles, lines, fossae, foramina, etc.)
   g. muscle attachments (humerus, clavicle, scapula, hip bone, femur)
   h. attachments of ligaments (especially on vertebrae)
   i. attachments of joint capsules

B. Skull
   a. mandible (as above)
   b. cranium
   c. identify separate bones as seen from: norma verticalis (superior view), norma dorsalis (posterior view), norma lateralis (lateral view), and norma frontalis (anterior view)
   d. bones of nasal cavity and paranasal sinuses
   e. bones of orbit
   f. calotte and sutures
   g. some individual bones (e.g., ethmoid, sphenoid, temporal, maxilla)
   h. three cranial fossae
   i. special features
   j. foramina and structures passing through them

C. Joints
   a. classification
   b. bones and articular surfaces involved
   c. capsule
   d. synovial membrane
   e. bursae
   f. intra-articular disc
   g. ligaments
   h. blood supply and nerve supply
   i. movements and the muscles that cause them
j. stability

D. Muscles
a. proximal and distal attachments
b. innervation and action

E. Arteries
a. origin
b. course and relations (limited to adjacent structures)
c. branches (primary) - secondary only in special cases
d. surface markings where possible
e. sheaths (e.g., axillary, carotid, femoral)

F. Veins
a. organ(s) drained
b. course and relations (limited to adjacent structures)
c. tributaries (veins very rarely have branches)
d. end drainage (into which main venous channel or organ does it drain?)
e. surface markings where possible

G. Nerves
a. origin
b. type (cranial nerves - motor, sensory, parasympathetic. mixed)
c. course and relations (limited to adjacent structures)
d. branches and distribution (motor and sensory)
e. surface markings where possible

H. Viscera
a. definition (what is it?) and function (what does it do?)
b. position, shape and size
c. components, borders, surfaces, etc.
d. special features (capsules, ducts, etc.)
e. relations (limited to adjacent structures)
f. arterial supply, venous drainage and lymphatic drainage
g. nerve supply
h. embryology if relevant
i. surface markings if relevant

I. Triangles, fossae, spaces and canals
a. position
b. boundaries / borders including roof and floor (if applicable)
c. recesses where applicable
d. contents
7 CORRECTIONS FOR PRACTICAL ANATOMY

Key:

W = wrong

R = right

X = cross out

Chapter 3: The Pectoral Girdle and Upper Limb

p20: 2nd and 4th lines from the bottom: X 1/M

p21: figure 3.8 is pectoralis minor and 3.9 is serratus anterior

p34: labels on the right of figure 3.22: brachial artery = W median nerve = R, radial nerve = W ulnar nerve = R

p35: 6th line from the top: radius is longer than the ulna = W; radius stretches further distally than the ulna = R

p36: 4th paragraph from top, 3rd last line: attaches to the lateral surface = W medial surface = R

p41: 14th line from the top: lying medial to the nerve = W lateral to the nerve = R

p44: 2nd last line: palmar arch = W palmar branch = R

p51: 12th line from the top: four anterior (palmar) interossei = W three anterior (palmar) interossei = R

p51: figure 3.42: label on the left: flexor carpi radialis and flexor carpi ulnaris are switched around

p53: figure 3.44 A: brachiaradialis = W brachioradialis = R

p53: figure 3.44 B: abductor pollicis = W abductor pollicis longus = R

p55: 3rd last line: posterior interosseus arteries = W posterior metacarpal arteries = R

p56: 3.12.1: 8th line from the top: teres major = W teres minor = R

Chapter 4: The Thorax

p62: 16th line from top: ribs 3 to 10 are called typical ribs = W 3 to 9 are called typical ribs = R

p62: 6th line from the bottom: These faces = W facets = R Page 7 of 18

p63: 5th line from the top: subcostal groove = W costal groove = R. “Subcostal groove” means a groove below the rib whereas these grooves are on the ribs.

p65: 4.1.1: 1st line: costochondral junction = W sternochondral junction = R
Chapter 7: The Pelvic Girdle and Lower Limb

p171: Differences between the male and the female pelvis: Distance between ischial tuberosities is greater in female = R
Distance between ischial spines is greater in female = R
Curvature of sacrum = greater in male = R

p175: 13th line from the bottom: pudendal nerve and internal pudendal artery = R

p178: 9th line from the bottom: obturator externis = W obturator externus = R

p183: 4th line from top: posterior intermuscular septum = W transverse intermuscular septum = R

p184: 3rd line from the top: gastrocnemius/soleus combination is a bipennate muscle = W is a triceps muscle = R (together they are sometimes called triceps surae)

p184: 3rd line from the bottom: compartment of the thigh = W compartment of the leg = R

p189: 9th line from the top: eight bones = W seven bones = R

p193: 5th line from bottom: passes laterally = W passes medially = R

p194: 2nd line from the top: oblique head = W transverse head = R

p204: 7.7.1: 11th line from the top: musculocutaneous nerve = W superficial fibular nerve = R
(one could call it a musculocutaneous nerve, but the term is not commonly used and it could cause confusion)

p205: 13th line from the bottom: musculocutaneous nerve = W deep fibular nerve = R

Chapter 8: The Head and Neck

p223: figure 8.5: transverse cutaneous nerve = W anterior cutaneous nerve of the neck = R or transverse cervical nerve = R

p224: 12th line from the bottom: posteriorly = W inferiorly = R

p227: figure 8.9: hypoglossus muscle = W hyoglossus muscle = R
p237: 11th line from the top: (see figure 8.9 = W see figure 8.8 = R)

p251: 6th line from the top: angle of the arytenoid = W angle of the thyroid = R

p286: box: action of hyoglossus: draws side of the tongue upwards = W draws side of the tongue downwards = R

p323: figure 8.130: nasolacrimal duct = W nasolacrimal duct = R

Chapter 9: Central Nervous System

p379: 12th line from the top: upper triangle = W lower triangle = R
B. STUDY COMPONENT: Gross anatomy

Block 1:
Unit 1.1: Anatomical terminology and bone classification
Unit 1.2: Upper limb & Back

Unit Theme 1.1: ANATOMICAL TERMINOLOGY AND BONE CLASSIFICATION
Capability statement

By completion of this section the student must be able to understand the important anatomical terminology and understand the concepts such as the anatomical position and anatomical planes. The student must be able to name the divisions of the skeleton, give the components of each and additionally be able to classify the bones.

Embedded Knowledge: Anatomical Terminology

The anatomical position is defined as: standing in an upright position facing forward. The arms are at the sides and the palms face forward (the forearms are therefore supinated). The legs are straight and next to each other, similar to standing at attention, with the toes pointing forward. The thumbs face away from the body with a neutral expression on the face.

When a body is in the anatomical position there are a number of planes that can be used to describe certain structures found in the body:

- **Median / mid-sagittal plane (midline):** a vertical plane that divides the body into two equally sized left and right halves (coincides with the sagittal suture of the skull).
- **Para-sagittal plane:** a vertical plane that runs parallel to the median or mid-sagittal plane (literally meaning beside or next to the sagittal plane).
- **Coronal plane:** a vertical plane that divides the body into front and back halves (coincides with the coronal suture of the skull).
- **Transverse / horizontal / axial plane:** a horizontal plane that divides the body into top and bottom portions.

Planes / lines that are used as reference points:

- **Midclavicular lines (MCL):** Two vertical lines running downward from the midpoint on each of the clavicles (collar bones).
- **Midaxillary lines (MAL):** Two vertical lines running parallel to the MCL and downward from the midpoint of each axilla (armpit).
- **Subcostal plane:** a line connecting the most inferior portions of the ribcage anteriorly.
- **Intertubercular plane:** a line that joins the apices of the right and left iliac tubercles (of the hip bones).

The following words are used to describe the position of structures as it would be when the body is in the anatomical position.

- **Anterior:** that which is in the front (ventral)
• **Posterior**: that which is at the back (dorsal)
• **Lateral**: that which is away from the midline of the body (to the sides)
• **Medial**: that which is closer to the midline of the body
• **Superior**: towards the top (above)
• ** Inferior**: towards the bottom (below)
• **Proximal**: closer to a structure’s point of origin
• **Distal**: farther from a structure’s origin

Please note that the layman’s terms (in brackets) only apply to the anatomical position. For example; the head is superior to the neck, which means that when standing in the anatomical position, the head is above the neck. If a person is lying in the supine position (on his/her back) the head is still superior; however, it is no longer above the neck. In other words, according to the anatomical position, the head is ALWAYS SUPERIOR to the neck, even if the person is hanging upside-down.

The following terminology will assist in the understanding of anatomy and facilitate learning.

**Terms related to movement:**
• **Flexion**: the act of decreasing the angle between two structures
• **Extension**: the act of increasing the angle between two structures
• **Abduction**: the act of moving something away from something else (usually away from the midline)
• **Adduction**: the act of moving something towards the midline or axis
• **Circumduction**: a combination of the above four actions

**Other commonly misunderstood terms:**
• **Anatomical/osteological landmark**: a projection or feature that is easily identifiable.
• **Articulation**: a junction between two or more structures that can allow some degree of movement (also called a joint).
• **Innervation**: the nerve supply to a structure.
• **Blood supply**: the arteries (and its branches) that deliver blood to a structure and the veins (and its tributaries) that remove blood from the structure.
• **Relations**: structures lying adjacent to the structure in question are always described with regards to the anatomical position. E.g. the left kidney lies inferior and medial to the spleen. Also note here that if an organ is described in parts each part has its own relations.
• **Clinical significance**: how can this fact be used to diagnose or how does it assist in diagnosing problems.
• **Surface anatomy**: the location of an organ that can be traced without removing the skin. This is done using anatomical landmarks.
Objectives: Anatomical terminology and bone classification

- Anatomical language:
  - What is the anatomical position?
  - What are the terminologies to describe positions?
  - What are the planes of the body?
  - What are the terminologies to describe movements?
  - Name the regions the body is divided into
  - Each of these regions have the following things in common:
    - Consist of a cavity surrounded by walls
    - The cavity contains organs
    - The walls consist of a skeletal framework lined by muscles
      - Except the abdomen
    - The bones and muscles have fascia and fat layers between them
    - All the structures inside as well as around the walls are supplied by arteries, veins and nerves

- The following rules apply to the body as a whole:
  - All arteries either directly or indirectly come from the heart (which is located in the thorax)
  - All veins eventually go to the heart
  - All nerves come from (or go to) the brain or the spinal cord directly, and indirectly all nerves end up in the brain

- Because of the above statements, it is necessary to know that the body regions are connected and each of these connections has a name

- Describe the body cavities under the following headings:
  - Location in relation to the rest of the body
  - The walls of the cavities with regards to components
  - The structures found within the cavity and their relation to each other
  - Connections between the cavity and its relations

- The skeleton is the bony framework of the human body. What is the importance of the bony framework?

- Name the divisions of the skeleton and give the components of each
  - Axial skeleton: skull (cranium and mandible), vertebral column, ribs, sternum and hyoid bone
  - Appendicular skeleton: clavicle, scapula, humerus, radius, ulna, hand and wrist bones, os coxa, femur, tibia, fibula, patella and bones of the foot and ankle

- Bones can be classified according to their appearance
  - Name each of these classifications and give the characteristics of each. Also state examples of each
    - Long bones: consist of a diaphysis with two extremities (i.e. humerus)
- Short bones: bones that are cuboidal in shape (carpals)
- Sesamoid bones (patella)
- Flat bones: consist of two layers of compact bone with spongy bone in between (i.e. skull bones)
- Irregular bones: bones with an irregular shape (i.e. vertebrae)
  - Pneumatic bones: bones that contain air spaces

You should be aware that a single bone can be classified into more than one category

**Study resources**

Gray’s Anatomy for Students (Drake et al.) 3rd Ed.: p2-50
Unit theme 1.2: UPPER LIMB & BACK

Capabilities statement

A detailed understanding of the upper limb is highly important. All the structures in these regions must be studied including the vasculatures and associated nerves. For the muscles in these regions all the attachments (origins and insertions) must be studied as well as the innervation and actions thereof. In addition, you must be able to demonstrate the actions of these muscles on yourself. Injuries to nerves and the consequences of injuries to muscle actions and posture must be studied. The pectoral region and upper limb will be dissected. All the bones in these regions must be studied.

Sub-unit theme 1.2.1: Anterior pectoral region and breast

Embedded knowledge

Students must know and understand the following before studying the sub-unit themes:
- Anatomical terminology
- Histology of muscle, bone and connective tissue
- Embryology of the upper limb

Osteology

- Define and describe all the features of the bones of the pectoral girdle: clavicle and scapula

Muscles

- Study all the muscles of the anterior pectoral region: Pectoralis major, subclavius, pectoralis minor
  - Give their origins and insertions and actions/function
  - Examine the orientation of the muscle fibres and try to work out the possible actions of these muscles
  - Study the muscle attachments of the anterior pectoral region on osteological specimens
  - Identify and define the clavipectoral fascia

Vasculature

- Identify the blood supply to the anterior pectoral region
- Study the blood supply of the breast and recall the multiple routes by which vascular supply and drainage can occur.
- Study the general lymphatic drainage of the breast

Nerves

- Provide the innervation for the muscles of the anterior pectoral region
Surface anatomy
- Define dermatomes and myotomes
  - What is the importance of dermatomes and myotomes?
- Describe the morphology of the breast
  - Give the normal position of the breast on the thoracic wall
  - Note the differences in size and extent of the male and female breasts
  - Study the areola and nipples
    - Take note of the variation in the position of the nipple in different female subjects
  - Draw a diagram to illustrate a cut section of the female breast and identify the duct system

Applied anatomy
- Which nerves are likely to be damaged during this mastectomy? Give reasons?
- What are the common pathologies of the breast (think of cancer/tumours and metastases)?

Study resources
- Gray’s Anatomy for Students (Drake et al.) 3rd Ed. p131; 139-143, 232

Sub-unit theme 1.2.2: Shoulder, posterior scapular region and back (superficial and intermediate)

Embedded knowledge
Students must know and understand the following before studying the sub-unit themes:
- Anatomical terminology
- Histology of muscle, bone and connective tissue
- Embryology of the upper limb
- Osteology of clavicle and scapula

Osteology
- Revise the major features of the clavicle and scapula
- Identify and name the bony landmarks on the proximal end of the humerus

Muscles
- Study the muscles of the shoulder and posterior scapular region (superficial and deep muscles) and give their attachments and actions/function
  - Examine the orientation of the muscle fibres and try to work out the possible actions of these muscles
- Study the superficial muscles of the back and give their attachments, innervation and actions
- Study the intermediate muscles of the back and give their attachments, innervation and actions
- Why are the superficial and intermediate muscles of the back called extrinsic muscles?
Vasculature
- Identify the arteries in the shoulder and posterior scapular region
- Describe the important connections (anastomosis) that they form around the scapula
  - Describe the formation of the arterial anastomosis around the scapula
  - Define an anastomosis and discuss the importance thereof

Nerves
- Identify the innervation of the muscles of the shoulder and posterior scapula region

Surface anatomy
- Identify the boundaries and contents of the
  - Suprascapular foramen, quadrangular space (from posterior) and triangular space, triangular interval
    - You should be able to illustrate these diagrammatically

Applied Anatomy
- Note the dangers of fracture of the proximal humerus
- Study the clinical significance of the spaces / gateways of the posterior scapular region

Study Resources
- Gray’s Anatomy for Students (Drake et al.) 3rd Ed. p702 -721

Sub-unit theme 1.2.3: Axilla (Transitional area)

Embedded knowledge
Students must know and understand the following before studying the sub-unit themes:
- Anatomical terminology
- Histology of muscle, bone and connective tissue
- Embryology of the upper limb
- Anterior and posterior scapular region

Surface anatomy
- What is a transitional area?
- Describe the location of the axilla
- Describe the boundaries of the axilla
- Describe the contents of the axilla

Osteology
- Revise the major features of the clavicle, scapula and proximal end of the humerus

Muscles
- Study the muscles that make up the boundaries of the axilla
Identify and provide the attachments and action/function of these muscles

**Vasculature**
- Identify the following (and pay particular attention to the relationships of):
  - Axillary artery and its branches
  - Axillary vein and tributaries
  - Axillary lymph nodes
- Name and describe the arrangement of the axillary lymph nodes
- Identify the lateral thoracic artery

**Nerves**
- Identify the following (and pay particular attention to the relationships of):
  - Cords and branches of the brachial plexus (the letter 'M' will be helpful in this process)
  - Identify the terminal branches of the brachial plexus and follow them out of the axilla
- Identify the long thoracic nerve

**Applied Anatomy**
- Draw a detailed scheme of the brachial plexus and label it
  - Think about the likely effect of cutting through (transecting) one of the branches of the brachial plexus
  - Consider the implications and clinical signs of damage to each of the parts of the brachial plexus
  - Describe the injuries to brachial plexus and their presentations
- Brachial plexus injuries:
  - Describe and write short notes on the following brachial plexus injuries:
    - Erb's Palsy (an upper trunk injury)
    - Klumpke's Palsy (a lower trunk injury)
  - For each injury, describe the cause, nerve roots affected, affected nerves, presentations due to denervation to the affected muscles
  - Also study the presentations of other injuries to the terminal nerves of the brachial plexus such as median, radial and ulnar nerves

- What is the clinical sign that indicates damage to the long thoracic nerve?

**Study Resources**
- Gray's Anatomy for Students (Drake et al.) 3rd Ed. p721 - 749

Sub-unit theme 1.2.4: Arm (Brachium)
Embedded knowledge
Students must know and understand the following before studying the sub-unit themes:
- Anatomical terminology
- Histology of muscle, bone and connective tissue
- Embryology of the upper limb

**Surface anatomy**
- Describe the muscle compartments of the arm

**Osteology**
- Revise the major features of the proximal end of the humerus
- Study and identify the major bony landmarks of the shaft and distal end of the humerus
- Palpate (feel with your hand) the head of the radius just distal to the lateral epicondyle of the humerus as you rotate the forearm
- Identify the olecranon process and follow the ulna distally to its styloid process

**Muscles**
- Identify and name the muscles in the anterior compartment of the arm
  - What are their attachments and actions?
  - Which joints do these muscles cross?
  - Examine the biceps brachii muscle on your partner. In which movements of the upper limb does it become more prominent?
  - Examine the orientation of the muscle fibres and try to work out the possible actions of these muscles
- The muscle of the posterior compartment of the arm is a triceps muscle
  - Why is it called “triceps”?
    - Examine the orientation of the muscle fibres and try to work out the possible actions of these muscles
  - The long head contributes to the formation of the boundaries of the quadrangular and triangular spaces, which you have seen before
    - Review the boundaries and contents of these spaces now
- Study the muscle attachments of the arm on osteological specimens

**Vascularature**
- Identify the major blood vessels in the brachium
- Study the course of these blood vessels

**Nerves**
- Name the neurovascular structures in the anterior compartment of the arm and give their origins
- Name the neurovascular structures in the posterior aspect of the arm and give their origins
Follow the course of the nerves through the arm to the forearm. Note the relationship of the neurovascular structures to each other

- Describe the motor and sensory innervation of the arm

**Applied Anatomy**

- Describe the importance of the brachial artery in blood pressure measurement

**Study Resources**

- Gray’s Anatomy for Students (Drake et al.) 3rd Ed. p750 -763

**Sub-unit theme 1.2.5: Cubital fossa (Transitional area)**

**Embedded knowledge**

Students must know and understand the following before studying the sub-unit themes:

- Anatomical terminology
- Histology of muscle, bone and connective tissue
- Embryology of the upper limb
- Musculature and neurovasculature of the arm

**Surface anatomy**

- Identify the boundaries of the cubital fossa (including the roof and floor)
- Identify and name the contents in order of their relative positions
- Distinguish between the content of the roof and fossa
- Identify and study the following:
  - Biceps brachii tendon
  - Brachial artery and vein
  - Median nerve
  - Radial nerve

**Osteology**

- Identify the bones and study the landmarks that make up the elbow joint

**Muscles**

- Identify the muscles that form the boundaries of the cubital fossa

**Vasculature**

- Regarding the brachial artery and vein, where does the brachial artery divide into its terminal branches?

**Nerves**

- Describe the course of the following nerves within the cubital fossa:
  - Median nerve
  - Radial nerve
Applied Anatomy

- Which vein is found in the roof of this fossa that may be used for withdrawing blood or administering 'substances' intravenously?
- Attempt to feel your arterial pulse on the medial aspect of the base of the fossa just medial to the tendon of the biceps brachii muscle. This is easier if you extend the elbow joint

Study Resources

- Gray’s Anatomy for Students (Drake et al.) 3rd Ed. p768 -770

Sub-unit theme 1.2.6: Forearm (Antebrachium; extrinsic muscles of the hand)

Embedded knowledge

Students must know and understand the following before studying the sub-unit themes:
- Anatomical terminology
- Histology of muscle, bone and connective tissue
- Embryology of the upper limb

Surface anatomy

- Describe the muscle compartments of the forearm

Osteology

- Examine the radius and ulna of an articulated skeleton or from your bone box. Identify their major features
- Identify the interosseous borders and identify the interosseous membrane in a forearm specimen (future practical). What is the function of this membrane?

Muscles

- Name and identify the muscles of the anterior compartment of the forearm. Also give the attachments and functions
  - These muscles are arranged in three functional groups or in three structural layers
    - Functional groups:
      - Superficial rotator muscles
      - Flexor muscles of the forearm
        - These can also be divided into 3 functional groups:
          - Flexors of the wrist
          - Flexors of the fingers
          - Flexor of the thumb
      - Deep rotator muscles of the forearm
Structural layers
- Superficial layer
- Intermediate layer
- Deep layer

- Name and identify the muscles of the posterior compartment of the forearm, also give the attachments and general functions
  - These muscles are arranged in four functional groups or in two structural layers
    - Functional groups:
      - Extensors of the wrist
      - Extensors of the fingers
      - Extensors of the thumb
      - Abductor of the thumb
    - Structural layers
      - Superficial muscles
      - Deep muscles

- Study the muscle attachments of the forearm on osteological specimens

Vasculature
- There is an arterial anastomosis around the elbow joint
  - You must know about its formation
  - What is the benefit of having such arterial anastomosis?
  - Where have you seen an anastomosis in your previous study?

Nerves
- Give the associated neurovascular structures/bundles of the muscles of the anterior compartment of the forearm
- Give the associated neurovascular structures/bundles of the muscles of the posterior compartment of the forearm
- Neurovascular bundles
  - Identify the median, ulnar and radial nerves and trace them to the wrist
  - Identify the radial and ulnar arteries just distal to the elbow joint and trace them to the wrist
- Describe the motor and sensory innervation of the forearm

Applied Anatomy

Study Resources
- Gray’s Anatomy for Students (Drake et al.) 3rd Ed. p771 -792
Sub-unit theme 1.2.7: Carpal tunnel (Transitional area)

Embedded knowledge

Students must know and understand the following before studying the sub-unit themes:
- Anatomical terminology
- Histology of muscle, bone and connective tissue
- Embryology of the upper limb
- Musculature and neurovasculature of the forearm

Surface anatomy

- What is the name of the tunnel formed by the deep fascia of the wrist (flexor retinaculum) and the anterior concavity of the carpal bones?
- Describe the carpal tunnel and its boundaries
- Name the structures that pass through the carpal tunnel and those that do not
- Which structures pass deep to the flexor retinaculum?
- Which structures pass superficial to the flexor retinaculum?
- Study a cross section of the wrist area with particular attention to the boundaries and contents of the carpal tunnel

Osteology

- Identify the bones of the wrist and hand
- Revise the names of the bones of the wrist and hand. If you look at an articulated hand, you will see that the carpal bones form a concavity that is directed anteriorly.

Muscles

- Identify the muscles that are associated with the carpal tunnel

Vasculation

- Identify the blood vessels that are associated with the carpal tunnel

Nerves

- Identify the nerves that are associated with the carpal tunnel

Applied Anatomy
• What is the consequence of increased pressure (e.g. from accumulated pus) in this tunnel?
• What is carpal tunnel syndrome?
• Which structures are at risk of damage during surgical decompression of the tunnel?

Study Resources

• Gray’s Anatomy for Students (Drake et al.) 3rd Ed. p798-799

Sub-unit theme 1.2.8: Hand (Intrinsic muscles of the hand)

Embedded knowledge

- Anatomical terminology
- Histology of muscle, bone and connective tissue
- Embryology of the upper limb
- Musculature and neurovasculature of the arm and forearm

Surface anatomy

• What is the anatomical snuff box?
  o What are the boundaries thereof?
  o List its contents

Osteology

• Revise the names of the bones of the wrist and hand

Muscles

• The muscles are grouped into flexors, extensors, abductors, adductors, and opposition muscle
• What are the names of the muscles that act on the fingers?

Vasculature

• Identify the superficial and deep palmar arterial arches
  o How are these arches formed?

Nerves

• What is the innervation of the intrinsic muscles of the hand?
• Follow the ulnar and median nerves distal to the wrist
• What is the innervation of the skin of the hand (palmar and dorsal surfaces)? Learn to draw this.
• Describe the motor and sensory innervation of the hand

Applied Anatomy

Study Resources
• Gray’s Anatomy for Students (Drake et al.) 3rd Ed. p792-818

Sub-unit theme 1.2.9: Joints of the upper limb

Embedded knowledge
• Bones are connected to each other at joints
  o What is a joint?
  o Classification of joints:
    ▪ Functional classification – based on the degree of movement allowed at the joint, i.e.:
      • Synarthroses: immovable joints, e.g. fibrous joints
      • Amphiarthroses: slightly movable joints, e.g. cartilaginous joints
      • Diarthroses: freely movable joints, e.g. synovial joints
    ▪ Structural classification: based on the material binding the bones and the absence or presence of a joint cavity, i.e.:
      • Fibrous joints: fibrous connective tissue binds the bones; joint cavity absent
      • Cartilaginous joints: cartilage binds the bones; joint cavity absent
      • Synovial joints: ligaments bind the bones; joint cavity present

NOTE: in naming any type of synovial joint, a full structural classification MUST BE GIVEN, e.g. synovial hinge joint

• All movements occur at a joint. There are specific ways of stating/describing this. For example:
  o Bicep brachii flexes the elbow joint
  o Bicep brachii flexes the forearm at the elbow joint
Learn to use these wordings. Link this to what have been done in the previous lectures by naming the different regions of the body and the joints that connect them.

Note: all joints in human body must be discussed under the following headings
• Names of joint
• Joints classification
  o E.g. Fibrous, cartilaginous and synovial joints
  o Note the differences between structural and functional classifications
• Type of joint
  o E.g. sutural, plane, synovial hinge, pivot, condyloid or ball and socket
  o NOTE: for all synovial joints a FULL classification must be given. This means that both the joint classification and the type must be stated e.g. synovial hinge joint, synovial ball and socket joint, etc.
• Articulating bones
  o You have to be specific e.g. head of humerus articulates with the glenoid cavity/fossa of the scapula
• Articulating surfaces
  o E.g. hyaline cartilage, fibrocartilage or connective tissue
• Joint capsule
  o General attachment
• Synovial membrane
  o General attachment
• Bursae
• Ligaments (intra and extracapsular)
• Movements possible and muscles producing these movements
• Factors stabilising the joint (usually in order of importance)
• Innervation of joint
• Blood supply (anastomoses) of joint

The following joints must be discussed:

• Glenohumeral (shoulder) joint
  o Examine the glenohumeral joint
  o Name the muscles that constitute the group of muscles called the 'rotator cuff' and why are they given this name?
  o Would you say that this is a very stable joint?
    ▪ Classify the features that account for its strength and weakness
  o Which ligaments stabilise the joints?
• Elbow joint (a compound joint)
  o This is compound joint
    ▪ Humeroulnar joint
    ▪ Proximal radioulnar joint
  o State the types of joints present and the articulating bones for each joint
  o What movement of the forearm takes place at the proximal and distal radio-ulnar joints?
- Demonstrate these movements on an articulated skeleton
- Is this movement possible in the lower limb?
  - Why or why not?
    - Which ligaments stabilise the joints?

Use the lecture scheme described above, to study and describe the above-mentioned joints as well as the:

- Distal radioulnar joint
- Wrist joint (radiocarpal joint)
- Joints of the hand and fingers
  - Study the general classification, type, bones, movements and muscles
    - Intercarpal joints
    - Carpometacarpal joints
    - Intermetacarpal joints
    - Metacarpophalangeal joints
    - Interphalangeal joints
  - Study the extensor expansion (hoods)

Remind yourself of the muscles that produce movement at these joints.

Students must be able to demonstrate movements at joints using the bones.

**Study Resources**

- Gray’s Anatomy for Students (Drake et al.) 3rd Ed. p706-711; 764-768; 774-775; 795-797

**GENERAL**

- Describe the arterial blood supply of the upper limb
- Describe the venous drainage of the upper limb
  - Superficial drainage (detail)
  - Deep drainage (general)
- Surface anatomy:
  - Upper limb
  - Anterior pectoral region