BIOLOGY 2011
HUMAN ANATOMY- MSK
"Where one has to work their phalanges to the periosteum!"
2023

COURSE SYLLABUS/LAB MANUAL

BIOLOGY 2011
HUMAN ANATOMY - MSK

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GA's & TA's:	Mariah MacFarlane (GA) Alex Malo (GA) Harrison Chow (TA) MacKenzie Nelson (TA) Antal Kovacs (TA) Elliott De Benetti (TA)
Required Texts:	Principles of Human Anatomy (13e). Author: Tortora & Nielsen (2019) Atlas of Human Anatomy (7e.). Author: Netter (2019)

Mark Breakdown

Lecture:	Topics	Course Weight	Date/Time
MT	Integument, Bones	30%	October 18, 2023 (5:30 pm)
Final	Bones, Muscles, Joints	30%	TBA
Lab:			
Lab Exam 1	Integument, Bones	20%	October 24 & 25, 2023 (7:00 pm)
Lab Exam 2	Joints, Muscles (and bones)	20%	Nov 28 & 29, 2023 (7:00 pm)

Course Description:
Anatomical systems/topics covered are the integumentary, muscular, and skeletal systems as well as arthrology (joints).

General Information: Lectures
Lectures will take place **in person**. ***Any*** material presented in lecture is testable material.

General Information: Lecture Examinations
There are two lecture (MT & Final) exams which will consist of a variety of questions (mostly fill-in-the-blank type (FITB - "Identify"), T/F, MCQ, Multi-Select

(MS) and short answer). The MT and Final exams will be out of approximately 100-200 marks. The MT exam will be written **(in person)** during the lecture time, whereas the final lecture exam will be written **(in person)** during the December Examination period and the date and time are TBA (in early October) by the Registrar's Office.

The MT & Final exams will assess the information covered in lectures and any ASSIGNED readings from the textbook.

General Information: Laboratory

Labs will take place "in person"

General Information: Laboratory Examinations

There will be a total of two LAB exams. The LAB exams will require students to "identify structure labeled A, B, C, etc". Students will have 30 seconds to identify each structure.

If you cannot write an exam on the scheduled day/time, then please contact me in advance via email (donna.newhouse@lakeheadu.ca).

Course and University Policies

The policies set out below are for the students' benefit. These policies are set forth to ensure that all students are treated fairly. Please read thoroughly.

Behavioral standards:

Please refer to the Student Code of Conduct - Academic Integrity.

Netiquette:

Please communicate with me via your Lakehead e-mail account. It is appropriate to address me as Donna or Professor Newhouse. Always use **Biology 2011 FA 2023 in the subject line** of any email you send to me. I will respond to all e-mails in a timely fashion (usually within 24 hours, with the exception of weekends).

Copyright:

Copyright Compliance:

I understand and agree that all instructional, reference, and administrative materials to which I am given access in this course (the "course materials"), whether they consist of text, still or kinetic images, or sound, whether they are in digital or hard copy formats, and in whatever media they are offered, are protected in their entirety by copyright, and that to comply with this copyright and the law

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(2) I am not permitted to download, copy, or store (in any medium) any text, image, or sound component of the course materials for any other purpose whatsoever, or to forward or share, transmit, broadcast, show, post or play in public, adapt, or change in any way any text, image, or sound component of the course materials, except as expressly authorized, and only to the extent authorized, in writing, by the course instructor."

I further understand and agree that, if I infringe the copyright of the course materials in any way, I may be prosecuted under the Lakehead University Student Code of Conduct – Academic Integrity, which requires students to act ethically and with integrity in academic matters and to demonstrate behaviours that support the University's academic values.

Regulations
It is the responsibility of each student registered at Lakehead University to be familiar with, and comply with all the terms, requirements, regulations, policies and conditions in the Lakehead University Academic Calendar. This includes, but is not limited to, Academic Program Requirements, Academic Schedule of Dates, University and Faculty/School Policies and Regulations and the Fees and Refund Policies and Schedules (Lakehead University Regulations webpage, 2020-21).

Academic Integrity
A breach of Academic Integrity is a serious offence. The principle of Academic Integrity, particularly of doing one's own work, documenting properly (including use of quotation marks, appropriate paraphrasing and referencing/citation), collaborating appropriately, and avoiding misrepresentation, is a core principle in university study. Students should view the Student Code of Conduct - Academic Integrity for a full description of academic offences, procedures when Academic Integrity breaches are suspected and sanctions for breaches of Academic Integrity.

Supports for Students – there are many resources available to support students. These include but are not limited to:

- Health and Wellness
- Student Success Centre
- Student Accessibility Centre

- Library
- Lakehead International
- Indigenous Initiatives

Lakehead University is committed to achieving full accessibility for persons with disabilities. Part of this commitment includes arranging academic accommodations for students with disabilities and/or medical conditions to ensure they have an equitable opportunity to participate in all of their academic activities. If you are a student with a disability and think you may need accommodations, you are strongly encouraged to contact Student Accessibility Services (SAS) and register as early as possible. For more information, please contact Student Accessibility Services (SC0003, 343-8047 or sas@lakeheadu.ca).

LABORATORY SCHEDULE 2023

BLOCK 1:

September 12 - October 18	Integument & Bones
October 24 & 25	LAB EXAM #1

BLOCK 2:

October 31 – November 22	Ligaments & Muscles (and some bones)
November 28 & 29	LAB EXAM #2

LECTURE OUTLINE
(Subject to Change)

I. Introduction
- A. Definition of Anatomy
- B. Anatomical Position, Planes, Movements
- C. Organization of the body
  - (1) cells
  - (2) tissues
  - (3) organs
  - (4) organ systems
  - (5) membranes (serous, synovial, mucous, cutaneous)
- C. Anatomical Terminology

II. Tissues and Tissue Types
- A. Tissue Types
  - (1) epithelial
  - (2) connective
  - (3) muscular
  - (4) nervous

III. Integumentary System
- A. Functions of the Skin
- B. Structure of the Skin
- C. Accessory Structures of the Skin
- D. Clinical considerations

IV. Skeletal System (Osseous connective tissue)

A. Skeletal Development and Function
(a) composition and structure of bones
B. Review of Human Bones
(1) axial division
(a) skull (cranium, facial bones)
(b) hyoid bone
(c) trunk (vertebrae, ribs, sternum)
(2) appendicular division
(a) upper (pectoral) appendages
(b) lower (pelvic) appendages
C. Joints
(1) synarthroses
(2) amphiarthroses
(3) diarthroses
(4) types of movement across joints
(5) types of joint injuries

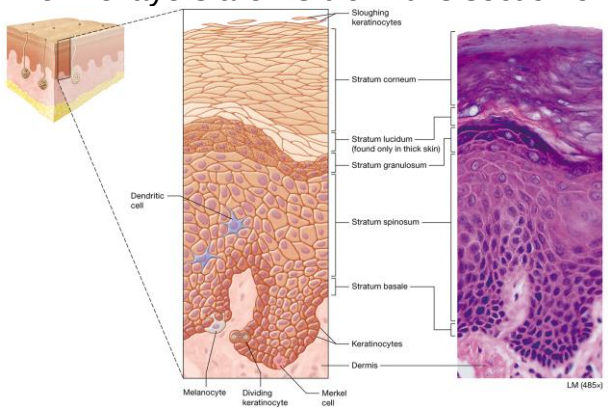
V. Muscular System
A. Muscle Tissue
(1) skeletal (striated)
(2) smooth (unstriated)
(3) cardiac
(4) properties of muscle tissue
(5) functions
(6) structure of skeletal muscles
B. Principle muscles of the body
(1) Muscles of facial expression
(2) Muscles of upper extremity
(a) shoulder joint
(b) muscles moving the shoulder
(c) muscles moving the upper arm
(d) muscles moving the lower arm
(e) muscles which move the hand
(f) muscles which move the fingers and thumb (forearm/hand)
(3) Muscles of the lower extremity
(a) hip joint
(b) muscles which move the thigh
(c) muscles which move the lower leg
(d) muscles which move the foot and toes
(4) Muscles of the abdominal wall
(5) Muscles that move the head and spine
(6) Muscles of the pelvic floor
(7) Muscles which move the chest wall

LABORATORY OUTLINE
SKELETAL SYSTEM AND JOINTS

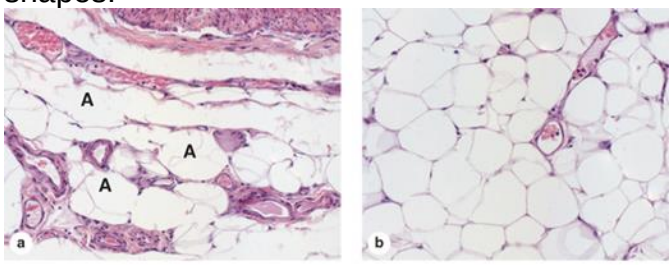
The following is a list of the bones and their parts that you are required to know for lab. (There may be additional structures that you should know from diagrams for lecture tests). Please note that you should also be able to tell if major bones are from the right or left side, which end is proximal or distal and with which bone(s) they articulate.

Histology: You are responsible for the following slides/images:

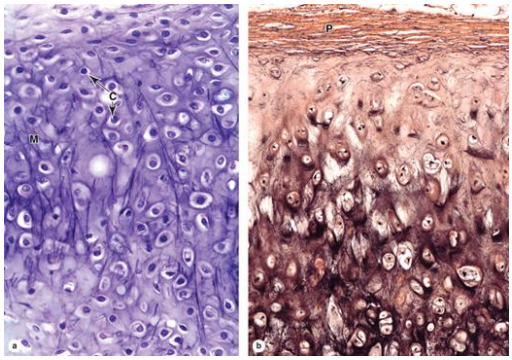
Slide 1: Integument.
The five layers are visible in this section of thick skin.



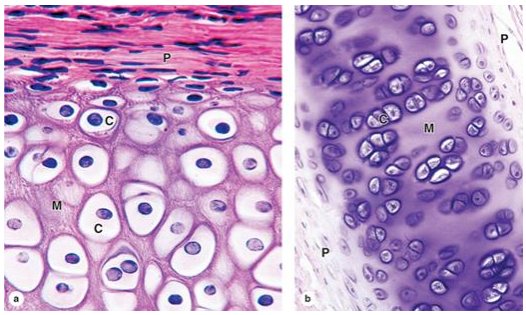
Slide 2: Adipose connective tissue.
Since the interior of the cell is full of fat, it looks empty but its cytoplasm and nucleus have been pushed against the wall and in some cells are visible. The walls are very thin and the cells are packed closely together giving them irregular shapes.



Slide 3: Elastic cartilage.
The cartilage is the broad band of pale purple. The matrix itself stains pale purple and within it are spaces called lacunae. Within the spaces are the cartilage cells - the chondrocytes. The elastic fibres are the fine strands running through the matrix.

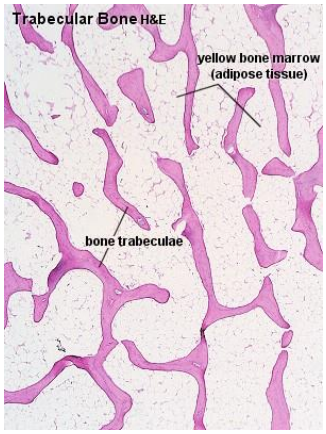


Slide 4: Hyaline cartilage. On this slide, the cartilage is the area of lacunae (stained purple). It has the chondrocytes just as elastic cartilage does but there are no elastic fibres.

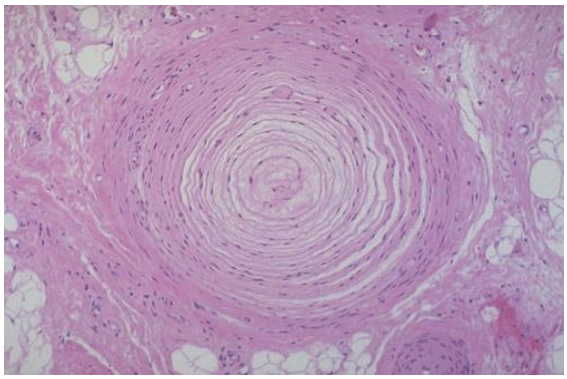


Slide 5: Compact bone. The characteristic of this slide is the Haversian system that is found only in compact bone. Although they are not visible, the osteocytes are in the lacunae.

Slide 6: Cancellous (spongy) bone. There is no Haversian system (see slide 5), only irregular rods of bone (called trabeculae) are produced that form a network filled with marrow. The bone is stained bright red or pink, depending on the slide, and the cells that produce the bone (osteocytes) are visible in the lacunae.



Slide 7. Pacinian (lamellated) corpuscle. These are either sections of skin or organs that have deep pressure sensors. Look for large round structures that consist of many concentric circles within the dermis. They have the appearance of the cut surface of an onion.



Integument

Epidermis

Stratum basale	Stratum spinosum	Stratum granulosum
Stratum lucidum	Stratum corneum	Dermis
Stratum papillarosum	Stratum reticularosum	
Pore	Dermal papillae	Arrector pili m.
Sebaceous gland	Sweat gland	Sweat gland duct
Hair root	Cutaneous blood vessels	Pacinian corpuscles
Hair medulla	Hair follicle receptor	Hair follicle
Hair cortex	Hair shaft	Hair papilla
Huxley's layer	Henle's layer	Inner root sheath
Outer root sheath	Free nerve ending	Ruffini corpuscle
Krause's end bulb	Meissner's corpuscle	Hypodermis
Adipose tissue		

Axial Skeleton

Skull - Cranium

Frontal bone:

Frontal sinus	Supraorbital ridge	Supraorbital foramen
Coronal suture		

Parietal bone:

Squamousal suture	Lambdoidal suture	Sagittal suture
Grooves of middle meningeal aa.		

Temporal bone:

Mastoid process	Mandibular fossa	Zygomatic process
Stylomastoid foramen	Styloid process	Petrous portion
Squmaous portion	External acoustic meatus	Internal acoustic meatus

Occipital bone:

Foramen magnum	Occipital condyles	Jugular foramen
Hypoglossal foramen	Groove of transverse sinus	Groove of sigmoid sinus

Sphenoid bone:

Sphenoid sinus	Foramen ovale	Foramen rotundum
Foramen spinosum	Optic foramen	Superior orbital fissure
Inferior orbital fissure	Sella turcica	

Ethmoid bone:

Crista galli	Cribriform foramina	Cribriform plate
Perpendicular plate	Superior nasal concha	Middle nasal concha

Axial Skeleton

Skull – Facial Bones

Maxilla:

Maxillary sinuses	Palatine process	Alveolar process
Infraorbital foramen		

Mandible:

Condylar process	Coronoid process	Ramus
Alveolar border	Angle	Mental foramen
Mandibular foramen	Lingula	Body
Mental symphysis		

Nasal bones
Lacrimal bones
Inferior nasal conchae
Zygomatic bones
Vomer bone
Palatine bones
Malleus (ear ossicle)
Incus (ear ossicle)
Stapes (ear ossicle)

Hyoid bone:

Greater horn	Lesser horn	body

Vertebrae: Typical

Body	Pedicle	Lamina
Superior articular process	Inferior articular process	Transverse process
Spinous process	Transverse foramen (C)	Costal facets (T)

Vertebrae: Atypical

Anterior arch (C1)	Posterior arch (C1)	Odontoid process (C2)

Sacrum:

Ala	Body	Sacral foramina
Cornu	hiatus	

Coccyx

Ribs:

Head	Neck	Tubercle
Costal groove		

Sternum:

Jugular notch	Manubrium	Sternal angle
Body	Xiphoid process	

Appendicular Skeleton
Pectoral Girdle

Scapula:

Vertebral (medial) border	Axillary (lateral) border	Superior angle
Inferior angle	Spine	Acromion
Glenoid fossa	Coracoid process	Supraspinous fossa
Infraspinous fossa	Subscapular fossa	

Clavicle:

Sternal (medial) end	Acromial (lateral) end	Conoid tubercle

Appendicular Skeleton
Upper Extremity

Humerus:

Head	Deltoid tuberosity	Capitulum
Coronoid fossa	Olecranon fossa	Trochlea
Medial epicondyle	Lateral epicondyle	Supracondylar ridges
Intertubercular groove	Greater tubercle	Lesser tubercle

Ulna:

Trochlear notch	Olecranon process	Coronoid process
Radial notch	Head	Styloid process

Radius:

Head	Radial tuberosity	Neck
Styloid process		

Carpal bones:

Scaphoid	Lunate	Trapezium
Capitate	Triquetral (triquetrum)	Pisiform
Trapezoid	Hamate (hook of hamate)	

Metacarpal bones:

Metacarpal I	Metacarpal II	Metacarpal III
Metacarpal IV	Metacarpal V	

Phalanges:

Proximal phalanx	Middle phalanx	Distal phalanx

Appendicular Skeleton
Pelvic Girdle

Os Coxae:

Pubis symphysis	Acetabulum	Obturator foramen
Greater sciatic notch	Lesser sciatic notch	Ischial spine
Anterior superior iliac spine	Ischial tuberosity	Pubis
Anterior inferior iliac spine	Ischium	Ilium
Posterior superior iliac spine		
Posterior inferior iliac spine		

Appendicular Skeleton
Lower Extremity

Femur:

Head	Neck	Greater trochanter
Lesser trochanter	Linea aspera	Medial condyle
Lateral condyle	Intercondylar fossa	

Patella:

Base	Apex

Tibia:

Lateral condyle	Medial condyle	Medial malleolus
Tibial tuberosity	Nutrient foramen	Intercondylar eminence

Fibula:

Head	Neck	Lateral malleolus

Tarsal Bones:

Talus	Calcaneus	Navicular
Cuboid	Medial (1st) cuneiform	
Intermediate (2nd) cuneiform	Lateral (3rd) cuneiform	

Phalanges:

Distal phalanx	Middle phalanx	Proximal phalanx

Model of Bone:

Periosteum	Lamellae - interstitial	Lamellae - concentric
Osteocyte	Canaliculi	Osteon
Central canal	lacuna	Perforating fibres
Perforating canals		

The following is a list of structures associated with the knee, shoulder, elbow, and hip joints which you are responsible to know:

Appendicular Skeleton
Joints

Knee:

Anterior cruciate ligament	Medial meniscus	Lateral meniscus
Posterior cruciate ligament	Quadriceps tendon	Patellar ligament
Medial collateral ligament	Lateral collateral ligament	
Posterior meniscofemoral ligament		

Shoulder:

Acromioclavicular ligament	Coracoacromial ligament	Coracohumeral ligament
Superior transverse scapular ligament	Tendon - Long head of biceps brachii m.	Transverse humeral retinaculum
Coracoclavicular ligament	Conoid ligament	Trapezoid ligament

Elbow:

Medial collateral ligament	Lateral collateral ligament	Annular ligament

Hip:

Iliofemoral ligament	Ischiofemoral ligament	Pubofemoral ligament

Foot:

Anterior talofibular ligament	Deltoid ligament

Hand:

Collateral ligaments (PIP,IP, PIP)

MUSCULAR SYSTEM

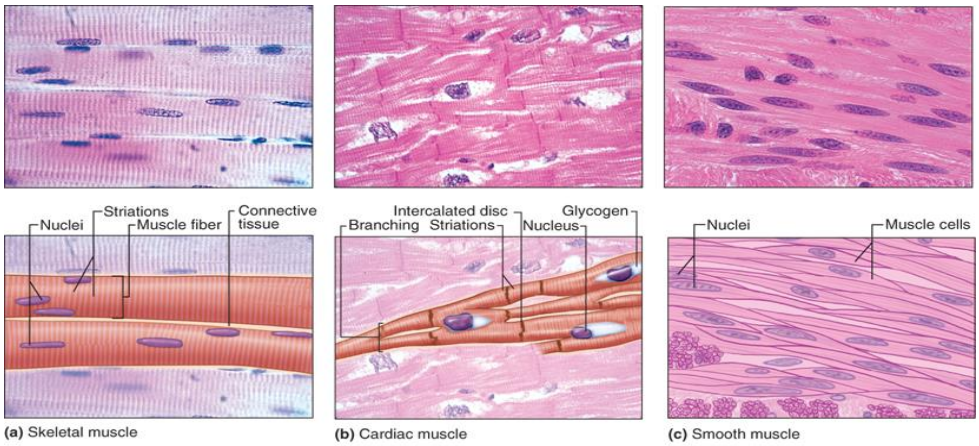
This section lists the muscles you need to know for the lab portion of the course. In addition to being able to identify muscles, you are responsible for origin(s), insertion(s) and action(s) for the major muscle groups in the human. The only tendon you should know is the Achilles (calcaneal) tendon.

Histology:
You are responsible for the microscopic anatomy of the three types of muscles. The three types of muscle are available shown in images below

Striated (skeletal) muscle. This is the major component of skeletal muscles, which pull on bones to cause body movements. Skeletal muscle fibres are long, large cylinders that contain many nuclei. Notice the obvious banding pattern and the fact that these large cells are multinucleated.

Smooth muscle. It is so named because there are no visible striations in its fibres. These fibres are spindle-shaped and contain one centrally located nucleus. Smooth muscle primarily occurs in the walls of hollow organs. It generally acts to squeeze substances through these organs by alternately contracting and relaxing

Cardiac muscle. Cardiac muscle is found in the walls of the heart. It contracts to propel blood through the blood vessels. Like skeletal muscle fibres, cardiac muscle fibres are striated. However, they differ in two ways: (1) cardiac fibres are generally uninucleated (one nucleus) and (2) cardiac cells branch and join at unique cellular junctions called intercalated discs.



(a) Skeletal muscle (b) Cardiac muscle (c) Smooth muscle

You are not responsible for identifying muscle types in cross section (xs), only in longitudinal section (ls).

Muscles of the Head/Neck Region

Head:

Masseter	Temporalis	Buccinator
Orbicularis oris	Orbicularis oculi	Frontalis
Occipitalis	Zygomaticus major	Zygomaticus minor

Neck:

Platysma	Sternocleidomastoid	sternohyoid
Sternothyroid	Thyrohyoid	stylohyoid
Anterior scalene	Middle scalene	Posterior scalene
Levator scapula		

Muscles of the Thorax/Abdomen/Back

Thorax:

Pectoralis minor	Pectoralis major	Serratus anterior
External intercostal	Internal intercostal	

Abdomen:

Internal abdominal oblique	Transversus abdominis	Rectus abdominis
External abdominal oblique		

Back:

Latissimus dorsi	Rhomboideus major	Rhomboideus minor
Erector spinae	Trapezius	Quadratus lumborum

Muscles of the Upper Extremity

Teres minor	Teres major
Supraspinatus	Infraspinatus
Subscapularis	Deltoid
Biceps brachii – long head	Biceps brachii – short head
Coracobrachialis	Brachialis
Pronator teres	Flexor carpi radialis
Palmaris longus	Flexor carpi ulnaris
Flexor digitorum superficialis	Flexor digitorum profundus
Flexor pollicis longus	Pronaor quadratus
Triceps brachii – long head	Triceps brachii – lateral head
Triceps brachii – medial head	Brachioradialis
Extensor carpi radialis longus	Extensor carpi radialis brevis
Extensor digitorum	Extensor carpi ulnaris
Abductor pollicis	Extensor pollicis brevis
Extensor pollicis longus	Flexor pollicis brevis
Abductor pollicis brevis	Opponens pollicis
Adductor pollicis	Flexor digiti minimi
Abductor digiti minimi	Opponens digiti minimi
Supinator	Lumbricals

Muscles of the Lower Extremity

Psoas major	Psoas minor
Iliacus	Iliopsoas
Tensor fasciae latae (Iliotibial band)	Sartorius
Rectus femoris	Vastus lateralis
Vastus medialis	Vastus intermedius
Pectineus	Adductor longus
Adductor brevis	Adductor magnus
Gracilis	Gluteus maximus
Gluteus medius	Gluteus minimus
Piriformis	Superior gemellus
Inferior gemellus	Obturator internus
Obturator externus	Quadratus femoris
Semitendinosus	Semimembranosus
Biceps femoris – long head	Biceps femoris – short head
Tibialis anterior	Extensor hallucis longus
Extensor digitorum	Fibularis (peroneus) longus
Fibularis (peroneus) brevis	Gastrocnemius
Soleus	Plantaris
Popliteus	Tibialis posterior
Flexor hallucis longus	Flexor digitorum longus