# BIOLOGY 2011
# HUMAN ANATOMY- MSK
## "Where one has to work their phalanges to the periosteum!"
## 2025

## COURSE SYLLABUS/LAB MANUAL

# BIOLOGY 2011
# HUMAN ANATOMY - MSK


| | |
|---|---|
| Instructor: | Donna Newhouse, M.Sc., Ph.D(c) |
| Office: | NOSM Medical School Building (MSW 3009) |
| Office Phone # | (807) 766-7387 |
| Phone: Cell | (807) 474-9016 |
| E-mail address: | donna.newhouse@lakeheadu.ca<br>donna.newhouse@nosm.ca |
| Office Hours: | By appointment |


| | |
|---|---|
| GA's & TA's: | Olivia Hicklin (GA)<br>Lauren Henriksson (TA)<br>Edgar Sarrazin (TA)<br>Lea McLean (TA)<br>Mia Popien (TA) |
| Required Texts: | Principles of Human Anatomy (15e) ($236.95; previous editions are acceptable)<br>Author: Tortora & Nielsen (2019)<br><br>Atlas of Human Anatomy (8e.) ($119.99; previous editions are acceptable)<br>Author: Netter (2019) |

Mark Breakdown

| Lecture: | Topics | Course Weight | Date/Time |
|---|---|---|---|
| MT | Integument, Bones | 30% | October 6, 2025 (7:00 pm) |
| Final | Bones, Muscles, Joints | 30% | TBA |
| Lab: | | | |
| Lab Exam 1 | Integument, Bones | 20% | October 21 & 22, 2025 (7:00 pm) |
| Lab Exam 2 | Joints, Muscles (& bones) | 20% | Nov 25 & 26, 2025 (7:00 pm) |
| **BONUS:** | Canadian Blood Services (Partners for Life) | Up to 2% (max) | Completion by November 30, 2025 |

## 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 2025 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:**

All instructional, reference, and administrative materials prepared for this course are protected in their entirety by copyright. Students are expected to comply with this copyright by only accessing and using the course materials for personal educational use related to the course, and that the materials cannot be shared in any way, without the written authorization of the course instructor. If this copyright is infringed in anyway, students 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.

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

(1) I may access and download the course materials only for my own personal and non-commercial use for this course; and

(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 2025

**BLOCK 1:**

| | |
|---|---|
| September 9 - October 15 | Integument & Bones |
| October 21 & 22 | LAB EXAM #1 |

**BLOCK 2:**

| | |
|---|---|
| October 28 – November 19 | Ligaments & Muscles (and some bones) |
| November 25 & 26 | 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

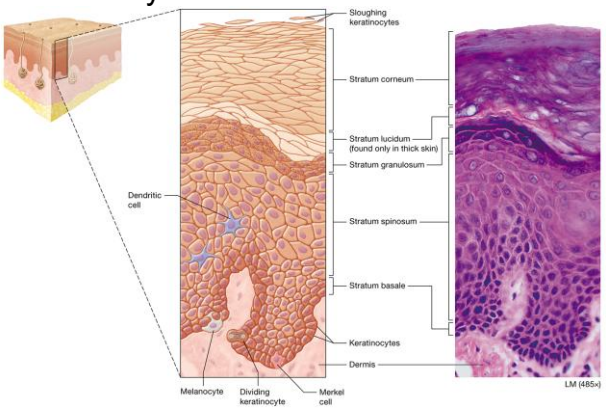
V. Muscular System
A. Muscle Tissue
(1) skeletal (striated)
(2) smooth (unstriated)
(3) cardiac
(4) properties of muscle tissue
(5) functions
(6) structure of skeletal muscles
B. Principle muscles of the body
(1) Muscles of facial expression
(2) Muscles of upper extremity
(a) shoulder joint
(b) muscles 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**

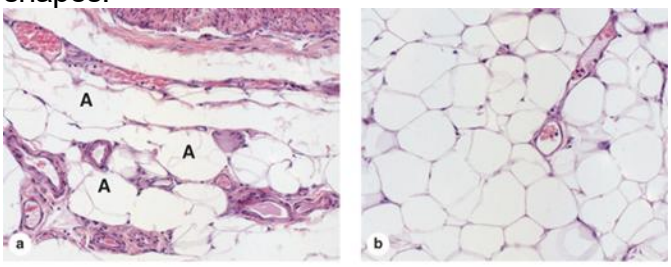
The following is a list of the bones and their parts that you are required to know for lab. (There may be additional structures that you should know from diagrams for lecture tests). Please note that you should also be able to tell if major bones are from the right or left side, which end is proximal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

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

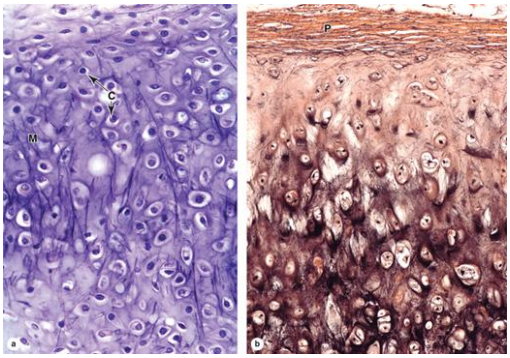
Slide 1: Integument.
The five layers are visible in this section of thick skin.



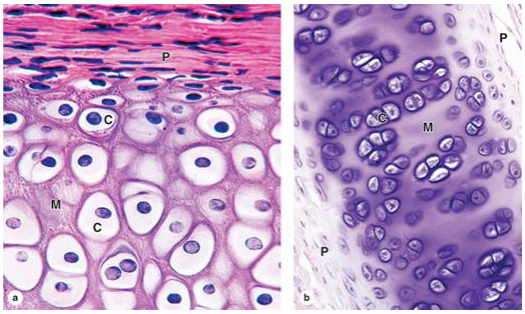

Slide 2: Adipose connective tissue.
Since the interior of the cell is full of fat, it looks empty but its cytoplasm and nucleus have been pushed against the wall and in some cells are visible. The walls are very thin and the cells are packed closely together giving them irregular shapes.




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.

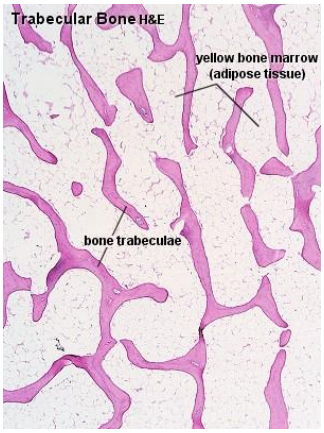



Slide 4: Hyaline cartilage. On this slide, the cartilage is the area of lacunae (stained purple). It has the chondrocytes just as elastic cartilage does but there are no elastic fibres.

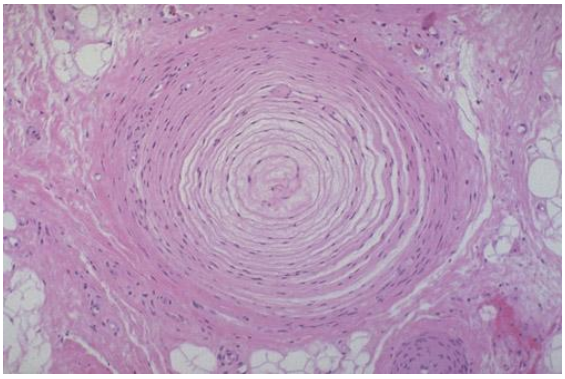



Slide 5: Compact bone. The characteristic of this slide is the Haversian system that is found only in compact bone. Although they are not visible, the osteocytes are in the lacunae.


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

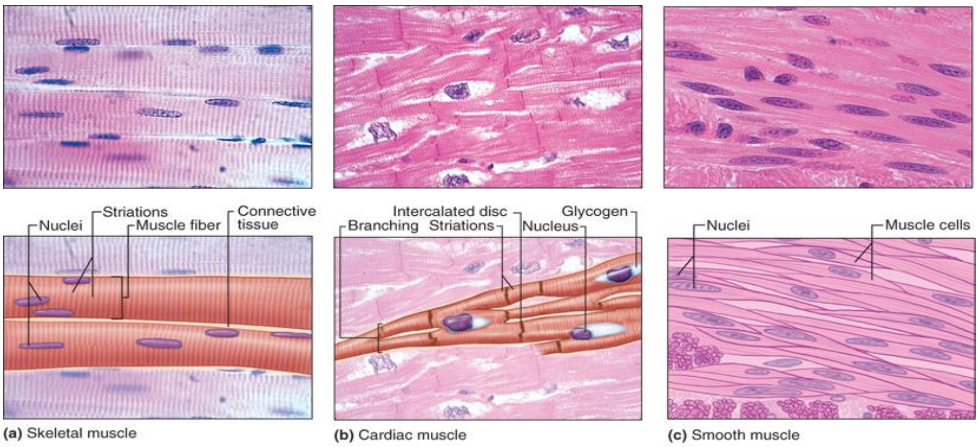
This section lists the muscles you need to know for the lab portion of the course. In addition to being able to identify muscles, you are responsible for origin(s), insertion(s) and action(s) for the major muscle groups in the human. The only tendon you should know is the Achilles (calcaneal) tendon.

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 |