HUMAN GROSS ANATOMY

ANTH 695 – SPRING 2016
THE UNIVERSITY OF TENNESSEE

Instructor: **Benjamin Auerbach, Ph.D.**
Contact information: Office: 229 South Stadium Hall
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Lab instructor: **Christina Fojas, M.S.**
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Time: Lecture and lab*
Mondays: 8:00 AM – 11:00 AM
Wednesdays: 9:00 AM – 11:00 AM
Fridays: 8:00 AM – 11:00 AM

Special Topics in Anatomy Lecture Series
Fridays: 2:30-3:40 (followed by Happy Hour with speaker)

* All participants in the course must vacate the lab at 11:00 AM (so undergraduate anatomy labs may meet). However, use of the lab outside class hours on Tuesday & Thursday mornings, Friday afternoons, as well as weekends, is permitted.

Location: Lecture and lab: 606 HESLER BIOLOGY BUILDING
Special topics lectures: 131 HASLAM BUSINESS BUILDING

Course description: Human Gross Anatomy provides advanced graduate students with in-depth anatomical training. A thorough comprehension of anatomy is at the core of biological anthropology and biomedical engineering. Skeletal function and form, often subjects of analysis in these fields, cannot be fully interpreted and understood without the context of the soft tissues—from muscles and ligaments to blood vessels and organs—that surround and interact with the bones. Using cadaver-based dissection, students experience the best method by which to learn about the structures of the human body, their integration, and, most importantly, variation among humans.

The course consists of three combined subjects: an anatomy lecture course, a laboratory dissection course, and an overview of human development. These topics are paired with nine guest lectures (the Special Topics in Anatomy Lecture Series) that bridge the textbook and lab knowledge with medicine, research and practical applications. This is an intensive course, requiring hours of study both in the lab and from texts, but it rewards you for those hours. Special emphasis is placed on functional anatomy of the body, though an understanding of development (embryology) and pathology (clinical knowledge) is also stressed.

Course textbooks: Human Gross Anatomy uses four different books to cover the various topics of the course: regional and functional anatomy, developmental biology, and gross anatomical dissection. These are all required for the course. Additional readings will be made available via Blackboard for topics not covered in these publications, and for the Special Topics Lectures. Students are encouraged to seek additional resources (e.g., additional anatomical atlases, study guides) if they prove useful, though all of the course content is more than adequately covered in the four books assigned for the course. Copies of all textbooks should be purchased via Internet retailers (as these will be cheaper than rates the campus bookstore is able to offer).

Principal textbook:

Keith L. Moore, Arther F. Dalley, Anne M.R. Agur. 2014. *Clinically Oriented Anatomy*. Seventh edition. Baltimore: Lippincott Williams & Wilkins. ISBN: 978-1451119459

Embryology textbook:

Gary C. Schoenwolf, Steve B. Bleyl, Philip R Brauer, Philippa H. Francis-West. 2015. *Larsen's Human Embryology*. Fifth edition. Philadelphia: Elsevier. ISBN: 978-1455706846

Anatomical atlas:

Anne Gilroy, Brian R. MacPherson, Lawrence M. Ross. 2012. *Thieme Atlas of Anatomy*. Second Edition. New York: Thieme Medical Publishers. ISBN: 978-1604067453

Anatomical dissector:

Patrick W. Tank. 2012. *Grant's Dissector*. Fifteenth edition. Baltimore: Lippincott Williams & Wilkins. ISBN: 978-1609136062.

YOU WILL NOT ALWAYS FOLLOW THE INSTRUCTIONS OF THE DISSECTOR VERBATIM. A LIST OF DISSECTION SUGGESTIONS AND ANNOTATIONS TO THE DISSECTOR ARE PROVIDED IN THE LABORATORY MANUAL.

BE SURE TO READ THESE, ALONG WITH THE DISSECTOR, BEFORE YOU COME TO LAB!!!

Optionally, you may be interested in acquiring copies of the following supplemental books:

John H. Langdon. 2005. *The Human Strategy: An Evolutionary Perspective on Human Anatomy*. New York: Oxford University Press. ISBN: 978-0-19-516735-1.

Robert H. Whitaker and Neil R. Borley. 2010. *Instant Anatomy*. Fourth edition. New York: Wiley-Blackwell. ISBN 978-1405199612.

David Levine, Jim Richards, and Michael Whittle. 2012. *Whittle's Gait Analysis*. Fifth edition. New York: Chuchill Livingstone (Elsevier). ISBN: 978-0702042652.

Course objectives: By the end of the course, you should:

- have developed an advanced understanding of human anatomy & some functional anatomy.
- possess a good basic comprehension of human developmental biology.
- have learned the fine dissection skills necessary to identify, isolate and preserve the delicate structures encountered throughout the course.
- be able to relate the anatomical knowledge gained to research and practical applications.

Course layout: Two major components comprise the course: lectures and dissection labs. However, the structure and content of these vary further. In addition, there are nine guest lectures that are required components of the course (see below). **Be sure to reference the course schedule at the end of the syllabus.**

Lectures occur on the majority of meeting days of the course, and will be of variable length. Some lectures may be as short as 30 or 45 minutes, while others will extend through the entire assigned meeting time. Dr. Auerbach will deliver all lectures. Topics of lectures include general anatomy, functional anatomy, and human development. There are three long lecture days scheduled (see the course schedule). **On days scheduled for laboratory dissection sessions, all lectures for the course will occur first** (with the notable exception of the Special Topics Lectures on Fridays). Unless otherwise noted in the schedule, be sure to complete readings for each day before the lecture.

There are 24 scheduled dissections in the course. Formal lectures are brief on the days in which they precede dissection. Be aware that fourteen lab periods are not preceded by formal lectures (see dissections 3, 7, 8, 11, 12, 13, 14, 16, 17, 18, 20, 21, 22, & 24). Be prepared to spend at least two to three hours dissecting in each lab. Many dissections, especially cleaning up structures, will most likely take longer than the assigned time. The course is scheduled to finish at 11:00 on all days (with the possible exception of the three long lecture days); all

participants must vacate the lab so undergraduate anatomy lab sections may meet. Students are permitted to continue dissections in the lab outside of scheduled course hours. Specific instructions for accessing the lab and policy for dissecting outside of course hours will be discussed during the first day of the course. (Also see Laboratory and Dissection Safety below, and well as the Lab Manual.)

Special Topics in Anatomy Lecture Series: Nine guest lectures are scheduled to occur on Fridays throughout the course. Clinicians and researchers from multiple disciplines and from various institutions will be visiting to share their knowledge and research. All of these visitors have extensive anatomical training, and all will participate in laboratory dissections in addition to their guest lectures. Lectures will link anatomical knowledge with their areas of research and practical application. Given the rare and exceptional opportunity the Special Topics in Anatomy Lectures provide, they are included as a required (though not assessed) portion of the course. Students and faculty not enrolled in the course but who are interested are welcome to attend these lectures.

Course web site: All course communication, study aids, external web resources, and supplementary readings will be available via Online@UT the University of Tennessee Blackboard service (**https://bblearn.utk.edu/**). Be sure to check this site frequently for updates.

LABORATORY AND DISSECTION SAFETY

You must be aware of the safety considerations that accompany human gross anatomy dissection. **All students enrolled in this course must attend the laboratory safety lecture on the 12th of January before being permitted to dissect.**

We are fortunate to be able to provide cadavers for use in this course. Remember that these individuals donated their bodies in order to further your pursuit of knowledge about human anatomy. Treat their bodies with respect and deference, and make the best possible use of their gift in your dissections. (After all, advanced gross anatomy courses that use human cadavers are very rarely taught outside of medical institutions.)

Written guidelines will be provided to you prior to the first course meeting. You must read through these and sign the consent and waiver form at the end of the guidelines *before* you are allowed to participate in dissections. Most of these rules concern your safety in the laboratory. This includes proper handling of biological waste generated by the dissection process, the

proper handling of sharp dissection equipment (namely disposable scalpels), and knowledge of what to do in the case of emergencies or accidents in the dissection lab. Problems, of course, are not anticipated, but an awareness of correct procedures will minimize the consequences should problems arise. Any lab incidents must be reported to Dr. Auerbach or to Ms. Fojas.

Be aware that hazardous chemicals are used in the preservation of human cadavers, namely a small concentration of formaldehyde, and a larger concentration of phenol suspended in an aqueous solution including glycerin and methanol. **DIRECT SKIN CONTACT WITH THIS PRESERVATIVE FLUID WILL CAUSE IRRITATION AND MAY LEAD TO MORE SERIOUS COMPLICATIONS.** For this reason, all students must wear neoprene gloves rated to resist phenol and use a neoprene apron when dissecting. **ANY STUDENT WITH MEDICAL CONDITIONS THAT MAY BE AFFECTED BY THESE DISSECTIONS (E.G., RESPIRATORY ILLNESS, PREGNANCY, CIRCULATORY PROBLEMS, OR DIABETES) OR WHO HAVE CONCERNS SHOULD CONTACT DR. AUERBACH BEFORE THE FIRST CLASS MEETING.**

Generally, use common sense in the lab. Do not leave sharp tools in places where others may accidentally bump into them, and do not lose the tools within or under the cadaver (a common but entirely preventable occurrence). Do not touch exposed skin with gloved hands. Wear facial protection when a chance of splatter is possible (e.g., during use of the Stryker saw). Do not work until fatigued in the lab; take breaks for water and to get off your feet. Be sure to properly dispose of all waste. See the list of guidelines provided before the first day of class for more information about the specific treatment of permanent laboratory equipment and for details on waste disposal, procedures for phenol exposure, and general laboratory safety.

Personal laboratory equipment: The laboratory component of this course requires proper equipment for the dissection of cadavers. **Students must acquire an anatomical dissection kit (e.g., McCoy Medical advanced dissection kit) before the beginning of the course. Dr. Auerbach will place bulk orders for these in early December; please contact him about pricing should you wish to participate in the bulk order (which is strongly recommended).** In addition, the course will provide students with safety attire:

- disposable neoprene surgical gloves & reusable neoprene gauntlets
- disposable surgical blades
- a reusable neoprene apron

Students are encouraged to invest in scrubs or to wear clothing that can be soiled; only long pants or long skirts are permitted. In addition, closed-toe shoes with good traction are required for the laboratory. Students wearing improper footwear will not be permitted to dissect. No exceptions will be made.

Study materials: Anatomical atlases will be made available to students in the lab for reference during dissection, though students are encouraged to acquire used copies of atlases in addition to these to provide multiple perspectives. Models of some anatomical structures will occasionally be made available to students in the laboratory, though these models may not leave the lab. Human crania will also be provided during the head and neck section, though these too may not be removed from the lab.

Skeletal study will help you make sense of much of the soft anatomy encountered throughout the course, and so it would benefit you to spend time studying or refreshing your osteological knowledge. A special arrangement has been made with the Forensic Anthropology Center to allow access during normal business hours (9:00 AM to 4:30 PM, Tuesdays and Thursdays) to select skeletons from the William Bass Skeletal Collection. These skeletons will be available in 206 East Stadium Hall. Space is limited in the collection, so try to stagger your visits with classmates.

Assessment: There are four forms of evaluation used during the course: lecture written exams, lecture pop quizzes, laboratory practical exams, and oral laboratory presentations. Each is explained below, and the dates for all of these (except pop quizzes) are highlighted in grey boxes in the course schedule.

Lecture written exams: There are four written lecture exams. The first is a short exam on the thorax only, designed to give you a taste of the exam layout and content for the course. The remaining three exams are full-length tests that cover sections of the course divided thematically and regionally. All lecture exams will cover material from the principal textbook (Moore et al.), readings from the human developmental biology textbook (Schoenwolf et al.), and lectures supplementing these two textbooks. Question forms on these exams will be short answer, fill-in-the-blank, identification (using anatomical illustrations), and some true-false and matching. **Written exams from prior years of the course are available on the course web site.**

Lecture pop quizzes: There will be ten unscheduled quizzes that will take place during the course. These are designed to serve as "checkpoints" for you throughout the semester, to ensure that you are studying effectively and may pinpoint topics that require additional attention in studying. The material on which you may be quizzed is the same as what appears on the major exams, and quizzes will focus on material already covered in lecture and lab.

Laboratory practical exams: Three laboratory practical exams occur simultaneously with the three full-length lecture exams. You will be given an answer form and have free access during the testing period to complete answers to questions on flagged structures located on the

cadavers or models. These lab practical exams involve identification of structures from the cadavers, models, and isolated bones, as well as some functional questions.

Laboratory oral presentations: Once during the semester, each student will be asked to present on the completed dissections of the previous section of the course. Presentations may occur on one of six possible days throughout the course listed in the syllabus, and will cover specific topics reflecting recent dissections. Guidelines for the material that must be covered during these presentations may be found in the lab manual along with dissector annotations. These oral presentations must be completed in front of Dr. Auerbach *and all dissection partners from the presenter's table*, and may take no longer than twenty minutes. As a maximum of four students will be dissecting at each table, each student at each table is only responsible for one presentation. Presentations will be graded as fail, pass, and high pass, which translate into scores of 60, 90, and 100 points out of 100 possible points. (High passes require a demonstration of good organization of knowledge, a clear presentation of the required topics, and an ability to show information and synthesize relationships beyond guideline requirements.)

Exams and points: The point values for assessment are given below. A total of 1000 points are available in the course, and are divided into letter grades according to the following point breakdown.

Thorax mini lecture exam	50 points
TAPP lecture exam	200 points
TAPP lab practical exam	50 points
Back & limbs lecture exam	200 points
Back & limbs lab practical exam	50 points
Head & neck lecture exam	200 points
Head & neck lab practical exam	50 points
Lecture pop quizzes (10 points each)	100 points
Lab oral presentation	100 points
TOTAL	**1000 points**

Letter grades:	A: 865-1000	B: 730-864	C: 600-729	D: <600

Tips for getting the most out of the course: Any course on human anatomy is challenging but rewarding. You are taking this course in preparation for a professional career in which anatomical knowledge will be essential. Even if you are not taking this for professional reasons,

knowledge of your anatomy has long-term practical use. So, remember that you are not learning this information for the exam, but for the rest of your life, professional or otherwise.

A golden rule for anatomy: **DON'T GET BEHIND!** It is to your advantage to keep up with the reading and keep reviewing throughout the course. I strong encourage you to review nightly, **and read both for the lecture and, especially, the lab dissections ahead of time**. Learning anatomy is similar to studying a language; constant review of terminology is essential. Cramming in anatomy just before the exam isn't to your advantage. Some learning is, admittedly, rote memorization, but much of anatomical study involves integrating functions and intuiting spatial relationships. In short, give time to reading anatomy each day. Drawing, like in osteology, is a key to helping you learn anatomy. Draw schematics of blood flow or nerves & their branches. Create tables of muscles and their functions, and then draw the muscles, linking them to bony origins and insertions. These techniques will help you much more than all-nighters before exams.

A number of resources are available as study aids, and I would recommend that you employ these as you find them to be useful in supplementing your primary studying. Web sites that are recommended for mnemonics, cross-sectional imagery, and embryology are available as "External Links" on the course Blackboard web site. There are also good summary study guides, the best of which is *Instant Anatomy* (see citation on page 3); this volume is recommended to help you to *review* vasculature, nerve distributions, and anatomical spatial relationships.

Students with disabilities: If you require accommodation because of special needs in learning, please contact the Office of Disability Services at 2227 Dunford Hall (974-6087). Please also contact Dr. Auerbach immediately via e-mail after you register with the Office of Disability Services. Arrangements will be made to adjust exams to fit your needs.

Make-up policy: Short of legitimate professional, religious, legal or medical reasons, you will not be eligible to take examinations at any time other than those that are officially designated. If you must miss an exam, you must contact Dr. Auerbach ***before*** the examinations.

COURSE SCHEDULE – ANTH 695 – SPRING 2016

COA – *Clinically Oriented Anatomy* **LHE – *Larsen's Human Embryology*** **GD – *Grant's Dissector*** **STAL – Special topics lecture**

SPECIAL TOPICS LECTURE TITLES WILL BE POSTED THROUGHOUT THE SEMESTER

DATE	LECTURES	DISSECTION / LAB	READINGS
12 JANUARY	Special meeting: Lab safety Introduction to the course		GD: 1-4
13 JANUARY (class starts at 8:00) **long lecture day**	Anatomical terminology and orientation Systemic overview of anatomy The nervous system Introduction to the thorax & thoracic wall		COA: 1-70 COA: 71-104
15 JANUARY	Pleural cavity & lungs NO STAL	1. Thoracic wall & pleural cavity (*students may stay past 11:00*)	COA: 106-127 GD: 26-30; 63-72
19 JANUARY (date change due to MLK holiday) **long lecture day**	Development of the embryo: weeks 1-4 Heart & middle mediastinum Posterior mediastinum Development of the heart		LHE: 14-107 **(read *after* lecture)** (optionally read chapters 5 and 11) LHE: 267-303 (and optionally chapter 13) COA: 127-180
20 JANUARY (class starts at 8:00)	Introduction to the abdominal wall; the inguinal canal	2. Heart and the mediastinum	COA: 182-216 GD: 72-87
22 JANUARY	STAL: Dr. Kirsten Brown (George Washington University School of Medicine)	3. Anterior abdominal wall & inguinal canal	GD: 89-98
25 JANUARY	**MINI EXAM: Thorax** Abdominal viscera	**FIRST LAB DISSECTION PRESENTATION: THORAX**	COA: 217-324 **(read *after* lecture)**
27 JANUARY	Development of the gastrointestinal tract	4. Abdominal cavity I	LHE: 341-374 GD: 98-116
29 JANUARY	STAL: Dr. John Bach (Surgeon, Critical Care Unit, Riverside Hospital, Columbus, OH)	5. Abdominal cavity II	COA: 327-362 GD: 116-124

DATE	LECTURES	DISSECTION / LAB	READINGS
1 FEBRUARY **long lecture day**	Introduction to the pelvis Pelvic viscera Perineum Urogenital development		COA: 362-438 LHE: 375-428
3 FEBRUARY	TAPP review	6. Perineum	GD: 125-129 GD: 148-152 (females) GD: 129-137 (males)
5 FEBRUARY	STAL: Dr. Arthur Kumpf (private practice: plastic and reconstructive surgery)	7. Pelvic cavity	GD: 152-163 (females) GD: 137-147 (males)
8 FEBRUARY	**EXAM: Thorax, abdomen, pelvis & perineum (TAPP)**	**LAB PRACTICAL EXAM: Thorax, abdomen, pelvis & perineum**	
10 FEBRUARY	The thigh and gluteal region Development of the limbs The hip & knee (start)	**SECOND LAB DISSECTION PRESENTATION: ABDOMEN, PELVIS & PERINEUM**	COA: 510-541 COA: 545-583 LHE: 501-523 (and optionally chapter 8)
12 FEBRUARY	STAL: Dr. Nathan Young (University of California-San Francisco School of Medicine)	8. Anterior thigh & medial thigh	GD: 165-176
15 FEBRUARY	The hip & knee (finish) The leg and the foot (start)	9. Gluteal region and posterior thigh	COA: 626-647 COA: 584-587 GD: 176-180
17 FEBRUARY (class starts at 8:00)	The leg and the foot (finish) Gait	10. Popliteal region and posterior leg	COA: 587-625 GD: 181-189
19 FEBRUARY	STAL: Dr. Jason Organ (Indiana University School of Medicine)	11. Anterior & lateral leg	COA: 542-544 Whittle: “Normal gait” GD: 190-193
22 FEBRUARY		12. The foot / Lower limb dissection catch-up	GD: 193-198
NO CLASS 24 & 26 FEBRUARY (American Academy of Forensic Science Annual Meeting)			

DATE	LECTURES	DISSECTION / LAB	READINGS
29 FEBRUARY	The back The brachial plexus (start)	**THIRD LAB DISSECTION PRESENTATION: LOWER LIMB**	COA: 440-507
2 MARCH	The brachial plexus / The arm The forearm and hand (start)		COA: 672-744
4 MARCH	STAL: Dr. Evan Garofalo (University of Arizona College of Medicine)	13. The back	GD: 5-14
7 MARCH	The forearm and hand (finish) Functional anatomy of the upper limb	14. The axilla	COA: 744-793 GD: 22; 24-34
9 MARCH	Back and limbs review	15. The arm; anterior forearm	GD: 34-46
11 MARCH	STAL: Dr. Adam Sylvester (Johns Hopkins University School of Medicine)	16. Posterior forearm and the hand	GD: 46-57
NO CLASS WEEK OF 14-18 MARCH (SPRING BREAK)			
21 MARCH	**EXAM: Back & limbs**	**LAB PRACTICAL EXAM: Back & limbs**	
23 MARCH	Introduction to the head and neck Neck triangles, muscles & viscera	**FOURTH LAB DISSECTION PRESENTATION: UPPER LIMB**	COA: 822-836 COA: 982-1021
24 MARCH	NO STAL (date change due to spring recess)	17. Suboccipital region; anterior neck	GD: 14-15; 206-214
28 MARCH	The face & muscles of mastication Cranial nerves I		COA: 842-860 COA: 914-926; 951-956 COA: 1054-1060
30 MARCH	Cranial nerves II Brain, blood flow, meninges, and ventricles		COA: 1060-1082 COA: 865-888
1 APRIL	STAL: Dr. Joan Richtsmeier (Pennsylvania State University)	18. Anterior neck & root of the neck	GD: 215-218
NO CLASS 4 & 6 APRIL (American Association of Anatomists Annual Meeting)			
8 APRIL	The eye and orbit NO STAL	19. Superficial face, parotid & temporal regions	COA: 889-914 GD: 221-235

DATE	LECTURES	DISSECTION / LAB	READINGS
11 APRIL		20. Brain (& completion of deep face)	GD: BMA & 237-245
13 APRIL (class starts at 8:00)		21. The orbit	GD: 247-252
NO CLASS 15 APRIL (American Association of Physical Anthropologists Annual Meeting)			
18 APRIL	Deep face (oral and nasal cavities)	**FIFTH LAB DISSECTION PRESENTATION: CRANIAL NERVES, EYE & FACE**	COA: 928-965
20 APRIL	The pharynx The larynx & ear		COA: 966-980 COA: 1021-1040
22 APRIL	STAL: Dr. Valerie DeLeon (University of Florida)	22. Head disarticulation, pharynx, & bisection of the head	GD: 252-259
25 APRIL	Development of the head	23. Nasal and oral cavities	LHE: 197-233 LHE: 429-500 GD: 260-271
27 APRIL		24. Larynx & the ear	GD: 271-278
29 APRIL	Head and neck review NO STAL	25. Finish dissections	
2 MAY – 4 MAY		**SIXTH LAB DISSECTION PRESENTATION: NECK, DEEP FACE, LARYNX**	
5 MAY	**EXAM: Head and neck**	**LAB PRACTICAL EXAM: Head and neck**	