

ANAT 6160 Human Clinical Neuroanatomy  
Spring 2023 Course Syllabus

Tuesdays and Thursdays 11:15 – 12:30 pm  
Asynchronous, Hybrid & In-Person Sessions (Ross Hall Room 117)

**Faculty:**

*Course director*

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*Lecturer*

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**Course Description:**

ANAT 6160 is a graduate course designed to provide foundational knowledge about the anatomy and function of the human central and peripheral nervous systems with a strong emphasis on clinical relevance. Neuroanatomy topics will include the gross and microscopic structure, embryology, and neurophysiology of the brain, spinal cord, and nerves with descriptions of alterations in normal anatomy through disease or injury.

The content for this course is divided into four discrete units to facilitate content organization and will constitute the foundation for the four exams. There is one laboratory demonstration for CNS and PNS related structures in the Medical School Anatomy Lab that supplements lecture material. The demonstration will use prosected human brain and spinal cord material. Students will also be provided with interactive PowerPoint Neuro Labs tailored to the content of each unit.

**Course Learning Objectives**

1. Identify the structures of the adult and developing central (CNS) and peripheral nervous system (PNS), including neurons.
2. Evaluate the supporting structures of the CNS and PNS, including the glial cells, blood supply, meninges, and the ventricular system.
3. Compare and contrast the major pathways and connections of the sensory and motor system.
4. Analyze normal functions of cortical areas, basal ganglia, cerebellum, brainstem, and the spinal cord, including their influence on one another.
5. Compare and contrast the symptoms resulting from discrete lesions or injury to the CNS or PNS.

**Credit Hours:**

Human Clinical Neuroanatomy is a three (3) credit hours which includes lectures, laboratory sessions, and presentations.

**Average Minimum of Out-Of-Class or Independent Learning Expected per Week:**

300 minutes (5hrs) per week

**Prerequisite**

Introductory Biology for Science or non-Science Majors and enrollment in either: (1) Graduate Certificate in Anatomical and Translational Sciences Program or (2) Institute for Biomedical Sciences Ph.D. program

**Core Texts**

*These texts are available through Himmelfarb.*

1. Lippincott Illustrated Reviews: Neuroscience (Krebs Et al, 2nd ed.)  
<https://meded.lwwhealthlibrary.com/book.aspx?bookid=2283>
2. Nolte's The Human Brain in Photographs and Diagrams (Nolte, 5th ed.)  
<https://www.clinicalkey.com/#!/browse/book/3-s2.0-C20170008030>

**Grading Policy**

At the end of the course, a final letter grade will be assigned according to the graduate program grading scale. As per program policy, a minimum grade of B- is required for successful completion of the course.

Letter Grade	GPA	Percentage
A	4.0	90.0 – 100
A-	3.7	89.0 – 89.9
B+	3.3	87.0 – 88.9
B	3.0	80.0 – 86.9
B-	2.7	79.0 – 79.9
C+	2.3	78 – 78.9
C	2.0	75 – 77.9
C-	1.7	72 – 74.9
F	0	<71.9

*Grades of D+, D, and D-, are not used for graduate students at GW. Faculty will have discretion on revising grades upward or downward as they deem appropriate; i.e. grades may be curved, extra credit may be given for extra work, etc.*

**Important Terms in syllabus:**

Asynchronous	Watch videos on your own in <u>preparation for hybrid class</u>
Hybrid	Watch videos on your own and <u>be prepared for today's class</u>
In-person	Meet in class for an activity or exam or lab session

**Schedule of Class Assessments:**

Assessment	Date	Percentage	
<b>Summative Exams</b>		<b>60%</b>	
Unit 1 Exam	Feb 9 <sup>th</sup>	15%	
Unit 2 Exam	March 9 <sup>th</sup>	15%	
Unit 3 Exam	Apr 11 <sup>th</sup>	15%	
Unit 4 Exam	TBD	15%	
<b>Formative Quizzes</b>		<b>20%</b>	
Quiz 1	UNIT 1	Jan 19 <sup>th</sup>	2%
Quiz 2		Jan 26 <sup>th</sup>	2%
Quiz 3		Feb 2 <sup>nd</sup>	2%
Quiz 4	UNIT 2	Feb 16 <sup>th</sup>	2%
Quiz 5		Feb 23 <sup>rd</sup>	2%
Quiz 6		Mar 2 <sup>nd</sup>	2%
Quiz 7	UNIT 3	Mar 23 <sup>rd</sup>	2%
Quiz 8		Mar 30 <sup>th</sup>	2%
Quiz 9	UNIT 4	Apr 20 <sup>th</sup>	2%
Quiz 10		Apr 27 <sup>th</sup>	2%
<b>Presentation &amp; Quiz Question</b>		<b>12%</b>	
<b>Review Sessions &amp; Class Activities</b>		<b>8%</b>	
Review #1	Feb 7 <sup>th</sup>	2%	
Review #2	Mar 7 <sup>nd</sup>	2%	
Review #3	Apr 6 <sup>th</sup>	2%	
Review #4	May 2 <sup>nd</sup>	2%	
<b>TOTAL PERCENTAGE</b>		<b>100%</b>	

**Summative Exams**

Multiple-choice exams will be administered in-person on the designated date indicated on the class schedule. If you require additional time/support during exams, please let the course director know **on the first day of class**. Content from lecture and neuromodule will be represented. Test questions will come from material covered in asynchronous lectures, hybrid sessions, and neuromodules. If a topic is listed as a learning objective or is covered in class then it will most likely be included on an exam.

**Formative Quizzes**

Multiple-choice quizzes will be administered virtually through Blackboard. These quizzes are low-stakes activities and will open on Thursdays at 5pm for students who have signed the attendance sheet at the hybrid or in-person sessions. Students will have one attempt to complete the quiz before it closes on Sundays at 5pm. Incomplete quizzes or quizzes with no attempt will receive a zero.

**Summaries, Review Sessions, and Class Activities**

Before each unit exam, there will be in-person unit summaries and review sessions. During this time students can bring questions that they would like to review regarding lecture and neuromodule content. Structured activities during these sessions may include review of the neuromodules, formative assessments, student presentations, and other tasks.

Graduate students will be responsible for preparing the review sessions which includes creating a presentation with multiple-choice questions (12% of total grade; more below), and answering quiz questions (2% of total grade) prepared by your colleagues.

**Presentation & Quiz Questions:**

Each graduate student will be assigned a unit topic to present, create 2-3 multiple-choice quiz questions, and facilitate a class discussion. The presentation will be 15-20 minutes including discussion. Students should discuss the relevant neuroanatomy including the relevant structures, how it functions normally and *why* specific deficits may be observed from an associated pathology.

***Assignment Due Date.*** The presentation draft and quiz questions are due a week in advance of your presentation. This will allow you to receive feedback from your instructor and allows for the quiz to be printed in advance of the scheduled review session.

***Attendance is mandatory for each review session.*** If you miss your presentation or your colleagues, you will not receive any points unless otherwise determined by the course director. See the instructions below and rubric attached as Appendix.

**Presentation Instructions [Grade determined by Rubric (Appendix)]**

- Student assignments will be selected during the first unit.
- Each student will be assigned a neuroanatomy concept associated with a neuropathological topic. The following are examples:
  - Ventricular system & vesiculation - Hydrocephaly
  - Neurocytology - Multiple Sclerosis
  - Neurocytology – Glioma
  - Cerebral blood flow – intracranial hemorrhage or vascular headaches
  - Spinal Cord - Brown Sequard Syndrome
  - Spinal Cord - Syringomyelia
  - Brainstem - Locked-in Syndrome
  - Brainstem - Medial Medullary Syndrome
  - Brainstem - Lateral Medullary Syndrome
  - Cranial nerves - Lyme disease effects on facial nerve
  - Brain - Cretzfeldt-Jakob Disease
- Students will prepare a PowerPoint presentation for a **15-20 minute facilitated discussion** about the neuroanatomy and related neuropathology topic.
  - It is critical to discuss the relevant neuroanatomy, how the neuroanatomical structures function normally, and *why* specific deficits are observed from the neuropathology. Specific grading information is provided in the rubric below.

### Neuromodules

Asynchronous laboratory materials will be provided at the beginning of each unit.

**Unit 1:** Neuromodule 1: Surface Anatomy of the Brain and Vascular Supply

**Unit 2:** Neuromodule 2: Spinal Cord and Brainstem

**Unit 3:** Neuromodule 3: Brainstem and Cranial Nerves

**Unit 4:** Neuromodule 4: Cerebellum, Thalamus, and Functional Regions

### **Class Policies**

Attendance policy: attendance for all in-person and hybrid sessions are mandatory. Unexcused absences will result in a 10% reduction of your grade. Access to the weekly quizzes are provided by signing the attendance sheet at each hybrid or in-person session.

### **Observance of Religious Holidays:**

In accordance with University policy, students should notify faculty during the first week of the semester of their intention to be absent from class on their day(s) of religious observance. For details and policy, see: <https://registrar.gwu.edu/university-policies#holidays>

### **Academic Integrity**

I, and the Anatomy and Cell Biology department, support the GW Code of Academic Integrity. It states: "Academic dishonesty is defined as cheating of any kind, including misrepresenting one's own work, taking credit for the work of others without crediting them and without appropriate authorization, and the fabrication of information." For the remainder of the code, see:

<https://studentconduct.gwu.edu/code-academic-integrity>

### **Support for Students Outside the Classroom**

#### *Disability Support Services (DSS)*

Any student who may need an accommodation based on the potential impact of a disability should contact the Disability Support Services office at 202-994-8250 in the Marvin Center, Suite 242, to establish eligibility and to coordinate reasonable accommodations. For additional information please refer to: <https://disabilitysupport.gwu.edu/>

#### *Mental Health Services 202-994-5300*

The University's Mental Health Services offers 24/7 assistance and referral to address students' personal, social, career, and study skills problems. Services for students include: crisis and emergency mental health consultations confidential assessment, counseling services (individual and small group), and referrals. For additional information see: [counselingcenter.gwu.edu/](https://counselingcenter.gwu.edu/)

### **Security**

In the case of an emergency, if at all possible, the class should shelter in place. If the building that the class is in is affected, follow the evacuation procedures for the building. After evacuation, seek shelter at a predetermined rendezvous location.

Tuesday (T) and Thursdays (H), 11:15 a.m. - 12:30 p.m.

[Q = Quiz]

Date	Instructor	Session Designation		Session Title
Jan 17/T	Pajooohesh-Ganji Carroll	In-person/Hybrid	-	Intro to course, CNS/PNS overview
Jan 19/H	Pajooohesh-Ganji	Asynchronous	Q	Gastrulation and Neurocytology
Jan 24/T	Carroll	Asynchronous	-	Primitive brainstem and brain anatomy
Jan 26/H	Pajooohesh-Ganji	In-person/Hybrid	Q	CSF, meninges, and ventricles
Jan 31/T	Carroll	Asynchronous	-	Cerebral vascular system
Feb 2/H	Pajooohesh-Ganji Carroll	In-person	Q	Summary
Feb 7/T	Pajooohesh-Ganji Carroll	In-person		Review session (Graduate Students)
Feb 9/H	Pajooohesh-Ganji Carroll	In-person		<b>Exam 1</b>
Feb 14/T	Carroll	Asynchronous	-	Spinal cord: introduction and overview
Feb 16/H	Pajooohesh-Ganji Carroll	In-person	Q	Gross Anatomy Lab (Ross Hall 218)
Feb 21/T	Carroll	Asynchronous	-	Spinal cord: sensory systems
Feb 23/H	Carroll	In-person/Hybrid	Q	Spinal cord: motor systems/reflexes
Feb 28/T	Pajooohesh-Ganji	Asynchronous	-	Intro to brainstem & CN nuclei
Mar 2/H	Pajooohesh-Ganji Carroll	In person	Q	Summary
Mar 7/T	Pajooohesh-Ganji Carroll	In-person		Review session (Graduate Students)
Mar 9/H	Pajooohesh-Ganji Carroll	In-person		<b>Exam 2</b>
<b>Mar 13-18</b>	<b>Spring Break</b>			
Mar 21/T	Carroll	Asynchronous	-	Motor/sensory CNs of the head & neck
Mar 23/H	Pajooohesh-Ganji	In-person/Hybrid	Q	CN II/visual system
Mar 28/T	Carroll	Asynchronous	-	CNs and eye movement III, IV, VI
Mar 30/H	Pajooohesh-Ganji	In-person/Hybrid	Q	CN VIII/ auditory/ vestibular system
Apr 4/T	Pajooohesh-Ganji Carroll	In-person	-	Summary
Apr 6/H	Pajooohesh-Ganji Carroll	In-person		Review session (Graduate Students)
Apr 11/T	Pajooohesh-Ganji Carroll	In-person		<b>Exam 3</b>
Apr 13/H	Pajooohesh-Ganji	Asynchronous	-	Cerebellum
Apr 18/T	Carroll	In-person/Hybrid	-	Extrapyramidal system, basal ganglia
Apr 20/H	Pajooohesh-Ganji	Asynchronous	Q	Limbic & olfactory system
Apr 25/T	Carroll	In person/Hybrid	-	Cortical functional areas & Internal anatomy of the brain
Apr 27/H	Pajooohesh-Ganji Carroll	In-person	Q	Summary
May 2/T	Pajooohesh-Ganji Carroll	In-person		Review session (Graduate Students)
<b>May 4/H</b>	<b>Reading Day</b>			
TBD May 5-16	Pajooohesh-Ganji Carroll	In-person		<b>Exam 4</b>

<b>Appendix: Presentation Rubric.</b>				
<b>Performance Criteria</b>	<b>0 – 1</b>	<b>1.5 – 2.5</b>	<b>3 – 4</b>	<b>Point Value</b>
Relevant neuroanatomy	<p>Fails to mention relevant neuroanatomy.</p> <p>Several key points that are pertinent to understanding the relevant neuroanatomy may be missing.</p>	<p>Provides an adequate explanation but fails to elaborate on the neuroanatomical concepts.</p> <p>A few key points may be missing that are neuroanatomically relevant</p>	<p>Provides a clear, concise, and well-thought-out explanation.</p> <p>Provides an accurate explanation of neuroanatomy and makes relevant connections between neuroanatomical concepts.</p> <p>Each key neuroanatomical point is clearly presented and described.</p>	<b>4</b>
Discussion of deficits linked to relevant neuroanatomy	<p>Fails to relate relevant neuroanatomy to deficits or the associated neuropathology.</p> <p>There is an apparent lack of understanding of how the neuropathology results in the deficits.</p>	<p>Provides an adequate explanation but fails to elaborate on the functional neuroanatomical system(s) or structure(s) related to the neuropathology</p>	<p>Provides a clear, concise, and well-thought-out explanation of the deficits.</p> <p>Provides an accurate explanation of how disruption leads to the neuropathology.</p> <p>Compares and contrasts how similar neuroanatomical deficits would present differently (as applicable).</p>	<b>4</b>
Overall effectiveness and organization	<p>The presentation fails to organize information logically.</p> <p>There is little to no use of relevant class materials.</p> <p>There is an apparent lack of effort.</p>	<p>The presentation is sometimes unstructured or unclear, but the discussion is adequately organized.</p> <p>Limited use or only a few relevant course materials</p>	<p>The presentation is well-organized and the facilitated class discussion is fruitful.</p> <p>There is a logical plan for the discussion</p> <p>Relevant use of available course materials and references.</p>	<b>4</b>
<b>Total</b>				<b>12</b>