Human Physiology I

BIPN 100

Spring 2024 **BIPN 100 Syllabus S2024**

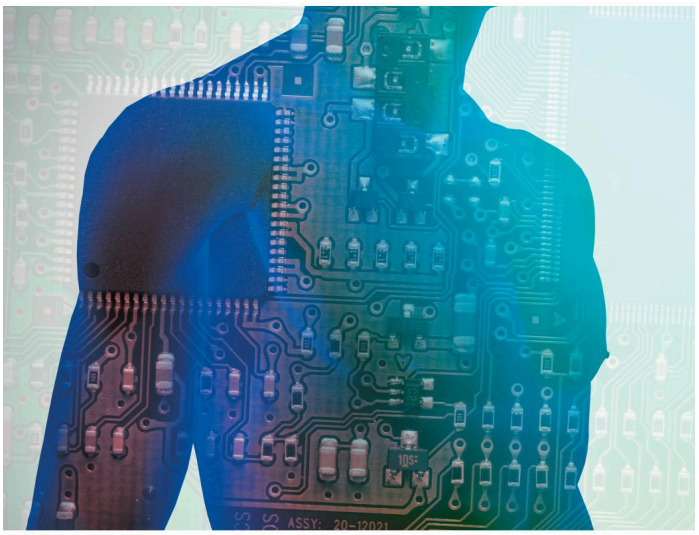
Instructor: Isabella Maita
Email: imaita@ucsd.edu
Student Hours: Tuesday, 3-4 PM HSS 8018
Thursday, 1-2 PM Zoom

Meeting Times:

Lecture	C00	M/W	6:30 PM - 7:50 PM	FAH 1301
Discussion	C01	M	3:00 PM - 3:50 PM	RWAC 115
	C02	M	4:00 PM - 4:50 PM	RWAC 115
	C03		*See below*	
	C04		*See below*	
	C05	W	4:00 PM - 4:50 PM	RWAC 115

Course Description

Physiology refers to the functions and mechanisms that support life. BIPN 100 covers the physiology of several organ systems that produce behavior, maintain homeostasis, and promote survival of the human body, including the nervous, endocrine, muscular, cardiac, and renal systems.



This course emphasizes the core biological concept of homeostasis at several levels of biological organization- from molecular mechanisms to integration of function between organ systems. Throughout the quarter, we will practice applying concepts in physiology by considering homeostatic dysfunction linked to disease states.

Role	Name	Email	Office Hours	Contact Regarding
Instructor	Isabella Maita	imaita@ucsd.edu	**Tuesday**, 3-4 PM HSS 8018 **Thursday**, 1-2 PM Zoom	- Exams/Quizzes - Course Content
Graduate IA	Changcheng Li	chl246@ucsd.edu	**Wednesday** 10-10:50 AM HSS 1145L	- Discussion Assignments - Discussion Section - Course Content
UGIA	Ruby Huang	zih027@ucsd.edu	**Monday** 5-5:50 PM Zoom	- Course Content - Studying tips
UGIA	Delilah Del Valle	ddelvall@ucsd.edu	**Tuesday** 1-1:50 PM Zoom	- Course Content - Studying tips
UGIA	Cole Geller	cgeller@ucsd.edu	**Wednesday** 9-9:50 AM Outside seating near M.O.M's Cafe	- Course Content - Studying tips

Course Materials

Canvas Website: https://canvas.ucsd.edu/courses/54445

Course materials, podcasted class sessions, quizzes, DAs, this syllabus, etc. will be posted on Canvas. Keep an eye out for Canvas announcements and quiz reminders.

Podcast: https://podcast.ucsd.edu/

Video & audio recordings can be found at the link above and in the Media Gallery on Canvas. That said, if the podcast fails to record, I cannot commit to re-recording my lecture. I highly recommend showing up in-person.

Recommended textbook: *Human Physiology*, 8th edition by Dee Silverthorn.

Highly recommended, NOT required. BIPN 100 is participating in the BryteWave/ RedShelf Inclusive Access (IA) program this term, thus **you have been opted-in** to the textbook at a discounted price ($39). Check out the book, and if you will not find it helpful then be sure to opt-out by April 13th to avoid charges. You should receive opt-out instructions via email or you can use this link. Please visit the bookstore website or contact textbooks@ucsd.edu if you have questions about IA.

Recommended readings are listed with the learning outcomes, but exams and quizzes will only contain content covered in lecture and discussion sessions, so consistent class attendance is highly recommended.

Recommended Learning Platform: *Mastering A&P*, Pearson

Recommended, NOT required. *Mastering* is an active-learning-based digital tool that guides students through textbook content. I will NOT assign you content on *Mastering*, and have not fully vetted the program. However, *Mastering* guided active-learning activities may be helpful for you.

Evaluation

Learning will be assessed via three types of assignments, DAs, quizzes, and exams.

	Quantity	**Due**	**Weight per assignment**	**Total Weight**
Discussion Activities (DA)	8 (1 incomplete dropped)	Thursdays at 11:59 PM	2%	14%
Quizzes	7	Fridays at 11:59	3.5%	21%

	(Lowest grade dropped)	PM		
Midterm Exams	2 midterms	E1: April 26th E2: May 24th	20%	40%
Final Exam	1 final	June 12th	25%	25%

Grading Scale: I do not grade on a curve. The grading scale is as follows:

A+	≥97%	**B+**	87 to <90%	**C+**	73 to <80%	**D**	50 to <60%
A	94 to <97%	**B**	84 to <87%	**C**	66 to <73%	**F**	<50%
A-	90 to <94%	**B-**	80 to <84%	**C-**	60 to <66%		

Exams

Midterm Exams: Two midterm exams will be administered outside of our normal lecture session. No rescheduling of the exams will be allowed, outside of the makeup exam conditions listed below. If you are late for an exam, additional time will not be given. Midterm exams will consist of multiple choice questions (50 pts) and short answer questions (20 pts), to be completed in 80 minutes.

Exam 1: Friday, April 26th, 6-7:20 PM. Warren Lecture Hall (WLH), Room 2001

Exam 2: Friday, May 24th, 6-7:20 PM. Warren Lecture Hall (WLH), Room 2001

Final Exam: One final exam will be administered during the final exam periodIt will consist of 120 multiple choice questions to be completed in 3 hours. The final is cumulative, with questions on material covered throughout the quarter, with a focus on more recent material.

Final Exam: Wednesday, June 12th, 7-10 PM. Location TBD

Make-Up Exams: Make-up exams can be administered only under the following conditions: (1) scheduled prior to the day of the exam, (2) written proof is provided (e.g. doctor's note, email notice of religious observation, court attendance, intercollegiate athletics) or (3) in an emergency and the instructor is promptly updated. Make-up exams will differ from the original exam.

Online Quizzes

- *Due WEEKLY on Fridays at 11:59 PM, except when a midterm is scheduled.*
- Access & Submission: Quizzes can be accessed starting on Mondays at 7:50 PM (after lecture) under the "Quizzes" tab on Canvas. Students are responsible for accessing quizzes and other online assignments with a stable Internet connection.
- Content: 5 multiple choice questions on material from the previous week of lecture. *If taking the quiz on Monday night, you can expect questions on content from the lecture that day and the previous Wednesday*. Question and answer pools are randomized, and quizzes should be completed independently.
- Grading: Quizzes are graded for accuracy. Your lowest quiz grade will be dropped.
- Purpose: Questions are similar to exam questions, and are used as practice and a predictor for exams. Quiz answers will be released on Saturdays at 12 AM. If you are unhappy with your quiz score, consider bringing your questions to Student Hours.

Discussion Section

Discussion sections will meet in-person in Ridge Walk Academic Complex (RWAC) room 0115. Discussion sections are not mandatory, but are *highly recommended* and designed to improve your learning of lecture content. During discussion sections, IAs will lead group discussions, presentations, and Discussion Activities (DAs) to facilitate your learning. Arrive

ready to collaborate with your team, ask questions, use lecture content, and actively participate. Only three sections will meet, so if you are enrolled in C03 or C04, feel free to attend any of the following sections:

C01 Mon 3:00 PM - 3:50 PM RWAC 115

C02 Mon 4:00 PM - 4:50 PM RWAC 115

C05 Wed 4:00 PM - 4:50 PM RWAC 115

While not mandatory, attending discussion sections will allow you to submit DAs as a group- see below. Those enrolled in C03 and C04 who cannot attend the discussion section can attend IA office hours for help with their DAs.

Discussion Activities (DAs)

- *Due WEEKLY on Thursdays at 11:59 PM.*
- Access & Submission: Released on Monday mornings at 12 AM under the "Assignments" tab on Canvas. DAs are designed as in-class assignments, to be completed in groups during our organized discussion section. DAs can be submitted as a group if completed at a discussion section. **If you are unable to attend the discussion section, then you can submit the assignment independently by following the instructions on the Canvas assignment.**
- Content: DAs will take a multitude of formats, including problem sets, visual organizers, case studies, and short answer questions about recent lecture content.
- Grading: Graded for completion, not accuracy.
- Purpose: DAs are designed to help you practice using lecture content: recalling and using information, discussing with classmates, teaching one-another, and presenting improves your learning. You benefit most if you complete DAs during discussion sections, where you will have opportunities to ask questions, present your work, and request feedback.

Extra Credit Videos

- *Due at 12 PM (noon) 2-4 days prior to exams. The due date is dependent upon the learning outcome your video covers.*
    - *Learning outcomes from lecture 1-6: Due Monday, April 22nd at 12 PM (noon)*
    - *Learning outcomes from lecture 7-14: Due Monday, May 20th at 12 PM (noon)*
    - *Learning outcomes from lecture 15-18: Due Monday, June 10th at 12 PM (noon)*
- Access and Submission: A 3-5 minute video on a learning outcome of your choice can be posted to the relevant Discussion tab on Canvas at any time during the quarter, at least 5 days prior to the exam.
    - See submission instructions in the Discussion tab
- Content: Videos must be about a course learning outcome, and must use a visual organizer to clearly and accurately explain the outcome.
    - Some outcomes are expansive, and do not need to be thoroughly covered in your video, however, clearly low-effort videos will not be accepted.
    - All figures and content presented must be your own. Videos may NOT use images from the textbook, lecture, DA assignments, or other external images.
- Grading: Graded for accuracy, clarity, and effort. No partial credit if any of the above policies are violated.
    - 2% extra credit per video, 4% extra credit maximum (2 videos)
    - Maximum of 1 video per exam
    - Maximum of 2 total videos
    - Extra credit points will be added to the *final course grade* at the end of the quarter
- Purpose: Creating and presenting visual organizers is a well-established learning method (see How to Succeed in BIPN 100). Videos must be posted to Canvas and accessible to other students, so fellow classmates share videos for review/study tools for tricky topics.

Surveys

You may be asked to complete an anonymous survey(s) for additional credit on a midterm exam(s). If you prefer not to participate, an alternate assignment for additional credit will be offered. Additional credit, surveys, and alternate assignments are not guaranteed.

Contacting the Instructor

Email: Email me at imaita@ucsd.edu with "BIPN 100" in the subject line and expect a response within 1 business day.

Student Hours: (aka "office hours") please complete the welcome survey

Student hours will be determined by a vote at the start of the quarter, in order to optimize student availability. Student hours are regularly scheduled periods of time for YOU, the student, to pop by my office to discuss lecture material, upcoming assignments/quizzes/exams, grades, and any other comments or concerns. If you cannot attend the decided upon office hours, please email the instructor to schedule an alternative in-person or virtual meeting time.

VOTE HERE on your Student Hour preferences:
https://docs.google.com/forms/d/e/1FAIpQLSf8ySI5R_1c6gZutMKQHlvN_ZuiinIWCN7qF0Gx7MQihPeCXg/viewform?usp=sf_link

How to Succeed in BIPN 100

Other than the obvious (attending lectures, taking notes).

Practice Learning Outcomes: Learning outcomes are achievable goals that can be practiced and assessed. Learning physiology requires more than drilling flashcards. In order to learn mechanisms and complex interactions, I recommend organizing lecture information into comprehensive visual organizers- labeled diagrams, drawings, flowcharts, and tables. Synthesization and visualization facilitate learning! Physiologists

are often interested in pathology, so also consider what may go wrong in any given system. For example:

- Create table CCing endocrine glands and hormones. Then, add a category to your table that predicts the consequences of hyper/hypo activity of each gland.
- Draw a flowchart SEQing the opening/closing voltage-gated ion channels during an AP. Consider if any one step of the AP is blocked by a neurotoxin.

Once you've created your visual organizers using your notes, recreate them! Recall strengthens long-term memory, so practice creating organizers both with *and without* your notes. Creating these organizers requires more cognitive energy *at first*, but results in more complete understanding.

Teaching is Learning: Teaching others- or just pretending to- improves learning outcomes. Once you have created a visual organizer, present it to a classmate, parent, or pet. Make use of discussion sections by collaborating with your classmates, talking through mechanisms, asking questions, and quizzing one another with predicted exam questions.

Conduct Gap Analysis: Identifying learning outcomes that you are struggling to achieve is an essential part of learning! Identify gaps in your knowledge and use the resources available to you- discussion sections, student hours, classmates, the textbook. Your instructor/TAs are rooting for your success! Bring up questions and concerns ASAP, so we can do everything in our power to help you succeed.

Course Policies

Plagiarism and Academic Dishonesty: Any violations of academic integrity, according to the UC San Diego policies on academic integrity, will be taken very seriously. Cheating on quizzes and exams will absolutely *not* be tolerated. Violations will be reported to the Academic Integrity (IA) Office.

Disability Services: UC San Diego- including this course and instructor- welcomes students of all abilities. Contact the campus Office for Students with Disabilities (OSD) to be considered for appropriate accommodations. Please provide the instructor with your accommodation letter (AFA) as early in the semester as possible.

OSD Website: https://osd.ucsd.edu/students/registering.html

Inclusivity Statement: I understand and celebrate that students come from a variety of backgrounds and perspectives. I strive to create an inclusive and welcoming classroom environment. To foster this environment, I ask that students maintain a considerate and kind class culture. I encourage students to share their experiences and views, while remaining open and respectful of the experiences and views of others. Disrespectful language and behavior will not be tolerated and may be penalized by reduced grades and/or further intervention.

Health and Well-Being Policy: In accordance with UC San Diego policy at the start of the Fall 2023 semester, masking is optional in the classroom. If you have recently been exposed to COVID or are under the weather, please consider wearing a mask. If you are experiencing symptoms, please do not attend class and take action to prepare alternate learning opportunities (ask a classmate to share their notes, review lectures online, schedule online office hours).

Transfer Students: The Triton Transfer Hub is available to meet transfer students' academic, social, and personal needs. Services include 1:1 involvement and academic success support with professional staff, peer coaching, professional and academic workshops, transfer meetups and more.

Triton Transfer Website: https://transferstudents.ucsd.edu/

Subject to Change Policy: The instructor reserves the right to alter the syllabus (i.e. course schedule) as needed to improve student learning.

Campus Policies

- **UC San Diego Principles of Community**
- **UC San Diego Policy on Integrity of Scholarship**
- **Religious Accommodation**
- **Nondiscrimination and Harassment**
- **UC San Diego Student Conduct Code**

Other Resources:

Learning and Academic Support	
Ask a Librarian: Library Support *Chat or make an appointment with a librarian to focus on your research needs* **Course Reserves, Connecting from Off-Campus and Research Support** *Find supplemental course materials* **First Gen Student Success Coaching Program** *Peer mentor program that provides students with information, resources, and support in meeting their goals* **Office of Academic Support & Instructional Services (OASIS)** *Intellectual and personal development support*	**Writing Hub Services in the Teaching + Learning Commons** *One-on-one online writing tutoring and workshops on key writing topics* **Supplemental Instruction** *Peer-assisted study sessions through the Academic Achievement Hub to improve success in historically challenging courses* **Tutoring – Content** *Drop-in and online tutoring through the Academic Achievement Hub* **Tutoring – Learning Strategies** *Address learning challenges with a metacognitive approach*
Support for Well-being and Inclusion	

Basic Needs at UCSD *Any student who has difficulty accessing sufficient food to eat every day, or who lacks a safe and stable place to live is encouraged to contact:* foodpantry@.ucsd.edu | basicneeds@ucsd.edu | (858) 246-2632 **Counseling and Psychological Services** *Confidential counseling and consultations for psychiatric service and mental health programming* **Triton Concern Line** *Report students of concern:* (858) 246-1111 **Office for Students with Disabilities (OSD)** *Supports students with disabilities and accessibility across campus*	**Community and Resource Centers** **Office of Equity, Diversity, and Inclusion** *As part of the Office of Equity, Diversity, and Inclusion the campus community centers provide programs and resources for students and contribute toward the evolution of a socially just campus* (858).822-.3542 | diversity@ucsd.edu **Get Involved** *Student organizations, clubs, service opportunities, and many other ways to connect with others on campus* **Undocumented Student Services** *Programs and services are designed to help students overcome obstacles that arise from their immigration status and support them through personal and academic excellence*

Course Schedule

The class schedule below is subject to change.

Week	Lecture	Day	Topic	Assessment
1	1	Monday, April 1	Syllabus Core concepts in Physiology Nervous System Physiology I: neuron structure & function	Welcome Survey **No DA due this week** **No discussion sections this week**
	2	Wednesday, April 3	Nervous System Physiology II: membrane potential, GHK, Ohms, Nerst	**No quiz due this week**
2	3	Monday, April 8	Nervous System Physiology III: action potential	**DA #1** due Thursday, April 11th: Neurons & Membrane Properties **DAs are due at 11:59 PM every Thursday**
	4	Wednesday, April 10	Nervous System Physiology IV: synaptic transmission	**Quiz #1** due Friday, April 12th: Lectures 1-3 *** Note 3 topics on this quiz *** **Quizzes are due at 11:59 PM every Friday**
3	5	Monday, April 15	Nervous System Physiology V: organization and functional anatomy of the CNS	**DA #2** due Thursday, April 18th: Action Potential
	6	Wednesday, April 17	Nervous System Physiology VI: sensory physiology	**Quiz #2** due Friday, April 19th: Lectures 4-5.
4	7	Monday, April 22	Neuromuscular Physiology I: NMJ, E-C coupling, power stroke	**DA #3** due Thursday, April 25th: Synaptic Transmission and PNS
		Wednesday, April 24	Catch up and Midterm #1 Review	**No quiz due this week**
	Midterm #1 Friday, April 26th: Lecture 1 through Lecture 6			
5	8	Monday, April 29	Neuromuscular Physiology II: motor pathways, metabolism, and muscle types	**DA #4** due Thursday, May 2nd: NMJ and E-C Coupling

Week	Lecture	Day	Topic	Assessment
	9	Wednesday, May 1	Nervous System Physiology VII: Autonomic Nervous System	**Quiz #3** due Friday, May 3rd: Lectures 6-8. *** Note 3 topics on this quiz ***
6	10	Monday, May 6	Endocrine Physiology I: hormones	**DA #5** due Thursday, May 9th: Motor Pathways and ANS
	11	Wednesday, May 8	Endocrine Physiology II: endocrine reflexes	**Quiz #4** due Friday, May 10th: Lectures 9-10.
7	12	Monday, May 13	Smooth Muscle Physiology: contraction, regulation	**DA #6** due Thursday, May 16th: Endocrine Reflex Loops
	13	Wednesday, May 15	Cardiac Physiology I: EC coupling, action potential	**Quiz #5** due Friday, May 17th: Lectures 11-12
8	14	Monday, May 20	Cardiac Physiology II: the heart, cardiac cycle, cardiac output	**DA #7** due Thursday, May 23rd: Smooth Muscle Contraction
		Wednesday, May 22	Catch up and Midterm #2 Review	**No quiz due this week**
	Midterm #2 Friday, May 24th: Lecture 7 through Lecture 13			
9		Monday, May 27	No Class: Memorial Day Holiday	**No DA due this week** **No discussion sections this week**
	15	Wednesday, May 29	Cardiac Physiology III: Wigger's diagram, ECG	**Quiz #6** due Friday, May 31st: Lecture 13-14
10	16	Monday, June 3	Renal Physiology I: the kidneys, filtration	**DA #8** due Thursday, June 6th: Cardiac Control and EKG
	17	Wednesday, June 5	Renal Physiology II: reabsorption, secretion, excretion, flow rates, endocrine control	**Quiz #7** due Friday, June 7th: Lecture 15-16.
	Final Exam Wednesday, June 12th: Cumulative, with an emphasis on Lectures 14-17.			

BIPN 100 Learning Outcomes

See: How to Succeed in BIPN 100

APPLY = identify and connect a concept to a real-world example (case study)

CALC = use equations to calculate real-world measures (problem sets)

CC = compare and contrast components of a mechanism (table)

DESC = describe (short answer/combination of visual organizers)

DIAG = draw, label, and identify components of a graph, diagram, physiological reading (diagram/graph)

SEQ = sequence a series of events that make up a mechanism (flowchart)

Lecture 1. Core Concepts & Neuron Physiology

Reading List: Chapters 1.2-1.5, 8.2 up to "Glial Cells Provide…"

Review: Chapters 2- Chemistry; Chapters 3 and 5- Cell Components

1. CC, APPLY themes physiology
2. APPLY, CALC law of mass balance
3. CC function and mechanism
4. CC, DIAG neuron structures and functions
5. CC 3 types of neurons
6. CC types of ion channels
7. Apply review material from BILD 1 and BILD 2

Lecture 2. Membrane Properties

Reading List: Chapter 8.3 up to "Action Potentials Travel…"

1. CC effects of chemical and electrical forces on ion movement across a membrane
2. CALC equilibrium potential for an ion using Nernst equation
3. CALC membrane potential using GHK equation
4. CALC current, resistance, conductance, and voltage using Ohm's Law

5. CC membrane properties: resting potential, conductance, resistance
6. SEQ current flow depending on ion concentration and membrane properties
7. DIAG voltage-current plots

Lecture 3. Action Potential

Reading List: Chapter 8.3 after "Action Potentials Travel"

1. CC components of axonal membrane: Na^+/K^+ pump, Na^+ and K^+ voltage-gated ion channels, Na^+ and K^+ leak channels
2. SEQ, DIAG membrane potential, ion channel activity and ion flow during an action potential
3. CC absolute and relative refractory period
4. CC activation and inactivation gates of voltage-gated Na+ ion channels
5. CC types of conduction
6. CC factors affecting conduction

Lecture 4. Synaptic Transmission

Reading List: Chapter 8.4-8.5

1. CC electrical and chemical synapses
2. SEQ neurocrine synthesis, storage, release, termination
3. CC types of NT termination
4. DESC link between APs, synaptic transmission, and size of stimulus
5. CC postsynaptic responses
6. CC ionotropic and metabotropic receptors
7. DESC how neurotransmitter can be excitatory at one synapse, inhibitory at another
8. CC, DIAG types of summation
9. APPLY, DIAG principles of summation, PSPs, graded potentials, threshold to determine whether a postsynaptic neuron will fire

Lecture 5. Central Nervous System Physiology

Reading List: Chapter 9.3-9.5, 9.6 (first two sections)

1. DESC concept of neural network. What functional properties of neurons allow formation of neural networks?
2. CC CNS and PNS
3. CC, DIAG white and gray matter
4. DESC blood brain barrier
5. CC functions of cerebral cortex, limbic system, and brain stem
6. DIAG lobes of the brain
7. CC functions of spinal cord
8. DIAG anatomy of spinal cord, CC functions
9. SEQ, CC flow of afferent/efferent information to/from brain via spinal cord
10. SEQ spinal reflex

Lecture 6. Sensory Physiology

Reading List: Chapter 10.1

1. SEQ sensation starting with stimulus
2. CC types of sensory receptors
3. SEQ gustatory transduction
4. DESC how convergence of sensory neurons affects size of receptive fields
5. CC how brain perceives modality, location, intensity, and duration of stimuli
6. CC tonic and phasic receptors

Lecture 7. Neuromuscular Junction

Reading List: Chapter 11.2, 12.1 up to “Skeletal muscle contraction requires at steady supply of ATP”

1. DIAG, CC components of muscle fibers:
    a. DIAG neuromuscular junction
    b. CC components of myofibrils
    c. CC regulatory, channel, and receptor proteins
    d. CC thick and thin filaments
    e. DIAG, CC regions of the sarcomere (A band, M line, etc)
2. DESC role of ATP in sliding filament model

3. SEQ muscle contraction starting with somatic motor neuron through the power stroke
    a. SEQ excitation-contraction coupling and role of calcium channels
    b. SEQ crossbridge formation

4. CC isotonic and isometric contractions

Lecture 8. Motor Pathways, Muscle Types, and Metabolism

Reading List: Chapter 12.1 after "Skeletal muscle contraction requires a steady supply of ATP", Chapter 13.3, 12.2

1. CC sources of energy for skeletal muscles
2. CC slow-twitch muscles and 2 types of fast-twitch muscles
3. CC, DIAG relationships between length & tension, summation & contraction, and motor units & contraction force
4. CC/SEQ motor pathways
5. CC components of skeletal muscle reflex
6. SEQ muscle tone reflex, GTO reflex, alpha-gamma coactivation, stretch reflex and withdrawal reflex
7. CC gamma motor neurons and alpha motor neurons
8. DIAG, CC components and structure of muscle spindles

Lecture 9. Autonomic Nervous System

Reading List: Chapter 11.1

1. CC, DIAG sympathetic and parasympathetic functions and pathways, SEQ interaction between two branches
2. SEQ, CC, DIAG signal transduction pathways at neuroeffector junction
3. CC neurotransmitters, receptors, and receptor subtypes in the ANS
4. SEQ activation of adrenal medulla

Lecture 10. Endocrine I

Reading List: Chapter 7.1-7.3, Chapter 6.3

1. CC, SEQ synthesis, storage, transport in blood, cell mechanism of action for each hormone type
2. APPLY law of mass action to plasma steroid hormone concentration

Lecture 11. Endocrine II

1. APPLY feedback loops to hormone action
2. CC endocrine & neuroendocrine structures
3. SEQ hormone actions
4. CC 3 types of hormone interactions

Lecture 12. Smooth Muscle

Reading List: Chapter 12.3

1. DIAG, CC components of smooth muscle fibers
2. CC tonic and phasic smooth muscle contraction
3. CC single-unit and multi-unit smooth muscle
4. SEQ smooth muscle contraction and relaxation
5. CC myosin light chain kinase and myosin light chain phosphatase
6. CC, SEQ ANS, local, hormonal control of smooth muscle contraction
7. CC, SEQ effects of calcium sensitivity on smooth muscle contraction
8. CC smooth and skeletal muscle anatomy and contraction

Lecture 13. Cardiac Physiology I: Cardiac Muscle

Reading List: Chapter 14.3

1. SEQ, CC steps of EC coupling in cardiac muscle
2. SEQ, DIAG, CC action potential in contractile and autorhythmic cardiac muscle
3. DESC how tetanus is prevented in cardiac muscle
4. CC skeletal, smooth, cardiac muscle
5. SEQ, CC ANS chronotropic and dromotropic effects

Lecture 14. Cardiac Physiology II: The heart

Reading List: Chapter 14.4 “Anatomy Summary”, 14.4 until “Pressure-Volume Curves…”

1. CC chambers of the heart and valves
2. SEQ, DIAG blood flow through the heart
3. SEQ electrical conduction in the heart
4. CC, CALC measures of cardiac performance (SV, CO)
5. CC, SEQ relationship between preload, contractility, afterload, SV, CO
6. SEQ catecholamine effects on contractile cells

Lecture 15. Cardiac Physiology III: EKG & Wigger’s

Reading: Chapter 14.2, 14.4 following “Pressure-Volume Curves”

1. CC, CALC blood flow
2. CC, CALC pulse pressure
3. CC, CALC mean arterial pressure
4. CC, DIAG electrical events in an EKG
5. DIAG Wigger’s Diagram
6. DIAG Pressure-Volume Curve

Lecture 16. Renal Physiology I

Reading: Chapter 19.1-19.4

1. CC 6 functions of the kidneys
2. CC, DIAG functional components of renal circulation and tubule systems of kidney
3. CC, SEQ relationship between GFR, filtration pressure, filtration coefficient
4. CALC net filtration pressure
5. CC functions, process, location of filtration, reabsorption, secretion, excretion
6. CC mechanisms of transepithelial and paracellular transport
7. SEQ, CC reabsorption of Na+, glucose, proteins, H2O
8. SEQ function of ADH/vasopressin

Lecture 17. Renal Physiology II

Reading: Chapter 19.5-19.7, 20.2

1. DIAG, APPLY saturation and renal threshold
2. SEQ regulation of GFR
3. CC, APPLY effects of renal handling on clearance