

PLANNING MOTOR ACTIONS

APK 6206 ~ 3 CREDITS ~ SPRING 2022

INSTRUCTOR:

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OFFICE HOURS:

Office hours are Tuesdays 1pm-1:55pm

MEETING TIME/LOCATION: T | Period 7 - 9 (1:55 PM - 4:55 PM) / FLG 230

COURSE DESCRIPTION: This course will address the role of the central nervous system in the control of voluntary movements. The focus is how different parts of nervous system including, the spinal cord, brainstem, cerebral cortex (frontal and parietal lobes), basal ganglia and cerebellum contribute to the planning and control of movement, as well as skill learning. Mechanisms of neural plasticity and regeneration will be discussed. Converging evidence from movement disorders, brain imaging, animal lesion, optogenetics, and single cell studies provide the primary basis for the content. At the completion of this class you should have a working knowledge of the major structures involved in the neural control of movement.

RECOMMENDED TEXTBOOK: **Neuroscience Sixth Edition** - Editor: Purves et al.

COURSE FORMAT: This class is primarily lecture-based with additional in-class demonstrations, discussions, and short videos.

COURSE LEARNING OBJECTIVES:

1. Describe electric signaling of nerve cells and synaptic transmission as they pertain to movement and induction of neural plasticity.

2. Describe how the following structures contribute to human motor control and learning: peripheral nerves, spinal cord, brainstem, basal ganglia, cerebellum, frontal and parietal cortical areas.
3. Discuss how functional tasks such as reach and grasp, skilled movement sequences, balance and gait are controlled by the central nervous system.
4. Understand mechanisms of repair and regeneration in brain and spinal cord injury, as they relate to movement.
5. Practice reading and interpreting primary research articles.
6. Improve written and verbal communication skills, specifically scientific writing and verbal presentation.

COURSE AND UNIVERSITY POLICIES:

ATTENDANCE POLICY: Make every effort to attend all lectures. Attendance will not directly affect your grade. However, numerous concepts will be made only during class (and are not in class notes).

PERSONAL CONDUCT POLICY: Students are expected to exhibit behaviors that reflect highly upon themselves and our University. Students will be expected to engage in class discussions in a manner that demonstrates respect for their peers and their instructor. They will be expected to engage in learning while in the classroom, as opposed to texting, emailing, or reading materials unrelated to the course. Students in this class must adhere to the UF Student Honor Code and will be reported for failure to do so. UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code." On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (<http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, as students in this course, you are obliged to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult the instructor in this class.

EXAM MAKE-UP POLICY: Make-up exams and other work can be requested given that there is a medical, family, or other emergency that deems the need for a make-up. Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found in the online catalog at: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>.

ACCOMMODATING STUDENTS WITH DISABILITIES: Students requesting accommodation for disabilities must first register with the Dean of Students Office (<https://disability.ufl.edu/students/get-started/>). The Dean of Students Office will

provide documentation to the student who must then provide this documentation to the instructor when requesting accommodation. You must submit this documentation prior to submitting assignments or taking the quizzes or exams. Accommodations are not retroactive, therefore, students should contact the office as soon as possible in the term for which they are seeking accommodations.

COURSE EVALUATIONS: Students in this class are participating in GatorEvals. This evaluation system is designed to be more informative to instructors so that teaching effectiveness is enhanced and can be more seamlessly linked to UF's CANVAS learning management system. Students can complete their evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Thank you for serving as a partner in this important effort.

GETTING HELP:

Please let me know if you are experiencing any personal or academic difficulties this semester. In addition, the following resources are available:

Health and Wellness

- U Matter, We Care: If you or a friend is in distress, please contact umatter@ufl.edu or 352 392-1575
- Counseling and Wellness Center: <https://counseling.ufl.edu/>, 352-392-1575
- Sexual Assault Recovery Services (SARS) - Student Health Care Center, 392-1161
- University Police Department, 392-1111 (or 9-1-1 for emergencies)
<http://www.police.ufl.edu/>

Academic Resources

- E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. <https://lss.at.ufl.edu/help.shtml>
- Career Connections Center, Reitz Union, 392-1601. Career assistance and counseling. <https://career.ufl.edu/>
- Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.
- Student Complaints On-Campus: <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/> On-Line Students Complaints: <http://distance.ufl.edu/student-complaint-process/>

GRADING:

CLASS PRESENTATIONS (25%)

FINAL PROJECT (25%)

EXAM 1 (25%)

EXAM 2 (25%)

The class presentation will be assigned to each student covering the “*Current views*” for different modules throughout the semester. The students will be given one or two

articles for each topic and need to make a PPT for 30 to 45 min presentation to cover the assigned topic. I will provide a sample presentation for the first topic that the presenters should use as a guide.

For the final project, the students will be given a list of research questions related to the neural control of movements that they can choose from, and need to write a 3-4 page article based on the relevant literature and their understanding of the topic to address their selected question.

We will have two examinations for this class covering the topics presented. Exam 2 is not cumulative. These will consist of short answer questions that will test your ability to integrate the relevant literature.

GRADING SCALE: The instructor will make every effort to post assignment and exam scores on canvas within one week of the assessment. More detailed information regarding current UF grading policies can be found here:

<https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/>.

Any requests for extra credit or special exceptions to these grading policies will be interpreted as an honor code violation (i.e., asking for preferential treatment) and will be handled accordingly.

GRADE SCALE

A (4.0)	93 – 100%	C (2.00)	73 – 76.99%
A- (3.67)	90 – 92.99%	C- (1.67)	70 – 72.99%
B+(3.33)	87 – 89.99%	D+(1.33)	67 – 69.99%
B (3.00)	83 – 86.99%	D (1.00)	63 – 66.99%
B- (2.67)	80 – 82.99%	D- (0.67)	60 – 62.99%
C+(2.33)	77 – 79.99%	E (0.00)	LESS THAN 60%

WEEKLY COURSE SCHEDULE:

Date	Module	Topic	Material
Jan 11	1	Introduction to the course	
Jan 11		<i>Modern techniques for neural recording and modulation</i>	Chapter 1
Jan 18		<i>From motor planning to motor learning</i>	Ref. 1-3
Jan 18	2	Electrical signaling and synaptic transmission, part 1	Chapters 2
Jan 25		Electrical signaling and synaptic transmission, part 2	Chapters 2, 5
Feb 1	3	Mechanisms of synaptic plasticity	Chapter 8, 25
Feb 8		<i>Current views: Synaptic plasticity in motor system</i>	Ref. 4- 6
Feb 8	4	Somatosensory control of movement	Chapter 9

Feb 15		<i>Current views: Proprioception in learning and recovery</i>	Ref. 7, 8
Feb 15	5	Spinal/Brainstem control of movement	Chapter 16
Feb 22		<i>Current views: Spinal interneurons and muscle synergies</i>	Ref. 9, 10
Feb 22		<i>Current views: The reticular formation bridge</i>	Ref. 11, 12
Feb 22		Exam 1 review	
Mar 1		Lab Demonstration – H-reflex	
Mar 1		Exam 1: Modules 1-5	
Mar 8		Spring Break	
Mar 15	6	Cortical control of movements	Chapter 17
Mar 15		Lab Demonstration – TMS	
Mar 22		<i>Current views: Corticocortical and corticothalamic loops</i>	Ref. 13, 14
Mar 22		<i>Current views: Cortical motor maps</i>	Ref. 15-17
Mar 22	7	Optimal estimation & control of movements	Ref. 18-20
Mar 29	8	Basal Ganglia control of movement	Chapter 18
Mar 29		<i>Current views: Action selection in striatum</i>	Ref. 21
Apr 5		<i>Current views: Sequence learning in M1 and striatum</i>	Ref. 22- 23
Apr 5	9	Cerebellar control of movement	Chapter 19
Apr 12		<i>Current views: Error-based learning in cerebellum</i>	Ref. 24, 25
Apr 12		<i>Current views: Cerebellar loops in planning and learning</i>	Ref. 26, 27
Apr 12	10	Repair and regeneration in the nervous system	Chapter 26
Apr 19		<i>Current views: Can we boost neuroplasticity?</i>	Ref. 28, 29
Apr 19		Exam 2 review	

Exam 2 will occur during Final Exam time scheduled for this course on 4/27/2022 @ 7:30 AM - 9:30 AM (NOT cumulative, covers Modules 6-10).

References

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