**KINE 7730: Neuromotor Control**

*Auburn University*

Summer 2019 (3 credits)

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| **Class Meeting:** |
| Mondays and Wednesdays, 4 – 6 PM  RBD Library, Room 3127 |
| **Course Professor:** |
| Dr. Kristina Neely |
| [kaneely@auburn.edu](mailto:kaneely@auburn.edu) |
| **Office Hours:** |
| Mondays, 2-3 PM, and by appointment  Office: Kinesiology Building Room 282 |

**SYLLABUS**

**Course goals**

Upon completion of this course, you will be able to:

* Describe and identify the major anatomical structures of the motor system.
* Explain the methods and techniques associated with study of the motor system.
* Describe the neural circuits that are involved in the production and inhibition of movement.
  + Create diagrams for neural circuits.
  + Create presentations related to the neural control of movement.
  + Identify historically relevant literature.
  + Describe how movement disorders are related to pathology in specific neural circuits.
* Identify the relevance of the neural control of movement to your personal, professional, and research goals.

**Office hours**

My office hours Mondays, 2-3 PM, and by appointment. I am happy to meet with you between the hours of 8 AM and 4 PM, Monday through Friday. Please send me an email proposing at least two day/times that work for you. Grades will not be discussed by email and require an in-person meeting.

**Required text**

This course is taught from the literature on the neural control of movement. All required reading is posted on Canvas. However, students may wish to read chapters 16-19 in Purves et al.’s *Neuroscience* (the 5th or 6th Edition). This text provides background information to support class discussion of scientific papers. Chapters 16 and 17 are available on Canvas.

**Canvas**

This course relies on Canvas. Students can find all of the course materials on Canvas and it will be used as a means of communication. It is expected that you check Canvas and Auburn email once per day for updates and/or announcements. If you have difficulty accessing Canvas, please contact the Office of Information Technology (OIT)) [844-4944] immediately as your access is imperative for success in this course.

**Proviso**

Dr. Neely may make changes to the syllabus if necessary. All changes will be announced in class and will be posted in writing on Canvas.

**EVALUATION**

If an extra-credit opportunity arises, it will be available to all students in the course. Any requests for extra credit or special exceptions to these grading policies are an honor code violation (i.e., asking for preferential treatment) and will be handled accordingly.

**This course is graded. The grading scale is as follows:**

A (4.0) 90 – 100%

B (3.00) 80 – 89.99%

C (2.00) 70 – 79.99%

D (1.00) 60 – 69.99%

F (0.00) less than 60%

**Evaluation Summary**

5 In-class Presentations, 10% each 50%

Class Participation 25%

Reaction Papers 10%

Final Exam (take-home) 15%

**TOTAL 100%**

**In-class presentations:** Students will present relevant research five times throughout the semester. Presentations will occur after each sub-section related to a specific structure in the motor system. For example, after covering lower motor neurons and the spinal cord, students will present a paper relevant to the study of lower motor neurons and the spinal cord. Specific instructions will be provided in class. A portion of your grade will come from comments on other presentations.

**Class participation:** Active participation during class meetings is imperative for success in this course. This includes contributing to the discussion of scientific papers as well as asking questions.

**Reaction papers:** There are two dates (June 26 and July 1) on which we will not meet as a class; however, you are responsible for the assigned reading and will write a brief reaction paper. The details of this assignment will be provided in class and will equate to about two hours of work (the duration of one class session).

**Final exam:** A final exam will be given in take-home form. The goal of this exam is threefold: (1) to identify the most personally relevant course material, (2) to think critically about the importance of the neural control of movement in the field of kinesiology, and (3) to identify areas for future research and discovery. Students will have access to the exam beginning on or before July 24. The exam is due July 31 by 8 AM via Canvas. No late work will be accepted without penalty.

**COURSE POLICIES**

**By remaining enrolled in this course, you agree to abide by all course policies.**

All policies set forth in the Student Policy Handbook apply to this course.

(<http://www.auburn.edu/student_info/student_policies/>).

**Students should be especially familiar with the following sections of the Handbook.**

Academic Honesty:

<https://sites.auburn.edu/admin/universitypolicies/Policies/AcademicHonestyCode.pdf>

Class Attendance:

<https://sites.auburn.edu/admin/universitypolicies/Policies/PolicyonClassAttendance.pdf>

Classroom Behavior:

<https://sites.auburn.edu/admin/universitypolicies/Policies/PolicyonClassroomBehavior.pdf>

**Attendance & Late Work**

Attendance is required in this course.

On occasion, students miss class and deadlines due to illness or emergencies.

1. Late assignments will not be accepted without penalty, except under medical or other emergent circumstances. Communicate with Dr. Neely before any anticipated absence and within 24 hours of any unanticipated absence.
2. Missing a course meeting without a valid explanation will result in a “0” for in-class participation on that date.
   1. Students may be given an alternate assignment to redeem participation points for an excused absence. A maximum of two excused absences will be given unless special circumstances apply.
   2. Students may attend one course meeting by video conferencing using Zoom.
3. Missing a course meeting, on a date when the student is to give a presentation, without a valid explanation will result in a “0” for the presentation.
4. Final exams turned in after the deadline, July 31 @ 8 AM, will be given a “0.”

**Copyright Statement**

Copyright laws protect all course materials students receive or to which students have online access. Students may use course materials and make copies for their own use as needed, but unauthorized distribution and/or uploading of materials without the instructor’s express permission is strictly prohibited. Students who engage in the unauthorized distribution of copyrighted materials may be held in violation of the University’s Code of Conduct and/or liable under Federal and State laws.

**Confidentiality**

The federal Family Educational Rights and Privacy Act (FERPA) of 1974 identifies the rights of students and their families with respect to student educational records kept by institutions.

**Students with Disabilities**

Students who need accommodations are asked to electronically submit their approved accommodations through AU Access and to arrange a meeting during office hours to discuss your accommodations. If you have a conflict with my office hours, an alternate time can be arranged. To set up this meeting, please contact me by e-mail. If you have not established accommodations through the Office of Accessibility, but need accommodations, make an appointment with the Office of Accessibility, 1228 Haley Center, 844-2096 (V/TT).

**Cell Phones**

As a courtesy to everyone, please turn off your cell phone during class. If you have a compelling reason for leaving your phone on, please let me know at the beginning of class. Do not text or video chat during class.

**Best Work**

Students are expected to show evidence of thorough reading of assigned materials. Please take pride in your work and be motivated to do your best work in this class: if you are, you will gain the maximum benefit from the course.

**Professionalism**

As faculty, staff, and students interact in educational settings, they are expected to demonstrate professional behaviors as defined in the College of Education’s conceptual framework. These professional commitments or dispositions are as follows: 1) engage in responsible and ethical practices, 2) contribute to collaborative learning communities, 3) demonstrate a commitment to diversity, and 4) model and nurture intellectual vitality.

**Course Schedule**

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| **Date** | **Topic** | **Reading** |
| Mon May 20 | Intro to the Motor System | * Introduction to the Nervous System, pages 1-9 * Basic Concepts of Motor Control, pages 213-239 |
| Wed May 22 | Lower motor neurons & spinal cord | * *Optional background: Purves ch 16* * Molnar, Z. and R. E. Brown (2010). "Insights into the life and work of Sir Charles Sherrington." Nat Rev Neurosci 11(6): 429-436. |
| Mon May 27 | **No Class, Memorial Day** | |
| Wed May 29 | The importance of animal research,  Dr. Chris Newland  Lower motor neurons & spinal cord | * Lemon, R. N. (2008). "Descending pathways in motor control." Annu Rev Neurosci 31: 195-218. |
| Mon June 3 | Lower motor neurons & spinal cord | * Burke, R.E., Levine, D.N., Tsairis, P., & Zajac, III, F.E. (1973). “Physiological types and histochemical profiles in motor units of the cat gastrocnemius.” J Physiol. 234: 723-748. |
| Wed June 5 | **No Class**  Student Presentations via Panopto | * Read abstracts for papers that are presented |
| Mon June 10 | Upper motor neurons & M1 | * *Optional background: Purves ch 17* * Evarts (1981) Functional studies of the motor cortex. (book chapter) * Evarts, E. V., et al. (1983). "Motor Cortex control of finely graded forces." J Neurophysiol 49(5): 1199-1215. |
| Wed June 12 | Fundamentals of TMS,  Dr. Sahana Kamath  Upper motor neurons & M1 | * Georgopoulos, A.P. (1984). “Behavioral neurophysiology of the motor cortex.” J Lab Clin Med 124(6): 766-774. |

**Course Schedule**

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| **Date** | **Topic** | **Reading** |
| Mon June 17 | Upper motor neurons & M1  Neural Correlates of Gait,  Sarah Brinkeroff | * Serino, A., et al. (2017). "Upper limb cortical maps in amputees with targeted muscle and sensory reinnervation." Brain 140(11): 2993-3011. |
| Wed June 19 | Student Presentations  (In-class) | * Read abstracts for papers that are presented |
| Mon June 24 | Premotor cortex | * Cisek, P. and J. F. Kalaska (2005). "Neural correlates of reaching decisions in dorsal premotor cortex: specification of multiple direction choices and final selection of action." Neuron 45(5): 801-814. |
| Wed June 26 | Premotor cortex  **No Class, Reaction Paper due by 6 PM** | * Li, N., et al. (2016). "Robust neuronal dynamics in premotor cortex during motor planning." Nature 532(7600): 459-464. * Ohbayashi, M., et al. (2016). "Inactivation of the Dorsal Premotor Area Disrupts Internally Generated, But Not Visually Guided, Sequential Movements." J Neurosci 36(6): 1971-1976. |
| Mon July 1 | Supplementary motor area  **No Class, Reaction Paper due by 6 PM** | * Green, P.E., Ridding, M.C., Hill, K.D., Semmler, J.G., Drummond, P.D., & Vallence, AM. (2018). Supplementary motor area – primary motor cortex facilitation in younger but not older adults. Neurobiol Aging 64:85-91. |
| Wed July 3 | **No Class**  Student Presentations via Panopto | * Read abstracts for papers that are presented |
| Mon July 8 | Basal ganglia | * *Optional background: Purves ch 18* * Humphries, M. D., et al. (2006). "A physiologically plausible model of action selection and oscillatory activity in the basal ganglia." J Neurosci 26(50): 12921-12942. |
| Wed July 10 | Basal ganglia | * Jarbo, K. and T. D. Verstynen (2015). "Converging structural and functional connectivity of orbitofrontal, dorsolateral prefrontal, and posterior parietal cortex in the human striatum." J Neurosci 35(9): 3865-3878. |

**Course Schedule**

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| **Date** | **Topic** | **Reading** |
| Mon July 15 | Student Presentations  (In-class) | * Read abstracts for papers that are presented |
| Wed July 17 | Cerebellum | * *Optional background: Purves ch 19* * Herzfeld, D. J., et al. (2018). "Encoding of error and learning to correct that error by the Purkinje cells of the cerebellum." Nat Neurosci 21(5): 736-743. |
| Mon July 22 | Cerebellum | * Kavaklioglu, T., et al. (2017). "Structural asymmetries of the human cerebellum in relation to cerebral cortical asymmetries and handedness." Brain Structure and Function 222(4): 1611-1623. |
| Wed July 24 | Student Presentations  (In-class) | * Read abstracts for papers that are presented |
| Wed July 31 | ***Final exam due by 8 AM*** | |