Department of Kinesiology

742-531 – Neural Control of Movement (3 credits) – Spring 2016

Lectures:	MW	08:50 – 09:40 a.m.	2081 Natatorium
Discussions:	F (301)	08:50 – 09:40 a.m.	2081 Natatorium
	F (302)	09:55 – 10:45 a.m.	2081 Natatorium
	F (303)	11:00 – 11:50 a.m.	2081 Natatorium

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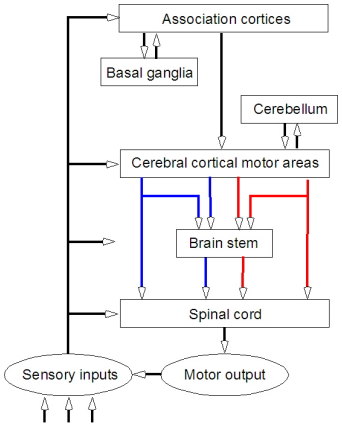
Course Description

Kinesiology 531 is an intermediate-level undergraduate course that provides an overview of neural circuits and neurophysiological mechanisms that underlie motor behavior. The course is offered as a 15-week one semester course and consists of two 50-min lectures and one 50-min discussion session each week. Students are advanced undergraduate Kinesiology majors, who take the course to fulfill an elective requirement. Most students pursue careers in the applied fields of spinal cord injury, stroke, neuroprosthetics, and the various disciplines concerned with motor rehabilitation. Career objectives of others are related to physical education, athletic training, sports medicine, or exercise science.



The course consists of 4 units. Unit 1 provides a general introduction to neural control of movement and briefly reviews neuronal mechanisms for information transmission. The organization of the motor system into three hierarchically arranged levels of control provides a framework for units 2-4. Unit 2 focuses on spinal circuits, which represent the lowest level of control involved with execution of motor commands. Unit 3 focuses on brain stem and cerebral cortical motor areas and associated cerebellar circuits, which represent the intermediate level of control involved with planning of movement tactics. Unit

4 focuses on association cortices and associated basal ganglia and cerebellar circuits, which represent the highest level of control involved with decisions of movement strategy.

Course Objectives

The overall objective of the course is to introduce neural control of movement within the context of the integrative action of the nervous system. Three specific objectives are for students to *1)* develop an understanding of sensorimotor integration, that is, how sensory information is used in the generation of motor signals, *2)* develop an understanding of the interactions between the different levels of control, and *3)* develop an understanding of how knowledge in the area of motor control is created and evaluated.

Course content is based on a required textbook and course reader, supplemented by videos, podcasts, and web resources. Lectures provide a basis for evaluating assigned reading materials by *1)* summarizing current understanding of neural control of movement, *2)* providing insights in theoretical underpinnings and controversies in the field, and *3)* interfacing basic science with clinical and practical applications. Lectures are complemented with in-class discussions, which enhance the learning experience by customizing course material to the students' levels of understanding, and their area of interest and/or specialization.

The specific objectives of the discussion section are for students to *1)* discuss in smaller groups (15-20 students/group) concepts and issues in motor control, *2)* solve problems and discuss practical and clinical applications relevant to lecture topics. Student evaluation is based on exams, discussion participation, and a collaborative group project on a neuromuscular disease of their choosing (paper and oral presentation).

The course prepares students for professional degree programs (Physical Therapy, Occupational Therapy, Medicine, etc.) or provides a stepping-stone to advanced graduate-level courses (e.g. Kinesiology 713, Kinesiology 721), which provide a more in-depth analysis of neural control of movement based on critical evaluation of original research literature. Upon completion of Kinesiology 531, students should have a basic understanding of the functional organization of the sensorimotor system, and should be able to appreciate the need for carefully conducted, basic science relevant to clinical and applied situations.

Course Policies

Academic Honesty and Integrity: You are required to adhere to all University, School of Education, and Department of Kinesiology standards regarding academic integrity. If you are not familiar with these standards, you are responsible for accessing, reading and understanding them. University academic standards are outlined in Chapter 14 of the Wisconsin Administrative Code (UWS 14). Further information detailing University policies and procedures related to these standards is available at the Dean of Students website: http://www.students.wisc.edu/doso/academic-integrity/

Accommodations: It is the policy of the instructor of this course and the University of Wisconsin-Madison to provide an accessible, accommodating and supportive teaching and learning environment for all students. Your success in this course is important to

me. If there are circumstances that may affect your performance, please let me know as soon as possible so that we may work together to develop strategies for adapting assignments to meet both your needs and the requirements of the course. I will attempt to maintain confidentiality of the information you share with me.

Grievance Procedures: Students who feel that they have been treated unfairly have the right to a prompt hearing of their grievance. Such complaints may involve course grades, classroom treatment, various forms of harassment, or other issues. Please see the School of Education's Academic Policies and Procedures for a detailed description: http://pubs.wisc.edu/ug/education_policy.htm#grievancepolicy

Course Resources

Required Textbook:
Sensorimotor Control and Learning: An Introduction to the Behavioral Neuroscience of Action, 2012. James Tresilian. Publisher: Palgrave Macmillan. ISBN-10: 0230371051 or ISBN-13: 978-0230371057.
http://www.amazon.com/Sensorimotor-Control-Learning-Introduction-Neuroscience/dp/0230371051
The text is on in-house reserve at the School of Education MERIT Library, 368 Teacher Education Building.

Additional required readings and course materials will be made available on Learn@UW (https://learnuw.wisc.edu) throughout the course. The website will be updated regularly and, therefore, it is important to check on a regular basis.

Technical Support: DoIT's Help Desk is available via LiveChat, phone (608-264-4357), email (help@doit.wisc.edu) and a Web Knowledgebase (https://kb.wisc.edu/helpdesk/).

Course Requirements

The course is offered in a Blended Learning format (https://blendedtoolkit.wisc.edu/what/). A blended approach will provide more coherent integration of basic science and clinical and other practical applications. By replacing some face-to-face lectures with online "micro-lectures" and by providing applications in the form of online case studies, face-to-face time can be used more productively. Specifically, face-to-face time will move beyond applications, and will focus on analytic, evaluative, and creative aspects of the learning process, which substantially increases the ability to meet learning objectives and evaluate whether learning objectives have been met. Students may be required to participate in online discussions or presentations of material. See course schedule for details.

You are expected to have completed reading assignments in advance of the relevant class session. If an extenuating circumstance arises and you are unable to attend a scheduled lecture, discussion or activity, inform the course instructor in advance so that adjustments to the planned activity structure can be made.

You are expected to complete an electronic course evaluation upon the course's conclusion.

Grading Requirements and Procedures

Exams and Assignments

There will be short multiple-choice Readiness Assurance Tests (RATs) given throughout the course. (The same RATs will be given to individuals and teams.)

Grading Criteria

Scores in three major performance areas will determine the grades: **Individual Performance**, **Team Performance,** and **Team Contribution**.

Grade Weights

	Grade weights and Percentages	
	Within Area	Of Total
1. **Individual performance** (minimum=30%)..... __%*		
Individual Readiness Assurance Tests (0-50%)..... __%*		
Final Exam (50-100%)..... __%*		
	100%	
2. **Team performance** (minimum=30%) ..... __%*		
Team Readiness Assurance Tests.....30%		
Team Assignments.....35%		
Discussion 35%		
	100%	
3. **Team Contribution** (Evaluated by Peers -- minimum=10%)....100%		__%*
		100%

* These percentages will be determined by the procedures described in "Setting Grade Weights."

Setting Grade Weights

The percentage of the grade that will be determined by scores in each of the major performance areas (Individual Performance, Team Performance, and Team Contribution) will be determined by representatives of student teams during the first class period. These representatives will also decide on the relative weight of the Readiness Assurance Tests versus the final exam *within* the individual performance area. Grade weights for the class will be set as follows:

1) Teams set preliminary weights and select a member to meet with other teams' representatives.
2) Team representatives will meet in the center of the room and develop a **consensus** (i.e. each representative has to be in agreement) about the grade weights for the class as a whole.)
3) The only limitations on your grade weight discussions will be that:
   a) a minimum of 30% of the total grade must be assigned to Individual Performance
   b) a minimum of 30% of the total grade must be assigned to Team Performance.
   c) a minimum of 10% of the total grade must be assigned to Team Contribution.
   d) within the Individual Performance area, at least 50% of the grade must be based on the final exam.

Team Contribution

Each individual will evaluate the contributions of all of the *other* team members during the final exam by assigning an average of 10 points to the other team members. For example, members of a 6-member team:

1) Must assign a total of 50 points to the other 5 members in their team (for a 5-member team it would be 40 points, for a 7-member team it would be 60 points, etc.) and must differentiate some in their ratings.
2) Must give at least one score of 11 or higher—with a maximum of 15—and at least one score of 9 or lower.

Team Contribution scores will be the average of the points *received* and will produce differences in grades only *within* teams. This means that team members can *not* help everyone in their team get an A by giving everyone high peer evaluation scores. The only way for everyone in a team to earn an A is by doing an outstanding job on the individual and team exams and assignments.

Grading scale

A 93-100	AB 88-92	B 83-87	BC 78-82
C 70-77	D 60-69	F 0-59	

COURSE SCHEDULE

The reading assignments below refer to *Sensorimotor Control and Learning: An Introduction to the Behavioral Neuroscience of Action* by James Tresilian. Additional assignments (reading, narrated animations, videos, podcasts, etc) are available on Learn@UW: https://learnuw.wisc.edu/

I. Introduction to Team-Based Learning

Date	Topic	Reading
W, Jan 20	Course overview / team building	Syllabus
F, Jan 22	Discussion 1	Ch. 2

II. Neuronal mechanisms for information transmission

Date	Topic	Reading
M, Jan 25 W, Jan 27	Neuronal signaling / synaptic transmission	Ch. 2
F, Jan 29	Discussion 2	
M, Feb 1 W, Feb 3	Neural integration / introduction to motor control	Ch. 2
F, Feb 5	Discussion 3	

III. Spinal mechanisms for sensorimotor integration

Date	Topic	Reading
M, Feb 8 W, Feb 10	Somatosensation	Ch. 3
F, Feb 12	Discussion 4	
M, Feb 15 W, Feb 17	Motor neurons & muscles / spinal reflexes	Ch. 3, 5
F, Feb 19	Discussion 5	

IV. Descending motor systems

Date	Topic	Reading
M, Feb 22 W, Feb 24	Descending motor pathways	Ch. 2
F, Feb 26	Discussion 6	
M, Feb 29 W, Mar 2	Vestibular system / posture & balance	Ch. 3, 6, 7
F, Mar 4	Discussion 7	
M, Mar 7 W, Mar 9	Locomotion / eye movements	Ch. 8, 6
F, Mar 11	Discussion 8	
M, Mar 14 W, Mar 16	Rubrospinal tract / cerebral cortex	Ch. 2
F, Mar 18	Discussion 9	
Mar 19 – Mar 27	SPRING BREAK	
M, Mar 28 W, Mar 30	Primary motor cortex / premotor cortical areas	Ch. 2
F, Apr 1	Discussion 10	

V. Integrative action of the motor system

Date	Topic	Reading
M, Apr 4 W, Apr 6	Vision for action	Ch. 4
F, Apr 8	Discussion 11	
M, Apr 11 W, Apr 13	Association cortices	
F, Apr 15	Discussion 12	
M, Apr 18 W, Apr 20	Cerebellum	Ch. 2, 15
F, Apr 22	Discussion 13	
M, Apr 25 W, Apr 27	Basal Ganglia	Ch. 2
F, Apr 29	Discussion 14	
M, May 2 W, May 4	Student presentations of Neuromuscular Disease projects	
F, May 6 8:50 a.m. – 12:00 noon	a) Student presentations of Neuromuscular Disease projects b) Peer evaluations c) Course evaluations d) Summary and Review	
Sun, May 8	**FINAL EXAM (10:05 – 12:05 pm, 2081 Natatorium)**	