

University of Florida
College of Public Health & Health Professions Syllabus
RSD 6718: Neuroplasticity: A Foundation for Rehabilitation (3 credit hours)
Fall 2020
Delivery Format: Online, Synchronous, Via the Zoom platform
Friday 9:35 AM -12:35 PM

Instructor Name: David Fuller, PhD
Office: HPNP 1153
Phone Number: 352-273-6634
Email Address: dfuller@php.ufl.edu
Office Hours: By appointment
Preferred Course Communications: Phone or email

Prerequisites *This course is open to all Rehabilitation Science PhD students. Other graduate students are invited to register with permission of the instructor.*

PURPOSE AND OUTCOME

Course Overview

We will review the basic biology of neuroplasticity, and discuss the implications for rehabilitation aimed at improving motor outcomes after injury or disease. This is a complex topic, and we will not have an exhaustive survey regarding the mechanisms of neuroplasticity – rather the intent is to review fundamental principles and to discuss how these principles can inform the design and implementation of rehabilitation paradigms. This course will emphasize building a bridge between research in basic science, clinical research, and clinical practice and thus encourage interdisciplinary work from “bench to bedside to park bench and back”. The greatest improvements following injury or disease may require an orchestration of rehabilitation approaches, thus reinforcing the need for interdisciplinary research.

Course requirements

- Attendance at all classes.
- Preparation by completing readings and assignments for class.
- Participation in all class discussions, question/answer sessions.
- Research seminars will be identified for attendance on campus in association with class discussions.
- For Fall 2020, the course will be online using the zoom platform. Students are required to be online with webcam on for the duration of the class meeting time.

Relation to RSD Program Outcomes

This course was designed to meet a number of learning outcomes outlined in the Rehabilitation Science academic assessment plan submitted to Southern Association of Colleges and Schools (SACS) the accrediting body of the University of Florida;

- Teach students to apply basic competencies in models and theory of Rehabilitation Science as they relate to Neuroplasticity.
- Develop competencies for conducting rehabilitation research
- Apply competencies in a focused area of rehabilitation science that can be applied in a research study

- Display understanding of role of academic researcher
- Exhibit ethical research conduct

Course Objectives and/or Goals

Following completion of the course, the student will be able to:

1. Define and discuss the concept of neuroplasticity. Discuss how this relates to injury/disease and neurorehabilitation.
2. Discuss the fundamental biological mechanisms of neuroplasticity in health and following disease or injury.
3. Identify and discuss biological and experiential factors which influence recovery following disease or injury.
4. Describe the progression of research from bench-to bedside-to-park bench, known as translational research, and the current relevance of translational research to neurorehabilitation using pertinent examples.
5. Identify and discuss medical/physiological interventions which may enhance recovery due to neuroplasticity.
6. Propose areas of further research in basic science and clinical research to examine gaps in our current knowledge relative to plasticity and clinical interventions.

In addition the student will have the opportunity to:

7. Practice scientific writing skills through weekly assignments.
8. Practice scientific presentation skills through weekly PowerPoint presentations.

DESCRIPTION OF COURSE CONTENT

Topical Outline/Course Schedule

November 25 - 28: Thanksgiving break

Dec 9: last day of classes

Dec. 12-18: finals week

*Be sure to review the requirements for formatting

Week	Date	Topic(s)	Readings	*Writing Assignment	Presentation Assignment	In Class Assignment
1	Sept 4	Introductions; Instructor expectations; course overview. Discussion of basic concepts related to neuroplasticity. Discussion of NIH roadmap.	NIH roadmap for rehabilitation			Yes; details provided in class. Upload to Canvas after class.

Week	Date	Topic(s)	Readings	*Writing Assignment	Presentation Assignment	In Class Assignment
2	Sept 11	Overview: neuroplasticity and rehabilitation	Hallett, 2005, Kleim and Jones, 2008 Warraich and Kleim, 2010	1-page of text. Define “ <i>neuroplasticity</i> ”, “ <i>rehabilitation</i> ”, and “ <i>compensation</i> ”. Discuss how these concepts relate to your current research interests.		Yes; details provided in class. Upload to Canvas after class.
3	Sept 18	Neuroanatomy of “your system”.	No specific reading assignment for this week. Consult textbooks or literature articles, as needed, to complete the presentation assignment		<u>Detailed description</u> of the neural control of whatever motor system you are studying (e.g., breathing, swallowing, walking, etc.). Include diagrams. Conclude with 1 slide that lists clinical conditions associated with impairment of this motor system.	Yes; details provided in class. Upload to Canvas after class.
4	Sept 25	Basic mechanisms of synaptic function and Hebb’s postulate.	A. In any basic textbook or web resource, read the section on synaptic transmission between neurons. B. Hebb 1947 and Sejnowski, 1999	1 page – define and discuss the significance of Hebb’s postulate. Include a statement, in your own words, of what Hebb was trying to convey.	Create a mini-lecture (3 slides maximum) illustrating how glutamate release leads to depolarization of neurons	Yes; details provided in class. Upload to Canvas after class.
5	Oct. 2	Classic models of synaptic plasticity – hippocampal long term potentiation (LTP) and aplysia long term facilitation (LTF).	Kandel Nobel Prize lecture (first section) Nicoll 2017		Slide 1: create an illustration showing a model of how a synapse can be strengthened by experience. Slide 2: in your system of interest, what might trigger synaptic plasticity? Is this relevant to rehabilitation?	Yes; details provided in class. Upload to Canvas after class.

Week	Date	Topic(s)	Readings	*Writing Assignment	Presentation Assignment	In Class Assignment
6	Oct. 9	Homeostatic plasticity	Fox 2017 Turrigiano 2017	1 page: Define <i>homeostatic plasticity</i> and <i>synaptic scaling</i> . Contrast with activity dependent synaptic plasticity.		Yes; details provided in class. Upload to Canvas after class.
7	Oct 16	Motor neurons and Interneurons	Readings: Bareyre et al., 2004 and a PDF handout from DF.		Slide 1: define motoneuron, interneuron, and motor unit. Slide 2: what is the size principle of motoneuron recruitment? Slides 3-4: interneurons are essential components of the circuits which control movement. In the system you are studying, describe the potential role of interneurons in controlling motor output.	Yes; details provided in class. Upload to Canvas after class.
8	Oct 23	Pain and neuroplasticity.	Woolf, 2011	1 page; answer one of the following questions: A) In your system or condition of interest (e.g., spinal injury, or stroke), is neuropathic pain a problem? What are some theories as to why this occurs? B) Neuroplasticity is not always good. Discuss multiple examples of situations in which neuroplasticity can impair function.		Yes; details provided in class. Upload to Canvas after class.

Week	Date	Topic(s)	Readings	*Writing Assignment	Presentation Assignment	In Class Assignment
9	Oct 30	Engineering neuroplasticity.	Moritz, 2018.		Slide 1: define "open loop" and "closed loop" stimulation. Slides 2-4: describe an example of how chronic electrical stimulation has been used to induce neuroplasticity	
10	Nov 6	Spinal neuroplasticity and the crossed phrenic phenomenon (CPP)	Porter, 1894 Sandhu, 2009	1 page. Answer the following questions: What was Porters hypothesis for the substrate of the CPP? Is there a role of spinal interneurons in the CPP?		
11	Nov 13	Cortical neuroplasticity	Kwakkel, 2015		Create a 3 slide presentation that outlines the evidence for cortical reorganization after neurologic injury or rehabilitation.	
12	Nov 20	Inflammation and neuroplasticity.	Carefully review Fig. 1 in Simon, 2017.	1 page. Describe a few that conditions that can lead to neuroinflammation. What is the role of glial cells and cytokines in neuroinflammation?		

Week	Date	Topic(s)	Readings	*Writing Assignment	Presentation Assignment	In Class Assignment
13	Dec 4	Thinking outside the box: the case of how hypoxia came to be (potentially) used as a rehabilitation tool. Course wrap up; hand out take-home exams	Gonzalez-Rothi et al., 2015		Create a between 5-10 slide PPT presentation that overviews a novel neurorehabilitation therapy in your area of interest. Be creative – this could be an existing method, or it could be something that is an idea you would like to explore.	

Course Materials and Technology

We will use the UF Canvas system. Readings and assignments will be posted on Canvas and also may be emailed to students.

For technical support for this class, please contact the UF Help Desk at:

- Learning-support@ufl.edu
- (352) 392-HELP - select option 2
- <https://lss.at.ufl.edu/help.shtml>

ACADEMIC REQUIREMENTS AND GRADING

Assignments

Assignments should be uploaded to Canvas prior to the beginning of class. Late assignments will not be accepted, no exceptions. The weekly assignments will be given out at the end of each class period. A general description of each assignment is provided in the course schedule, but specific details will be provided in class.

- a) There will be 13 graded assignments as outlined in the weekly schedule. Each will be graded on a 5-pt scale with the following general guidelines.
 - a. 5 = meets all formatting requirements (1 pt), there are no spelling or grammatical errors (1 pt), correct citations are provided (1 pt), and the student has made a strong effort to provide the requested information (2 pts).
 - b. 0 = late or not turned in.
- b) For written assignments: Title page required with name, date, course number, and title of the assignment. Formatting for the document: single spacing, 11-pt arial font, 1 inch margins. A citation page is required. It is highly recommended that you use EndNote or a similar citation program.
- c) For PPT assignments: Provide a title slide with name, date, course number, and title of the assignment. Provide appropriate citations for any images or data slides.

Grading

The grade for the course will be based on the following criteria:

1. **Class participation (30%)**: includes active participation in all in-class exercises; contribution to discussions; demonstration of preparation for class through discussion and active inquiry; ability to respond to questions; integration of current readings with experience, background, and past readings. Note: during most classes, we will have in-class exercises/assignments that require students to work in groups. The completed assignments must be uploaded to canvas at the completion of class. Provide a title page (or slide, for PPT) that includes the names of each student in the group. However, each student should separately upload the assignment (for record keeping purposes).
2. **Weekly assignments (50%)**: [note: see section above for description of how each assignment will be graded]
3. **Final written examination (20%)**: Take-home exam. Detailed instructions will be given later in the semester.

Point system used (i.e., how do course points translate into letter grades).

Points earned	93-100	90-92	87-89	83-86	80-82	77-79	73-76	70-72	67-69	63-66	60-62	Below 60
Letter Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E

Letter Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E	WF	I	NG	S-U
Grade Points	4.0	3.67	3.33	3.0	2.67	2.33	2.0	1.67	1.33	1.0	0.67	0.0	0.0	0.0	0.0	0.0

For greater detail on the meaning of letter grades and university policies related to them, see the Registrar's Grade Policy regulations at:

<http://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Exam Policy

There is a single, "take home" examination at the end of the course.

Format:

- Use 11 point size Arial Font
- Double space
- Margins of 1" on every side.
- Responses no greater than 3 pages in length for each answer (6 pages of text total). This will require you to be succinct and effectively communicate.
- Include references as appropriate
- References and diagrams are not included in the page limit.
- Typos and presentation of figures will be considered when grading.

Policy Related to Make up Exams or Other Work

Make up work is not permitted unless a documented excuse is provided. Coordination in advance with instructor for make up work is required.

Policy Related to Required Class Attendance

Attendance is mandatory. Please contact the instructor as soon as possible if you are unable to attend class for any reason. Personal issues with respect to class attendance or fulfillment of course requirements will be handled on an individual basis.

The Rehabilitation Science program abides by the UF Attendance Policy. For information regarding the UF Attendance Policy see the Registrar website for additional details:

<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

STUDENT EXPECTATIONS, ROLES, AND OPPORTUNITIES FOR INPUT

Expectations Regarding Course Behavior

Professional behavior is expected and is exemplified by:

1. Attendance to all classes
2. Timeliness
3. Attentiveness
4. Respectful and polite interaction with peers and instructors
5. Active learning as demonstrated by questions and discussion

Academic Integrity

Students are expected to act in accordance with the University of Florida policy on academic integrity. As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge:

“We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.”

You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit 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.”

It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For additional information regarding Academic Integrity, please see Student Conduct and Honor Code or the Graduate Student Website for additional details:

<https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>

<http://gradschool.ufl.edu/students/introduction.html>

Please remember cheating, lying, misrepresentation, or plagiarism in any form is unacceptable and inexcusable behavior.

Online Faculty Course Evaluation Process

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at

<https://evaluations.ufl.edu/results/>.

Online Synchronous Sessions:

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

SUPPORT SERVICES

Accommodations for Students with Disabilities

If you require classroom accommodation because of a disability, you must register with the Dean of Students Office <http://www.dso.ufl.edu> within the first week of class. The Dean of Students Office will provide documentation of accommodations to you, which you must then give to me as the instructor of the course to receive accommodations. Please make sure you provide this letter to me by the end of the second week of the course. The College is committed to providing reasonable accommodations to assist students in their coursework.

Counseling and Student Health

Students sometimes experience stress from academic expectations and/or personal and interpersonal issues that may interfere with their academic performance. If you find yourself facing issues that have the potential to or are already negatively affecting your coursework, you are encouraged to talk with an instructor and/or seek help through University resources available to you.

- The Counseling and Wellness Center 352-392-1575 offers a variety of support services such as psychological assessment and intervention and assistance for math and test anxiety. Visit their web site for more information: <http://www.counseling.ufl.edu>. On line and in person assistance is available.
- You Matter We Care website: <http://www.umatter.ufl.edu/>. If you are feeling overwhelmed or stressed, you can reach out for help through the You Matter We Care website, which is staffed by Dean of Students and Counseling Center personnel.
- The Student Health Care Center at Shands is a satellite clinic of the main Student Health Care Center located on Fletcher Drive on campus. Student Health at Shands offers a variety of clinical services. The clinic is located on the second floor of the Dental Tower in the Health Science Center. For more information, contact the clinic at 392-0627 or check out the web site at: <https://shcc.ufl.edu/>
- Crisis intervention is always available 24/7 from:
Alachua County Crisis Center:
(352) 264-6789
<http://www.alachuacounty.us/DEPTS/CSS/CRISISCENTER/Pages/CrisisCenter.aspx>

Do not wait until you reach a crisis to come in and talk with us. We have helped many students through stressful situations impacting their academic performance. You are not alone so do not be afraid to ask for assistance.

Inclusive Learning Environment

Public health and health professions are based on the belief in human dignity and on respect for the individual. As we share our personal beliefs inside or outside of the classroom, it is always with the understanding that we value and respect diversity of background, experience, and opinion, where every individual feels valued. We believe in, and promote, openness and tolerance of differences in ethnicity and culture, and we respect differing personal, spiritual, religious and political values. We further believe that

celebrating such diversity enriches the quality of the educational experiences we provide our students and enhances our own personal and professional relationships. We embrace The University of Florida's Non-Discrimination Policy, which reads, "The University shall actively promote equal opportunity policies and practices conforming to laws against discrimination. The University is committed to non-discrimination with respect to race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information and veteran status as protected under the Vietnam Era Veterans' Readjustment Assistance Act." If you have questions or concerns about your rights and responsibilities for inclusive learning environment, please see your instructor or refer to the Office of Multicultural & Diversity Affairs website: www.multicultural.ufl.edu

The schedule, policies, and assignments described in this syllabus are subject to change in the event of extenuating circumstances or by mutual agreement between the instructor, and the students.