

 <b>FLORIDA ATLANTIC UNIVERSITY</b>	<b>COURSE CHANGE REQUEST Undergraduate Programs</b>	UUPC Approval <u>3-29-21</u> UFS Approval _____ SCNS Submittal _____ Confirmed _____ Banner Posted _____ Catalog _____
	Department Psychology College Science	
<b>Current Course Prefix and Number</b> PSB 4810	<b>Current Course Title</b> Neurobiology of Learning & Memory	
<i>Syllabus must be attached for ANY changes to current course details. See <u>Checklist</u>. Please consult and list departments that may be affected by the changes; attach documentation.</i>		
<b>Change title to:</b> RI: Neurobiology of Learning & Memory  <b>Change prefix</b> From: _____ To: _____  <b>Change course number</b> From: _____ To: _____  <b>Change credits*</b> From: _____ To: _____  <b>Change grading</b> From: _____ To: _____  <b>Change WAC/Gordon Rule status**</b> Add <input type="checkbox"/> Remove <input type="checkbox"/>  <b>Change General Education Requirements***</b> Add <input type="checkbox"/> Remove <input type="checkbox"/>  <small>*Review <u>Provost memorandum</u></small> <small>**WAC/Gordon Rule criteria must be indicated in syllabus and approval attached to this form. See <u>WAC Guidelines</u>.</small> <small>***General Education criteria must be indicated in syllabus and approval attached to this form. See <u>GE Guidelines</u>.</small>	<b>Change description to:</b> The course examines contemporary and classical research on the neural substrates of learning and memory. The format includes 50 % lectures and 50 % student presentations of research papers. Students work in groups to design and complete a research project through the semester.  <b>Change prerequisites/minimum grades to:</b> no change  <b>Change corequisites to:</b> no change  <b>Change registration controls to:</b> no change  <small>Please list existing and new pre/corequisites, specify AND or OR and include minimum passing grade (default is D-).</small>	
<b>Effective Term/Year for Changes:</b> Fall/2021	<b>Terminate course? Effective Term/Year for Termination:</b>	
<b>Faculty Contact/Email/Phone</b> Carmen Varela/varelac@fau.edu/5617998555		
<b>Approved by</b> Department Chair <u>Robin Vallacher</u> College Curriculum Chair <u>Jerry Haky</u> College Dean <u>Jerry Haky</u> UUPC Chair <u>Jerry Haky</u> Undergraduate Studies Dean <u>Edward Pratt</u> UFS President _____ Provost _____	<b>Date</b> <u>March 16, 2021</u> <u>3-18-21</u> <u>3/29/2021</u> <u>3-29-21</u> <u>3-29-21</u> _____ _____	

Email this form and syllabus to [mjenning@fau.edu](mailto:mjenning@fau.edu) seven business days before the UUPC meeting.

**RI: Neurobiology of Learning & Memory. Fall 2021.**  
**003**

PSB 4810-001, 002,

**Number of credits: 3**

CRN: 15241

**Course Prerequisites \*important\*:** PSB 3002 (Bio Bases of Behavior 1), PSB 4006 (Bio Bases of Behavior 2), PSY 3213 (Research Methods in Psychology).**Logistics:**

- **Instructional Method:** [Fall 2021] Online, live lecture via Canvas-Zoom. Attendance Required and Graded
- **Meeting times:** Wednesday & Friday 09:30 AM - 10:50 AM
- **Instructors:**
  - Dr. Carmen Varela. Office hours by appointment: [varelac@fau.edu](mailto:varelac@fau.edu)
  - **Activity (A): Invited speakers:**

*Every semester we invite 2-3 research active scientists at different career stages to present one lecture. We will request that the invited speakers dedicate 5-10 mins of the lecture to briefly summarize their research trajectory and engage in a Q&A with the students. I will prioritize inviting current graduate students and postdocs at FAU/Scripps/Max Planck because scientists that are closer to the career stage of the undergraduates can more easily connect with the students and represent achievable role models.*

**Research Intensive Course Characteristics:**

This course contains an assignment or multiple assignments designed to help students conduct research and inquiry at an intensive level. If this class is selected to participate in the university-wide assessment program, students will be asked to complete a consent form and submit electronically some of their research assignments for review. Visit the Office of Undergraduate Research and Inquiry (OURI) for additional opportunities and information at <http://www.fau.edu/ouri>.

**The course actively engages students in the process of research and inquiry** through 2 activities:

**Activity (B):** 15 % of the grade. Students work in pre-assigned groups to present a peer-reviewed research paper. Each week a paper is presented by one group of students and discussed by the whole class. In their presentation, they identify the research question and hypothesis, the methodology, results and implications. The main goal is for students to gain familiarity with **the process of research and inquiry through the work of expert scientists.**

**Activity (C):** 15 % of the grade. Students work in self-organized groups to propose a research project in which they work through the semester. The projects are directed by the students and they must be relevant to class topics. The main goal is for students to gain familiarity with **the process of research and inquiry through their own work.**

Students will be evaluated and graded individually for the group projects (Activities B and C).

**Provide opportunities for students to communicate the design, method and results of the inquiry.** There are two opportunities for communication of the group research projects: Midway through the semester, the groups

communicate and discuss their proposed research question and proposed experimental design and methods; the goal is to obtain feedback from the rest of the class. At the end of the semester the groups communicate the results of their work and discuss the implications with the rest of the class. Students are encouraged to use online technologies, such as the 'Psych101' app, which contains implementations of a variety of psychological tests used in clinical settings, or apps that track movement during sleep (which have been used by students to investigate the effects of sleep on memory).

**Responsible Conduct of Research.** Students will be required to complete the Responsible Conduct of Research (RCR) certificate through the FAU CITI training. Students will also be encouraged to attend FAU OURI workshops on topics related to the responsible conduct of research.

These combined activities (hearing from invited speakers; presenting and discussing peer-reviewed research papers; presenting and discussing group research projects) are planned to engage students in intensive-level research and inquiry activities and expected to achieve the following learning outcomes (SLOs):

**SLO 1: Knowledge.** Students are expected to demonstrate content knowledge, as it relates to the language and terminology used in the study and investigation of the neurobiology of learning and memory.

**SLO 2: Formulate Questions.** Students are required to formulate creative research questions as part of activity (C), in a manner appropriate to the course topics. Students will investigate the identified questions throughout the semester.

**SLO 3: Plan of Action.** Students will develop and implement an experimental plan to address their research questions and to be carried out through the semester.

**SLO 4: Critical Thinking.** Students are expected to apply critical thinking skills to evaluate their own work (activity C), and the work of others (activity B).

**SLO 5: Ethical Conduct.** Students will be asked to identify potential ethical issues associated with conducting research in neuroscience and psychology.

**SLO 6: Communication.** Students will communicate their project plans and research outcomes from the group research projects on two occasions, and they will communicate and discuss peer-reviewed literature on a weekly basis through the semester.

Although much of the work is performed in groups to promote peer-mentoring and collaborative work, the students will be evaluated individually during their presentations and will be required to submit written assignments (weekly for each paper discussion; and at the end of the course with the results of their research proposal).

In addition, throughout the course I provide students the links to the seminar series being offered at the local campuses or online. In particular, I send them specific information to seminars that are relevant for the course.

Furthermore, starting this year I have introduced 'Career days', which involve two 20mins presentations. In one of them, I walk students through the structure of relevant graduate programs at FAU/Scripps/Max Planck. For the other 20min presentation, I have invited FAU's Career Center to give students a presentation on a topic selected by the students, based on an in-class survey.

**Required Course Materials for distance learning:** computer, webcam with microphone, gmail account (for collaborative work through canvas), Respondus LockDown Browser and Respondus Monitor (for exam proctoring).

More on tools for online classes and proctoring: <https://www.fau.edu/keep-learning/proctoring/>

**Course Description:** The course examines contemporary and classical research on the neural substrates of learning and memory, from the cellular and molecular to the neuronal network and behavioral levels. The course follows a blended learning format that includes ~ 50 % lectures and 50 % student presentations of primary literature papers with in-class discussion. In addition, students work in groups to design and complete a research project through the semester. Active participation, questions and comments are a core feature of the course.

**Course Objectives:** This course is an **entry level to graduate courses**, reviewing in depth materials on the neuroscience of learning and memory, including cellular, systems and behavioral neuroscience. Each week we focus on one learning topic, which we explore in two ways: 1) a lecture that presents relevant terms and conceptual frameworks; and 2) a presentation by a designated group of students of primary papers from the field. The goal of the student presentations is to reinforce learning through active engagement while reviewing a combination of classic and recent papers.

While students are encouraged to actively participate in all the lectures, the weekly discussions have a strong focus on student participation, providing an extended opportunity to raise questions, clarify concepts, sharpen critical reading skills and benefit from exploring topics in a group.

**Recommended Textbooks:** Study materials will be based on the lectures and will be presented in a graduate level style, with references to primary literature. Chapters from these textbooks will be used as reference and can help with clarification (but are not required):

Mark A. Gluck, Eduardo Mercado, Catherine E. Myers (2016) Learning and Memory, 3<sup>rd</sup> edition, Macmillan Learning.

Purves, Augustine, Fitzpatrick, Hall, LaMantia & White (2017) Neuroscience, 6<sup>th</sup> edition, Sinauer Associates.

**Course Evaluation Method:** Course grade will be based on: **(i) three equally weighted exams (20 % each), for 60 % of the final grade. (ii) Activity (B): 15 % total;** 10 % will be given for the group presentation of the assigned research paper. An additional 5% will be given for timely submission of weekly assignments related to the paper discussion: Each week, the students that do not present the paper will submit 2-3 questions related to the critical reading of the paper (the questions will identify strengths/weaknesses, identify missing controls/future experiments). **(iii) Activity (C): 15 % total, based on evaluation of the research project, particularly the depth of background literature review, experimental design (inclusion of controls etc.), description of potential data types and analyses, ethical implications and future experiments; less importance will be given to specific results or total amount of data collected. The remaining 10 % points are based on attendance** (two justified absences permitted), paper presentation and participation in discussions. The exams will be comprised of multiple-choice and short essay style questions. **Exams will be based on material from lectures.** No extra credit will be given.

## Detailed Schedule

### August

- 8/26 (W). **General plan for the semester. Introductions and discussion:** What are your background, interests, future plans? How can your career benefit from understanding the mechanisms of learning and memory?
- 8/28 (F). **Introduction—Types of memory. Research study design and teams. Paper discussion:** *Science* 02 Jul 2004: Vol. 305, Issue 5680, pp. 96-99. *Sites of Neocortical Reorganization Critical for Remote Spatial Memory*. Thibault Maviel, Thomas P. Durkin, Frédérique Menzaghi, Bruno Bontempi.

### September

- 9/02 (W). Overview of key brain regions for learning and memory: Spinal cord. Brainstem
- 9/04 (F). **Paper discussion:** *Curr Biol.* 2001 Nov 27;11(23):R986-96. *Central pattern generators and the control of rhythmic movements*. Marder E1, Bucher D. [PRESENTERS: TBA]
- 9/9 (W). Synaptic Mechanisms of Learning & Memory
- 9/11 (F). **Paper:** *Science.* 1997 Jan 10;275(5297):213-5. *Regulation of synaptic efficacy by coincidence of postsynaptic APs and EPSPs*. Markram H, Lübke J, Frotscher M, Sakmann B. [PRESENTERS: TBA]
- 9/16 (W). Molecular mechanisms of learning and memory (invited speaker: *Isabel Espadas, Postdoctoral Researcher, Scripps Institute*)
- 9/18 (F). **Paper:** *Stimulation of cAMP response element (CRE)-mediated transcription during contextual learning*. Soren Impey, Dave M. Smith, Karl Obrietan, Rachel Donahue, Christian Wade & Daniel R. Storm. *Nature Neuroscience* volume 1, pages595–601(1998). [PRESENTERS: TBA]
- 9/23 (W). Overview of key brain regions for learning and memory: Forebrain. Review for exam 1.
- 9/25 (F). **Exam 1**
- 9/30 (W). Hippocampus 1. Episodic and Semantic Memory: Memory for Facts and Events (invited speaker: *Seungwoo Yoo, Postdoctoral Fellow, Brain Institute*).

### October

- 10/2 (F). **Paper:** *J Neuropsychiatry Clin Neurosci.* 2000 Winter;12(1):103-13. *Loss of recent memory after bilateral hippocampal lesions*. 1957. Scoville WB, Milner B. [PRESENTERS: TBA]
- 10/7 (W). Hippocampus-Neocortical Interactions

10/9 (F).	<b>Paper:</b> Nat Neurosci. 2013 Feb;16(2):139-45. doi: 10.1038/nn.3303. Epub 2013 Jan 28. Sleep-dependent memory triage: evolving generalization through selective processing. Stickgold R, Walker MP. [PRESENTERS: TBA]
10/14 (W).	The role of resting states in learning and memory
10/16 (F).	<b>Paper:</b> Front Syst Neurosci. 2019 Feb 1;13:2. doi: 10.3389/fnsys.2019.00002. eCollection 2019. Primed to Sleep: The Dynamics of Synaptic Plasticity Across Brain States. Seibt J1, Frank MG2. [TBA]
10/21 (W).	Cerebellum. Motor learning and classical conditioning
10/23 (F).	<b>Paper:</b> Cerebellum. 2016 Aug;15(4):526-34. doi: 10.1007/s12311-015-0722-4. Are Purkinje Cell Pauses Drivers of Classically Conditioned Blink Responses? Jirenhed DA, Hesslow G [PRESENTERS: TBA ]
10/28 (W).	RESEARCH PROJECT --- status updates from each group (10-20 min presentation+discussion, 2-3 slides per group). 'Career day': local graduate programs
10/30 (F).	<b>Exam 2</b>
11/4 (W).	Basal ganglia. Non-declarative, skill memory.
11/6 (F).	<b>Paper:</b> Neuron. 2014 Jun 4;82(5):1145-56. doi: 10.1016/j.neuron.2014.04.021. Neurons in the ventral striatum exhibit cell-type-specific representations of outcome during learning. Atallah HE, McCool AD, Howe MW, Graybiel AM. [PRESENTERS: TBA]
11/11 (W).	(no class. Veteran's day)
11/13 (F).	Working Memory and Cognitive Control. Learning Algorithms and Machine Learning.
11/18 (W).	<b>Paper:</b> Elife. 2014 Jul 29;3:e03061. doi: 10.7554/eLife.03061. Enhancement of encoding and retrieval functions through theta phase-specific manipulation of hippocampus. Siegle JH, Wilson MA. [PRESENTERS: TBA]
11/20 (F).	Learning and Disease. RESEARCH PROJECT FINAL PRESENTATION AND DISCUSSION.
11/25 (W).	Career Center visit. Any pending materials. Review of the course
Week of Dec 5-11	<b>Final</b>

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### Code of Academic Integrity

Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty is considered a serious breach of these ethical standards, because it interferes with the university mission to provide a high quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the university community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information, see University Regulation 4.001.

**Attendance Policy**

Students are expected to attend all of their scheduled University classes and to satisfy all academic objectives as outlined by the instructor. Students are responsible for arranging to make up work missed because of legitimate class absence, such as illness, family emergencies, military obligation, court-imposed legal obligations or participation in University-approved activities. Examples of University-approved reasons for absences include participating on an athletic or scholastic team, musical and theatrical performances and debate activities. It is the student's responsibility to give the instructor notice prior to any anticipated absences and within a reasonable amount of time after an unanticipated absence, ordinarily by the next scheduled class meeting. **Reasonable Accommodation Statement for Makeups:** Reasonable accommodation will be made for students participating in a religious observance or in University-approved activities, including athletic or scholastics teams, musical and theatrical performances and debate activities.

**Counseling and Psychological Services (CAPS) Center**

Life as a university student can be challenging physically, mentally and emotionally. Students who find stress negatively affecting their ability to achieve academic or personal goals may wish to consider utilizing FAU's Counseling and Psychological Services (CAPS) Center. CAPS provides FAU students a range of services – individual counseling, support meetings, and psychiatric services, to name a few – offered to help improve and maintain emotional well-being. For more information, go to <http://www.fau.edu/counseling/>

**Disability Policy**

In compliance with the Americans with Disabilities Act Amendments Act (ADAAA), students who require reasonable accommodations due to a disability to properly execute coursework must register with Student Accessibility Services (SAS) and follow all SAS procedures. SAS has offices across three of FAU's campuses – Boca Raton, Davie and Jupiter – however disability services are available for students on all campuses. For more information, please visit the SAS website at [www.fau.edu/sas/](http://www.fau.edu/sas/).