

INSTRUCTORS:	Dr. Jill Leutgeb Pacific Hall 3125A 858-246-0825	Dr. Stefan Leutgeb Pacific Hall 3225A 858-246-0824
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COURSE FORMAT: This course will include an in-depth presentation of mechanisms for learning and memory at molecular, cellular, and systems levels, and it will introduce students to current topics in learning and memory research. In addition to teaching about the biology of learning and memory, this course will also introduce how basic research can lead to major advances in the treatment of disease. Please make sure to review all information about the nervous system from prerequisites BILD 2, BIPN 100 as well as other physiology/neuroscience classes.

LECTURES: Tuesday and Thursday 3:30 - 4:50 pm, CENTR 119

TEXT AND READINGS: *Memory, From Mind to Molecules*, 2nd edition, by L. R. Squire and E. R. Kandel (2010). Journal articles and reviews will also be assigned and available on the course website. All assigned reading material will be covered in the exams.

COURSE WEB SITE: There will be a Triton Education site (TED) for the course <http://ted.ucsd.edu> (formerly known as WebCT). Student accounts are added on the first day of classes. Concurrent enrollment (Extension) students are not added automatically. Extension students should obtain a registration token from Extension's student services or the ACS Help Desk. More information is at <<http://sdacs.ucsd.edu/~icc/ce.php>>

Announcements, updates, postings, lecture slides, class discussion forums, and exam grades will all be communicated using TED.

PODCASTS OF LECTURES Lectures will be podcast as long as students are using this resource. If students use Podcasts as a substitute for attending lectures or do not use them at all, podcasting will stop without advance notice. To reach the Podcasts use your Web browser to go to <podcast.ucsd.edu>. You can listen to each lecture from that site or download it to your personal device. These are audio files; no figures are included.

CLICKERS. Clicker questions will be used throughout the lecture to achieve an in-depth understanding of the material. **Please register your clicker using TED. Twenty points (corresponding to approx. 5 % of the course grade) will be given by responding to at least 75 % of ALL clicker questions (excluding questions during the first class on Jan. 6th).** When responding to less than 75 %, credit will be assigned in proportion to the number of answered questions. It is irrelevant whether the questions are answered correctly or incorrectly. Note that some lectures have more and that some have fewer clicker questions, but that your score will nonetheless be for the number of answered questions rather than for the number of classes that you attended. If your clicker is registered, the percentage of **your responses to clicker questions will be periodically posted on TED so that you can estimate whether you are on track for receiving full credit.**

OFFICE HOURS. Each TA and the instructors will hold one office hour per week as long as they are well-attended. An additional review session will be offered before each exam. All office hours will be open to groups of students. If you need to discuss matters other than the course material, please make an appointment with one of the course instructors by e-mail.

Times and locations of all office hours will be announced by the end of week 1 (Jan. 13th).

ELECTRONIC COMMUNICATION. You can ask questions by posting a message on TED. If you have questions about the course material, please use the message board so that the answers will be available to others in the class. Please use the regular e-mail addresses (sleutgeb@ucsd.edu; jleutgeb@ucsd.edu) only for matters that **require** an instructor's personal attention and **be sure to include <BIPN148> in the subject line**. Note that e-mail will not be checked after 8 pm, including evenings before exams.

LECTURE SLIDES WILL BE AVAILABLE ON TED AFTER THE LECTURE. Problem sets may be posted if applicable to a topic, and if turned in, will be graded for extra credit. Problems/questions require that you **use** information and critical thinking skills. A typical question states an experimental observation and asks you to apply what you have learned and to be able to explain, interpret, or predict something.

SECTIONS: Sections will not meet during the first week of the quarter; they will start in the week of January 12th. The times and locations of sections listed in the Winter Quarter Schedule of Classes may change. **If changed, an updated schedule will be posted on TED by January 9th. Attendance at sections is optional, but it is highly recommended that you attend at least one of the sections.** Regular attendance at and active participation in a section can weigh in your favor if your final grade is just below a grade line. Your attendance will be monitored by a sign-up sheet, please be sure to sign in when you have attended section. The sections are designed to provide a forum for you to ask questions about the course material, and receive additional instruction. During the second week of the quarter, the TAs will review basic neuroscience concepts (neurons, receptors, ligands, membrane potentials, transmitter release, EPSPs, IPSPs), in addition to lecture material.

REVIEW SESSIONS: Will be conducted by TAs. A schedule will be posted.

EXAMS:

1. GRADING: Your grade for this course will be based on your performance on clicker participation, one mid-term exam and a final. The mid-term exam will be worth approximately 100 points and will consist largely of short-answer and essay questions. Some questions may also include problems. The final will be worth 200-225 points and will be composed of the same format as the midterm exam. **Because your grade in this course will depend largely on your performance on two exams, please make sure to write clear and precise answers. We can only grade the words and diagrams on your exam.**

2. EXAM SCHEDULE:

Midterm: **Tuesday, February 3** **3:30 to 4:50 pm**

Final: **Tuesday, March 17** **3:00 to 5:59 pm**

Locations will be announced in class and on TED. If no changes are announced, the exams will be in the lecture hall (CENTR 119).

3. MAKE-UP EXAMS: You are expected to take the exams when they are scheduled. To be fair to your fellow students, make-up exams can be arranged **only** in the following three circumstances:

- A. You are too ill to take the exam. In order to be excused from an exam or to take a make-up exam (The instructor decides which is most appropriate for you), you must telephone Dr. Leutgeb and let him/her know that you are ill as soon as it is possible to do so (before the exam, if it is at all possible). **If you do not bring written verification by a physician that you were too ill to take the exam when it was scheduled, it is at the instructor's discretion to accept or to not accept your excuse.**

- B. You have an extremely pressing need to be out of town at the time when the exam is scheduled (not the day before or the day after) AND you have arranged the make-up exam at least one week in advance. You cannot arrange a make-up exam after the fact. It will help in making these arrangements if you bring written confirmation of your need to miss the regularly scheduled exam when you ask to schedule a make-up exam. In any case, you will also need to bring the corroborating documents to the make-up exam. There are no make-up exams for the final because the date and time was posted when you signed up for the class.
- C. You are taking an exam for a course for academic credit toward graduation that conflicts with the exam for this course AND you have arranged the make-up exam at least one week in advance. You must bring corroborating documents to the make-up exam.

Your last chance to schedule a make-up exam for the circumstances that are listed in B and C is by talking to Dr. Leutgeb after the class that is held one week before the day of the exam. If you fail to talk with an instructor before or at that time, you must take the exam as scheduled (unless you are too sick to do it--see part A above).

PLEASE NOTE: Having another mid-term scheduled on or near the day of our mid-term is not a reason to take a make-up exam.

4. GETTING BACK GRADED EXAMS: Each exam will include a waiver that you can sign to have your exam put in a box in the elevator lobby on the 3rd floor of Pacific Hall, so it will be available to you any time when Pacific Hall is open. Grading usually takes about a week. If you do not sign the waiver, you must pick your exam up with ID from another location (to be announced).

5. GRADES: All the points that each student earned on all exams and participation will be totaled. The final course grade will be determined either by using a standard curve or a straight grading scale depending on which yields the highest number of A's. In the second case the top five scores will be averaged, and that average will be considered "100%." An A will be 90% and above, a B 80%-89%, a C 70%-79%, and a D 60%-69%. Plus or minus signs will be added for grades within 2% of cutoff between letter grades. In addition, we will also calculate the mean and standard deviation. An A will be assigned for scores that are greater than one standard deviations above the mean, a B for scores that are above the mean, a C for scores that are below the mean, a D for scores that are more than one standard deviation below the mean, and an F for scores that are more than two standard deviations below the mean. If scores have a normal distribution, grading on a curve implies that 16 % will receive A's, 34 % B's, 34 % C's, and 16 % below C. The exact distribution between grades can vary depending on the distribution of the scores.

6. REGRADES: If you have an objection to a **particular exam question**, you have 24 hours from the end of the exam to raise your concerns. Objections to exam questions must be made in person with a prepared, written argument of why that question was unfair. A decision will then be made whether to not grade that question for the entire class.

An exam key will be posted above the distributed exams. If you have objections to the grading of a question on **your** exam, you can e-mail a written argument to the teaching assistant who graded the question (e-mail addresses will be available on TED, graders on listed on the exam key). **The e-mail has to be received within a week after you receive the exam. You then have to meet with the TA during her/his next office hour.** If you and the TA do not agree, you can have the TA forward your petition and exam to an instructor. Note that a regrade by the instructor may result in a gain or loss of points; regrading may not be limited to the question you petitioned about. Graded exams will be randomly copied before

being returned. If you are found altering your answer to an exam question and resubmitting that question for a regrade, you will be given a zero on the entire exam and reported for academic dishonesty. Note that false statements that are sent by e-mail are equal grounds for academic dishonesty as those that are stated in person.

7. ACADEMIC DISHONESTY: All suspicions of academic misconduct will be reported to the Academic Integrity Office according to university policy. Academic misconduct is not just blatant cheating (e.g., copying off another student during an exam), but what you might have thought of as "minor cheating" in high school, for example: copying other students' papers or homework; copying or using old papers/report; working with others on individual assignments; forgetting to cite material you took from an outside resource; turning in work completed in total or part by another; writing e-mail that includes fabricated statements. The Policy on Integrity of Scholarship (academicintegrity.ucsd.edu) and this syllabus list some of the standards by which you are expected to complete your academic work, but your good ethical judgment (or asking for advice) is also expected as we cannot list every behavior that is unethical or not in the spirit of academic integrity.

Those students found to have committed academic misconduct will face administrative sanctions imposed by their college Dean of Student Affairs and academic sanctions imposed by the instructor. The standard administrative sanctions include: the creation of a disciplinary record (which will be checked by graduate and professional schools); disciplinary probation; and attendance at an Academic Integrity Seminar (at a cost of \$75). Students can also face suspension and dismissal from the University; those sanctions are not at the instructors' discretion. Academic sanctions can range from an F on the assignment to an F in the class. The appropriate sanctions are determined by the egregiousness of the Policy violation. Students who assist in or are complicit with cheating could also be in violation of the Policy. Thus, students who become aware of their peers either facilitating academic misconduct or committing it should report their suspicions to an instructor for investigation.

Any student caught cheating on an exam will receive a zero for that exam.

See <http://weber.ucsd.edu/~dkjordan/resources/cheat.html> for additional information.

INSTRUCTIONS FOR TAKING EXAMS

The exams in this course are closed book, closed notes, and electronics-free. That is, you must use only what is in your brain to answer questions. Using anything else (e.g. electronic devices or someone else's exam) constitutes a breach of academic integrity and will be treated accordingly. We will enforce all of the following conditions. You can minimize the time it takes to get set up for an exam--and thus maximize the time you have available to complete the exam--by learning the rules and following them without being reminded. YOU have the power to make exams go efficiently and smoothly or not, which will eat into your time for the exam.

- 1. Students will sit every-other-seat. Your TAs will tell you the seating arrangement in your room.**
- 2. All electronic devices must be turned off and stored in a bag/backpack that is placed under your desk. This rule applies to cell phones, MP3 players (iPods), calculators, notebooks, earphones--all electronic devices except digital watches. Setting your cell phone to "vibrate" isn't turning it off, and putting devices into your pockets isn't putting them under your desk. If we can see or hear an electronic device, we will confiscate it.**
- 3. All of your belongings--except what you will write with--must be placed UNDER the seat that YOU are sitting in. Please don't put anything on the desk next to you, on the floor in front of you, or anywhere else except under your desk where you can't see them and we can't trip over them.**
- 4. You can have one clear plastic bottle of water or anything you may need because of medical reasons (doctor's notice is required). You cannot have large pencil boxes filled with lots of things or any snacks.**
- 4. Hats can either be removed or turned with the bill to the back of your head. Once the exam begins, you can't touch your hat, wherever it is. Hooded sweatshirts or jackets must be worn with the hood down, not on your head or covering your face.**
- 5. You can write either with a pen or with a pencil. Please use whatever allows you to write legible answers. If the person grading your answer can't read it, you will not be given credit, so keeping your exam neat and legible is definitely in your best interest. IF YOU USE PENCIL, WE CANNOT CONSIDER REGRADE REQUESTS.**
- 6. BRING YOUR UCSD ID CARD TO EVERY EXAM. You will have to show it when you turn in your exam.**
- 7. Be sure you turn your exam in as you leave the exam room. Don't take any exam materials with you when you leave. You may be asked to leave through a particular door.**
- 8. Put your name and ID number on EVERY page. We take the exams apart, and if pages are unlabeled, we won't know whose they are.**
- 9. Depending on circumstances, we may or may not be able to allow restroom breaks. Arrive early at the exam room to learn how this issue will be handled in your room.**
- 10. Anything that is written on the back of exam pages will not be graded. You can use the backs of pages as scratch paper. If you need to write something on the back of a page and you want us to grade it, you must get explicit permission from an instructor BEFORE you begin writing on the back of the page.**

Lecture	Date	Topic	Assigned Reading	Instructor
1	TUESDAY Jan. 6	Introduction and History Short-term and long-term memory; formation, storage, consolidation, retrieval	Squire LR, Kandel ER. Chapter 1.	S. Leutgeb
2	THURSDAY Jan. 8	Introduction to the neuroanatomy of memory circuits	Squire LR, Kandel ER. Chapters 2 and 5.	J. Leutgeb
3	TUESDAY Jan. 13	Synapses, presynaptic and postsynaptic components	Squire LR, Kandel ER. Chapters 2 and 3.	J. Leutgeb
4	THURSDAY Jan. 15	Synapses, presynaptic and postsynaptic components: molecular mechanisms underlying short term memory	Squire LR, Kandel ER. Chapters 2 and 3.	J. Leutgeb
5	TUESDAY Jan. 20	Long-term potentiation, long-term depression	Squire LR, Kandel ER. Chapter 6. Malenka RC, Nicoll RA. Science. 1999; (285): 1870-1874.	J. Leutgeb
6	THURSDAY Jan. 22	Cellular consolidation, receptor trafficking, synaptic tagging	Squire LR, Kandel ER. Chapter 7. Martin KC and Kosik KS. Nat Rev Neurosci. 2002 (10) 813-820.	J. Leutgeb
7	TUESDAY Jan. 27	Synaptic tagging LTP and LTD: mechanisms for memory.	Martin KC and Kosik KS. Nat Rev Neurosci. 2002 (10) 813-820.	J. Leutgeb,
8	THURSDAY Jan. 29	Network function: Genetic tools to dissect memory circuitry.	Squire LR, Kandel ER. Chapter 7. Mayford M, Kandel ER. Genetic approaches to memory storage. TIG. 1999; 11 (15):463-470.	S. Leutgeb
	TUESDAY Feb. 3	MIDTERM EXAM 3:30 TO 4:50 PM (Exam will cover material including the lecture on Thursday, Jan. 29)	See the syllabus for more information about exams.	
9	THURSDAY Feb. 5	The amygdala and emotional memories	Squire LR, Kandel ER. Chapter 8.	S. Leutgeb
10	TUESDAY Feb. 10	Experimental manipulation of memory	Nabavi et al., Nature. 2014 (7509) 348-52.	S. Leutgeb
11	THURSDAY Feb. 12	Spatial coding in memory circuits	Moser EI, Moser MB. A metric for space. Hippocampus. 2008; 18(12):1142-56.	S. Leutgeb
12	TUESDAY	Pattern completion and pattern separation	Bakker AB, Kirwan CB, Miller M, Stark CE.	J. Leutgeb

	Feb. 17		Pattern separation in the human hippocampal CA3 and Dentate Gyrus. Science. 2008 (319): 1640-1642	
13	THURSDAY Feb. 19	Pattern completion and pattern separation Aging	Yassa MA and Stark CE. Trans Neurosci. 2011 (10) 515-25.	J. Leutgeb
14	TUESDAY Feb. 24	Memory allocation	To be announced	S. Leutgeb
15	THURSDAY Feb. 26	Memory allocation	To be announced	S. Leutgeb
16	TUESDAY Mar. 3	Brain activity patterns during wakefulness and sleep Mechanisms of systems consolidation	To be announced	S. Leutgeb
17	THURSDAY Mar. 5	Motor learning and the cerebellum	Squire LR, Kandel ER. Chapter 9.	J. Leutgeb
18	TUESDAY Mar. 10	Final Exam Review		J. Leutgeb S. Leutgeb
19	THURSDAY Mar. 12	Diseases with memory dysfunction Alzheimer's disease	Squire LR, Kandel ER. Chapter 10.	S. Leutgeb
	TUESDAY Mar. 17	FINAL EXAM: 3:00 PM – 5:59 PM Half of the exam will cover material after the midterm, the other half will cover material from the entire quarter.	See the syllabus for more information about exams.	

The class schedule is subject to change at any time. Any changes will be announced in class and published on the course website
<http://ted.ucsd.edu>