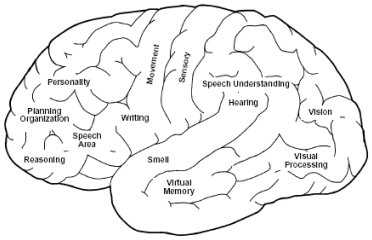
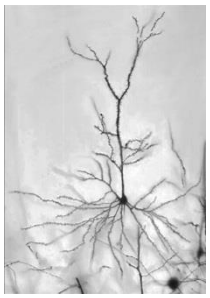
PSYC 6: INTRODUCTION TO NEUROSCIENCE

COURSE DESCRIPTION

The purpose of this course is to introduce you to the organization and function of the nervous system, or in other words, to discover how your brain works! To that end, we will explore the fundamentals of brain function to prepare you for further study in neuroscience, or at the very least, to help you become a more informed consumer of neuroscience research and information. **Part 1** of the course will provide a strong foundation in neurobiology through an in-depth analysis of the structure and function of nerve cells. In **Part 2**, we will consider how the nervous system detects and responds to environmental stimuli. **Part 3** will focus on the neural circuits and mechanisms that underlie complex behaviors and processes such as movement, emotion, and motivation. Finally, **Part 4** will build upon the prior sections by exploring the neural basis of sleep and higher order cognitive functions including attention and memory, and how the brain responds to change. Throughout all four parts of the course, we will relate our discussions to examples of brain disease and mental illness. Since neuroscience is a broad field that is intrinsically interdisciplinary, the course will draw on a variety of disciplines, including biochemistry, biology, physiology, pharmacology, anatomy and psychology.





LEARNING GOALS/OUTCOMES

- Identify and explain core principles of nervous system structure and function
- Apply neuroscience knowledge and methods to real world problems and understand the impacts of neuroscience on everyday life
- Gain knowledge of contemporary neuroscience research methods
- Identify current questions in the field of neuroscience
- Synthesize and integrate information across cellular, molecular, and systems-level neuroscience

INSTRUCTORS

Professor David Bucci	263 Moore Hall, 646-3439, david.j.bucci@dartmouth.edu Office hours: Thurs, 1-2pm
Jessica Goold	TBA

CLASS MEETINGS

MWF 1:45-2:50pm, X-period on Th 1:00-1:50pm (Filene Auditorium).

Use of X-PERIODs: As noted in the Course Schedule, one of the section exams is already scheduled during an X-period. Additional X-periods may be used as necessary at the discretion of the instructors. In addition, Professor Bucci's weekly office hours will be during the X-period. Finally, your only chance to review an exam will be at an X-hour after it is graded (see below). So the point is, **do not** schedule other activities during the X- period (no exceptions)!

PRE-REQUISITES

A high-school level background in science is assumed and recommended

COURSE MATERIAL

- REQUIRED: *Neuroscience- Exploring the Brain* by Bear, Connors, & Paradiso (3rd edition)
- REQUIRED: familiarity with Canvas

COURSE FORMAT

My own research program focuses on the biological mechanisms that underlie the ability to learn and remember information; thus, I have a pretty good understanding of how to optimize learning. Simply said, research has clearly shown that learning is optimal when YOU take an ACTIVE role in it. This philosophy will directly impact the format of our course as follows, and may differ significantly from other courses you have taken.

- I see my role as a facilitator of your learning, not as a dispenser of knowledge. Thus, YOU will play a large role in WHAT you learn, HOW you learn, and WHEN you learn.
- Class time, activities, assignments, and demonstrations will be explicitly designed to engage you in the learning process and have you be responsible for what you learn.
- The primary purpose of the class meetings will be to explain and reinforce key concepts and to answer your questions. I will not simply reiterate the material included in the readings; yet, you will be responsible for the material covered in the readings. This means two things: 1) it is ***absolutely essential*** to read the assigned material ahead of time because the points discussed during the class period will assume familiarity with the topic; 2) You must be willing to ask questions and engage in discussion with me and your classmates.
- Class format: each class period will involve 1) an interactive discussion in which I will explain and reinforce key concepts and take your questions, and 2) a combination of one or more of the following: demonstrations, clinical cases, and group problem solving.
- Consideration of each topic in the course will follow this general pattern:
  Guided Reading →Pre-Class Quiz → Class Discussion & Problem Solving → Re-Quiz

LEARNING MECHANISMS AND ASSESSMENT

This is an introductory course and it is therefore my job to expose you to the whole spectrum of neuroscience. As a result, there will be a lot of reading on many different topics. However, research clearly shows that packing in too much information during a short time results in poor learning. So how do we reconcile this? My strategy is two-fold: First, several different mechanisms will used to facilitate your learning, as described below. Using these tools and approaches to learning will make it much more likely that you will leave the class with a long-lasting understanding of brain function and not merely a bunch of facts and figures that would likely be soon forgotten. Second, your reading of the text will be 'guided reading.' This means that prior to each reading assignment I will give you a list of learning goals for that chapter. By keeping these goals in mind as you read, you will be able to focus your reading and comprehension on specific concepts and issues and thus not get lost in the details.

1. Textbook reading and Pre-Class Reading Quizzes (30 points): The success of the class discussion and activities will depend on everyone having a certain level of familiarity with the topic via the assigned readings. To help you keep up on the readings and to provide you with practice answering potential test questions, there will be Pre-Class Quizzes based on the reading assigned for each class period. Importantly, the quiz results will also be used to help me make 'online' adjustments to the class sessions so that I can address areas of difficulty. All Pre-class Reading Quizzes will be administered using Canvas and will only be available to take for the 24 hour period ending on the day and time indicated in the Course Schedule. Quizzes must be completed within 10 minutes of beginning. You can use any notes or outlines you made while reading the chapter when you take the quiz, but you cannot consult your text or any other resource (human, internet, or otherwise) during the quiz. Please note that missed quizzes cannot be made up and that you are expected to abide by the Honor Principles during quizzes.

   Reading Re-Quizzes: Hopefully you will find that your knowledge and understanding of a topic will be improved by discussing key concepts in class and by engaging in group activities, demonstrations, etc. Thus, if you like, you may

choose to retake each of your quizzes (different set of questions) after we are done with that topic. As with the Reading Pre-Quizzes, these must be completed within 10 minutes of beginning. You can use any notes or outlines you made while reading the chapter when you take the quiz, but you cannot consult your text or any other resource (human, internet, or otherwise) during the quiz. The Re-Quizzes will be available after the class meeting on that topic until 9am the next day, as indicated in the Course Schedule. Note that if you decide to retake a quiz, it will be averaged with the score you earned on your Pre-class Quiz. Also note that **if you do not first take the Pre-class Quiz, the Re-Quiz on that topic will not count**.

2. In-class Quizzes (40 points): At random times during the term there will be in-class quizzes. They must be taken without consulting anyone else or any notes, texts, internet, etc. Missed In-class Quizzes cannot be made up and you are expected to abide by the Honor Principles during the quizzes.

3. Group Activities (30 points): I intend for the class meetings to be very interactive. Throughout the term, I will ask you to pair up with someone or form small groups to discuss and solve a problem or brainstorm on a specific topic. Each group's work will be collected and contribute to your overall grade. Groups will be called on at random to share their work with the class. Group work cannot be made up if class is missed.

4. Course Blog: Peer learning is an excellent way to further develop your knowledge. Thus, we will have a course blog on the Canvas page where you can post questions and fellow students will be responsible for answering or commenting on the questions (the course instructors will monitor the site for accuracy and chime in as appropriate). **The blog should be the first place you go to ask a question outside of class periods.** If you email me your question instead, I will ask you to first post it on the blog because it is likely that other students have the same question and answering it on the blog will be most efficient.

5. Study Groups: Explaining concepts to others (ie, teaching!) often reveals limitations in your own knowledge, and also helps to solidify your understanding of a topic. To facilitate this, study-groups will be arranged at the start of the term and students will be encouraged to participate regularly.

6. Exams (500 points): To assess your developing knowledge of brain science, an exam will be given after each of the four sections of the course (100 points each). The first 3 will held during a regular class meeting or an X-hour as noted in the Course Schedule. The 4th section exam will be given during the final exam period scheduled by the Registrar. In addition, a cumulative final exam will also be given during the regularly-scheduled final exam period scheduled by the Registrar (200 points). Please note that the **exams can only be taken on the scheduled dates**. Thus, do not plan on being away from campus when an exam is scheduled. Having multiple exams in the same week or on the same day during the term will not be considered grounds for taking the exam on a different day.

   Your lowest grade of the 4 section exams (including a missed exam) will be dropped before calculating your final grade. Thus, make-up exams will not be given for common conflicts such as minor illness, athletic participation, off-campus interviews, or heavy workloads. Requests for a make-up exam for more serious situations (e.g., family emergency or extended illness) will need to be accompanied by appropriate documentation from a dean or (in the case of medical emergency) a physician. Note that that the cumulative final cannot be dropped.

   All exams will consist of multiple-choice *concept-based* questions. The questions are designed to test your ability to *use* the information taught in class and in the text. In other words, the exams *will not* be based simply on memorizing and recalling facts. All cell phones, computers, tablets etc must be turned off (not just muted) during exams. Students may not leave the room until they are ready to turn in their exam. At least one of the instructors will be available in the classroom to answer any questions you may have during the exam.

   Note that it is PBS department policy that all exams must be kept on file for 1 year, thus I cannot simply hand back

your exams for you to review and keep. Instead, once an exam has been graded and grades have been posted on Canvas, you will be able to review your exam during the next X-hour period. If you have a question about your exam and/or the grading, your question or rebuttal must be submitted to me in writing via email within one week of that X-hour.

FINAL GRADES

Final grades will be calculated based on a maximum total score of 600 points as follows: A = 575-600 points; A- = 550-574; B+ = 525-549; B = 500-524; B- = 475-499; C+ = 450-474; C = 425-449; C- = 400-424; D+ = 375-399; D = 350-374; E<350. Note that because of the option to earn extra credit points (see T-points below) grades will not be rounded up to the next level.

POLICIES

Honor Code: Students in PSYC 6 are expected to strictly adhere to the Dartmouth Academic Honor Principle. As described in the Student Handbook, *fundamental to the principle of independent learning is the requirement of honesty and integrity in the performance of academic assignments, both in the classroom and outside. Dartmouth operates on the principle of academic honor. Students who submit work that is not their own or who commit other acts of academic dishonesty will forfeit the opportunity to continue at Dartmouth*. By enrolling in this course you are indicating that you accept and will abide by the Honor Code. Violations of the Honor Principle will, in addition to any discipline imposed by the College, result in failure in the course. If you have any questions or concerns regarding this policy during the course, please contact Professor Bucci.

Students with disabilities: Students with disabilities, including "invisible" disabilities such as chronic illnesses and learning disabilities, are encourage to arrange for accommodations that might be helpful to them. Please meet with Professor Bucci as soon as possible (preferably during the first week of the class) to discuss possible accommodations. All discussions will be help in the strictest confidence, although the Academic Skills Center may be consulted to verify documentation of the disability.

Religious Observance: Some students may wish to take part in religious observances that occur during this academic term. If you have a religious observance that conflicts with your participation in the course, please meet with Professor Bucci before the end of the second week of the term to discuss appropriate accommodations.

T-POINTS

As described above, Exams, Quizzes, and Group Activities cannot be made up if they are missed. Thus, to allow for unavoidable missed classes due to illness, etc, you will have the opportunity to earn extra credit points as follows:

Many faculty, graduate students, and honors majors in the Psychological and Brain Sciences Department conduct research involving human subjects. You can learn more about psychology and neuroscience by serving as a volunteer in this research. To encourage your participation, we offer extra credit toward your final grade.

Each hour of participation will be worth one T-point, and you will receive one-half T-point for periods of time less than half an hour. Your credits are limited to a total of eight (8) T-points. If you earn 8 T-points, your final grade will be increased by one step (i.e., from a B to B+). **Exception:** T-points will not move a failing grade up to a passing grade (i.e., an E to a D). If you earn fewer than eight T-points, the effect on your grade will be prorated. T-points do not influence the setting of grading criteria; they are added to your final grade after the criteria are applied. Thus, in the setting of grades they may help those who decide to obtain them, but they do not hurt those who do not seek them.

In order to sign-up and receive credit for participating in experiments you will need to register with our web-based system (Sona systems). Instructions on how to use this site will be provided in class. Please do not register until you are

provided with instructions. Be aware that T-point opportunities decrease drastically near the end of the term. So sign up early! In the past, there have been enough experiments to accommodate all students who are interested in participating and who began their participation early in the term. Note that no T-points will be credited after the last day of class meetings.

To increase further the educational value of your participation, we have required that experiments offer a full debriefing session at the conclusion of the experiment for all of their participants who wish to attend. These debriefings may be done right after you finish in the experiment or near the end of the term. In the latter case, notices will be sent by email.

[For those students unwilling or unable to participate in experiments, an alternative activity is available in the form of reading, summarizing, and critiquing approved research articles. These readings will only be available for limited periods of time during the course (see Instructor for more information). You can also use any combination of reading summaries and experiment participation to reach the max of 8 T-points. Also, please note that it is not possible to have T-points that are gained for doing the reading summaries show up on in the Sona system. But rest assured that we are keeping tracking of them.]

COURSE SCHEDULE

Date	Topic	Reading	Reading Quizzes
Jan 5	Introduction	Bear Ch 1	
Part 1: Brains and Brain Cells			
Jan 7	Neurons and Glia	Bear Ch 2	Ch2 Pre-Quiz by 9am 1/7; Re-Quiz by 9am 1/8
Jan 9	Membrane Potentials	Bear Ch 3	Ch 3 Pre-Quiz by 9am 1/9; Re-Quiz by 9am 1/10
Jan 12	Coding of Information within Neurons	Bear Ch 4	Ch 4 Pre-Quiz by 9am 1/12; Re-Quiz by 9am 1/13
Jan 14	Transfer of Information between Neurons	Bear Ch 5	Ch 5 Pre-Quiz by 9am 1/14; Re-Quiz by 9am 1/15
Jan 16	Neurotransmitter Systems	Bear Ch 6 & pp. 679-684	Ch 6 Pre-Quiz by 9am 1/16; Re-Quiz by 9am 1/17
Jan 21	Gross Anatomy and Brain Damage	Bear Ch 7	Ch 7 Pre-Quiz by 9am 1/21; Re-Quiz by 9am 1/22
Jan 23	**EXAM 1**		
Part 2: Sensation and Perception			
Jan 26	Intro to Sensation, Somatic Sensory System	Bear Ch 12	Ch 12 Pre-Quiz by 9am 1/26; Re-Quiz by 9am 1/27
Jan 28	Chemosensation	Bear Ch 8	Ch 8 Pre-Quiz by 9am 1/28; Re-Quiz by 9am 1/29
Jan 30	Auditory system	Bear Ch 11	Ch 11 Pre-Quiz by 9am 1/30; Re-Quiz by 9am 1/31
Feb 2	Visual system	Bear Ch 9	Ch 9 Pre-Quiz by 9am 2/2; Re-Quiz by 9am 2/3
Feb 4	Perception	Bear Ch 10	Ch 10 Pre-Quiz by 9am 2/4; Re-Quiz by 9am 2/5
Feb 5 (X)	**EXAM 2**		

Part 3: Motor Control, Motivation, and Emotion

Feb 9	Spinal motor control	Bear Ch 13	Ch 13 Pre-Quiz by 9am 2/9; Re-Quiz by 9am 2/10
Feb 11	Central motor control	Bear Ch 14	Ch 14 Pre-Quiz by 9am 2/11; Re-Quiz by 9am 2/12
Feb 13	Autonomic functions and Psychoactive Drugs	Bear Ch 15	Ch 15 Pre-Quiz by 9am 2/13; Re-Quiz by 9am 2/14
Feb 16	Motivation	Bear Ch 16	Ch 16 Pre-Quiz by 9am 2/16; Re-Quiz by 9am 2/17
Feb 18	Sex and Brain	Bear Ch 17	Ch 17 Pre-Quiz by 9am 2/18; Re-Quiz by 9a 2/19
Feb 20	Neural Basis of Emotion	Bear Ch 18 & pp 665-678	Ch 18 Pre-Quiz by 9am 2/20; Re-quiz by 9am 2/21
Feb 23	**EXAM 3**		

Part 4: Sleep, Memory, & Plasticity

Feb 25	Rhythms and Sleep	Bear Ch 19	Ch 19 Pre-Quiz by 9am 2/25; Re-Quiz by 9am 2/26
Feb 27	Language	Bear Ch 20	Ch 20 Pre-Quiz by 9am 2/27; Re-Quiz by 9am 2/28
March 2	Attention	Bear Ch 21	Ch 21 Pre-Quiz by 9am 3/2; Re-Quiz by 9am 3/3
March 4	How Brains Change and Adapt	Bear Ch 23	Ch 23 Pre-Quiz by 9am 3/4; Re-Quiz by 9am 3/5
March 6	Learning	Bear Ch 25	Ch 25 Pre-Quiz by 9am 3/6; Re-Quiz by 9am 3/7
March 9	Memory and Amnesia	Bear Ch 24	Ch 24 Pre-Quiz by 9am 3/9; Re-Quiz by 9am 3/10
March 13 (11:30am)	**EXAM 4 and the Cumulative EXAM**		