Cellular Bases of Behavior

COURSE DESCRIPTION
Through the use of selected examples of invertebrate and vertebrate animal models, this lecture-based course illustrates how behaviors emerge from the activity of dedicated neural circuits and how experience modulates the activity of these circuits to produce the behavioral modifications necessary to adapt to a continuously changing environment. Each animal model, which will be described, provides a unique combination of behavioral skills and technical advantages. Topics of this course include:

- Processing of sensory information
- Execution of movements
- Behavioral plasticity

At the end of parts II and III, one lecture day will be dedicated to in-class discussion about the material presented during those parts. Input from the students into the class is welcomed and encouraged. We all benefit when the students contribute their personal and professional perspectives.

STUDENT LEARNING OUTCOMES
Upon completion of this course, students will have gained facility in understanding and describing:

- Architecture of neural circuits and the genesis of behaviors
- Mechanisms of sensory encoding and information processing in the central nervous system
- Mechanism of behavioral selection, programming and execution
- Cellular and molecular mechanisms of learning and experience

REQUIRED REQUIRED READINGS
1) Textbook: Carew T.J. (2000) “Behavioral Neurobiology, the Cellular Organization of Natural Behavior”, Sinauer Associates Inc. The lectures (titles and chapters numbers) listed in the tentative schedule correspond to the chapters of this book. Also, some of the material illustrated in the lectures and in the handouts is derived from the chapters of this book.

2) The electronic versions of the lecture handouts (PDF format) will be made available on Blackboard 8. Handouts will be posted on Blackboard 8 one week before class. Blackboard 8 can be accessed at: https://iol.tamucc.edu/ (the Island Online). The access to Blackboard 8 is located on the right side of the Island Online home page (Island Online Login). Make sure that the option “Blackboard 8” is selected before log in. Banner ID and banner PIN are required to log in Blackboard 8. Frequently asked questions about the use of Blackboard 8 are available at: https://iol.tamucc.edu/faq.php. For further information about the use of Blackboard 8, call (361-825-2825) or email the Help Desk (iol.support@tamucc.edu). If you need to contact the instructor about the course, please do not use the Blackboard 8 internal email system, but use the instructor’s regular email address instead (riccardo.mozzachiodi@tamucc.edu). Having a binder for your handouts is a good idea.

3) Articles on selected topics, which will be provided by the instructor.
READINGS

MAJOR COURSE REQUIREMENTS

Assessment = Exams + Review Paper

Exams: There will be 4 comprehensive Exams (3 during the semester + final Exam). Each Exam is worth 100 points. Each Exam will focus on the material covered during lectures and is listed in bold in the tentative schedule (see below). For example, Exam 2 will cover material from chapters 5-7, but it may also contain questions about the previous section (chapters 1-4). In addition to the handouts, students are responsible for all material, such as videos, guest lectures, websites etc. covered during class. Exams may contain questions in the following formats: multiple choice, matching, true/false, making/labeling drawings, short answer questions, and essay questions. All the exams are comprehensive. Exams are completed on a scantron answer sheet, which will be provided; you will need number two (# 2) pencils for the scantron sheet. Both Exams and scantron answer sheet must be completed and submitted at the end of the test. Grades are calculated based on the answers provided on the scantron sheet. Consequently, if an answer was bubbled wrong on the scantron, but was marked correctly on the Exam text, it will remain counted wrong. Therefore, students are strongly encouraged to carefully check their answers on the scantron before turning it in.

An Exam will last as a regular class (approximately 60 min). There will be no lecture on exam days.
- Different test forms may be prepared for an individual Exam. Follow instructions.
- If you leave an examination room for any reason you must hand in your test and you will not be allowed to resume the examination. Attend to personal matters (e.g., rest room visits) before the beginning of the exam.
- Be on time! Anyone arriving after someone has already completed and turned in an examination and left the room will not be allowed to take that examination.

Partial grades for the Exams will be posted on Blackboard.

Review Paper: Graduate students are entering careers where they will be required to communicate ideas to others in research (manuscripts, grant proposals, reports, etc.) and/or in teaching (academic education or public outreach). In this course, each student will prepare a Review Paper on a topic chosen within the area of Cellular Bases of Behavior in consultation with the instructor. The Review Paper must be based on:
- At least four primary research articles published in peer-reviewed journals during the last ten years.
- At least one review article published in peer-reviewed journals during the last ten years.

Once a topic is identified, the student is encouraged to discuss with the instructor about the choice before proceeding with the review. The review should be 10-12 pages long and arranged using the following format:
1) Title
2) Abstract
3) Introduction
4) Experimental Analysis
5) Discussion/Conclusions
6) Reference List

Because this is a review-style paper that requires the student to synthesize data from several sources, the “Materials and Methods,” and “Results” sections should be combined into a single
“Experimental Analysis” section. In this section, the student should paraphrase and reorganize the data from their sources into a coherent “story.” Students should discuss and evaluate the experimental data and conclusions of their sources in the “Discussion” or “Conclusions” section. All the cited references must be cited in the text and the full citations must be provided in the Reference List. Each student must provide the instructor with a hard copy of all reference sources. The student is allowed to use the illustrations published in the chosen articles. As regards for the other sections (i.e., Title, Abstract, Introduction, Experimental Analysis, Figure Legends, Discussion/Conclusions), the student is required to prepare these sections using his/her own words and not just copy or paraphrase portions of the chosen articles (read note about plagiarism on page 4). References must be cited in the text. The Reference List must be prepared by using the format of a peer-reviewed journal chosen by the student.

The Review Paper is worth 100 points.

- Each student must select a topic of interest, discuss it with the instructor and have it approved by September 21.
- A first draft of the Review Paper is due at the beginning of class on October 19.
- The final draft of the Review Paper is due at the beginning of class on November 21.
- Both the initial and the final drafts of the Review Paper must be sent via email as electronic word files.

The final grade is based on the sum of four Exams (400 points) and the Review Paper (100 points), for a total of 500 points.

Grading Scale:

- 500 - 440 = A
- 439 - 390 = B
- 389 - 340 = C
- 339 - 290 = D
- 289 or below = F

COURSE POLICIES

Attendance/tardiness

Students are expected to attend every class. If absent, it is the student's responsibility to obtain missed information from a classmate. Missed information includes not only lecture notes, but also any possible information regarding changes to the agenda. The student is expected to arrive prepared to take notes and should bring textbook and handouts.

Communications with the instructor

All students are required to access and use their university Islander email accounts to communicate with the instructor. To find out more about your TAMU-CC email account go to: http://www.tamucc.edu/ise.html. The instructor will use these addresses to create a class email list to disseminate important course information. **The instructor will not reply to personal email accounts (e.g., Gmail, yahoo, etc.) other than the student’s islander email.**

Academic assistance

If a student experiences academic difficulty, the instructor is available for consultation and extra help. However, it is the responsibility of the student to seek help, preferably while the investment made by the student can still be salvaged. Please contact the instructor by phone or via email to arrange an appointment.
**Late work and make-up exams**

This course does not include make-up Exams. If you are not able to attend one of the Exams, contact the instructor ASAP (see below).

Points missed because of an **unexcused absence** (including tardiness and leaving early) **cannot** be recovered. An excused absence allows us to make alternative arrangements for completing assignments. The documentation required for an absence to be excused **must** be:

- From an appropriate source (e.g., doctor, dentist, funeral director) who states the nature of the event that caused (or will cause) your absence.
- In writing, on official stationery, and signed (I do **not** return excuses to you). Telephone calls, FAXes, and e-mails are **not** acceptable.
- Presented **prior to** the absence for a scheduled event (e.g., university-sponsored activity, recognized religious holiday, military service).
- Presented **no** more than **one week** after the date of an unexpected absence.
- In case a student cannot attend class because he/she will be officially representing TAMU-CC (e.g., meetings or sports events), the documentation required for an absence to be excused must be from the Office of Dr. Eliot Chenaux, Vice President for Student Affairs. Refer to your student handbook on obtaining an excused absence from his office.

**Unacceptable excuses:** Only unavoidable absences are excused, so you should schedule routine personal events (e.g., vacations, weddings, reunions, non-emergency medical or dental visits, parent-teacher conferences, household or auto repairs) to avoid conflicts with your classes. Oversleeping is never an acceptable excuse. Employment conflicts are not acceptable excuses for absences, tardiness, or leaving class early. Once enrolled in a class, it is the student’s responsibility to arrange his or her work schedule so that no regularly scheduled class, laboratory, or examination time is missed. Texas waives jury duty for students, so jury duty is not an acceptable excuse.

- Different test forms may be prepared for an individual Exam. Follow instructions.
- If you leave an examination room for any reason you must hand in your test and you will not be allowed to resume the examination. Attend to personal matters (e.g., rest room visits) before the beginning of the exam.
- **Be on time! Anyone arriving after someone has completed an examination and left the room will not be allowed to take that examination.**

**Cell phone/electronic device usage**

- During lectures, cell phones and any other portable devices must be turned off and removed from the table. Cell/smart phones must be turned off at the beginning of class and remain so until the class is dismissed. Computers and notebooks can be used to take notes.
- During exams, any portable device, including phones, computers and notebooks must be turned off and removed from the table.

**Academic integrity**

University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, falsification, forgery, complicity or plagiarism (plagiarism is the presentation of the work of another as one's own work). For this class, acts of academic misconduct, including plagiarism, cheating and complicity conducted during an exam will result in a grade of zero (0) points for that given assignment. For the review paper, a grade of zero (0) points will be given in the event that part(s) of the review is found plagiarizing material previously published. In both
cases, an Academic Misconduct Incident will be filed and reported to the University Academic Standard Grievance Committee.

**Dropping a class**
I hope that you never find it necessary to drop this or any other class. However, events can sometimes occur that make dropping a course necessary or wise. Please, consult with the instructor before you decide to drop to be sure it is the best thing to do. Should dropping the course be the best course of action, you must initiate the process to drop the course by going to the Student Services Center and filling out a course drop form. Just stopping attendance and participation **WILL NOT** automatically result in your being dropped from the class. November 4, 2011 is the last day to drop a class with an automatic grade of “W” in the fall semester.

**Grade appeal process**
As stated in University Rule 13.02.99.C2, Student Grade Appeals, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Rule 13.02.99.C2, Student Grade Appeals, and University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules Web site at http://www.tamucc.edu/provost/university_rules/index.html. For assistance and/or guidance in the grade appeal process, students may contact the Office of Student Affairs.

**About the final exam**
Students are not required to take more than two final examinations in any one day. The students who have three or more final examinations scheduled on the same day may request to take the final exam for this course on another day during the final examination period. The process is described below:

1) The student should first try to resolve the matter with the appropriate instructor(s). If this is the case, students are strongly encouraged to contact Dr. Mozzachiodi in a timely manner.

2) If the matter remains unresolved, the student should submit a request for an alternative final exam time in writing to the Office of Student Affairs. This request must be submitted by the drop date (the last day to drop a course for the semester with an automatic grade of W as stated in the semester class schedule).

3) The Office of Student Affairs will select which of the exams should be taken at an alternative time and formally contact the faculty member at least 15 working days before the final examination period. Preference for selection of which course would have an alternative final exam time must be based on the course with the smaller class size and, then, courses with final exam times in between other exams.

4) The faculty member will then arrange an alternative time for the student to take the final exam for that course that does not conflict with the student’s final exam schedule or require the student to take more than two final exams in one day. If students have difficulties in rescheduling the examination, they should consult with the Office of Student Affairs. Final exams given outside the regularly scheduled time may vary in content and format at the discretion of the faculty member.

**Opportunities listserv**
Students are strongly encouraged to subscribe to the opportunities listserv, which announces scholarships, fellowships, internships, seminars, jobs, etc. Some SPAM filters will not accept mass mailings, but you can adjust your settings to accept messages from this listserv. To
subscribe:
1) Send an email message to: opportunities-list-request@sci.tamucc.edu
2) Make sure that your e-mail address appears in the “From:” heading, and that the word “subscribe” is typed in the subject line.
3) You will receive a subscription acknowledgement from the listserv letting you know that you have subscribed successfully.
4) To post a message to all members of the listserv, send the message to: opportunities-list@sci.tamucc.edu

You must be subscribed to the listserv to send messages.

DISABLING CONDITIONS
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. The Biology and Biomedical Sciences Programs comply with the ADA in making reasonable accommodation for qualified students with disabilities. Any student who suspects that a disabling condition (physical impairment, learning disability, psychiatric disability, etc.) may necessitate special arrangements to meet course requirements, should first obtain appropriate verification from A&M-Corpus Christi Services for Students with Disabilities Office (located in Driftwood 101, phone #: 825-5816). If the student is a returning veteran and is experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance. It is important to contact the Disability Services office in a timely fashion as it may take several days to review requests and prepare accommodations and accommodation letters. Upon receipt of accommodation letters, a student should take them to appropriate instructors as soon as possible. Please note that instructors are not required to make accommodations prior to receipt of an official accommodation letter. Should you have mobility problems, please notify the lecture and laboratory instructors so that they may seek assistance for you in the case of fire drills or emergencies. Also, any student having a medical condition that may fulminate (i.e., “flare-up” without warning such as diabetes, epilepsy, etc.) should notify your instructors.

ACADEMIC ADVISING
The College of Science and Technology requires that students meet with an Academic Advisor as soon as they are ready to declare a major. The Academic Advisor will set up a degree plan, which must be signed by the student, a faculty mentor, and the department chair. The College’s Academic Advising Center is located in the Center for Instruction, room CI-350.

RELIGIOUS HOLIDAYS
Any student who will miss class and/or test days because of recognized religious holidays should notify me as soon as possible so we can make alternative arrangements. Prior notification is required for such absences to be excused.

GENERAL DISCLAIMER:
The Instructor reserves the right to modify the schedules and policies in this syllabus if and when necessary. Such changes will be announced during regularly scheduled lecture periods, but no attempt will be made to contact students who were absent when an announcement was made. Nevertheless, all students are responsible for abiding by all announced changes, and it is a student’s responsibility to obtain this information. Changes will be announced in a timely manner, but be aware that some modifications may be implemented without prior warning.
TENTATIVE SCHEDULE

This schedule may change depending on unforeseen events. Numbers refer to specific chapters of the textbook.

August
24 Syllabus description and course Introduction. Part I. An Introduction to the Cellular Analysis of Behavior. Chapter 1: Neurons as the Building Blocks of Behavior
29 Chapter 1: Neurons as the Building Blocks of Behavior (continued)
31 Part II. Sensory Worlds. Chapter 2: Echolocation in Bats

September
5 Labor Day, no class
7 Chapter 2: Echolocation in Bats (continued)
12 Chapter 3: Prey Location in Barn Owls
14 Chapter 3: Prey Location in Barn Owls (continued)
19 Chapter 4: Feature Detection in Toads
21 Chapter 4: Feature Detection in Toads (continued) (topic of the Review Paper discussed with the instructor and approved by today)
26 Class discussion
28 Exam 1: chapters: 1, 2, 3 and 4

October
3 Part III. Motor Strategies. Chapter 5: Mate Calling in Crickets
5 Chapter 5: Mate Calling in Crickets (continued)
10 Chapter 6: Locust Flight
12 Chapter 6: Locust Flight (continued)
17 Chapter 7: Escape Behavior in the Crayfish
19 Chapter 7: Escape Behavior in the Crayfish (continued) (first draft of the Review Paper due today)
24 Class discussion
26 Part IV. Behavioral Plasticity. Chapter 8: The Development of Learning in Songbirds
31 Exam 2: chapters: 5, 6, and 7

November
2 Chapter 8: The Development of Learning in Songbirds (continued)
7 Chapter 10: Learning and Memory in Simple Reflex Systems in *Aplysia*
9 Chapter 10: Learning and Memory in Simple Reflex Systems in *Aplysia* (continued)
14 Chapter 11: Molecular Genetics of Learning and Memory in *Drosophila*
16 Chapter 11: Molecular Genetics of Learning and Memory in *Drosophila* (continued)
21 Chapter 12: Spatial Navigation in the Rat *(final draft of the Review Paper due today)*
23 TBA
28 Chapter 12: Spatial Navigation in the Rat (continued)
30 Exam 3: chapters: 8, 10 and 11

December
5 General review of the course material and questions in preparation to the final exam
12 Final exam: 4:30 – 7:00 PM. Final exam will be comprehensive and will also include questions on chapter 12