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 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 9.1. Handouts will be posted on Blackboard 9.1 one week before class. Blackboard can be accessed at: https://bb9.tamucc.edu/. If you need to contact the instructor about the course, please use the instructor’s regular email address (riccardo.mozzachiodi@tamucc.edu).
3) Articles on selected topics, which will be provided by the instructor.
MAJOR COURSE REQUIREMENTS

Assessment = Exams + Review Paper

Exams: There will be 4 comprehensive exams (3 during the semester + final exam). Each Exam, including the final 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 4-6, but it may also contain questions about the previous section (chapters 1-3). 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 exam 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, but was marked correctly on the exam text, it will remain counted wrong. Additionally, answers that are not bubbled on the scantron will be counted wrong, even when marked correctly on the exam text. 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 exams and in-class learning exercises will be posted on Blackboard. It is the students’ responsibility to regularly check their scores 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 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 at least 10-page long (double spaced) 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. 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 17, 2014.
- A first draft of the Review Paper is due at the beginning of class on October 15, 2014.
- The final draft of the Review Paper is due at the beginning of class on November 12, 2014.
- Both the initial and the final drafts of the Review Paper must be sent via email as electronic word files.
- Delayed submission dates are not permitted. If the student experiences difficulties with the preparation of the review paper, he/she is encouraged to inform the instructor in a timely manner.

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 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. **Students must remember that it is their responsibility to know the course schedule on pages 7 and 8 of this syllabus. If you miss an exam because you forgot, or because you were not aware that it was scheduled for that day, you WILL NOT be allowed to make it up!**

**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. Furthermore, 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 7, 2014 is the last day to drop a class with an automatic grade of "W" in the fall semester.

**Classroom/professional behavior**
Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructor’s ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom.

**Grade appeal process**
As stated in University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures, a student who believes that he/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 Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules website at http://www.tamucc.edu/provost/university_rules/index.html, and the College of Science and Engineering Grade Appeals webpage (http://sci.tamucc.edu/students/GradeAppeal.html). For assistance and/or guidance in the grade appeal process, students may contact the Chair or Director of the appropriate Department or School, the Office of the College of Science and Engineering Dean, or the Office of the Provost.

**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). The schedule with the final exams for the Fall 2014 is available at: http://registrar.tamucc.edu/final_exams/index.html. Therefore, students should already know whether they have to reschedule their final exam. If this is the case, they are strongly encouraged to contact Dr. Mozzachiodi in a timely manner. Requests about rescheduling the final exam will not be considered if received after October 31, 2014.
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, which is November 7, 2014.
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.tamu.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.tamu.edu
You must be subscribed to the listserv to send messages.

DISABILITIES ACCOMMODATIONS
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 in Corpus Christi Hall 116, 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.
ACADEMIC CONTINUITY
In the event of an unforeseen adverse event, such as a major hurricane and classes could not be held on the campus of Texas A&M University–Corpus Christi; this course would continue through the use of Blackboard and/or email. In addition, the syllabus and class activities may be modified to allow continuation of the course. Ideally, University facilities (i.e., emails, web sites, and Blackboard) will be operational within two days of the closing of the physical campus. However, students need to make certain that the course instructor has a primary and a secondary means of contacting each student.

INSTRUCTOR NOTES
In choosing to take this course, you are agreeing to abide by the course rules, regulations, and standards. Should you have concerns or questions, you are encouraged to discuss them with the instructor as soon as possible. However, you are bound by these rules, regulations and standards from the first day of class throughout the duration of the course. Failure to comply with course rules or showing disrespect toward the instructor or other classmates will result in removal from the course.

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

August
27 Syllabus description and course Introduction. Part I. An Introduction to the Cellular Analysis of Behavior. Chapter 1: Neurons as the Building Blocks of Behavior

September
1 Labor Day, no class
3 Chapter 1: Neurons as the Building Blocks of Behavior (continued)
8 Part II. Sensory Worlds. Chapter 2: Echolocation in Bats
10 Chapter 2: Echolocation in Bats (continued)
15 Chapter 3: Prey Location in Barn Owls
17 Chapter 3: Prey Location in Barn Owls (continued) (topic of the Review Paper discussed with the instructor and approved by today)
22 Chapter 4: Feature Detection in Toads
24 Chapter 4: Feature Detection in Toads (continued)
29 Exam 1: chapters: 1, 2 and 3

October
1 Part III. Motor Strategies. Chapter 5: Mate Calling in Crickets
6 Chapter 5: Mate Calling in Crickets (continued)
8 Chapter 6: Locust Flight
Chapter 6: Locust Flight (continued)

Chapter 7: Escape Behavior in the Crayfish
(first draft of the Review Paper due today)

Chapter 7: Escape Behavior in the Crayfish (continued)

Exam 2: chapters: 4, 5 and 6

Chapter 7: Escape Behavior in the Crayfish (continued)

Part IV. Behavioral Plasticity. Chapter 8: The Development of Learning in Songbirds

Chapter 8: The Development of Learning in Songbirds (continued)

November

Chapter 10: Learning and Memory in Simple Reflex Systems in *Aplysia*

Chapter 10: Learning and Memory in Simple Reflex Systems in *Aplysia* (continued)

Chapter 10: Learning and Memory in Simple Reflex Systems in *Aplysia* (continued)

Chapter 11: Molecular Genetics of Learning and Memory in *Drosophila*
(final draft of the Review Paper due today)

Visit to the Mozzachiodi Lab

Exam 3: chapters: 7, 8 and 10

Chapter 11: Molecular Genetics of Learning and Memory in *Drosophila* (continued)

Chapter 12: Spatial Navigation in the Rat

December

Chapter 12: Spatial Navigation in the Rat (continued)

Final exam: 4:30 – 7:00 PM. Final exam will be comprehensive and will also include questions on chapters 11 and 12