In the first part of this course, students will be introduced to underlying problems and strategies for cross-level analytical science, and to behavioral science as the organizing framework for this class’s material. Under this organizing framework, they will then be introduced to the general architecture of the brain, to the known functions of important areas, and to the behavioral and environmental processes that contribute to building this anatomy. The second part of the course will focus on the mechanisms by which brains and behavior change, the mechanisms of neural plasticity and their relationship to the environment, to the physiological mediation of environment-behavior relations, to the network structures related to brain and behavioral plasticity, and to the role of biological complexity, systems organization, and integration in behavioral processes. Although it is not required, students will be best prepared for this course if they have already taken one at least one of the following: BEHV4900-711 (Behavioral Neuroscience), BIOL 4751/BIOL 5751 (Cells and Circuits), and BEHV 2700, 2300, 3150, or 5100 (Introduction to Behavior Analysis).

**COURSE OBJECTIVES:**

Students use a behavioral organizing framework to:

1. Discuss common philosophical problems involved with the study of intersectional fields between levels of analysis and incorporate their practical implications into the design of experiments, interpretation, and epistemology.
2. Identify sound approaches to connecting the fields of behavior analysis and neuroscience.
3. Recall and discuss basic principles of behavior analysis including the three term contingency, respondent conditioning, operant conditioning, and stimulus control.
4. Recall and discuss basic principles of neuroscience including the structures and functions of the neuron and glia, action potentials, synaptic transmission, and circuits.
5. Recall basic neuroanatomy, basic brain functions, the structure of important circuits, and the mechanisms of global brain states.
6. Apply the difference between selections and essentialist approaches to behavior and brain sciences with regard to various topics.
7. Identify developmental influences on neuroanatomy and dynamics.
8. Identify cellular, synaptic, systems, functional, and structural, mechanisms of brain plasticity.
9. Classify developmental, experience-based, and homeostatic plasticity and identify their underlying functions.
10. Describe the modulation of brain plasticity by neuromodulatory systems and feedback circuits.
ACCOMMODATIONS

The Department of Behavior Analysis, in cooperation with The Office of Disability Accommodation, complies with the Americans with Disabilities Act. Additionally, I consider all students to be need an accommodation of some kind since you are all unique and diverse individuals with complex histories and current situations. I request that you all submit a description of your accommodations using the attachment to this syllabus. If your accommodations need to go through ODA as well, please include ODA paperwork and make sure to get it to me by the 3rd week.

POLICIES ON CHILDREN

Respecting parenting status is part of my overall commitment to respecting the wonderful diversity of our UNT classrooms. All exclusively breastfeeding babies are welcome in class as often as necessary. While it is not meant to be a long-term childcare solution, bringing an older child to class in response to unforeseen disruptions to life is also perfectly acceptable. I ask that other students work to reasonably create a welcoming environment for such children. If you do bring your child to class I ask that you sit near the door so that if your little one needs special attention or starts behaving in a way that is disruptive to the learning of other students, you may step outside until their needs have been met. Please use good judgement where this is concerned.

TEXTBOOKS:

- Materials for this class will be posted on Canvas.

COURSE EXPECTATIONS:

Students are expected to:

- Complete all readings before each class period
- Turn in all assignments including weekly topics documents on time
- Participate actively in class discussions and activities in order to maximize their learning experience
- Regularly monitor their UNT e-mail and blackboard and to respond accordingly to messages pertaining to schedule changes, clarifications, or other course-relevant announcements and requests

Students will be evaluated in part on preparedness and in-class activities.
# CLASS ACTIVITIES & REQUIREMENTS

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly Topics Document</td>
<td>Each student will produce a document about the week’s readings and seminar discussion, including: 1. A bulleted outline covering the main and important topics from the readings (please be as brief as possible but complete), with subtopic summaries of points discussed in the day’s seminar 2. A section about how the readings and seminar form a big picture and what that picture is The readings section of this doc should be completed before coming to class. Seminar notes will be added during or after class. This document will serve as a learning tool, but also as a reference in the future. You should write your summaries with your future self in mind. These should be complete in the sense that large concepts are all included, but your focus should also be perhaps even more on parsimony. It is easy to make an outline complete and easy to make it parsimonious, but to balance both will contribute to your clear thinking. Your goal is to produce the simplest document that still accounts for all vital concepts. Tools to achieve brevity include bulleted and visual rather than verbal conveyance (feel free to make a drawing or figure!). When we have readings that cover a great deal of simple route information, please copy/paste or page#/reference these important points into an appendix on your doc rather than re-stating or re-summarizing. Again, this is a learning tool and a reference – do not engage in work that serves neither purpose.</td>
<td>30</td>
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<tr>
<td>Seminar Leadership</td>
<td>Each week, one student will utilize their topics document to lead a seminar on the readings. Other students may also use the concepts in their document to participate in the discussions. The role of the leader will be to: 1. Make sure the conversation is complete (covers all aspects of the week’s material). This means you may need to redirect or keep us on topic. Use your best judgement when redirecting interesting diversions. 2. Prompt participation in quiet people, guide participation with talkative people. Play devil’s advocate if ideas are going unchallenged.</td>
<td>20</td>
</tr>
<tr>
<td>Intraverbal &amp; Route Facts Tests</td>
<td>There will be at least two tests throughout the semester that will provide an opportunity to practice promptless recall of route, anatomical, or intraverbal principles covered in the class. Students will design their own tests/testing materials based on their individual learning goals. Four small tests will be worth 5 points each and a final, long test will be worth 10.</td>
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<tr>
<td>Term Paper</td>
<td>Each student will write a paper synthesizing some portion of the class with a topic of their personal interest. Please vet your topics before you begin writing. The topic should be profound enough to justify at least 4-5 pages, but there is no maximum page limit. Papers should be as simple as possible yet complete.</td>
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</tbody>
</table>

**TOTAL POINTS** 100

*A*= 100-90, *B*= 89-80, *C*= 79-70, *F*= 69 or below
<table>
<thead>
<tr>
<th>DATE</th>
<th>TOPICS</th>
<th>SCHEDULE/DUE</th>
<th>OPTIONAL ANATOMY SEQUENCE</th>
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</thead>
<tbody>
<tr>
<td>26-Aug</td>
<td>Syllabus, Overview, Individual Learning Choices, Topics Introduction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-Sep</td>
<td>Before we can connect the dots: Levels of Analysis &amp; Reductionism</td>
<td><strong>TOPICS DOC (NEXT DAY)</strong></td>
<td>Cerebrum 1 (chapters 1-6)</td>
</tr>
<tr>
<td>12-Sep</td>
<td>Connecting Behavior Analysis and Neuroscience</td>
<td><strong>TOPICS DOC (NEXT DAY)</strong></td>
<td>Cerebrum 2 (chapters 7-14)</td>
</tr>
<tr>
<td>19-Sep</td>
<td>Components Week (Background Specific)</td>
<td><strong>TOPICS DOC (NEXT DAY)</strong></td>
<td>Cerebrum 3 (chapters 15-22)</td>
</tr>
<tr>
<td>26-Sep</td>
<td>Brain Anatomy and Function Overview: Input-Output Flow &amp; the 3 Term Contingency</td>
<td><strong>TEST 1 (FIRST 20 MIN)</strong> <strong>TOPICS DOC (NEXT DAY)</strong></td>
<td>Basal Nuclei &amp; Cerebellum</td>
</tr>
<tr>
<td>3-Oct</td>
<td>Developmental and Dynamical Determinants of Brain Structure and Function: Selection vs. Essentialism</td>
<td><strong>TOPICS DOC (NEXT DAY)</strong></td>
<td>Diencephalon</td>
</tr>
<tr>
<td>10-Oct</td>
<td>Selection-based Approaches to Behavioral and Brain Dynamics</td>
<td><strong>TEST 2 (FIRST 20 MIN)</strong> <strong>TOPICS DOC (NEXT DAY)</strong></td>
<td>Brainstem 1 (chapters 43-50)</td>
</tr>
<tr>
<td>17-Oct</td>
<td>Brain Plasticity: Overview, Mechanisms, Timing-Dependent Plasticity</td>
<td><strong>TOPICS DOC (NEXT DAY)</strong></td>
<td>Brainstem 2 (chapters 51-59)</td>
</tr>
<tr>
<td>24-Oct</td>
<td>Plasticity in Systems</td>
<td><strong>TOPICS DOC (NEXT DAY)</strong></td>
<td>Spinal Cord 1 (chapters 60-67)</td>
</tr>
<tr>
<td>31-Oct</td>
<td>Developmental, Homeostatic, and Meta Plasticity</td>
<td><strong>TEST 3 (FIRST 20 MIN)</strong> <strong>TOPICS DOC (NEXT DAY)</strong></td>
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<tr>
<td>7-Nov</td>
<td>Plasticity-Controlling Systems: Neuromodulators</td>
<td><strong>TOPICS DOC (NEXT DAY)</strong></td>
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<tr>
<td>14-Nov</td>
<td>Feedback/Feedforward Circuits part 1 – Basal Ganglia</td>
<td><strong>TEST 4 (FIRST 20 MIN)</strong> <strong>TOPICS DOC (NEXT DAY)</strong></td>
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<tr>
<td>21-Nov</td>
<td>Feedback/Feedforward Circuits part 2 – Hippocampus &amp; Cerebellum</td>
<td><strong>TOPICS DOC (NEXT DAY)</strong></td>
<td></td>
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<tr>
<td>28-Nov</td>
<td>NO CLASS - THANKSGIVING</td>
<td><strong>TOPICS DOC (NEXT DAY)</strong></td>
<td></td>
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<tr>
<td>5-Dec</td>
<td>Selection meets Emergence: Systems, Self-Organization, Degeneracy, Complexity, and Integration</td>
<td><strong>TOPICS DOC (NEXT DAY)</strong></td>
<td></td>
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<tr>
<td>12-Dec</td>
<td>Final Test &amp; Paper Topics</td>
<td><strong>FINAL TEST (1.5 HOUR)</strong></td>
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SCHOLARLY EXPECTATIONS

- Students are expected to use correct spelling, grammar and clarity in any written material submitted for class credit. If you need assistance in fulfilling this expectation, please refer to the writing lab (listed below), where you will find teachers ready to help you acquire these skills.

- In keeping with the norms of higher education, any student found guilty of academic dishonesty may receive a failing grade for the course and be reported to their college dean. Refer to your student handbook for complete provisions of the policies and procedures set forth by UNT.

- Religious Holidays: Please let me know within the first 15 days of the semester if you require provision for religious holidays. In accordance with state law, students absent due to the observance of a religious holiday may take examinations or complete assignments scheduled for the day missed within a reasonable time after the absence if the student has notified the instructor of each class of the date of the absence within the first 15 days of the semester. Notification must be in writing, either personally delivered with receipt of the notification acknowledged and dated by the instructor, or by certified mail, return receipt requested.
STUDENT PERCEPTIONS OF TEACHING (SPOT)

Student feedback is important and an essential part of participation in this course. The student evaluation of instruction is a requirement for all organized classes at UNT. The short SPOT survey will be made available to you with an opportunity to evaluate how this course is taught. You will receive an email from "UNT SPOT Course Evaluations via IASystem Notification" (no-reply@iasystem.org) with the survey link. Please look for the email in your UNT email inbox.

ABSENCES

If you must be absent for any reason, you should arrange to submit the written assignments early. If absent unexpectedly for unavoidable reasons, you may submit the day’s assignments electronically. No assignments turned in after the due date can be accepted. Students are responsible for making their own arrangements to obtain information from any missed class period. There will be no additional make-up opportunities for missed examinations.

STUDENT CONDUCT

Each student automatically certifies that any material submitted for grading is his/her own independent work. UNT policies require reporting of plagiarism or any suspected violations that constitute possible academic misconduct. Students are responsible for being familiar with the Code of Student Conduct.

STUDENT RESOURCES

Office of Disability Accommodation - http://disability.unt.edu/
Learning Center - http://learningcenter.unt.edu/ UNT
Writing Lab - http://writinglab.unt.edu/
WEEKLY READINGS

Reading guidance: Page numbers for each reading precede the reference, and approximate weekly totals antecede the header to help you with your study/time management. “Quick read” means skim all material that is not new to you and do a moderate-speed read only of those parts that are of particular novelty or interest. “Moderate Read” means read all material once but don’t worry about digesting every detail or re-reading parts that confuse you. “Deep Read” means read fully for complete understanding. “Lay read” means that this paper was taken from a popular source and should therefore be a faster read. “Optional read” is what it sounds like.

This class will involve a lot of new material for any given background. You will have to learn to be a strategic reader in order to avoid getting lost, panicking, or creating disruptive holes in your learning process. We will discuss strategies to this end on the first day, which include: 1. knowing when to skim, when to skip, and when to focus, 2. scheduling lay reads for bedtime or times when you’re not fresh/need to relax, difficult reads for your best, most focused “on” times, and multiple reading windows ( subdivided by sections/ headings) for long/complex reads.

Before we can connect the dots: Levels of analysis & Reductionism 65


Connecting Behavior Analysis and Neuroscience 50


Components Week (Background Specific) 129 / 107

If you are new to Neuroscience:


**If you are new to Behavior Analysis:**


20 Skinner, B. F. (1935). The generic nature of the concepts of stimulus and response. *The Journal of General Psychology, 12*(1), 40-65. Sort of moderate read, however this will be difficult even at moderate level. It may take multiple readings to get a moderate-read outcome. Do not read when you’re tired. Act like the page count is twice as long.


**Brain Anatomy and Function Overview: Input-Output Flow & the 3 Term Contingency 75**


**Developmental and Dynamical Determinants of Brain Structure and Function: Selection vs. Essentialism 85**


Selection-based Approaches to Behavioral and Brain Dynamics 46 - 63


Brain Plasticity: Overview, Mechanisms, Timing-Dependent Plasticity 34 - 42

For this week: Non-bio folks DO NOT STRUGGLE, just absorb what you can. We will clarify in class.


Plasticity in Systems 60


*Developmental Homeostatic, and Meta Plasticity 50*


*Plasticity-Controlling Systems: Neuromodulators 45 - 72*


*Feedback/Feedforward Circuits 1 – Basal Ganglia 66*


6 Donahoe, J. W. (2014). Evocation of behavioral change by the reinforcer is the critical event in both the classical and operant procedures. *International Journal of Comparative Psychology, 27*(4). Deep read


*Feedback/Feedforward Circuits 2 – Hippocampus & Cerebellum 78 - 98*


1 Neural Circuits of the hippocampus. Neural Circuits and Memory Lab Website, https://sites.lsa.umich.edu/diba-lab/neural-circuits-of-the-hippocampus/ Take a glance


*Selection meets Emergence: Systems, Self-Organization, Degeneracy, Complexity, and Integration 86*


ACCOMMODATIONS DESCRIPTIONS:

Please describe any points of your unique life that will or may weigh on the logistical implementation of this class. For each, please tell me if it’s just something I should be aware of or if there is a particular point of reasonable accommodation or flexibility that can be provided.