Psychology 392 section 1 Research in Human Cognitive Neuroscience, Winter 2017

Location: PAS 2259

Time: Tues 12:30-2:20, Thursday 12:30- 2:20

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Instructor: Professor Mike Dixon office: PAS 4035

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(email me or see me in class)

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Course is listed on Desire to Learn
https://learn.uwaterloo.ca
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## Expanded Course Description

This course is a lab course that will introduce students to some of the techniques used in conducting experiments in human cognitive neuroscience with a particular emphasis on psychophysiology. Students will be taught how to program a simple experiment and accurately acquire response time data. They will be taught how to gather a number of psychophysiological measures. The psychophysiological measures acquired will reflect brain-body relationships e.g., how psychological reactions can influence heart rate, and changes in skin conductance (i.e., sweat increases or decreases related to the processing of external information). Students will be taught how to apply these different measures to conduct research in a number of diverse areas including a slot machine simulator, video game playing, and distortions of body schema. Students will gain experience by collecting data on themselves and their lab team members (the data is solely for educational purposes not for formal research).

This course is first and foremost an experiential learning course where students will learn by doing. After being introduced to the theory and practice of these experimental techniques (and completing labs to solidify their learning), students will be asked to work in small teams, program their own experiments, and collect sample data on themselves and team members and write up a final report on their self-generated project.

## Course Requirements and Evaluation: 4 Labs and a Final Report

Marks in this course will be based on 4 labs (10% for labs 1, 2, and 3 and 20% for lab 4), and the final project report (50%). All labs and the final report will be submitted via electronic drop boxes on the *Learn* site.

A note on Late Lab and Final Reports. All late Reports will be penalized. For every day that an assignment is late, 10% will be deducted from your assignment grade. For example, if you received 100% on lab report 1 but handed it in two days late you would receive 80% on this lab.

**LABS:**

10% **Laboratory Report 1:** Students will work in pairs and learn to program in SuperLab. Each student will submit via *Learn*'s electronic dropbox, a program that they have created using SuperLab, along with an excel workbook containing both raw and analyzed response time and error data.

10% **Laboratory Report 2:** Students will work in teams of 5 or 6. Each member of the team will record their heart rate, filter their heart rate, and record beats per minute as they play a simple (non-violent video game). Using Powerlab and "LabChart" software students will then learn to analyze their heart rate and graph the results in Excel. In addition they will record inter-beat intervals of a participant anticipating a burst of white noise. Finally they will write up an APA-formatted Method Section outlining the apparati and procedures used in the video game study. Each student will submit via electronic dropbox on *Learn* their LabChart, excel files, and method section.

10% **Laboratory Report 3:** Students will work in teams of 5 or 6. Using Powerlab and LabChart software students will record Skin Conductance Responses for an experiment involving an illusion involving a distortion of body schema (the "rubber hand" illusion). Each student will submit via electronic dropbox on *Learn*, the LabChart files which they recorded and an excel file summarizing their results.

20% **Laboratory Report 4:** Students will learn more complex data analytic techniques involving analyzing the physiological responses of people playing on a slot machine simulator. Students will learn how to analyze event-related individual psychophysical responses to wins, losses, and a special type of slot-machine loss called a "near miss". Each student will submit via *Learn's* electronic dropbox the LabChart files they analysed and an excel file with the relevant data analyses.

**Final Report** - Worth 50% of student's mark.

Students will work in pairs or teams of three. Each student will create an experiment in SuperLab, interface the experiment with Powerlab (the psychophysiological data acquisition system), collect sample data using either electrocardiogram variables (heart rate, inter-beat intervals), or skin conductance as the dependent variables, and analyse these data. Each student will: write a 250 word abstract, write a brief (4 page double spaced) introduction summarizing research on their topic, write a 3-4 page method

section, write a 2-page results section summarizing their findings, and a 4-page discussion, followed by references in APA format. Before conducting their experiments all projects must be approved by Dr. Dixon or by the T.A. A one-page proposal must be submitted via electronic dropbox for approval prior to any programming or data collection. This proposal is due on Mar 9th. The final lab report is due in the exam period on April 18th and must be submitted via electronic dropbox.

A note on collaboration. Although team members should consult with one another, agree on a project, and work together on this project, *each individual student will submit their own proposal and their own final report about their agreed-upon project.*

Here are some possible experiments.

1. Electrodermal and heart rate responses to different types of video-games (strategic vs, racing) *NB* video games games must be non-violent.
2. Electrodermal and heart rate responses to happy, neutral and sad movie clips.
3. Psychophysical responses to faces showing positive, neutral and negative (angry) faces.
4. Psychophysical responses to classically conditioned stimuli.
5. Psychophysical responses to familiar and unfamiliar faces.
6. Lie detection.
7. SCR and Heart Rate reactions to frustration
8. SCR and Heart Rate responses to different types of music.
9. Restorative effects of Nature scenes, and audio clips

A note on Powerlab and the Imacs. Each powerlab system costs in excess of $8000. The IMacs cost $1,300 each. Treat them with extreme care. NO FOOD OR DRINKS ARE ALLOWED IN THE LAB ROOM.

**Schedule of Topics**

Note: All readings will be available within *Learn*. As mentioned all submissions will be via electronic drop box in *Learn*.

Jan 3 Overview of Research in Human Cognitive Neuroscience

- Cognitive Neuroscience using behavioural measures

Jan 5 Overview of Superlab

Reading: Dixon M. J., Smilek, D., Cudahy, C., Merikle, P.M. (2000) Five plus two equals yellow *Nature,* 406, 365.

- programming a Stroop Experiment
- running a Stroop Experiment

Jan 10 Analyzing the data, outlier trimming and rudimentary data analysis/summarization using Microsoft Excel.

Jan 12- Intro to LABORATORY 1 - Strategic and Automatic Influences on Stroop Performance

Jan 17 - LABORATORY 1 in class data collection and analysis.

Jan 19 - Finish LABORATORY 1 complete in class work on data analysis.

***DEADLINE: Laboratory 1 must be submitted by Jan 19 (at or before 11:59 p.m.)***

Jan 24
Reading: John L Andreassi, J.L. (2000). Heart Activity and Behavior I: Developmental Factors, Motor and Mental Activities, Perception, Attention, and Orienting Responses. Chapter In Psychophysiology: Human Behaviour and Physiological Response. Lawrence Erlbaum Associates, London

- Psychophysiology of the human heart
- Introduction to Powerlab

Jan 26
- Introduction to LabChart Software

Jan 31

LABORATORY 2 Heart Rate Responses to Playing a Video Game (Tonic effects), and Heart Rate Changes in Anticipation of a loud Noise (Phasic effects)

- Reading: Turner, R. J., Carroll, D. and Courtney, H. (1983). Cardiac and metabolic responses to space invaders: An instance of metabolically-exaggerated cardiac adjustment? *Psychophysiology, 20,* 544-549.

Feb 2
- LABORATORY 2 data collection and analysis for Laboratory 2.

Feb 7
- LABORATORY 2 data analysis and completion of Laboratory 2.

***DEADLINE: Laboratory 2 must be submitted by Feb 7th (at or before 11:59 p.m.)***

Feb 9

Introduction to electrodermal measures, and recording of skin conductance levels and skin conductance responses (SCRs) using Powerlab.

Reading: Dawson, M.E., Schell, A.M., and Filion, D. (2007). The Electrodermal System. In Handbook of Psychopysiology, 3RD Edition, (J.T. Cacioppo, L.G. Tassinary, G.G. Bernston Eds.), Cambridge University Press.

Reading Armel, K.C., and Ramachandran, V. S. (2003). Projecting sensations to external objects: Evidence from skin conductance response. *Proceedings of the Royal Society, B: Biological Sciences, 270,* 1499-1506.

LABORATORY 3 - The rubber hand illusion

Feb 14 Data collection and analysis of Laboratory 3.

Feb 16 LABORATORY 3 - Completion of analysis for Laboratory 3.

***DEADLINE: Laboratory 3 must be submitted by Feb 16 (at or before 11:59 p.m.)***

Feb 28 Introduction to Macros in LabChart

LABORATORY 4 Analyzing Slot Machine Outcomes: Wins, Losses and Near Misses.

Reading: Dixon, M.J., MacLaren, V., Jarick, M., Fugelsang, J.A., and Harrigan, K.A. (2013). The Frustrating effects of just missing the jackpot: Slot machine near-misses trigger large skin conductance responses, but no post-reinforcement pauses. *Journal of Gambling Studies, 29,* 661-674. doi: 10.1007/s10899-012-9333-x.

Mar 2 - LABORATORY 4 - Data Analysis for Laboratory 4.

Mar 7 - LABORATORY 4 - Data Analysis for Laboratory 4.

Mar 9 - LABORATORY 4 - Data Analysis for Laboratory 4.

***DEADLINE: Laboratory 4 must be submitted Mar 9 (at or before 11:59 p.m.)***

***DEADLINE: 1 Page Proposal for the final paper must be sumbitted Mar 9 (at or before 11:59 p.m.)***

Mar 14 Begin Work on student projects

March 16, 21, 23, 28, 30 In-class work on the student projects.

**DEADLINE: FINAL REPORTS DUE APR 18 *(at or before 11:59 p.m.)***

*The Information That Appears on All Course Syllabi…*

**Academic Integrity**

***Academic Integrity:*** In order to maintain a culture of academic integrity, members of the University of Waterloo are expected to promote honesty, trust, fairness, respect and responsibility. See the UWaterloo Academic Integrity webpage and the Arts Academic Integrity webpage for more information.

***Discipline:*** A student is expected to know what constitutes academic integrity, to avoid committing academic offences, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course professor, academic advisor, or the Undergraduate Associate Dean. When misconduct has been found to have occurred, disciplinary penalties will be imposed under Policy 71 – Student Discipline. For information on categories of offenses and types of penalties, students should refer to Policy 71 - Student Discipline. For typical penalties check Guidelines for the Assessment of Penalties.

**Concerns About a Course Policy or Decision**

***Informal Stage.*** We in the Psychology Department take great pride in the high quality of our program and our instructors. Though infrequent, we know that students occasionally find themselves in situations of conflict with their instructors over course policies or grade assessments. If such a conflict arises, the Associate Chair for Undergraduate Affairs (Richard Eibach) is available for consultation and to mediate a resolution between the student and instructor: Email: reibach@uwaterloo.ca; Ph 519-888-4567 ext. 38790

***Grievance:*** A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70 - Student Petitions and Grievances, Section 4. When in doubt, please be certain to contact Richard Eibach, the Associate Chair for Undergraduate Affairs who will provide further assistance; reibach@uwaterloo.ca.

***Appeals:*** A decision made or penalty imposed under Policy 70 - Student Petitions and Grievances (other than a petition) or Policy 71 - Student Discipline may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72 - Student Appeals

**Accommodation for Students with Disabilities**

***Note for students with disabilities:*** The AccessAbility Services office, located on the first floor of the Needles Hall extension (1401), collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with the AS office at the beginning of each academic term.

**Accommodation for course requirements**

- Students requesting accommodation for course requirements (assignments, midterm tests, final exams, etc.) due to illness should do the following:
  - seek medical treatment as soon as possible and obtain a completed uWaterloo Verification of Illness Form
  - submit that form to the instructor within 48 hours.

- (if possible) inform the instructor by the due date for the course requirement that you will be unable to meet the deadline and that documentation will be forthcoming.

- In the case of a missed assignment deadline, midterm test, or quiz, the instructor will either:
  - waive the course component and re-weight remaining term work as he/she deems fit according to circumstances and the goals of the course, or
  - provide an extension.
- In the case of bereavement, the instructor will provide similar accommodations to those for illness. Appropriate documentation to support the request will be required.
- Students who are experiencing extenuating circumstances should also inform their academic advisors regarding their personal difficulties.
- Elective arrangements such as travel plans are not acceptable grounds for granting accommodations to course requirements per the uWaterloo Examination Regulations and Related Matters.

**Official version of the course outline**

If there is a discrepancy between the hard copy outline (i.e., if students were provided with a hard copy at the first class) and the outline posted on LEARN, the outline on LEARN will be deemed the official version. Outlines on LEARN may change as instructors develop a course, but they become final as of the first class meeting for the term.

**Cross-listed course**

Please note that a cross-listed course will count in all respective averages no matter under which rubric it has been taken. For example, a PHIL/PSYCH cross-list will count in the Philosophy major average, even if the course was taken under the Psychology rubric.