Psychology 392 "Research in Human Cognitive Neuroscience", Spring, 2009

Location: PAS 2259

Time: Tues 8:30-10:20, Thursday 8:30- 10:20

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Instructor: Professor Mike Dixon office: PAS 4035

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Wednesday 8:30 – 10:20

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T.A. Deltcho Valtchanov office hours: held in PAS 2259
Monday 8:30-10:20

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Course is listed on UW ACE
https://uwangel.uwaterloo.ca/uwangel/home.asp
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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. 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. In this course the psychophysiological measures will focus primarily on psychological influences on heartbeat, and psychological 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 reaction time tasks, distortions of body schema, and video game playing. 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 – 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% each for a total of 40%), and the final project report (60%). All labs and the final report will be submitted via the electronic drop box on UW-ACE.

**LABS:**

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

10% **Laboratory Report 2:** Using Powerlab and Chart 6.0 software students will record heart rate responses for Stroop trials with and without incentive. They will analyze the results using Chart Software, and graph the results in Excel. In addition they will record the inter-beat interval while they anticipate a burst of white noise.

10% **Laboratory Report 3:** Students will work in teams of 5. 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).

10% **Laboratory Report 4:** Students will work in teams of 5. Using Powerlab and Chart 6.0 software students will record Galvanic Skin Responses (GSRs) for an experiment involving an illusion involving a distortion of body schema ("the rubber hand" illusion).

**Final Report** - Worth 60% of student's mark.

Students will work in teams of three. Each student will create an experiment in SuperLab, interface the experiment with Powerlab, and collect sample data using either heart rate, or skin conductance/GSR as the dependent variables. Each student will: 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, plus references. Before conducting their experiments all projects must be approved by Dr. Dixon or by the T.A. A one-page proposal must be submitted for approval prior to any programming or data collection. This proposal is due on June 30th. The final lab report is due July 28th.

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 this agreed upon project.

Here are some possible experiments.

1) Electrodermal and heart rate responses to different types of video-games (strategic vs, racing) video games – NB games must be non-violent.
2) Electrodermal and heart rate responses to happy and sad movie clips.
3) Psychophysical responses to faces showing positive and negative (angry) faces.
4) Psychophysical responses to classically conditioned stimuli.
5) Psychophysical responses to familiar and unfamiliar faces.
6) Lie detection.
7) GSR and Heart Rate influences on slot machine play.

8) Restorative effects of nature (for the latter experiment specialized equipment will *hopefully* be available).

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 via downloads – information will be provided within UW ACE. Also all submissions will be via electronic drop box in UW ACE.

**Week 1**

May 5th Overview of Research in Human Cognitive Neuroscience

- Cognitive Neuroscience using behavioural measures

May 7th - 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

**Week 2**

May 12th - Analyzing the data, outlier trimming and rudimentary data analysis/summarization using Microsoft Excel.

May 14th

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

**Week 3**

May 19

- LABORATORY 1 –in class data collection and analysis.

May 21st

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

***DEADLINE: Laboratory 1 must be submitted by May 21st***

**Week 4**

May 26th

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

- Lecture – Psychophysiology of the human heart

- Introduction to Powerlab

May 28th

- Introduction to Using Chart Software

**Week 5**

June 2nd

Reading: Elliott, R., Bankart, B & Light, T. (1970). Differences in the motivational significance of heart rate and palmar conductance. Journal of Personality and Social Psychology, 14, 166-172.

- LABORATORY 2 – Heart Rate Responses to Incentive (Tonic effects), and Heart Rate Changes in Anticipation of a loud Noise (Phasic effects)

June 4th

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

**Week 6**

June 9th

LABORATORY 2 –data analysis and completion of Laboratory 2.

***DEADLINE: Laboratory 2 must be submitted by June 9th***

June 11th

- 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.

- LABORATORY 3- Heart rate changes while playing a simple (Non-Violent) video game.

**Week 7**

June 16th

- LABORATORY 3 - Data collection and analysis of Laboratory 3.

June 18th

- LABORATORY 3 - Completion analysis of Laboratory 3.

***DEADLINE: Laboratory 3 must be submitted by June 18th***

**Week 8**

June 23rd

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 4 Galvanic skin responses in the "rubber hand" illusion.

June 25th
- LABORATORY 4 - Data Collection and Analysis for Laboratory 4.

**Week 9**

June 30th
- LABORATORY 4 – Finish Data Collection and Analysis for Laboratory 4.

***DEADLINE: Laboratory 4 must be submitted by June 30th***

***DEADLINE: 1 Page Proposal for the final paper due. June 30th***

July 2
Begin Work on student's projects

**Weeks 10 - 13** In-class work on the student projects.

**DEADLINE: July 28th FINAL REPORTS DUE**

*The Information That Appears on All Course Syllabi…*

Students with Disabilities

The Office for Persons with Disabilities (OPD), located in Needles Hall, Room 1132, 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 OPD at the beginning of each academic term.

Concerns About the Course or Instructor (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 (Dr. Colin Ellard) is available for consultation and to mediate a resolution between the student and instructor. Dr. Ellard's contact information is as follows:

Email: cellard@uwaterloo.ca
Ph 519-888- 4567 ext 36852

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. See Policy 70 and 71 below for further details.

**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.

**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, http://www.adm.uwaterloo.ca/infosec/Policies/policy71.htm

**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, http://www.adm.uwaterloo.ca/infosec/Policies/policy70.htm

**Appeals:** A student may appeal the finding and/or penalty in a decision made under Policy 70 - Student Petitions and Grievances (other than regarding a petition) or Policy 71 - Student Discipline if a ground for an appeal can be established. Read Policy 72 - Student Appeals, http://www.adm.uwaterloo.ca/infosec/Policies/policy72.htm

**Academic Integrity website (Arts):** http://arts.uwaterloo.ca/arts/ugrad/academic_responsibility.html

**Academic Integrity Office (UW):** http://uwaterloo.ca/academicintegrity/

For further advice from the Faculty of Arts on the avoidance of academic offenses, see the following website:
http://arts.uwaterloo.ca/arts/ugrad/academic_responsibility.html