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Principles of Neuroeconomics
PSY 398 / ECON 443
Winter 2019/2020

Class Days, Times: Wednesday 1-2:30 pm
                         Friday 11:30-1 pm
Location: Botterell Hall, Room B143
Course Website: onQ

Course Instructor: Anita Tusche
E-mail: anita.tusche@queensu.ca
Office: Humphrey Hall 344
Office Hours: Wednesday, 4.30-5.30 pm (Humphrey Hall 344**)** and by appointment

Teaching Assistants (TA)
TA: Lisa Bas (psychology); lisa.bas@queensu.ca
TA: Suzyo Chilongo (economics); chilongo@econ.queensu.ca
Office Hours: By Appointment

Email address to be used for accommodations: lisa.bas@queensu.ca

All questions pertaining to course-related content should be addressed using the discussion board on OnQ. If you have any questions that are unsuitable for the discussion board (e.g. personal information or accommodations) email your TA or myself.

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1. Course Description

The course introduces basic principles governing the emerging field of neuroeconomics, drawing on insights and tools from economics, psychology and neuroscience. We will discuss how fundamental economic principles like risk, ambiguity, and volatility shape human decision making, and why the influence of these factors seems to vary across people and contexts. Students will learn about insights from psychology on understanding the private reasons people make the choices they do—reasons they themselves may not be aware of or even understand (e.g. emotional responses, the influence of other people, or heuristics). Finally, students will learn about the basic architecture of the decision process in the human brain, from identification of choice options, to the calculation of their utility, to selecting one for consumption, and learning from this experience.

2. Course goals/Intended Student Learning Outcomes

1. Become aware of the value of interdisciplinary approaches to study human decision-making. This course aims to facilitates interaction and communication among students with different backgrounds (i.e. economics, psychology, neuroscience). At the end of the course, students should become aware that these disciplines study conceptually related choice phenomena. Students should be able to

describe contributions of the different research disciplines (assessed in the weekly multiple-choice questions, final project presentation, midterm and final exam).

2. Become aware of neuroscience techniques that can address questions of interest in economics, psychology and other decision sciences. At the end of this course students should be able to name and describe choice phenomena of interest to both economics and psychology that are studied using neuroscience techniques. Note that this course is _not_ intended to convince you that knowledge of how the brain works is useful in testing *all* hypotheses in economics or psychology (assessed in the midterm and final exam).

3. Students should gain a general understanding of how the brain evaluates stimuli (i.e. estimates value or utility or desirability) in order to make choices. At the end of this course students should be able to identify brain areas involved in choice phenomena, to describe cognitive processes in the brain, and apply this knowledge to new choice scenarios and contexts (assessed in the midterm and final exam).

4. Be able to _critically_ evaluate empirical studies from the field of neuroeconomics and to communicate seminal empirical findings to their fellow students (assessed in the final project presentation).

3. Textbooks/Readings

There is one required text for the course, ***Neuroeconomics*. by Martin Reuter (Editor), Christian Montag (Editor) Springer, 2016.** Relevant chapters (Ch.) are specified in the course outline (see table in 8 below; the book is referred to as **RM**).

- Paperback/Kindle: https://www.amazon.ca/Neuroeconomics-Martin-Reuter/dp/3662568608
- eBook: https://link.springer.com/book/10.1007/978-3-642-35923-1

There are also a number of additional reading materials (especially for the final group presentations), including primary scientific articles and popular media, which will be posted on the course website (onQ). Students are responsible for all assigned readings as they contain more material than can be covered directly in lecture. Similarly, some material covered in lectures will not appear in the assigned readings. ***Students are responsible for this material as it will appear on exams***.

A limited number of chapters are found in the following text book: **"Neuroeconomics: Decision making and the brain," *2nd edition (!)*, edited by Glimcher & Fehr, 2014, Elsevier Academic Press**. The book is referred to as ***Glimcher*** in the course outline (see 8) below. A copy of that text book can be found at the library.

4. Online Materials and Couse Notes

***Online Materials*:** Students are advised to consult OnQ on a regular basis for supplemental materials, updates, and announcements.

***Course Notes*:** Partial lecture slides will be provided for this course (you will need to attend lectures to fill in some of the gaps).

5. Contacting the Course Instructor

Students requiring assistance are encouraged to speak with me either after lectures. I will leave lectures approximately 10-15 minutes after the lecture and will be more than happy to answer any questions during this time. This will happen outside of the lecture room to allow the preceding/following class to exit/enter smoothly. Should you wish to meet with me outside of this time, please email me (or the class TA) to make an appointment. Email, while commonly used, does limit the effectiveness of communications and may not be the best way for me to answer your question(s). In such instances, I may suggest a personal meeting during office hours or at a mutually agreed upon time. I will do my very best to answer emails as soon as possible; however, emails can be expected to be replied to within 2 working days (i.e., a reply to a 1 am Saturday night email may not arrive before Tuesday). To facilitate my responses, please include the course ID (i.e., "PSYC 398" or "ECON 443") in the subject line of the email. Thanks!

6. Grading Scheme

Midterm Exam (in-class)	35%	Wednesday, February 12, 1 pm – 2.30 pm
Final Exam	35%	***TBA***
Team Project Presentation	20%	See timetable
Presentation Feedback/Critique	5%	See timetable for dates of the Team Project Presentation
Weekly MC Questions	5%	Max. 1 per session/lecture (for 10 lectures in total)

Details on Course Assignments

(i) Midterm and Final Exams (35% and 35%, respectively; 70% of final mark):

The midterm and final exam will each consist of multiple-choice questions (MC) and short-answer questions, respectively, and will be assessing a combination of factual and conceptual issues related to the content of the course.

- *Missed Test and Accommodation Policies*: See below for specific details regarding the University's Regulations on these items. Specific to Psych 398/Econ 443, if the Midterm is missed for a ***valid and approved reason PRIOR to the test***, a make-up date will be arranged at a mutually agreed upon time with the course TA. ***All make-up test arrangements must be made by direct contact with the Instructor (please always cc both TAs to ensure an effective information flow).***

(ii) Weekly Multiple Choice (MC) Questions (5% of final mark):

For each lecture (with the **exception of the introductory lecture**), students will have the opportunity to create **one** multiple-choice question on the topic of the lecture and/or the assigned reading material that could, in principle, be used on an exam (Midterm or Final). **You must upload these questions**, along with the corresponding **correct response to these questions**, using OnQ, **prior to every following Tuesday by 10 am**. Each question will have a value of 0.5% on your final mark. Students will receive a 0.5% grade for producing a viable question (with the **correct** answer) that could be used in an exam (i.e., it must require that one knows the course material to answer it correctly and it must be of average difficulty). Otherwise, students will receive a 0% grade for that particular question. **Students can produce 10 of these questions** over the term, **and not more than one question per lecture**. Questions can include

the material covered in the "Team Project Presentations" (see timetables). The purpose of this assignment is to encourage students to reflect on and apply the course material.

- Note 1: particularly thoughtful and well-formed MC questions *may actually be used on either the Midterm or Final Exam.* Thus, not only will the student who creates these questions receive a 0.5% grade, but they will know the answer to that particular question on the exam, and thus also get another guaranteed 1%!
- Note 2: although they carry a small percentage, they can often determine whether you end the course with an 89% versus a 90%, or a 79% versus 80% grade)
- *Missed Test and Accommodation Policies***: *LATE MCs WILL NOT BE ACCEPTED.*

(iii) Team Project Presentations (20% of final mark):

For this assignment, self-assemble into teams of 3-4 students (this number is subject to change depending on total course enrollment). *Teams have to consist of at least one psychology student and one economics student* to facilitate cooperation among students with different backgrounds.

You and your team will choose a research article in a particular content area. *Research articles cannot be duplicated between groups. Therefore, topics will be selected on a first-come first-serve basis and must be approved by me.* The purpose of this assignment is threefold: first, it will foster cross-disciplinary work and cooperation among economics and psychology students, working towards a common goal (i.e. 20% of your final mark). Second, it will train students to read empirical articles in the field of neuroeconomics. Third, students are encouraged to think critically and apply the knowledge that they have acquired from the entire course in an applied context. Such a task is highly relevant to many of the possible career paths associated with a university degree in psychology, economics, the Life Sciences in general, and related disciplines.

You and your team will be required to complete this project outside of class time. During this time, I will be available to help answer any questions related to the Team Project. The team project is worth 20% of your final grade and all group members will receive the same mark.

- **Video Content:** Your team will be required to read one of the research articles provided and produce a (hopefully) creative video presentation that addresses each of the following (this is not meant to be an exhaustive list of aspects you can include):
    - What was known before your selected research article and what particular gap in knowledge did the experiment(s) address? (note that providing this adequate background for the viewer may require you to read a few key papers from previous work cited in the article)
    - What was the specific research question asked and why (at the time) was it important, timely or novel?
    - What specific task and analysis methods were used?
    - What did the authors find?
    - Why are these results important in this particular research area? How do they fit within the larger literature on this topic?
    - What are some of the limitations in the methods used and/or conclusions drawn?

    Note that visual aids, including diagrams, article figures, and/or animations etc. should be incorporated into your video so as to effectively convey your understanding of the article. You

will also be graded on your ability to take complex ideas, research questions and approaches, and distill them so that they are easy-to-follow and readily comprehendible to non-experts in this area (this will require some thought on your part).

Please note that the class will have the opportunity to ask questions after the video presentation (1-5 min). *This means that you are expected to be physically present in class at the date of your team video presentation*.

- **Format Guidelines:** Each video should be 5-7 minutes in length (no shorter or longer) and *all groups members must talk in the video at least once.* There are lots of free video editing programs to allow you to finalize your video presentation (most computers include a program capable of doing this) and most of you, I am assuming, have smart phones with video recording capability.

- **Submission Guidelines:** Each team's video presentation will need to be *uploaded to OnQ on Monday at 5pm of the week of your Team Project Presentation.* On the date of your class presentation, one member from your group will need to transfer your video presentation to a designated computer. Time will be provided for this at the start of lecture.

- **Multiple Choice Questions:** Every team has to submit three Multiple Choice Questions to me and the TA. I will select one of the questions and include it in the study material that will be uploaded on onQ to support the preparation of the final exam.

- **Grading:** Your total grade (20%) for this team project will be determined by the TA and the course instructor, based on how well the criteria in "Video Content" are met. I will also consider the average of peer evaluations (i.e., see presentation feedback (iv, below) by your classmates). Note that *content derived from the video presentations is fair game for the Final Exam and thus, attending the video presentations of your peers will prove to be in your benefit*.

(iv) Presentation Feedback (5% of total mark)

For each of the "Team Project Presentations" sessions, students will be asked to fill out extended feedback sheets. Students can fill out *up to 10 of extended feedback sheets, but not more than 3 per session*. Each extended feedback sheet will have a value of 0.5% on your final mark. This assignment is designed to train students ability to critically evaluate the presentations of their fellow students and to provide feedback to the presenters about the effectiveness of their "teaching". Extended feedback sheets will be uploaded on onQ prior to the first Team Project Presentation and will also be handed out as printed versions prior to each team presentation session.

7. Grading Systems

All components of this course will receive numerical percentage marks. The final grade you receive for the course will be derived by converting your numerical course average to a letter grade according to Queen's Official Grade Conversion Scale as shown below:

Grade	Numerical Course Average (Range)
A+	90-100
A	85-89

A-	80-84
B+	77-79
B	73-76
B-	70-72
C+	67-69
C	63-66
C-	60-62
D+	57-59
D	53-56
D-	50-52
F	49 and below

8. Course Outline *Tentative lecture schedule and reading material (Subject to modification)*

	Date	Title	Reading
Introduction			
1	Wednesday, Jan. 8, 2020	**Introduction**	**RM Ch.1.** Neuroeconomics—An Introduction ** introduces neuroeconomics and provides an overview of topics discussed in this class*
Fundamental Tools of Neuroeconomics: Decision-Making and the Brain			
2	Friday, Jan. 10, 2020	**Crash Course: Neuroscience** - Basic neuroanatomy	Homework – play with brains (onQ)
3	Wednesday, Jan. 15, 2020	**Crash Course: Neuroscience (continued)** - Methods in neuroscience - How does the brain encode the value/utility of choice options?	**Glimcher (!) Ch. 6.** Experimental Methods in Cognitive Neuroscience ** see reading guide (onQ)* *** you can find a copy of the textbook at the library*

			Supplemental reading (NOT part of the exam) ** RM Ch. 20-21.* *provide a more in-depth presentation of fMRI and structural MRI for the curious mind (not part of the exam)*
4	Friday, Jan. 17, 2020	**Neural Basis of Value in Simple Choice** - How does the brain encode the value/utility of choice options? (continued)	*Berkman, E.T., & Falk, E. B. (2013) Beyond Brain Mapping: Using Neural Measures to Predict Real-World Outcomes. Current Directions in Psychological Science, 22 (1), 45-50.* https://www.youtube.com/watch?v=D6CQjaP98Ew
Foundations of Economic Preferences			
5	Wednesday, Jan. 22, 2020	**Crash Course: Value and Rational Choice in Economics** - Expected Value (EV) theory - Expected Utility (EU) theory - Axioms of rational choice - (Prospect Theory)	**Glimcher (!) Ch.1.** Basic Methods from Neoclassical Economics ** The content in the following sub-chapters will NOT part of the exam:* *- Quantitative tests of qualitative theories: revealed preference* *- Using axioms: the neoclassical approach in neuroeconomics*
6	Friday, Jan. 24, 2020	**Loss Aversion and Framing Effects** - Prospect Theory - Framing - Endowment Effects	**RM Ch. 9.** Framing Effects: Behavioral Dynamics and Neural Basis

			9.2 (A Neuroscience Approach to Understanding Framing Effects) will <u>NOT</u> be part of the exam (you are welcome to read it, of course)
			Sokol-Hessner, P. & Rutledge, R. B. (2019). The Psychological and Neural Basis of Loss Aversion. Current Directions in Psychological Science, 28(1) 20 –27.
			* the neuromodulatory effects described in the section "The Neural and Psychological Basis of Loss Aversion" (i.e. effects of dopamine and noradrenalin on loss aversion and risk preferences) will <u>NOT</u> be part of the midterm (we will come back to that in the 2nd half of this course)
7	Wednesday Jan. 29, 2020	**Risk Preferences: Valuation for Risky and Uncertain Choices**	**RM Ch. 6.** Decision-Making Under Uncertainty
8	Friday Jan. 31, 2020	**Context-Dependent Choice** - Choice set size - Decoy effect	
9	Wednesday, February 5, 2020	**Value Comparisons and Integration:** - Costs and Benefits - Decision strategies (heuristics and cognitive shortcuts)	**RM Ch. 10.** The Influence of Costs, Benefits and Their Interaction on the Economic Behaviour of Consumers ** formulas presented in 10.1- will NOT be part*

| | | | *of the exam; please focus on the gist of the information presented in these sub-chapters* |
			** NOT part of the exam: 10.4 Cost, Benefits, and Their Interaction in Microeconomic Models of Consumer Behaviour
10	Friday, February 7, 2020	**Intertemporal Choice and Self-Control**	**RM Ch. 11.** Individual Differences in Decision-Making: A Neural Trait Approach to Study Sources of Behavioral Heterogeneity

** Note: Ch. **11.4.2-11.4.6** will <u>NOT</u> be part of the midterm exam, we will cover this part of the chapter later in the term when we talk about social preferences (altruism, cooperation)* |
11	Wednesday, February 12, 2020	**Midterm**	
12	Friday, February 14, 2020	**No Class (self-study)**	
	Wednesday, February 19, 2020	**No Class (Reading week)**	
	Friday, February 21, 2020	**No Class (Reading week)**	
Social Choice			
13	Wednesday, February 26, 2020	**Game Theory in Neuroeconomics**	**RM Ch. 2.** Game Theory in Neuroeconomics

* please pay particular attention to 2.1.1 (Basic Terms and Definitions) and 2.2 (Compendium of Common Games). |
| 14 | Friday February 28, 2020 | **Social Preferences 1: Altruism, Fairness, Trust, Cooperation** | |

		- Models - Measures - Neural substrates	
15	Wednesday, March 4, 2020	**Social Preferences 2: Altruism, Fairness, Trust, Cooperation (continued)** - Dictator Game, Ultimatum Game, Trust Game	**RM Ch. 12.** Altruistic Punishment * **Ch. 12.10.** will <u>NOT</u> be part of the exam Please resume **RM Ch. 11.4.2-11.4.6** Neural Trait approach – Social Preferences
16	Friday, March 6, 2020	**Emotions in Economic and Social Choice**	**RM Ch. 7.** Emotion Regulation and Economic Decision-Making **Dunning, D., Fetchenhauer, D. & Schlösser, T**. (2017). The varying roles played by emotion in economic decision making. Current opinion in behavioral sciences, 15, 33-38. ** provides an overview of empirical work on incidental (immediate) vs. anticipated emotions in (economic) decision making; please note that the distinction between background and action-related emotions is less established*
17	Wednesday, March 11, 2020	**Pharmacology of Social Preferences**	**RM Ch. 3.** Hormones and Economic Decisions ** nicely outlines the contradicting and converging empirical*

			evidence in this emerging line of research ***3.5.2-3.5.7. and 3.5.9 are <u>NOT</u> part of the final exam, obviously you are free to read anyway (note 3.5.8 <u>WILL</u> be covered in the exam!)*
18	Friday, March 13, 2020	**Pharmacology of Social Preferences 2 (continued)**	
Team Project Presentations I			
19	Wednesday, March 18, 2020	**Team Project Presentations**	
20	Friday, March 20, 2020	**Team Project Presentations**	
Applied Neuroeconomics			
21	Wednesday, March 25, 2020	**Consumer Neuroscience and Neuromarketing**	**RM Ch. 17.** Consumer Neuroscience and Neuromarketing **Knutson, B. & Genevsky, A.** (2018). Neuroforecasting Aggregate Choice. Current Directions in Psychological Science, 27(2), 110–115.
Team Project Presentations II			
22	Friday March 27, 2020	**Team Project Presentations**	
23	Wednesday, April 1, 2020	**Team Project Presentations**	
Applied Neuroeconomics			
24	Friday, April 3, 2020	**Course Wrap-up**	
	TBD	****Final Exam****	

9. Location and Timing of Final Examinations

Students should delay finalizing any travel plans until after the examination schedule for the final exam has been posted. Final exams will <u>not</u> be moved or deferred to accommodate employment,

travel/holiday plans or flight reservations. Also, as indicated in Academic Regulation 9.3, students must write all final examination in all on-campus courses on the Kingston campus.

Regulations and Policies

10. Statement on Academic Integrity

Academic Integrity is constituted by the six core fundamental values of honesty, trust, fairness, respect, responsibility and courage (see www.academicintegrity.org). These values are central to the building, nurturing and sustaining of an academic community in which all members of the community will thrive. Adherence to the values expressed through academic integrity forms a foundation for the "freedom of inquiry and exchange of ideas" essential to the intellectual life of the University (see the Senate Report on Principles and Priorities http://www.queensu.ca/secretariat/policies/senate/report-principles-and-priorities).

Students are responsible for familiarizing themselves with the regulations concerning academic integrity and for ensuring that their assignments conform to the principles of academic integrity. Information on academic integrity is available in the Arts and Science Calendar (see Academic Regulation 1 http://www.queensu.ca/artsci/academic-calendars/regulations/academic-regulations/regulation-1), on the Arts and Science website (see http://www.queensu.ca/artsci/academics/undergraduate/academic-integrity), and from the instructor of this course. Departures from academic integrity include plagiarism, use of unauthorized materials, facilitation, forgery and falsification, and are antithetical to the development of an academic community at Queen's. Given the seriousness of these matters, actions which contravene the regulation on academic integrity carry sanctions that can range from a warning or the loss of grades on an assignment to the failure of a course to a requirement to withdraw from the university.

11. Copyright of Course Materials

All course created material is copyrighted and is for the sole use of students registered in Psyc 398 / Econ 443 (Winter 2020) at Queen's University. This material shall not be distributed or disseminated to anyone other than students registered in this course. Materials generated by instructors of this course may not be posted to commercial course material sites without permission. Failure to abide by these conditions is a breach of copyright, and may also constitute a breach of academic integrity under the University Senate's Academic Integrity Policy Statement. Third party copyrighted materials (such as journal articles) have either been licensed for use in this course or fall under and exception or limitation in Canadian Copyright law.

12. Accommodations for Disabilities

Queen's University is committed to achieving full accessibility for people with disabilities. Part of this commitment includes arranging academic accommodations for students with disabilities to ensure they have an equitable opportunity to participate in all of their academic activities. The Senate Policy for Accommodations for Students with Disabilities was approved at Senate in November 2016 (see https://www.queensu.ca/secretariat/sites/webpublish.queensu.ca.uslcwww/files/files/policies/senateandtrustees/ACADACCOMMPOLICY2016.pdf). If you are a student with a disability and think you may need academic accommodations, you are strongly encouraged to contact the Queen's Student Accessibility Services (QSAS) and register as early as possible. For more information, including important deadlines, please visit the QSAS website at: http://www.queensu.ca/studentwellness/accessibility-services/

13. Academic Consideration for Students with Extenuating Circumstances

Queen's University is committed to providing academic consideration to students experiencing extenuating circumstances that are beyond their control and are interfering with their ability to complete academic requirements related to a course for a short period of time, not to exceed three months. Students receiving academic consideration must meet all essential requirements of a course. The Senate Policy on Academic Consideration for Students in Extenuating Circumstances was approved at Senate in April, 2017 (see http://www.queensu.ca/secretariat/sites/webpublish.queensu.ca.uslcwww/files/files/policies/senateandtrustees/Academic%20Considerations%20for%20Extenuating%20Circumstances%20Policy%20Final.pdf) Each Faculty has developed a protocol to provide a consistent and equitable approach in dealing with requests for academic consideration for students facing extenuating circumstances. Arts and Science undergraduate students can find the Faculty of Arts and Science protocol and the portal where a request can be submitted at: http://www.queensu.ca/artsci/accommodations. Students in other Faculties and Schools who are enrolled in this course should refer to the protocol for their home Faculty.

If you need to request academic consideration for this course, you will be required to provide the name and email address of the instructor/coordinator. Please use the following:

Instructor/Coordinator Name: *Anita Tusche*

Instructor/Coordinator email address: anita.tusche@queensu.ca