Fall 2016

AMS80A: Gambling and Gaming

Description

This course is an introduction to probability and game theory. The course's main goal is to introduce the basic ideas of probability and mathematics of gambling and games. You can play games by learning the rules and goals and just enjoy playing. But you can go beyond that and use mathematics for a deeper understanding of the workings of the game. The emphasis in this class is to learn the concepts and ideas which are applied to common games like the roulette, blackjack and poker. The game theory part will cover the basic concepts such as two-person zero and non-zero-sum games and games of perfect information, Zermelo's theorem and unravelling.

Required Background

This course assumes you have little mathematical background. But a good working knowledge of College Algebra (including summation notation, sequences and series) and basic knowledge in probability (counting, addition and multiplication rules) is recommended. However, these concepts will be cover in the first days of the course.

Textbook (required)

Gambling and Gamin, Rodriguez and Mendes. You can find the book in this link (password protected):

https://ams080a-fall16-01.courses.soe.ucsc.edu/system/files/secure-attachments/book.pdf

General class information

Lectures:	Tuesdays and Thursdays, 1:30 pm to 3:05 pm Stevens Academic 150
Instructor:	Lelys Bravo de Guenni lbravo@soe.ucsc.edu Jack Baskin Engr 365B
Office Hours:	Mondays and Wednesdays 11:30 am to 12:30 pm, or by Appointment
Teaching Assistants:	• Kurtis Shuler (kshuler@ucsc.edu. Office hours: Tu, 11:00 am – 12:00 m, BE 312B

- Annalisa Cadonna (acadonna@ucsc.edu)

Sean Elliot (sqelliot@ucsc.edu)

Tutoring:	• 01A, Mo 04:00 pm – 5:05 pm, J Baskin Engr 372 • 01B, Tu 08:30 am – 9:35 am, J Baskin Engr 372 • 01C, We 12:00 am – 1:05 pm, J Baskin Engr 372
Sections:	Although sections are not mandatory, attendance to sections will be taken and they will account for an **extra credit** of 2.5% of your final grade.

Course Web Page: https://ams080a-fall16-01.courses.soe.ucsc.edu/home

Evaluation

Exams:	Most of your grade (85%) will be assessed from two midterms and one final exam. The final exam is cumulative, but will focus mostly on the material covered after 11/01. **Midterm 1** - Tu 10/20 during class hours (**20%**) **Midterm 2** - Tu 11/15 during class hours (**25%**) **Final** - Mo 12/05 between 12:00 m and 2:30 pm (Set by the Registrar) (**40%**)
Homework:	Homework will account for 10% of your final grade. **They are a fundamental part of this class.** Weekly homework will be assigned every Thursday, and they are due every Friday at 5 pm. At least 50% of the questions used in the exams will be taken from them. There is a drop box with the name of the course at one of the entrances to Jack's Lounge (check map on class's website). You can also submit your homework electronically using the *Drop Box* tool in eCommons. Solutions will be posted every week in the course Web page shortly after deadline, and you can discuss the solutions in your section with your TA. There are not homework re-dos. Some students do have situations beyond their control that might keep them from completing their weekly homework. We will drop the worst homework score at the time to calculate your homework average. **Any questions regarding homework scores or grading should be addressed to the TA.** **Please note: Two random problems from the assigned list will be graded every week. You must attempt ALL problems**
Movie summaries:	Students must turn in a one-page summary for each one of the four movies to be screened. This will account for 5% of your final grade. These summaries are due

by the beginning of the class following the movie screening; the deadlines have been posted in the course calendar. The summaries must be no longer than 400 words long and contain a reference to events in the beginning, middle and end of the movie.

Bibliography

Lecture notes, supplementary materials and homework problems will be available electronically. Please check the *Web Page:*

https://ams080a-fall16-01.courses.soe.ucsc.edu/home

For the first part of the course, a few recommended books that can be used to complement the materials presented in the class include:

- Packel, E. (2006) *The Mathematics of Games and Gambling.* Second Edition, The American Statistical Association.
- Epstein, R. A. (2009) *The Theory of Gambling and Statistical Logic.* Second Edition, Academic Press.
- Bewersdorff, J. (2005) *Luck, Logic and White Lies. The Mathematics of Games.* A K Peters

For the second part of the course we recommend:

- Harrington, J. E. (2009) *Games, strategies and decision making.* Worth Publishers.
- Binmore, K. (2007) *Playing for Real. A Text on Game Theory.* Oxford University Press.
- Fisher, L. (2008) *Rock, Paper, Scissors. Game Theory in Everyday Life.* Basic Books.

Class schedule

Week 0

- *Th 09/22* Introduction to the course. Introduction to probability.   (Sec. 1.1-1.2)

Week 1

- *Tu 09/27* Introduction to probability (Cont.). Equiprobable spaces. Addition and multiplication rules (Sec. 1.3-1.4)
- *Th 09/29* Expectation and Variance. Utility. (Sec 2.1-2.5)

Week 2

- *Tu 10/04* Playing roulette: rules and bets. (Sec 3.1-3.2)

- *Th 10/06* Screening of History Channel *Beat the Wheel*. Discussion on biased wheels. (Sec 3.3)

Week 3

- *Tu 10/11* Gambling systems (Sec 7.1-7.3).
- *Th 10/13* Screening of History Channel *Roulette Attack*. Biased wheels revisited (Sec 7.4-7.5).

Week 4

- *Tu 10/18* Playing Lotto: Some advanced counting rules. (Sec 4.1-4.2)
- *Th 10/20* **Midterm Exam 1 (20%)**.

Week 5

- *Tu 10/25* Conditional probabilities and Bayes theorem. (Sec 5.1-5.4)
- *Th 10/27* Craps: rules and bets. Screening of History Channel *Dice Dominator*. (Sec 6.1)

Week 6

- *Tu 11/01* Playing blackjack: Rules and bets. (Sec 8.1-8.2)
- *Th 11/03* Screening of *Professor Blackjack*. Card counting. (Sec 8.3)

Week 7

- *Tu 11/08* Roulette revisited: Biased wheels, lengths of games and the distribution of profits. (Sec 7.1-7.5)
- *Th 11/10* Playing poker: Rules and bets. (Sec 9.1-9.5)

Week 8

- *Tu 11/15* **Midterm Exam 2 (25%).**
- *Th 11/17* Two-person, zero-sum games with non-random equilibriums.

Week 9

- *Tu 11/22* The general, two-person zero-sum game. (Sec 10.1-10.4)
- *Th 11/24* *HOLIDAY*

Week 10

- *Tu 11/29* The two-person, non-zero-sum game. (Sec 12.1-12.4)

- *Th 12/01* Games of perfect information, Zermelo's theorem and unraveling (Sec 31.1-13.4)

Mo 12/05 **Final exam (40%), between 12:00 m and 02:30 pm**.

Accommodations for students with disabilities

UC Santa Cruz is committed to creating an academic environment that supports its diverse student body. If you are a student with a disability who requires accommodations to achieve equal access in this course, please submit your Accommodation Authorization Letter from the Disability Resource Center (DRC) to me privately during my office hours or by appointment, preferably within the first two weeks of the quarter. At this time, we would also like us to discuss ways we can ensure your full participation in the course. We encourage all students who may benefit from learning more about DRC services to contact DRC by phone at 831-459-2089 or by email at drc@ucsc.edu.

Academic integrity

All work you submit for this class must be your own, and a strict code of honor will be enforced. You may wish to refer to the *UC Santa Cruz Academic Misconduct Policy for Undergraduates, https://www.ue.ucsc.edu/academic_misconduct,* which details the disciplinary processes surrounding academic misconduct.

Please avoid plagiarism! You should properly cite others' work or recognize collaboration. For more information you can consult the library's resource page *http://guides.library.ucsc.edu/citesources*