MATH 5040–001

Topics Course: Introduction to Stochastic Control[1]

Instructor: Dr. George Yin, gyin@uconn.edu

Term: 2024 Spring

Lectures: Tuesdays and Thursdays, 9:30 am-10:45 am, MONT 314

Office Hours: Tuesdays and Thursdays 10:45 am-11:00 am [MONT 314]; Tuesdays and Thursdays 1:15 pm-2:15 pm [WebEx: I will have the WebEx page open at the indicated times. However, sending me an email in advance is a good idea.]

Link: 1/18/2024-4/25/2024 [except Springbreak]

Meeting link:
https://uconn-cmr.webex.com/uconn-cmr/j.php?MTID=m195537115dc079c8af54dd88e1fe9781
Meeting number: 2634 287 0439
Password: wDT6jZXcS43

References:

1. D. Bertsekas, *Dynamic Programming: Deterministic and Stochastic Models*, Prentice-Hall, Englewood Cliffs, NJ, 1987.

2. M.G. Crandall, H. Ishii, and P.L. Lions, User's guide to viscosity solutions of second order partial differential equations, *Bull. Amer. Math. Soc.* **27** (1992), 1-67.

3. W. H. Fleming and R. W. Rishel, *Deterministic and Stochastic Optimal Control*, Springer, New York, 1975.

4. J. Yong and X.Y. Zhou *Stochastic Controls, Hamiltonian Systems, and HJB Equations*, Springer, 1999.

Learning Outcomes: Students will

- be able to articulate methods and techniques in stochastic control theory,
- be able to apply the methods to applications,
- be prepared for the study of the current literature and research in stochastic control and related fields.

Methods of Evaluation: There will be homework assignments, an in-class presentation, and a comprehensive take-home exam. Performance on these is the primary basis for the course grade.

[1]This syllabus provides a general plan for the course; some modifications and derivations may be needed.

Homework	8	4%
Take-Home Exam	100	48%
Presentation	100	48%
Total	210	100%

Course Plan:

Selected topics from the list below will be covered.

- preliminary materials including Markov processes, diffusions, stochastic differential equations, generators and associated partial differential equations, weak convergence method, martingale problems
- controlled diffusion
- stochastic optimization
- dynamic programming
- viscosity solutions of HJB equations
- maximum principle
- filtering
- adaptive control
- computational methods

Important Dates: Jan. 29 - courses dropped after this date will have a "W" for withdrawal recorded on the academic record. Last day to add/drop courses without additional signatures. April 8 - last day to drop a course, last day to place courses on or remove from Pass/Fail grading.

Academic, Scholarly, and Professional Integrity and Misconduct Policy: See https://policy.uconn.edu/2023/07/11/academic-scholarly-and-professional-integrity-and-misconduct-aspim-policy-on/

Policy on Makeup Exams: I plan to give no makeups. Thus, if you have an actual *emergency* which prevents you from taking an exam, I will need *convincing evidence* in order to be willing to accommodate your special situation.

Policy on Late Homework: It is important to observe the due date of the homework (project). A late homework will result in a reduction of 25% of the points for each day delayed.

Students with Disabilities: The University of Connecticut is committed to protecting the rights of individuals with disabilities and assuring that the learning environment is accessible. If you anticipate or experience physical or academic barriers based on disability or pregnancy, please let me know immediately so that we can discuss options. Students who require accommodations should contact the Center for Students with Disabilities, Wilbur Cross Building Room 204, (860) 486-2020 or http://csd.uconn.edu/.