Economics 4775/7775
Dynamic Optimization and Its Applications to the Natural Sciences and Economics
Spring 2019

Instructors:  Dr. X. H. Wang, 125 Professional Building, 882-4954, wangx@missouri.edu.
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Dr. Wang’s Office Hours: 1pm – 3pm Tuesdays, or by appointment

Course Description:
The first part of this class will start with a brief review of static optimization, then provide a quick introduction to ordinary differential equations, difference equations, and their applications in economics. Topics include first-order differential (difference) equations, higher-order differential (difference) equations, and systems of differential (difference) equations.

Then the course will use these tools to study dynamic optimization. We will first develop the calculus of variations by doing a series of applications. Next we will develop optimal control theory, which is, basically, just a generalized form of the simpler calculus of variations. We will then develop stochastic generalizations of optimal control theory and the basics of robust control and give applications. The level of rigor of the mathematical presentation will be geared to the mathematical level of the students in the class.

Applications will include ecology, economics, finance, climate science, and others depending upon the interests of the class.

Prerequisite is Economics 4370/7370 (Quantitative Economics) or equivalent, or instructor’s consent.

Grading: Class participation and homework sets (50%), midterm exam (25%), final exam (25%). Problem-solving will be emphasized. Plus/minus grades will be used.

Major Topics (All materials will be provided)

Economic Dynamics
Differential Equations
Systems of Differential Equations
Difference Equations
Calculus of Variations (with Applications)
Optimal Control (with Applications)
Applications to Economics, Climate Science, Ecology, and Other Areas of Natural Science
Student References:


Boileau, Martin, Econ 7020: A child’s guide to optimal control theory http://www.colorado.edu/Economics/courses/boileau/7020/Cgoptcon.PDF.

Evans, Lawrence C., An Introduction to Mathematical Optimal Control Theory http://math.berkeley.edu/~evans/control.course.pdf (for very advanced students--not used in this class).


ACADEMIC INTEGRITY POLICY

Academic honesty is fundamental to the activities and principles of a university. All members of the academic community must be confident that each person's work has been responsibly and honorably acquired, developed, and presented. Any effort to gain an advantage not given to all students is dishonest whether or not the effort is successful. The academic community regards academic dishonesty as an extremely serious matter, with serious consequences that range from probation to expulsion. When in doubt about plagiarism, paraphrasing, quoting, or collaboration, consult the course instructor.

Academic Dishonesty includes but is not necessarily limited to the following:

A. Cheating or knowingly assisting another student in committing an act of cheating or other academic dishonesty.
B. Plagiarism which includes but is not necessarily limited to submitting examinations, themes, reports, drawings, laboratory notes, or other material as one's own work when such work has been prepared by another person or copied from another person.
C. Unauthorized possession of examinations or reserve library materials, or laboratory materials or experiments, or any other similar actions.
D. Unauthorized changing of grades or markings on an examination or in an instructor's grade book or such change of any grade report.

ACADEMIC INTEGRITY PLEDGE: "I strive to uphold the University values of respect, responsibility, discovery, and excellence. On my honor, I pledge that I have neither given nor received unauthorized assistance on this work." Students are expected to adhere to this pledge on all graded work whether or not they are explicitly asked in advance to do so.

The University has specific academic dishonesty administrative procedures. Although policy states that cases of academic dishonesty must be reported to the Office of the Provost for possible action, the instructor may assign a failing grade for the assignment or a failing grade for the course, or may adjust the grade as deemed appropriate. The instructor also may require the student to repeat the assignment or to perform additional assignments. In instances where academic integrity is in question, faculty, staff and students should refer to Article VI of the Faculty Handbook. Article VI is also available in the M-Book. Article VI provides further information regarding the process by which violations are handled and sets forth a standard of excellence in our community.

ADA STATEMENT (FROM OFFICE OF THE PROVOST)

If you anticipate barriers related to the format or requirements of this course, if you have emergency medical information to share with me, or if you need to make arrangements in case the building must be evacuated, please let me know as soon as possible.

If disability related accommodations are necessary (for example, a note taker, extended time on exams, captioning), please register with the Disability Center (http://disabilitycenter.missouri.edu), S5 Memorial Union, 573–882-4696, and then notify me of your eligibility for reasonable accommodations. For other MU resources for persons with disabilities, click on "Disability Resources" on the MU homepage.

Intellectual Property Notice

All course materials including but not limited to the syllabus, course assignments, study guides, learning guides, online lecture videos and content, and lab book (i.e. course pack) are property of the instructor and
University and may not be shared online or distributed in any manner to others. Students are prohibited from posting course materials or notes online and from selling notes to or being paid for taking notes by any person or commercial firm without the express written permission of the professor teaching this course. Doing so will constitute both an academic integrity violation and a copyright violation. Violations of copyright laws could subject you to civil penalties and criminal liability. Violations of academic integrity may subject you to disciplinary action under University policies.

**Audio/Video Recording**

University of Missouri System Executive Order No. 38 lays out principles regarding the sanctity of classroom discussions at the university. The policy is described fully in Section 200.015 of the Collected Rules and Regulations. In this class, students may not make audio or video recordings of course activity, except students permitted to record as an accommodation under Section 240.040 of the Collected Rules. All other students who record and/or distribute audio or video recordings of class activity are subject to discipline in accordance with provisions of Section 200.020 of the Collected Rules and Regulations of the University of Missouri pertaining to student conduct matters.

Those students who are permitted to record are not permitted to redistribute audio or video recordings of statements or comments from the course to individuals who are not students in the course without the express permission of the faculty member and of any students who are recorded. Students found to have violated this policy are subject to discipline in accordance with provisions of Section 200.020 of the Collected Rules and Regulations of the University of Missouri pertaining to student conduct matters.

**Intellectual Pluralism Statement (from Office of the Provost)**

The University community welcomes intellectual diversity and respects student rights. Students who have questions concerning the quality of instruction in this class may address concerns to either the Departmental Chair or Divisional leader or Director of the Office of Students Rights and Responsibilities (http://osrr.missouri.edu/). All students will have the opportunity to submit an anonymous evaluation of the instructor(s) at the end of the course.