

IE 5306
Dynamic Optimization
Fall 2017
MW 5:30 – 6:50 p.m.
Woolf Hall 208

Instructor: Bill Corley

Office: Woolf 420-O

Phone: 817-272-3159

E-mail: corley@uta.edu

Faculty Profile: <https://www.uta.edu/profiles/herbert-corley>

Office Hours: M 1-3 p.m.

GTA: Ahmad Nahhas (ahmad.nahhas@mavs.uta.edu)

Office Hours: MW 11 a.m. -12 p.m. and 1-2 p.m.

Description of Course Content: A survey of topics covering various aspects of dynamic decision making and modeling. Topics include dynamic programming, the calculus of variations, and optimal control theory. Emphasis is on the modeling and solution of practical problems using these techniques.

Student Learning Outcomes: This course is designed to develop modeling skills for dynamic decision making, as well as the ability to solve such mathematical problems. These outcomes will be evaluated with the two tests and a group project.

Prerequisite: calculus and basic probability

Required Text: None

Changes to Syllabus: The instructor reserves the right to make reasonable modifications to this syllabus as needed during the semester when circumstances arise. Students will be notified in advance of such changes both in class and by email. All students are responsible for such changes.

Attendance: At The University of Texas at Arlington, taking attendance is not required but attendance is a critical indicator in student success. Each faculty member is free to develop his or her own methods of evaluating students' academic performance, which includes establishing course-specific policies on attendance. However, while UT Arlington does not require instructors to take attendance in their courses, the U.S. Department of Education requires that the University have a mechanism in place to mark when Federal Student Aid recipients "begin attendance in a course." UT Arlington instructors will report when students begin attendance in a course as part of the final grading process. Specifically, when assigning a student a grade of F, faculty report the last date a student attended their class based on evidence such as a test, participation in a class project or presentation, or an engagement online via Blackboard. This date is reported to the Department of Education for federal financial aid recipients.

For this class, I have established the following attendance policy.

(1) Class attendance is required for the first two weeks of class. Afterward, attendance is not required except on days noted in the schedule. However, attendance is strongly encouraged.

(2) You are responsible for all information given in class. It will not be repeated outside class since you also have access to a video of each class as noted below.

Videos: You will have access on Blackboard to a video of each class unless there is a technical issue. The availability of videos is thus not guaranteed. The videos are provided as a means to review the material presented in class.

Homework: Homework will not be graded. However, students are strongly encouraged to work the assigned practice problems.

Expectations for Out-of-Class Study: Beyond the time required to attend each class meeting, students enrolled in this course should expect to spend at least an additional 6 hours per week of their own time in course-related activities. Exams will require further time.

Class Courtesy: To enhance learning, the instructor insists on a quiet classroom. Silence cell phones before class and refrain from talking during class. Students who come to class late should enter the classroom as discreetly as possible.

Schedule:

- Basic theory and overview of dynamic programming
- Computations for discrete deterministic problems
- Examples
- Continuous deterministic problems
- Examples
- Computations for probabilistic problems
- Examples
- Project proposal due October 11
- Take-home quiz 1 given out by October 18
- Introduction to infinite stage problems
- Examples
- Introduction to the calculus of variations
- Examples
- Short introduction to optimal control
- Examples
- Take-home quiz 2 will be given out on Wednesday, November 22, and due Monday, December 11, by noon.
- On Monday, December 6, students should have completed the online course evaluation.
- Group projects will be presented by on Wednesday, December 6.

Description of Major Assignments and Examinations:

1. There will be two take-home quizzes as noted in the schedule. The problems on each exam will be equally weighted even though some may be easier or harder than others. No collaboration is permitted. Exam grades are not curved.
2. Course Project:

- Form groups of 2 students. Find a realistic but simple version of a practical problem, and model it using dynamic optimization methods. For example, you could pick a practical sequential problem and model it using dynamic programming. Or if you are interested in statistics, you might show how the calculus of variations can be used to maximize relative entropy and obtain Bayes' theorem - for which I have papers with the derivation. Textbook examples are not acceptable. However, one group can survey dynamic programming software.
- Solve an applied problem using any software that you wish, such as Excel as described in Taha, or the approaches at the following links.

<http://www.me.utexas.edu/~jensen/ORMM/frontpage/jensen.lib/index.html>

http://www.me.utexas.edu/~jensen/ORMM/computation/unit/dynamic_programming/examples/dp_examples.html

http://www.me.utexas.edu/~jensen/ORMM/computation/unit/dynamic_programming/dp_models/elements_ddp.html

http://www.me.utexas.edu/~jensen/ORMM/computation/unit/dynamic_programming/examples/dp_examples.html.

- Write a professional-level report describing the problem, developing the model, solving the problem numerically, and then discussing your results.
- Prepare a professional-level PowerPoint presentation.
- All reports and PowerPoint presentations are due on Wednesday, December 6, the date of the presentations. Email them to the class. Your presentation should take no more than 15 minutes.

Course Grade: The two examinations will each count one-third of your grade. The remaining third will come from the group project. Typical Grading Scheme: A = 90 - 100, B = 80 - 89, C = 70 - 79, D = 60-69, F = below 60. Exams grades are not curved since they will be quite reasonable.

Drop Policy: Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to withdraw officially if they do not plan to attend after registering. Students will not be automatically dropped for non-attendance. Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (<http://www.uta.edu/aao/fao/>).

Electronic Communication: UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at <http://www.uta.edu/oit/cs/email/mavmail.php>.

Disability Accommodations: UT Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including The Americans with Disabilities Act (ADA), The

Americans with Disabilities Amendments Act (ADAAA), and Section 504 of the Rehabilitation Act. All instructors at UT Arlington are required by law to provide “reasonable accommodations” to students with disabilities, so as not to discriminate on the basis of disability. Students are responsible for providing the instructor with official notification in the form of a letter certified by the Office for Students with Disabilities (OSD). Only those students who have officially documented a need for an accommodation will have their request honored. Students experiencing a range of conditions (Physical, Learning, Chronic Health, Mental Health, and Sensory) that may cause diminished academic performance or other barriers to learning may seek services and/or accommodations by contacting: The Office for Students with Disabilities, (OSD) www.uta.edu/disability or calling 817-272-3364. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability.

Non-Discrimination Policy: The University of Texas at Arlington does not discriminate on the basis of race, color, national origin, religion, age, gender, sexual orientation, disabilities, genetic information, and/or veteran status in its educational programs or activities it operates. For more information, visit uta.edu/eos.

Title IX Policy: The University of Texas at Arlington (“University”) is committed to maintaining a learning and working environment that is free from discrimination based on sex in accordance with Title IX of the Higher Education Amendments of 1972 (Title IX), which prohibits discrimination on the basis of sex in educational programs or activities; Title VII of the Civil Rights Act of 1964 (Title VII), which prohibits sex discrimination in employment; and the Campus Sexual Violence Elimination Act (SaVE Act). Sexual misconduct is a form of sex discrimination and will not be tolerated. For information regarding Title IX, visit www.uta.edu/titleIX or contact Ms. Jean Hood, Vice President and Title IX Coordinator at (817) 272-7091 or jmhood@uta.edu.

Academic Integrity: UTA expects all students, whether in-class or distance, to abide by its Honor Code posted at <http://www.uta.edu/engineering/current-students/academic-honesty.php>.

I pledge, on my honor, to uphold UT Arlington's tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence.

I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.

UT Arlington faculty members may employ the Honor Code as they see fit in their courses, including (but not limited to) having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System Regents' Rule 50101, §2.2, suspected violations of university's standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student's suspension or expulsion from the University. **Note: Take home quizzes and project reports will be scrutinized for collaboration. Collaboration will be punished to the full extent possible.**

Student Support Services: UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include [tutoring](#), [major-based learning centers](#), developmental education, [advising and mentoring](#), personal counseling, and [federally funded programs](#). For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to resources@uta.edu, or view the information at <http://www.uta.edu/universitycollege/resources/index.php>.

Student Feedback Survey: At the end of each term, students enrolled in classes categorized as lecture, seminar, or laboratory shall be directed to complete a Student Feedback Survey (SFS). Instructions on

how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student's feedback enters the SFS database anonymously and is aggregated with that of other students enrolled in the course. UT Arlington's effort to solicit, gather, tabulate, and publish student feedback is required by state law; students are strongly urged to participate. For more information, visit <http://www.uta.edu/sfs>.

Final Review Week: A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week *unless specified in the class syllabus*. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

Emergency Exit Procedures: Should we experience an emergency event that requires us to vacate the building, students should exit the room and move toward the nearest exit, which is located across the hallway through the double doors on the right. When exiting the building during an emergency, one should never take an elevator but should use the stairwells. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist handicapped individuals.

Inclement Weather Policy: If the University is closed, this class will not meet. Any scheduled assignments or examinations will be rescheduled to the next class period that the class meets. You can get information by dialing 972-601-2049 or checking the main website at www.uta.edu.