An Introduction to Deterministic Processes  
ACSO 4510  
Spring 2021  
New College  
University of North Texas at Frisco

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Class Time & Location: 2:00 PM–4:50 PM (M), Hall Park A / FRHA 121

...there are known knowns; there are things we know we know. We also 
know there are known unknowns; that is to say we know there are some 
things we do not know. But there are also unknown unknowns—the ones 
we don’t know we don’t know.


Course Description

This course continues building techniques of scientific research, as used in the field 
of operations research (OR). The class explores more advanced techniques of quanti-
tative research, and covers deterministic processes – systems and questions without 
important random components. Students will learn how to optimize processes and 
schedules with appropriate programmatic approaches. To this end, this course covers 
topics including more advanced research design, and a variety of methods for deter-
mining optimal solutions and decisions surrounding relevant problems for operations 
research. The course also includes an introduction to the field of operations research, 
including systems of linear equations and linear algebra, as these skills are required 
to understand most of the techniques seen this semester.

What you learn in this course enables practical applications in the next 16 weeks, but 
also lays the foundation for the two remaining classes in this series, that will expand 
and empower you to do more complex and nuanced work, accommodating even more 
of the challenges and peculiarities of data found in even more difficult operations.
Communication and Email

My email address is [jh@unt.edu](mailto:jh@unt.edu). When you email me, please include the course number (ACSO 4510) in the subject line of your messages. Also, please sign your emails with your first and last name, and include an appropriate salutation. (Hint: you can’t go wrong with “Hi Dr. Hamner”). Articulate the content of your message clearly: do not use the lax language style of SMS, text messages, or Twitter: if your message is important enough to warrant my attention, you should craft it using proper English grammar and spelling. Finally, before you email me, you should review the syllabus and course announcements on the class website—often you can find an answer to your question(s) by examining the course materials. Provided a response is needed, I will respond to your email within 24 hours, possibly excluding the weekends.

If I need to contact you by email, I will send email only to your UNT EagleConnect account. If you do not normally use this account, you should set up email forwarding so messages will be forwarded to your preferred account. Instructions on email forwarding are available from [http://eagleconnect.unt.edu/](http://eagleconnect.unt.edu/).

Chosen Names

A chosen name is a name that a person goes by that may or may not match their legal name. If you have a chosen name that is different from your legal name and would like that to be used in class, please let me know. You can officially specify your chosen name (i.e., the name used for addressing you, often times the “first name”) by following the directions at [this UNT Registrar page](http://eagleconnect.unt.edu/).

Office Hours

Professors hold office hours regularly for your benefit. You may talk to me without an appointment during these hours; come with questions, concerns, or a desire for further discussion—but not for a repeat of the lectures. My office hours are M/Tu/We/Th from 11:00 AM to 12:00 PM. During this time, I will be available in Hall Park 125 or
Assignments and Grading

Homework: (50% of your grade) Assignments include two short essays, and a selection of math problems and computer-based exercises. Homework will be turned in on the due date, by the start of class. If a student does not turn in a homework assignment, s/he will receive a zero for the assignment. 50% of your grade is a lot. Keep up!

Exams: (40% of your grade, 20% for each exam) Two exams will be given. The midterm exam includes questions requiring paragraph-length answers on topics learned in the course and includes math problems.

• The mid-term exam will be held in class on .
• The final exam will be held on April 28 at 1:30PM – 3:30 PM.

Project Work: (10% of your grade) I take into account your work for your cohort project this semester as you apply principles and methods of this course, and past analysis courses.

Make-Up Examinations: Failure to take an exam on time on the scheduled date will normally result in a zero. Make-up examinations are given at the discretion for the instructor, and only for excused absences. Excused absences are absences that result from a verifiable, documented emergency or unavoidable legal or University obligation. Students needing to miss an exam must request a make-up exam and provide documentation at least one week prior to the scheduled exam. If that is not possible, students must produce documentation demonstrating the emergent nature of their absence, such as a police report, physician’s letter, or hospital receipt with your name on it.

Late Assignments: Assignments are due without exception before the start of class on the due date. If class has started, the assignment will be considered late. Assignments, including the paper, will be penalized one-half of a letter grade if turned in late but on the due date and a full letter grade for each day thereafter.

Assigned Readings

The required text for this course is available as an e-text and is substantially cheaper in PDF form, compared to paperback or hardback. Further, the cost of the book will be spread over several semesters. The other texts are all open textbooks, meaning you only pay for the book if you want to. They are all reputable textbooks, and will be a valuable reference or refresher for this course and subsequent courses.


**Additional Resources**

A curated list of videos on probability and statistics is available at the UNT Libraries [page for Math 1680](http://page for Math 1680).

Resources are also available at the UNT Libraries [Advanced Data Analytics page](http://Advanced Data Analytics page).


I expect you to read assigned chapters and/or readings before class. Lectures assume you have done so, and will not necessarily summarize the readings. As such, tests may draw questions from assigned materials not discussed in class. These questions may feel unfair to those who have not read the assignments.

**Software**

The course requires software tools for some assignments, and you have access to them. These include:

- Excel Solver
- LINDO and LINGO, an optimizer and an algebraic modeling language
- Analytic Solver Platform for Education (ASPE)

You will see these software packages over the next two years, but not all this semester.
Grade Disputes

A significant amount of time is invested in grading student assignments. If you dispute a grade, you must do so within one week of the date that grades are made available to the class. When requesting reconsideration of a grade, you must provide a clear, written explanation as to why a different grade is in order. Please be advised that I will not change a grade simply because someone “needs” a higher grade: your work determines your grade. Also, when work is reviewed for a grade dispute, the grade may be left unchanged, raised or lowered. All grade disputes are due in hard copy within one week of the date that grades are returned in class. Grade disputes will not be considered if submitted past the one-week statute of limitations.

The Family Educational Rights and Privacy Act (FERPA) of 1974, in some ways, prohibits me from discussing grades via email. I will handle grade disputes during office hours.

Extra Credit

There may be opportunities for extra credit. If I offer extra credit work, I will offer it to the entire class and when it furthers some goal relevant to class objectives. I will not offer extra credit as a “do-over” to students who produce unsatisfactory work. If you need a particular grade to graduate, keep a scholarship, etc., then ensure you are exerting the effort necessary to earn such a grade. If problems arise, address them early before they become unresolvable.

Math

Mathematical literacy is no longer optional for information and business workers. This class reflects the necessity of algebra when doing tasks related to making decisions inside the framework of operations research. This class includes extensive instruction on linear and matrix algebra. You will do actual math problems for homework and on the exams that Math is not the focus of the class, but to use many of the tools of operations research, you use math. While most of these techniques have been implemented in software, using the software without a fundamental understanding of what the software is doing would be detrimental to your ability to correctly solve problems.

Attendance

Your attendance and earnest participation are expected. I do not require attendance, because I find that students who do not come to class do not need additional punishment: missing more than a few classes is typically devastating to a student’s grade. Missing class for any other reason than illness or emergencies is a poor choice. Because of concerns around COVID-19, seating will be assigned. Attendance will be
taken to assist with COVID-19 contact tracing should it be required. If you have a request for accommodations, please inform me as soon as possible – I would prefer to finalize the seating chart as soon as possible. I fully embrace the technology that enables you to attend remotely, if that is required by health or other relevant considerations. I don’t want remote access to the class to become an excuse to not attend class in person, if you are otherwise able and healthy. After November 28th, the class will be fully online, including final examinations.

![Figure 2: XKCD comic. This may make sense later.](image)

**Important:** Face coverings are required in all UNT facilities. Wearing masks correctly is a sign of respect for others. Everyone is expected to wear face coverings during this class. If you are unable to wear a face covering due to a disability, please contact the Office of Disability Access to request an accommodation. UNT face covering requirements are subject to change due to community health guidelines. Any changes will be communicated by your instructors.

If you are experiencing any symptoms of COVID-19 (see [here](#) for specifics) please seek medical attention from the Student Health and Wellness Center (940-565-2333 or askSHWC@unt.edu) or your health care provider prior to coming to campus. UNT also requires you to contact the UNT COVID Hotline at 844-366-5892 or COVID@unt.edu for guidance on actions to take due to symptoms, pending or positive test results, or potential exposure. While attendance is an important part of succeeding in this class, your own health, and those of others in the community, is more important.

When we clean the classroom, remember that your hands should be considered unsafe until you have sterilized them with thorough hand washing or hand sanitizer, whether you choose to wear disposable gloves or not. Please don’t handle cleaning supplies until you have cleaned your hands. Again, being careful is a sign of respect. I will try to lead by example.
Remote Access to Class Sessions

When you attend class remotely, you will need a device capable of fairly high resolution video in order to view the course content. It is unlikely that watching the class lecture on your phone is adequate. To fully participate in remote class sessions, you should have a device that, in addition to a large enough screen, has a microphone interface that you can use. Video transmission capability (i.e. a webcam) is also important. A reliable and video-capable network connection is required.

Notes, Slides, Lectures, and Phones

I find that laptops are less useful for taking notes than some might believe. Typing every word I say is only possible if you don’t think about what you’re hearing. Handwriting notes, for those able to use a pen or pencil, has been shown to improve understanding and recall compared to taking notes on a digital device. Unsurprisingly, reading the assigned homework before class makes note-taking in class smoother. I will record most lectures and will make slides available online, further eliminating your need to use a laptop or phone in class.

Using your phone in class means you are responding to an emergency of much greater magnitude than attending my class. If you must answer a phone call, please leave the room and return when finished.
Class Recordings & Student Likenesses

Synchronous (live) sessions in this course may be recorded for students enrolled in this class section to refer to throughout the semester. Class recordings are the intellectual property of the university or instructor and are reserved for use only by students in this class and only for educational purposes. Students may not post or otherwise share the recordings outside the class, or outside the Canvas Learning Management System, in any form. Failing to follow this restriction is a violation of the UNT Code of Student Conduct and could lead to disciplinary action.

Also note: this course employs lecture capture technology to record class sessions. Students may occasionally appear on video. Lecture recordings will be available to you for study purposes and may also be reused in future course offerings.

![Figure 4: XKCD comic. Actually a fairly useful matrix.](image)

Acceptable Behavior

As members of the UNT community, we have all made a commitment to be part of an institution that respects and values the identities of the students and employees with whom we interact. UNT does not tolerate identity-based discrimination, harassment,
and retaliation. The University of North Texas (UNT) policy on the prohibition of discrimination, harassment, and retaliation can be found at policy.unt.edu. Acceptable student behavior can be easily summarized: “Please behave in ways that are respectful of and courteous to your fellow students, your instructor, and the classroom environment.” An expansion of this statement follows, with specifics.

Class starts at 2:00 PM and runs until 4:50 PM. I expect you to be in class, seated and ready to roll, at 2:00 PM, and I expect you to stay until we start cleaning surfaces at 4:50 PM after which I will dismiss you by rows. Moreover, I expect you to be attentive. Student behavior that interferes with an instructor’s ability to conduct a class or other students’ opportunity to learn is unacceptable and disruptive: arriving late, leaving early, talking to your neighbor, checking email or texts, or otherwise distracting your fellow students should not happen, and it is your responsibility to ensure it does not. Repeated or egregious instances of classroom disruption will result in referral to the Center for Student Rights and Responsibilities to assess whether the student has violated the Code of Student Conduct. The university’s expectations for student conduct apply to all instructional forums, including university and electronic classrooms, labs, discussion groups, etc. See http://conduct.unt.edu/student_conduct for more information.

I expect you to ask questions if you need clarification. I also want you to know that it is okay to challenge me on new aspects of your learning. I do not intend to debate established facts (if you’re a flat-Earther, class is not the time to discuss that perception), but I very much encourage you to engage with the material, ask about exceptions to the usual rules, or inquire a bit more deeply, even during class. I may need to push ahead with the class, but I do encourage you to interact with me.

The nature of the class means we may discuss contentious issues through the lens of analysis and data. Everyone in the class will treat everyone else with respect, speaking calmly and refraining from provocation and insulting language or gestures, no matter how vehemently you disagree with your colleagues. I reserve the right to stop discussion at any time, even if all viewpoints have not been heard nor all conversation threads addressed.

**Academic Integrity**

New College supports and enforces UNT’s policy on academic integrity (cheating, plagiarism, forgery, fabrication, facilitating academic dishonesty and sabotage). Review http://policy.unt.edu (UNT Policy Manual sec. 18.1.16) and read the University’s Policy of Academic Dishonesty found in the UNT Student Handbook; the content of the Handbook applies to this course. I address academic integrity issues using the penalties and procedures laid out in the academic integrity procedures. Purchasing answers, using online “quizzes” that are directly copied from course materials or previous test questions, and collaborating on answers when not explicitly allowed, are some examples of cheating.
Accommodations

The University of North Texas is committed to both the spirit and letter of federal equal opportunity legislation\(^1\). Newer federal legislation is entitled the *Americans with Disabilities Act* (ADA)\(^2\). Pursuant to Section 504 of the *Rehabilitation Act of 1973*, UNT strives to provide the population of those with physical or mental disabilities with the same opportunities enjoyed by all citizens. The [Office of Disability Accommodation](#) (ODA) makes formal recommendations regarding necessary and appropriate accommodations based on specifically diagnosed disabilities. New College cooperates with the ODA. If you are a student with a disability and wish to request accommodations, you should contact the ODA at 940.565.4323. Please give me your written accommodation request by August 31 (that is, one week after the start of class). Information regarding disabilities is confidential.

Syllabus Changes

This syllabus is not a contract (nor should you ever consider *any* syllabus a binding contract). It is subject to changes and modifications as I deem necessary.

Course Grade Components

Your grade in the course will be determined by a proportion of 1000 overall points.

<table>
<thead>
<tr>
<th>Deliverable</th>
<th>Points</th>
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<tbody>
<tr>
<td>8 homework assignments</td>
<td>40 points each</td>
</tr>
<tr>
<td>Project work (process, not results)</td>
<td>100 points</td>
</tr>
<tr>
<td>Lecture topic proposal</td>
<td>90 points</td>
</tr>
<tr>
<td>OR solution outline proposal</td>
<td>90 points</td>
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<tr>
<td>Exam 1</td>
<td>200 points</td>
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<tr>
<td>Exam 2</td>
<td>200 points</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>1000 points</strong></td>
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Course Schedule

Jan 11: Class intro

Jan. 18: *UNT observes MLK holiday*

Jan. 25: Linear algebra I / systems of equations; *IOR* Chapter 4—recap of simplex method; simplex tableaux

Feb. 1: Linear algebra II; *IOR* Chapter 4—postoptimality, sensitivity, interior-point solutions, & Case 4.1

Feb. 8: Matrix algebra I; *IOR* Chapter 5

Feb. 15: Matrix algebra II; *IOR* Chapter 6—Duality theory

Feb. 22: Matrix algebra III; *IOR* Chapter 6, continued

Mar. 1: Matrix algebra IV; *Project-specific lecture/skill topics*

Mar. 8: Midterm Exam

Mar. 15: *IOR* Ch. 7—Linear programming under uncertainty; sensitivity analysis

Mar. 22: *IOR* Ch. 7—Robust optimization; stochastic constraints

Mar. 29: *IOR* Ch. 8—The dual simplex method; parametric linear programming

Apr. 5: *IOR* Ch. 8—The upper bound technique; the interior point algorithm

Apr. 12: *IOR* Ch. 9—The transportation problem

Apr. 19: *IOR* Ch. 9—The assignment problem

Apr. 26: Review / catch-up

Apr. 27: Final Exam Due
<table>
<thead>
<tr>
<th>Week</th>
<th>Date Due</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jan. 11</td>
<td>Read <em>Matrix Algebra</em> Ch. 1</td>
</tr>
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</table>
| 2    | Jan. 25  | Read *Matrix Algebra* Ch. 1  
|      |          | Write at least 300 words arguing for a specific lecture topic (probably on March 1st) that your group could actually use to improve or achieve this semester’s goals for nThrive. **Consult with Dr. Hamner or Dr. Mendizabal before writing this assignment.** |
| 3    | Feb. 1   | Problem set, *Matrix Algebra* Ch. 1  
|      |          | Problem set, *IOR* Ch. 4.5  
|      |          | Read *Matrix Algebra*, Ch. 2 |
| 4    | Feb. 8   | Problem set, *Matrix Algebra* Ch. 2  
|      |          | Read *Matrix Algebra*, Ch. 3 |
| 5    | Feb. 15  | Problem set, *IOR* Ch. 5 |
| 6    | Feb. 22  | Problem set, *IOR* Ch. 6 |
| 7    | Mar. 1   | Problem set, *IOR* Ch. 6 |
| 8    | Mar. 8   | Read *IOR*, Ch. 7 |
| 9    | Mar. 15  | Project-specific operations research solution *proposal* due |
| 10   | Mar. 22  | Problem set, *IOR* Ch. 7 |
| 11   | Mar. 29  | Read *IOR*, Ch. 8 |
| 12   | Apr. 5   | Problem set, *IOR* Ch. 8 |
| 13   | Apr. 12  | Project-specific operations research solution outline due |
| 14   | Apr. 19  | Problem set, *IOR* Ch. 9 |
| 15   | Apr. 26  | End material for midterm exam |