

**Game Theory**  
**Math 365**  
Spring 2025; TR 10:00-11:15am

*Instructor:* Dr. Jennifer Nordstrom

*Phone:* x2654

*Office hours for extra help:* MWF: 1:00-3:00 pm, Thurs: 9-10 am.

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**Text:** *Game Theory, an Introduction, 3rd ed*, Barron, Wiley, 2024.

Tentative Daily Schedule

Week 1	1.1& 1.2 1.3	Week 5	1.6 1.7	Week 9	2.1 2.1	Week 13	6.1 Group Quiz
Week 2	1.3 1.4	Week 6	1.7 Group Quiz	Week 10	2.2 2.2	Week 14	Vol. Dil 6.3
Week 3	1.4 1.5	Week 7	Break Break	Week 11	2.3 2.3	Week 15	Present
Week 4	1.5 1.6	Week 8	Linear Prog Linear Prog	Week 12	4.1 4.1	Tuesday	Present 10:30 am

**Topics:** We will cover Chapters 1 and 2, parts of Chapters 4 and 6. Topics include matrix two-person games, the von Neumann Minimax Theorem, mixed strategies, graphical solutions, invertible matrix games, symmetric games, linear programming, two-person nonzero sum games, Nash equilibrium, n-person nonzero sum games, cooperative games.

**Course Objectives:**

1. to introduce students to the concepts of game theory;
2. to bring together techniques from linear algebra, calculus, and probability to solve problems in game theory;
3. to introduce students to various methods for solving optimization problems.
4. to increase students' problem solving abilities;
5. to improve the students' ability to think logically and abstractly;
6. to foster students' ability to do mathematics independently.

**Linfield Curriculum:** This course contributes to the Linfield Curriculum in the area of *Quantitative Reasoning*. Courses with this designation explore contextual problems involving quantitative relationships by means of numerical, symbolic, and visual representations. These courses foster critical analysis of the uses and constraints of quantitative information and its representations. Finally, they focus on discussing models; making appropriate assumptions; and deducing consequences or making predictions.

Courses with QR designation are designed to develop the student's ability to do the following:

- Frame contextual questions using mathematical representation.
- Apply models to deduce consequences or make predictions.
- Communicate quantitative arguments using clear prose.
- Critique quantitative arguments with respect to assumptions, constraints, and logical coherence.

In this course students will apply the principles of game theory to the analysis and solution of real world scenarios of competition and cooperation. Such problems arise in politics, economics, and psychology. Emphasis will be on analyzing problems in order to apply the appropriate game theoretic models including numerical, symbolic and visual representations of these models. We will use the economic concepts of utility and individual rationality to convert familiar competitive situations such as elections, cold war, and competition between firms into mathematical games. We will then use mathematical methods to try to predict outcomes and determine optimal strategies. An essential component of game theory is the evaluation of the assumptions and limitations of the model. Students will communicate their quantitative arguments through regular written assignments and class presentations.

In order to earn QR credit for this course, you must complete the electronic submission of exemplar work and supporting descriptions by the last day of finals week, as discussed in the Linfield College Course Catalog, "The Modes of Inquiry."

**Homework:** Homework problems will be due on **Thursdays at 4 pm**. Although you may work together, your written work should be your own. Late homework will be accepted within 24 hours if an extension is requested prior to 4 pm on the due date. Homework may be rewritten for full credit. All rewrites are due the Thursday following the original due date.

**Class Presentations:** This material for this course will often be presented by the students. Students will be assigned examples or problems from the text to present on **Tuesdays**. Presentations will be informal, neatly hand-written work along with a verbal explanation will be sufficient. The class will be expected to discuss the ideas presented. You are welcome to work together to solve the problem, but presentations will be individual. You are expected to present at least 5 problems over the course of the semester.

**Class Participation:** Your participation is vital to the success of this course. Not only are you required to present problems regularly, you are required to be an active and engaged audience member. It is your responsibility to ask questions of the presenter if you don't understand something or disagree with the justification. Do not count on me to correct mistakes or clarify concepts during a presentation. In order to foster a comfortable mathematical community and to keep the whole experience fun for everyone, I expect you to treat your classmates with respect.

**Group Quizzes:** There will be two midterm quizzes. These will be done in-class. The problems may be solved and presented by any subset of students. The entire class will get the same letter grade, but students who contribute more will get a "plus," while students who are not active participants will get a "minus." It is expected that you study for the quiz, ideally as a group. Any student who is unable to attend class, for whatever reason, will have an opportunity to take an alternative oral quiz outside of class time. Dates:

Quiz 1: Thursday, March 20.

Quiz 2: Thursday, May 8.

**Final Presentation:** During the last week of class and the final exam time students will do a 10-15 minute presentation on one of the extra topics not covered in class. Part of your grade will be peer review of the other presentations.

Final Presentations will be May 20 and during the final exam period, **Tuesday, May 27 10:30 am**.

**Grading:**

Homework:	50%
Presentations:	20%
Group Quizzes:	20%
Final Presentation:	10%

Letter grades correspond to the following percentages:

A-, A:	90-100%
B-, B, B+:	80-89%
C-, C, C+:	65-79%
D:	55-64%

**Advising Information:** The prerequisites for this course are Math 175–Calculus II and Math 250–Linear Algebra. This course is may be of interest to any math major or minor. The independent nature of this course is excellent preparation for graduate study. Applications of Game Theory may be of particular interest to Economics majors.

**Cell Phone Policy:** Cell phones must be off and put away during class. Laptop computers and tablets may be appropriate, as we will at times be engaging with materials that are available electronically. However, please use them in ways that are focused on the course and the activities of the class.

**Academic Integrity Policy:** Linfield University operates under the assumption that all students are honest and ethical in the way they conduct their personal and scholastic lives. Academic work is evaluated on the assumption that the work presented is the students own, unless designated otherwise. Anything less is unacceptable and is considered a violation of academic integrity. Furthermore, a breach of academic integrity will have concrete consequences that may include failing a particular course or even dismissal from the university. Violations of academic integrity include but are not limited to the following:

**Cheating:** Using or attempting to use unauthorized sources, materials, information, or study aids in any submitted academic work; changing answers after graded work has been returned; making unauthorized changes to an exam, quiz, or assignment.

**Plagiarism:** Submission of academic work that includes material copied or paraphrased from published or unpublished sources without proper documentation. This includes self-plagiarism, the submission of work created by the student for another class unless they receive consent from both instructors.

**Fabrication:** Deliberate falsification or invention of any information, data, or citation in academic work.

**Facilitating Academic Dishonesty:** Knowingly helping or attempting to help another to violate the universitys policy on academic integrity.

Any form of academic dishonesty will result in a 0 on that assignment/ quiz/ exam. Additionally, academic dishonesty may result in a failing grade in the course. See the Linfield Academic Integrity Policy (<https://catalog.linfield.edu/academic-policies-procedures/undergraduate/academic-integrity/>) in the Linfield Catalog for information on the procedure to be used in dealing with academic dishonesty.

**Use of AI in Student-Generated Work:** Students in this course are expected to avoid the use AI tools, such as Chat GPT and PhotoMath, to generate presentation, quiz, or homework solutions. Any tools used may only be in a manner that contributes to understanding math, rather than avoiding the work necessary to deepen your understanding. Use of such tools, like any other academic work that is not entirely the students own, must be cited. Work for a grade that is not primarily in the students own words and properly cited, will be considered plagiarized. Note, many of the math tools that exist use techniques that are not part of this course. Clear violations of the policy will receive a 0 on the entire assignment/ quiz/ presentation.

**Disability Statement:** Students with disabilities are protected by the Americans with Disabilities Act and Section 504 of the Rehabilitation Act. If you are a student with a disability and feel you may require academic accommodations please contact Learning Support Services (LSS), as early as possible to request accommodation for your disability. The timeliness of your request will allow LSS to promptly arrange the details of your support. LSS is located in Melrose Hall 020 (503-883-2562), or [LSS@linfield.edu](mailto:LSS@linfield.edu). We also encourage students to communicate with faculty about their accommodations.

**Electronic Recording/ Content Sharing:** I may opt to record the classroom activities for instructional purposes and post them to the cloud. The electronic recording of classroom lectures, discussions, simulations, and other course-related activity is governed by Linfields Classroom Recording Policy (Faculty Handbook, VII.26 and Student Policy Guide). Students do not have permission to record any Zoom meetings. Students do not have permission to distribute or share any recorded content from Zoom meetings.

**Sexual Misconduct and Relationship Violence & Title IX:** Linfield University faculty are committed to supporting students and fostering a campus environment free of sexual misconduct and relationship violence. If a student chooses to disclose to a faculty or staff member an experience related to sexual misconduct, sexual assault, domestic violence, dating violence, or stalking, all faculty and staff are obligated to report this disclosure to the Linfield Title IX Coordinator by emailing [titleix@linfield.edu](mailto:titleix@linfield.edu). Upon receipt of the report, the Title IX Coordinator will contact

you to inform you of your rights and options and connect you with support services. If you would rather share information about these experiences with an employee who does not have these reporting responsibilities and can keep the information confidential, please visit confidential resources: <https://inside.linfield.edu/sexual-misconduct/reporting-options/confidential.html>.

For more information about your rights and reporting options at Linfield, including confidential reporting options, please visit [inside.linfield.edu/sexual-misconduct/](https://inside.linfield.edu/sexual-misconduct/). Support services are offered to all Linfield students regardless of whether or not they report. Still have questions? Email [knowmore@linfield.edu](mailto:knowmore@linfield.edu).

**Commitment to Diversity and Inclusion:** Linfield University honors human rights and academic freedom, celebrates diverse cultures, fosters a climate of mutual respect, and promotes an inclusive environment that affirms the value of all persons. Dimensions of diversity can include sex, race, age, national origin, immigration status, ethnicity, gender identity and expression, intellectual and physical ability, sexual orientation, income, faith and non-faith perspectives, socio-economic class, political ideology, education, primary language, family status, military experience, cognitive style, and communication style. In a multi-perspective intellectual space, challenges to our beliefs and ideas are part of the learning process and can provide opportunities for growth. Reasoning, thoughtfulness, and open dialogues that honor the dignity of everyone is expected.