COMP_SCI 5408 101
Game Theory for CS
2024 Fall Semester

Instructor Information

Venkata Sriram Siddhardh Nadendla
Email: nadendla@mst.edu
Office: Room 314, Computer Science Building
Office Hours
Wednesday, 3:30 pm - 5:00 pm
Phone: 573-341-4090
Preferred Method of Contact: Email (via CANVAS)

Course Information

Meeting Location: Computer Science 00209
Meeting Days: TuTh
Meeting Time: 11:00AM - 12:15PM
Modality: In-Person

Students taking this class are expected to have a strong foundation in linear algebra ('C' or better grade in Math 3108), algorithms ('C' or better grade in Comp Sci 2500), along with basic background in probability theory and/or statistics ('C' or better grade in one of Stat 3113, Stat 3115, Stat 3117, or Stat 5643.)

Course Description

Description from JoeSS - Course Catalog:

Course Description from your Instructor

Game theory is a powerful framework that models strategic interactions between competing entities in various domains such as economics, computer science, business, politics and transportation. This course introduces the mathematical and computational foundations of game theory, and its applications particularly in computer science (e.g. cybersecurity, robotics and networking). Topics include rationality, noncooperative game models (e.g. normal form, extensive form), solution concepts (e.g. Nash equilibrium, subgame perfect equilibrium), effects of information asymmetry (e.g. Bayesian games), dynamical settings (e.g. repeated games), strategic alliances (e.g. cooperative game theory), and mechanism design (e.g. auctions).

Course Goals

At the end of this course students will:

- Develop analytical thinking to model individual/group rationality in diverse decision-making contexts.

- Gain mastery in modeling strategic interactions under different informational vignettes using games.

- Become proficient in applying/finding relevant solutions for different games.

- Develop the ability to model and solve games in dynamic settings using richer solution concepts.

- Cultivate the ability to reason how/why autonomous decision makers form strategic alliances (teams).

- Design strategic mechanisms to achieve desired objectives when the participating agents act rationally in their own respective manner.

Course Materials
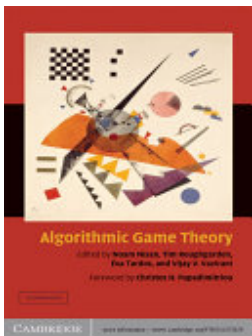
Dr. Sid's Lecture Notes
Required
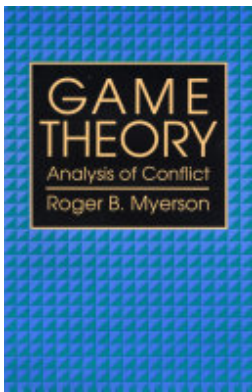
Game Theory
ISBN: 9780674728622
Authors: Roger B. Myerson
Publisher: Harvard University Press
Publication Date: 2013-03-01
Optional

Algorithmic Game Theory
ISBN: 9781139466547
Authors: Noam Nisan, Tim Roughgarden, Eva Tardos, Vijay V. Vazirani
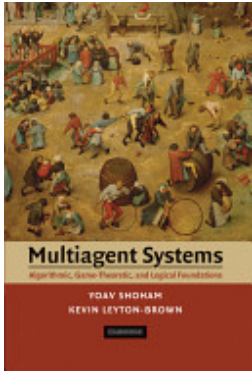**Publisher:** Cambridge University Press
Publication Date: 2007-09-24
Optional

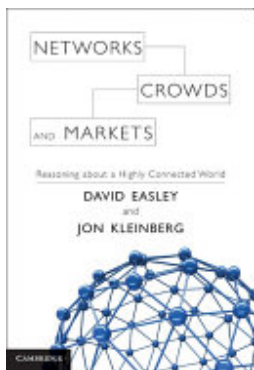**Multiagent Systems**
ISBN: 9780521899437
Authors: Yoav Shoham, Kevin Leyton-Brown
Publisher: Cambridge University Press

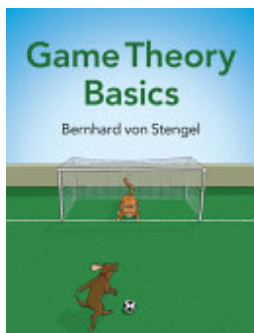**Publication Date:** 2008-12-15

Optional

Networks, Crowds, and Markets
ISBN: 9781139490306
Authors: David Easley, Jon Kleinberg
Publisher: Cambridge University Press
Publication Date: 2010-07-19
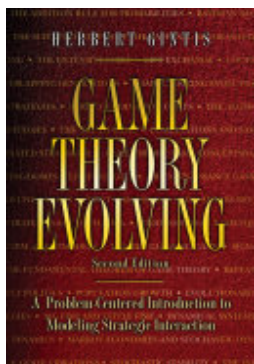
Optional

Game Theory Basics
ISBN: 9781108910644
Authors: Bernhard von Stengel
Publisher: Cambridge University Press
Publication Date: 2021-08-19

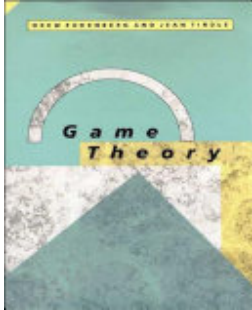Optional

Game Theory Evolving
ISBN: 9781400830077
Authors: Herbert Gintis
Publisher: Princeton University Press
Publication Date: 2009-01-26

Optional

Game Theory

ISBN: 9780262061414
Authors: Drew Fudenberg, Jean Tirole
Publisher: MIT Press
Publication Date: 1991-08-29
Optional
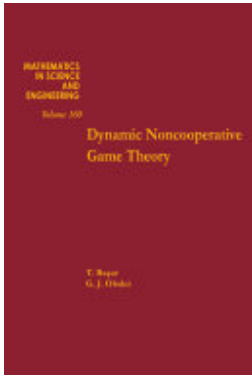
Dynamic Noncooperative Game Theory
ISBN: 9780080956664
Authors: Tamer Basar and Geert Jan Olsder
Publisher: Academic Press
Publication Date: 1982-02-02
Optional
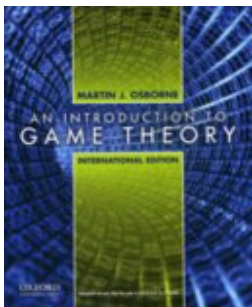
An Introduction to Game Theory
ISBN: 9780195322484
Authors: Martin J. Osborne
Publisher: Oxford University Press, USA
Publication Date: 2009-01-01
Optional

Generative AI (GAI) usage is NOT allowed in this course

No use of GAI is acceptable for use on any graded class activity.
Use of GAI may result in a zero for the assignment.

Your instructor does not allow the use of GAI on assignments or projects in this class.

Generative AI (GAI) Course Policies

Students are expected to acquire the skills taught in this class without the use of any GAI, since this course covers fundamental concepts in game theory. Otherwise, students will not accomplish the desired learning outcomes.

Unauthorized use of artificially generated content violates University Student Academic Standards without consent of the instructor. Students are not allowed to use ChatGPT and other AI tools in solving questions posted in homework assignments, or in developing code for projects. Instead, the instructor encourages students to use GAI tools to learn the fundamentals of game theory, and discuss with the instructor to verify the correctness of the material. For more resources, visit https://teaching.missouri.edu/blog/teaching-time-ai

Course Policies

One Canvas (https://umsystem.instructure.com/) will only be used to maintain grades, conduct quizzes and post recorded lectures (only when the instructor is out-of-town, attending conferences). All other information (including lecture notes, assignments and Jupyter notebooks) used in this course will be found only in the course website. If needed, laptops, web cams, scanners (if submitting a hand-written assignment), headsets, microphones, or other resources are available for checkout from the Service Desk in the library. There are several mobile applications available in different platforms that can use the camera in smart devices to scan documents.

Communication Expectations

Students are strongly encouraged to meet either the instructor, or the grader, and ask questions regarding the assignments before submission. Instructor will attempt to respond any email question within 24 hours upon their receipt. If the student did not receive any reply within 48 hours, they should send him a reminder under the same email chain.

Contingency Information

Instructor Illness or Unavailability:

If the instructor is unavailable due to travel or health reasons, the instructor will either post recorded lectures on CANVAS, or will switch to online instructor based on his availability.

Student Illness:

Students should contact Student Health Services (mstshs@mst.edu), 573-341-4284, if they become ill or are unable to attend class or take tests on campus.

If a student is isolating, the student will receive an absence note from Student Health and not Student Support and Community Standards (Care Management). The student will be responsible of forwarding the absence note to their instructors.

Departmental Contact

First point of contact for questions, issues, and concerns is the instructor of your course. If you have a situation that you cannot resolve through discussion with the instructor, you may contact the department chair.

Name: Seung-Yong Park
Title: Kummer Endowed Department Chair

Email: seung-jong.park@mst.edu

Course Schedule

Topic	Subtopics	Lectures
Decision Theory	Revealed Preferences, Utilities, Bounded Rationality, Domination	4
Basic Models	Representation, Nash Equilibrium, Subgame Perfect Equilibrium	6
Coalitional Games	Transferable Utility, Core, Shapley Value	4
Exam 1		1
Information Asymmetry	Bayesian Games, Sequential Equilibrium	5
Mechanism Design	Social Choice, Revelation Principle, Truthfulness, VCG Auctions	4
Adv. Solution Concepts	Correlated Equilibrium, Evolutionary Games, CFR Minimization	3
Exam 2		1

Grading Policies

Students will submit all of their homework assignments via **Gitlab**, regarding which the instructor will discuss in the first class.

Quizzes will be conducted on Canvas at the time of the class, regarding which no exceptions will be made whatsoever.

Grading Scale Information

Course grading scale

Letter Grade	Points
A	90 -100 points
B	75 - 89 points
C	60 - 74 points
D	50 - 59 points
F	49 and below

Assignment breakdown of grade calculation

Assignment	Percentage of Grade
Homeworks (Top-5 in HWs 1-6)	30%
Quizzes (Top 5 in Quizzes 1-6)	10%
Exams (1 and 2)	40%
Projects (1 and 2)	20%
	Total: 100%

STUDENT ASSISTANCE, RESOURCES & UNIVERSITY POLICIES

This section of the syllabus contains information and links to important information regarding:

- Academic Dishonesty & Integrity Policies
- Student Resources
    - Educational & Tutoring
    - Health and Well-Being
    - Other Support Services
- Missouri S&T and UM System Policies

Use the syllabus navigation menu to migrate easily through the information.

Academic Integrity & Generative AI Policy

Student Honor Code and Academic Integrity

As a student at Missouri S&T you are responsible for maintaining your own academic integrity. Familiarize yourself with this information.

- All students are expected to follow the [Honor Code](#).
- Your instructor is a mandated reporter in cases of Academic Integrity and Dishonesty
- [Student Academic Regulations](#) describes the student standard of conduct relative to the University of Missouri System's Collected Rules and Regulations section 200.010, and offers descriptions of academic dishonesty including cheating, plagiarism, sabotage, and unauthorized use of artificially generated content, any of which will be reported to the Dean of Students.
- Other resources for students regarding academic integrity can be found [online](#).

Generative Artificial Intelligence (GAI)
Your instructor should provide information that explains what their policy is on use of Generative AI (GAI).

Your instructor may use one of these indicators to define their policy. If your instructor has tagged your course as conditional that means that GAI may be allowed on one assignment, but not another. If in doubt, check with your instructor.

It is your responsibility to know the GAI policy for your courses.

Indicators that may be used in your course:

Allowed	**GAI tools may be used to augment your learning process, not replace it.** When GAI is allowed you must verify and cite all claims and information appropriately. GAI are known to hallucinate. Do not blindly trust the information an AI generates. You must also not adopt generated content without reflection and revision to make it your work.	✓
May be allowed (check each assignment)	**GAI tools may only be used under the guidance of the instructor for specific assignments and in a particular manner.** When GAI is allowed you must verify and cite all claims and information appropriately. GAI are known to hallucinate. Do not blindly trust the information an AI generates. You must also not adopt generated content without reflection and revision to make it your work.	⚠
Not allowed	**No use of GAI is acceptable for use on any graded class activity. Use of GAI may result in a zero for the assignment.**	🚫

For more information about the GAI policy, visit
https://teaching.missouri.edu/blog/teaching-time-ai

S&T Tutoring & Campus Educational Support Resources

One Canvas (https://umsystem.instructure.com/)

Course content may be used by your instructor to post syllabi, policies, schedule(s), and grades.

S&T Connect
S&T Connect enables students to request appointments with their instructors and advisors via the S&T Connect calendar, which syncs with the Outlook Exchange calendar. S&T Connect tracks each student's performance across all courses. S&T Connect Early Alert enables students to be provided with services as needs arise.

Student Success Center
The Student Success Center (SSC) offers peer tutoring and success coaching to help students succeed in their academic goals. Additionally, we

work as a resource hub and can connect you to the campus resources necessary to help you dig deeper and finish the semester strong. Visit the SSC in Room 117 Innovation Lab and contact us at ssc@mst.edu or 573-341-7590. To learn more about the SSC, visit https://ssc.mst.edu/.

Writing and Communication Center

The Writing and Communication Center's mission is to assist all students in their efforts to become better writers, communicators, and critical thinkers. The Center's peer consultants and coaches provide free individualized one-on-one and small-group conversations to offer meaningful feedback and guidance to students across all disciplines. More information can be found on our website, through email: writing@mst.edu or stop by Curtis Laws Wilson Library 314–315.

University Libraries

The Curtis Laws Wilson Library is the place to gather on campus, offering group meeting spaces, quiet study carrels and reservable conference rooms. The library provides students and faculty with physical and electronic books, journals, articles and databases as well as recreational reading, games and DVDs. We also have technology to check out, from laptops to charges to calculators and everything in-between. Librarians create library and course guides to help navigate searching for resources. Talk to us one-on-one via chat, email, phone or in person for any assistance regarding library services or finding peer-reviewed, credible research materials for study and research needs. Find out more information and connect with the library here: library.mst.edu.

S&T Tutoring Opportunities

The Student Success Center (SSC) helps you with your studies in three ways:

- **LEAD Drop-in:** Our LEAD Drop-in service provides convenient access to experienced peer learning assistants for a multitude of courses across campus. No appointments necessary. Simply check our tutoring schedule to discover when support for your specific course is available: https://ssc.mst.edu/leaddrop-in/

- **LEAD Group Sessions:** Our LEAD Group sessions offer after-hours group tutoring, facilitated by our dedicated peer learning assistants in partnership with faculty members. Explore the LEAD Group schedule to see if your course is featured and join us at the next session: https://ssc.mst.edu/leadgroup/

- **Knack Tutoring:** If your schedule clashes with our LEAD offerings, or if your course isn't covered, Knack is your solution. Request a tutor for either a virtual meeting or an in-person session on campus, ensuring you get the help you need, when you need it. To sign up for your FREE Knack account, visit: https://ssc.mst.edu/knacktutoring/

Student Veterans Resource Center

The Student Veterans Resource Center (SVRC) is the nexus of resources and support for student veterans at S&T. The SVRC provides student veterans with a "safe space" and a familiar atmosphere. The center's Veteran Consuls provide one-on-one consultations to guide students to various resources on campus, while its advisor provides students with VA health and benefits resources. Visit the SVRC at Harris Hall, Suite G10, and contact us at svrc@mst.edu.

Student Emergency Fund (SEF)

The SEF is administered by the Division of Student Success to help ensure Missouri S&T students have access to the support and resources they need to successfully recover from an unforeseeable financial emergency. The goal of this fund is to prevent one small emergency or unexpected expense from derailing a student's progress toward degree completion.

Respiratory & Other Illness Policy Updates

In March 2024, the Centers for Disease Control and Prevention (CDC) updated recommendations on how people can protect themselves and their communities from respiratory viruses, including COVID-19.

The new simplified recommendations follow similar guidelines for other respiratory infections.

For any respiratory illness, COVID-19 and influenza in particular, the new recommendations suggest returning to normal activities when:

- Symptoms have been improving overall for at least 24 hour, and
- If fever is present, no fever for 24 hours without the use of fever-reducing medication.

Students who are ill are advised to be seen at Student Health Services. Students can schedule appointments by calling (573) 341-4284 or online through their patient portal.

If you are ill, protect others around you by:

- Practicing good hygiene: cover your coughs and sneezes, wash or sanitize hands often, and clean frequently touched surfaces.
- Stay away from others until you are feeling better, particularly if they are immune-compromised.

Notify your instructor of any illnesses that prevent you from attending class.

Health & Well-Being Support Resources

Student Mental Health and Well-Being

Your well-being is important, and it contributes to your success in this

course. At S&T, we provide resources to support your mental, physical, and social well-being. Any of us can experience challenges that make learning difficult. If you are struggling, take advantage of the following resources offered by the university:

Student Well-Being (https://wellbeing.mst.edu/)
Student Well-Being provides counseling services, health promotion initiatives, and prevention programs to empower the S&T community to thrive and enhance personal, academic, and professional success. Department office hours are Monday-Friday, 8 a.m. – 5:00 p.m. On the website, you can find information related to confidential individual and group counseling, wellness consultations and trainings, case management services, resources for many health and wellness topics, and help for mental health crisis situations. For the 988 Suicide and Crisis Lifeline, call or text 988, or visit missouri988.org For the National Suicide Prevention Lifeline, call or text 988, or visit missouri988.org.

Health and Well-Being Canvas Course
(https://umsystem.instructure.com/enroll/G3LY3G)
The Health and Well-Being Canvas Course features trainings, presentations, and other health and well-being resources for students. The course is free for all students, is non-credit, and students can enroll at any point in the semester.

UCARE
UCARE, housed within the Division of Student Success, is the central point of contact to connect a student who may be experiencing a personal, academic, financial, well-being, and/or other concern to support and resources. An instructor, staff member, or other student may share concerns about a student with UCARE. UCARE helps connect a student with solution-focused assistance to support their holistic well-being, success, and academic progress. A referral can be submitted at https://go.mst.edu/ucare-

[refer](#) or by emailing ucare@mst.edu. For urgent matters, check out the after-hour and urgent resources.

[Miner Oasis](#)

The Miner Oasis is simply a place to relax.
We have coloring books, customizable essential oils, coffee and tea, healthy snacks, yoga mats, and a massage chair to help you de-stress and be your best self!

The Miner Oasis is open Monday - Friday, 8am - 5pm, in 201 Norwood Hall

Other free resources available for students are the Zen Den (similar to the oasis but private and for only one student at a time), light therapy, a Buddha board, and a biofeedback/HeartMath program. Stop by the front desk in 204 Norwood Hall to learn more about these resources.

[Morning Cup of Joe](#)

Using pop culture to explore mental health topics relevant to the students at S&T and the S&T community at large. Find us at: https://wellbeing.mst.edu/
https://www.instagram.com/sandtwellbeing
https://www.facebook.com/sandtwellbeing

Other Student Support Services & Resources

[Student Emergency Fund (SEF)](#)
The SEF is administered by the Division of Student Success to help ensure Missouri S&T students have access to the support and resources they need to successfully recover from an unforeseeable financial emergency. The goal of this fund is to prevent one small emergency or unexpected expense from derailing a student's progress toward degree completion.

[Missouri S&T Fitness Center](https://studentrec.mst.edu/fitness-center/)
Access to the Fitness Center and swimming pool is provided to actively enrolled students who pay an activity fee. Students who have not registered for classes will not be granted access. A valid Miner ID card must be presented for entry. For information on hours and equipment availability visit https://studentrec.mst.edu/fitness-center/

Commuter's Commodities (Food Pantry)

Hunger is a real problem for far too many of today's students. The pantry is to help alleviate the financial burden of obtaining good quality food and supplies.

Today's college students face serious financial challenges. Many students find it difficult to support themselves while also paying for college. Hunger is a real problem for far too many of today's students. One issue they are faced with is food insecurity - not having reliable access to sufficient, nutritious food.
Commuter's Commodities is a food and supply pantry to help alleviate the financial burden of obtaining good quality food, small household goods, cleaning supplies and hygiene products. Our hope is that this will help our commuter students and students who may be in need.

We are a partner agency with The Food Bank for Central & Northeast Missouri.

Closets Are For Clothes Exchange & Boutique

The purpose of this service is to alleviate the often heavy financial burden of transitioning or coming out. All S&T students who have a need may use it accordingly.

A clothing exchange is a type of swap wherein participants exchange their valued but no longer used clothing for clothing they need and will use. Don't have anything to swap? No problem! This service is available to all S&T students who have a need.

[LGBTQ+ Resource Center](#)

Here you will find a wide variety of resources, information about the LGBT community at Missouri S&T, and ways to get involved as students, staff, faculty, or alumni. The LGBT Resource Center is the centeral hub of LGBTQ life at Missouri S&T.

[Resource Library](#)

SDI has many books and resources in our library that are available to check-out.

[MinerLink](#)

MinerLink is your connection to most student organizations on campus. MinerLink allows you to:

- Browse registered student organizations
- Contact and join a student organization
- View daily and upcoming events
- RSVP to events
- Check into university events using the event pass ... and more!

For more information visit https://involvement.mst.edu/involvement/minerlink/

Missouri S&T Campus & UM System Policies

Statement about Copyright, FERPA, and Use of Video

It is vitally important that our classroom environment promote the respectful exchange of ideas. This entails being sensitive to the views and beliefs expressed during discussions, whether in class or online. Please obtain instructor permission before recording any class activity. It is a violation of University of Missouri policy to distribute such recordings without authorization and the permission of all who are recorded. More information is provided [online](#).

Accessibility and Accommodations

It is the university's goal that learning experiences be as accessible as possible. Student Accessibility and Testing provides services and accommodations that facilitate full participation in Missouri S&T's learning experience for students with disabilities. If you anticipate or experience physical, academic, and/or digital barriers due to a disability, please contact Student Accessibility and Testing at (573) 341-6655, email dss@mst.edu, or visit https://saat.mst.edu/; for information.

Nondiscrimination, Equity, and Title IX

Missouri S&T is committed to the safety and well-being of our campus community, and to creating an environment free from discrimination and harassment.

The University prohibits discrimination and harassment on the basis of race, color, national origin, ancestry, religion, sex, pregnancy, sexual orientation, gender identity, gender expression, age, disability, protected veteran status, and any other status protected by applicable state or federal law. As used in this policy, the word "sex" is also inclusive of the term "gender."

Additionally, US Federal Law Title IX states that no member of the university community shall, on the basis of sex, be excluded from participation in, or

be denied benefits of, or be subjected to discrimination under any education program or activity. Sexual harassment violations of this law include quid pro quo, hostile environment, sexual assault, dating/domestic violence, and stalking. The U.S. Department of Education has stated the prohibition on discrimination on the basis of sex includes sexual orientation and gender identity.

Students who are experiencing pregnancy or pregnancy-related conditions, including the birthing parent and non-birthing parent, have rights protected under Title IX. Students should contact Student Accessibility and Testing or the Office of Equity and Title IX to learn more about their rights and pregnancy-related assistance/accommodations provided by the University to ensure equitable access to University educational programs and activities.

In accordance with the University of Missouri's Collected Rules and Regulations, all faculty and staff are required to report any information concerning discrimination disclosed through communication including, but not limited to, direct conversation, email, social media, classroom papers and homework exercises to the Equity Officer/Title IX Coordinator.

For more information regarding support for those that have been impacted or to report an incident of discrimination or harassment as defined by [Chapter 600](#) of the University's Collected Rules and Regulations, visit the Office of Equity and Title IX or visit their website at equity.mst.edu.

Office of Equity and Title IX
Equity Officer and Title IX Coordinator: Dr. Paul Hirtz
Phone: (573) 341-7734
Location: 900 Innovation Drive, Suite 500
E-mail: equity@mst.edu

Emergency Info & Classroom Egress Maps

[Campus Police Emergency Quick Reference](#)

Classroom Egress Maps

I case of emergency both instructors and students should know where to go that is safe. These maps show where the classroom emergency exits are located. http://designconstruction.mst.edu/floorplan/.