



Purdue West Lafayette/Indianapolis
Department of Computer Science
Algorithmic Game Theory
CS (WL) 58100
WL Fall 2026

Course Information

Meeting Information: LWSN 1106

Meeting Day(s) and Time(s): TR / 1330

Instructor(s) Contact Information

Name: Christos Alexandros Psomas

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Office Phone Number: 765-494-6010

Student Consultation Hours

Tuesdays at 14:45

Course Description

Credit Hours: 3.00. The field of algorithmic game theory (also known as economics and computation) has been expanding at a rapid pace in recent years, with computational reasoning playing a crucial role in transforming classical economics. An increasing number of real-world systems require careful design of algorithms where the inputs are provided by agents with different preferences. Applications include Google's ad auctions, spectrum auctions, Bitcoin, matching markets, and allocation of vaccines. This has inspired new models and algorithms and led to deep connections with machine learning through multi-agent learning and computational complexity. This course will introduce the area of Algorithmic Game Theory by studying games, solution concepts, complexity of equilibria, mechanism design, auction theory, fair division, social choice, learning

dynamics, and markets. It will include both classical results and recent developments.

Prerequisites: Undergraduate level, CS 38100, Minimum Grade of B+ or Undergraduate level, CS 58000, Minimum Grade of B+ or Undergraduate level, CS 58800, Minimum Grade of B+

Course Learning Outcomes

By the end of the course, you will be able to:

1. Analyze and solve games (zero-sum, general-sum, potential games), identify stable solutions, and design algorithms for computing them where applicable.
2. Design and analyze mechanisms that work well when the participants are strategic, for various problems including selling goods (auctions).
3. Design and analyze algorithms with provable fairness guarantees.
4. Explain concepts of social choice used in specific domains, e.g., elections.
5. Analyze markets and design algorithms that market participants can use to achieve desirable outcomes in both static and repeated settings.
6. Analyze multi-agent learning settings, where agents learn together in some environment but have different incentives, which influence their interactions.

Learning Resources, Technology & Texts

No required textbooks

Assignments

There will be 3-5 homework assignments (25% of the total grade), a midterm (20%), a final exam (30%), and a final project (25%).

Grading Scale

Per the Purdue University Academic Regulations, the following grades shall be available to be assigned by the instructors and reported when they are called for by the registrar:

A+

A: Highest passing grade.

A-

B+

B

B-

C+

C

C-

D+

D

D-: Lowest passing grade; marginally passing minimal objectives of the course.

E: Conditional failure; failure to achieve minimum objectives, but only to such limited extent that credit can be obtained by examination or otherwise without repeating the entire course. This grade represents failure in the course unless and until the record is duly changed within one semester. It cannot be improved to a grade higher than D. (See section E.) When an instructor reports a grade of E, they shall file in the departmental office a statement of what is required of the student to receive the passing grade.

F: Failure; failure to achieve minimal objectives of the course.

The student must repeat the course satisfactorily in order to establish credit in it.

Attendance Policy

Attendance is not required.

Course Schedule

The course is split into four roughly equal modules: Game Theory, Mechanism Design, Fairness, and Social Choice.

Academic Integrity

All submitted work must be your own. On homework, you may discuss problems with other students at the idea level, but you must write your solutions entirely on your own and list everyone you discussed each problem with. You may not search for solutions in any form (online, in other textbooks, or in materials from previous offerings of this or similar courses) and you may not post the problems anywhere. AI tools (ChatGPT, Claude, etc.) may be used to review course material, but not to produce, complete, or check solutions to graded work; everything you submit must be written by you, unassisted. Exams are strictly individual work, with no materials or tools beyond those explicitly permitted.

Incidents of academic misconduct in this course will be addressed by the course instructor and referred to the Office of Student Rights and Responsibilities (OSRR) for review at the university level. Any violation of course policies as it relates to academic integrity will result minimally in a failing or zero grade for that assignment, and at the instructor's discretion may result in a failing grade for the course. In addition, all incidents of academic misconduct will be forwarded to OSRR where university penalties, including removal from the university, may be considered.

AI Policy

Generative AI may be used in this course only as authorized by the instructor. Unless stated otherwise on a specific assignment, the course-wide policy is: you may use AI tools (ChatGPT, Claude, etc.) to review and explore course material, but not to produce, complete, or check solutions to graded work. Where an assignment permits broader use, this will be stated explicitly on the assignment itself.

All AI use must comply with current Purdue University policies and instructor requirements. You may not enter another person's personal or confidential information into AI tools. Instructor-created materials (lecture notes, homework and exam problems, solutions) and other copyrighted or licensed course content may not be uploaded to AI tools without explicit authorization.

Where AI use is permitted, you must disclose it in your submission: identify the tool or tools used and describe how you actually used them. If you are unsure whether a particular use is permitted, ask before using it; use is not authorized until permission is given.

Unauthorized or undisclosed generative AI use is academic misconduct and will be handled under the academic integrity policy above, consistent with Purdue University academic-integrity policies and procedures.

Nondiscrimination Statement

Purdue's full Nondiscrimination Policy Statement is included in the Academic Resources table on your Brightspace homepage.

Accessibility

Every member of our course should be able to access, use, and learn from the materials we share. This includes all course related digital content that you and I share in the course. This approach helps promote equal access for everyone at Purdue and is mandated federally by [Title II of the Americans with Disabilities Act \(ADA\)](#). We will work together to provide this access within our Brightspace course.

- My part, as the instructor, is to make sure all course materials shared to Brightspace, such as documents, slides, videos and audio, and images, meet accessibility guidelines and to assist you in making sure anything you share is accessible. If we can do anything further to support your access to and engagement with course materials, please notify me.
- Your role, as a student, is to make sure anything you post for other students to engage with is also accessible, such as peer grading, peer feedback, and discussion board posts. This expectation is built into all course assignments that require you to post to Brightspace.
- A good starting place for students and instructors is to bookmark and review the [Innovative Learning Accessibility Checklist](#) for guidance on creating accessible materials. We need to work together to make sure all materials on our course Brightspace are accessible.
- If you select materials to share on our Brightspace from Purdue Libraries catalog or databases, best practices include choosing items that:
 - Can be downloaded in full
 - Are available in EPUB or HTML formats
 - Include alternative text for written materials or captions for audio/visual content

Accommodations

Purdue University strives to make learning experiences accessible to all participants. If you anticipate or experience physical or academic barriers based on disability, you are encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone: 765-494-1247, as soon as possible.

If the Disability Resource Center (DRC) has determined reasonable accommodations that you would like to utilize in my class, you must release your Course Accommodation Letter to me. Instructions on sharing your Course Accommodation Letter can be found by visiting: [How To Use Your Course Accommodation Letter](#). Additionally, you are strongly encouraged to contact me as soon as possible to discuss implementation of your accommodation.

Mental Health/Wellness Statement

If you find yourself beginning to feel some stress, anxiety and/or feeling slightly overwhelmed, try [Therapy Assistance Online \(TAO\)](#), a web and app-based mental health resource available courtesy of Purdue Counseling and Psychological Services (CAPS). TAO is available to all students at any time by creating an account on the [TAO Connect](#) website, or downloading the app from the App Store or Google Play. It offers free, confidential well-being resources through a self-guided program informed by psychotherapy research and strategies that may aid in overcoming anxiety, depression and other concerns. It provides accessible and effective resources including short videos, brief exercises, and self-reflection tools.

If you need support and information about options and resources, please contact or see the [Office of the Dean of Students](#). Call 765-494-1747. Hours of operation are M-F, 8 a.m.-5 p.m.

If you find yourself struggling to find a healthy balance between academics, social life, stress, etc., sign up for free one-on-one virtual or in-person sessions in West Lafayette with a [Purdue Wellness Coach at RecWell](#). Student coaches can help you navigate through barriers and challenges toward your goals throughout the semester. Sign up is free and can be done on BoilerConnect. Students in Indianapolis will find support services curated on the [Vice Provost for Student Life](#) website.

If you're struggling and need mental health services: Purdue University is committed to

advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of mental health support, services are available. For help, such individuals should contact [Counseling and Psychological Services \(CAPS\)](#) at 765-494-6995 during and after hours, on weekends and holidays, or by going to the CAPS offices in [West Lafayette](#) or [Indianapolis](#).

Emergency Preparedness

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. Relevant changes to this course will be posted onto the course website or can be obtained by contacting the instructors or TAs via email or phone. You are expected to read your @purdue.edu email on a frequent basis.

See [Purdue's Information on Emergency Preparation and Planning](#). This website covers topics such as Severe Weather Guidance, Emergency Plans, and a place to sign up for the Emergency Warning Notification System. I encourage you to download and review the [Emergency Procedures Guide](#).

The first day of class, I will review the **Emergency Preparedness plan for our specific classroom**. Please make note of items like:

- The location to where we will proceed after evacuating the building if we hear a fire alarm.
- The location of our Shelter in Place in the event of a tornado warning.
- The location of our Shelter in Place in the event of an active threat such as a shooting.

Student-Related Policies

The Vice President for Ethics & Compliance website includes a list of [Student Policies](#). Among those is the [Violent Behavior](#) policy, which explains that Purdue is committed to providing a safe and secure campus environment for members of the university community. Purdue strives to create an educational environment for students and a work environment for employees that promote educational and career goals. Violent behavior impedes such goals. Therefore, violent behavior is prohibited in or on any University facility or while participating in any university activity.

Grade Appeals Process

At the end of the course, after final course grades have been assigned, students who believe their grade was assigned contrary to what is outlined in the course syllabus, has been assigned arbitrarily, or has been reduced too severely due to a violation of course academic integrity policies, may submit an appeal request to have this final course grade reviewed. The University's Grade Appeal Process is outlined in the University Catalog and is also referenced on the website for the [Office of Student Rights and Responsibilities \(OSRR\)](#).

Staff in the OSRR office are able to assist in determining if a Grade Appeal is appropriate. Generally, students should not expect a grade appeal to be successful if there is a lack of information to support the appeal or if the student merely thinks that the assigned grade is "unfair". Students must also attempt to resolve the matter informally with the course instructor prior to beginning the appeal process.

Basic Needs Program

If you are facing challenges securing basic needs such as food, housing, transportation, health services, or access to technology or childcare resources and believe this may affect your performance in the course, please contact the Office of the Dean of Students (ODOS) to help coordinate with community resources. These services vary by location. In West Lafayette, see the [Basic Needs Program](#) website, or email basicneeds@purdue.edu. To connect with a Student Support Generalist on the Indianapolis campus, contact them by phone at 765-495-7797 or email studentlifeindy@purdue.edu.

Course Evaluation

Toward the end of this semester, you will be provided with an opportunity to give feedback on this course and your instructor. Purdue uses an online course evaluation system, and I will not have access to this anonymous feedback until after final grades are submitted. You will receive an official email from evaluation administrators with a link to the online evaluation site and will receive a prompt to complete the survey when you login to Brightspace. The subject line will be: Please take 2-5 minutes to complete the survey. Check your "Junk E-mail" folder occasionally to be sure the evaluation emails were not accidentally routed there. Your participation is an integral part of this course, and your feedback is vital to improving education at Purdue University. I strongly urge you to participate in the evaluation system.

This syllabus is subject to change. You will be notified of any changes as far in advance as possible via an announcement on Brightspace. Monitor your Purdue email daily for updates.