

**Earlham College**  
**ECON 313 – Game Theory – Spring 2020**  
**Instructor: Rajaram Krishnan**

**OFFICE HOURS**

*Mon. 4 p.m. – 5.30 p.m.; Tues 1.30 p.m. – 3.30 p.m.; Wed. 10.30 a.m. to noon*  
*My office is at LBC 335. My extension (phone) is 1301*  
*I can be emailed at [krishra@earlham.edu](mailto:krishra@earlham.edu)*

### **Course Abstract, Requirements**

This course is designed to introduce you to the basic framework and language of Game Theory. At the end of this course you must be comfortable with the basics of how economists work in a game theoretic framework. However, there is much more to the field of game theory than we will cover in this course

A necessary condition to succeed in this class is a desire to learn and a commitment to work. For my part, I offer a desire to teach and a commitment to work. In addition, a smile and pleasant disposition will help, though it is optional! Since this is a 300 level, it is assumed that the prerequisite has been met. In addition, it is assumed that students are comfortable working in a mathematical framework. Please speak to me if you are unsure of your math training.

This course is a required core course for the Quantitative Economics major, and is an elective for the Economics major. Of course, you are most welcome if you are taking it without planning to graduate without either of those two majors. Also, the course is designate a [Writing Intensive \(WI\) course](#). We'll talk more about this in class.

### **Learning Goals**

The course is structured to help develop the broad learning goals set out by the department which are to build **Disciplinary Knowledge**, and **Interdisciplinary and Collaborative Capacities**, develop **Intellectual Capacities**, deepen **Discerning and Inquisitive Capacities**, and foster **Personal Development Goals**.

The immediate disciplinary related learning goals for this class are to:

1. Develop a clear understanding of the vocabulary, grammar, method and framework used in Game Theory.
2. Gain a historical sense of the development of the field.
3. Appreciate some of the debates within the field.
4. Be able to express different aspects of game theory through the written word.

In addition to the above economics related learning goals, I hope to develop in those of you who are still not there the following study skills for succeeding in college:

- a. Good note taking skills
- b. Regular and sensible study skills
- c. Develop the joy of learning rather than simply pursuing a grade.
- d. Being honest. Some of you have learned the art of being honest. Unfortunately, others amongst you need to get there. In this class we'll think about and practice being honest hoping it becomes second nature. Yes, integrity is a learned skill. Every time you are in a position of being able to cut corners and cheat, work hard at not doing so. Over time being honest will become easier.

Finally, the course contributes to develop the following college learning goals: *Investigate, Integrate, Reflect, and Apply*<sup>1</sup>.

### Readings and Structure

The required textbook for the class is *An Introduction to Game Theory by Martin, J. Osborne - (ISBN 978-0-19-512895-6)*. I will be using the book rather extensively, and you are required to have a hard copy of the book. In addition, I will give you supplementary material in class from a number of other sources. They will be uploaded on Moodle as required.

The course will be structured as a combination of student contributions, at times student presentations, and faculty instruction. Please come to class having read the relevant chapters, and making relevant notes to participate meaningfully in class conversations. This is not optional, or a suggestion – it is required. I will call on you to talk through definitions, explain the examples from the readings amongst other things, present what a reading may be saying, make presentations of concepts and ideas in class, and help work out problems in class. Put simply, I expect you to be engaged and active learners. We may also play some games in class. And of course, each topic will be accompanied by a problem set which we will discuss in class, and which students are expected to work on by themselves. The problem sets need to be completed and you may be asked to submit them. They will be randomly evaluated (see below). In addition, you will be given regular writing assignments. All of them will be need to be submitted and they will be commented upon and returned to you.

### Grading

The grading for the course will be based on:

- a. **Problem Sets** – 75 points. Every topic will have a problem set associated with it. We will work on some of these problems in class and you will be required to work on other of those problems on your own. Work on them diligently and submit them if asked to do so. I will speak to you if I have concerns about your work on the problem sets. While I will carefully look over your problem set submissions, it is unlikely that I will grade each problem set. I will evaluate the quality of your work in terms of input and output based on my careful looking over.
- b. **Regular Pop-Quizzes and In-class Assignments** – 75 points. Rather self-descriptive, don't you think? No make ups.
- c. **Exams**
  - a. Exam 1 – In Class – tentatively Tuesday, February 18, 2020 – 75 points
  - b. Exam 2 – tentatively to be given on Thursday, April 2, 2020. I may make this a Take Home Exam, in which case it will be given to you on Wednesday, April 1, 2020 and should be turned in by noon on Saturday, April 4, 2020 – 75 points
  - c. Exam 3 - Final Exam – Monday, May 4, 2020, at 4.30 p.m. – 100 points.
- d. **Writing** – At regular intervals you will be given assignments involving different kinds of writing which will call for you to investigate, research, react, think, explain, and be creative. I will always give you at least one week to work on a

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<sup>1</sup> For more on the college's learning goals visit, <http://earlham.edu/curriculum-guide/learning-goals/>

given assignment. The process of investigating, researching, reacting, thinking, explaining, and being creative is as important as the product. If given a week I expect that you will use the week, rather than the 'night before' to work on your 'papers'. – 125 points

- e. **Class Participation, Punctuality, Notes and Binder** - This is a 300 level class and you shouldn't be here if you aren't interested. Read before, attend, and participate in class and do what you need to do to learn in this class. An important part of learning the material well is being organized and structured. I expect you to take down notes when you are reading the text, in class, and then organize them in a manner that is useful to study. I also expect you to diligently work on the problem sets and writing assignments and have them well organized to facilitate learning. Put everything into a binder in an organized and logical way. Feel free to talk with me about a good way to organize the material. You will need to bring your binder to class every day. They will be inspected regularly. And I am requiring that you use pen/pencil and paper to take notes in class. That means no laptops in class. The 'paper over laptop for notes' policy is based on pedagogical reasons ([read this](#)), in addition to laptops being an unmanageable distraction in class.

Acquit yourself well and you will see the fruits of your labor. Mess up by being tardy and/or a less than responsible student, and I will bump your grade down. How much? Depends on how tardy and unresponsive you were to regular requests to get your act together. The most your grade will be reduced by is one grade (as in, for example a C+ to a D+).

**Also I would like to emphasize that coming to class on time (by 10.30 a.m.) is not optional.** At this point I am going to trust your sense of propriety (which includes being punctual) and not frame a cost function for being late. However, if I see an individual tests my patience by being late often enough (as defined by me) then I will selectively impose 'a late day is a missed class' rule for the particular student. This will be unhelpful, given...

**Miss three classes and I reserve the option to fail you for the class/course. This implies attending class is important. Once you miss three classes I will exercise my option based on a combination of factors. And once I make a call it is unlikely that I will change my mind. Put simply, the impression I have for your absence and your attitude to the material matters in case you miss three classes. The reason why you miss a class is irrelevant.**

**Note: It is necessary that you pass the exams (part c) to pass the course.**

### **Statement on Learning Disability**

Any student with a documented disability (e.g., physical, learning, psychiatric, visual, hearing, etc.) who needs to arrange reasonable classroom accommodations must request accommodation memos from the Academic Enrichment Center and contact the instructor each semester. Students are strongly encouraged to visit the Academic Enrichment Center within the first two weeks of the beginning of the semester to begin the process for greater success. However, if students want accommodations even after the first two weeks they should not hesitate to contact the Academic Enrichment Center.

## **Caring Policy**

I want to be clear that the amount of help you get from me outside of class is a function of how much effort you put into the class. Not attending class, not coming prepared to class, not working diligently on home assignments, not coming to office hours to clear doubts will all be signals to me that you don't care much and so shouldn't I. I hope that all of you demonstrate enough effort and good will that I do not have to demonstrate my capacity not to care. This is a 300 level class and for most of you signals a deep desire to be an Econ major. I should be able to take your commitment to work hard and learn well for granted. This policy suggests I cannot do that.

## **Office Hours and Study Groups**

Disciplined, regular, outside the classroom study and work are important to learn the material and do well in this class. I strongly encourage you to form in groups of 2 or 3 people to study outside class. I also encourage you to come to my office hours regularly.

## **Academic Conduct**

Anybody who is in doubt as to what constitutes academic misconduct should speak to me. There are many reasons why you should not cheat, the least of which is you will be penalized heavily for doing so. Do not put me in a position to play cop and prosecutor. But if you do, I will do so to the best of my abilities, and with no joy. We will have a conversation in class before I decide whether I should proctor your mid-terms and final.

## **The Basic Rules (a.k.a The Implicit Contract)**

### **READ READ READ READ READ READ READ**

- The aim of the game is that you must learn economics. If you do not understand anything I am saying, stop me. Some questions are stupid - ask them and get over it! Most questions are not stupid - ask them and get over it!!!
- Be respectful of your classmates. Remember we are all here to learn.
- Come to class on time. At this point I trust your sense of social decency to be punctual. However, if I do find that appealing to your social conscience is not a wise strategy, I reserve the right to enforce some of the incentive mechanisms that we will learn about in this course!!!
- Please note that Exam 1 and Exam 2 dates are listed as tentative. I'd like to give them on the dates listed but it may make sense to reschedule them for pedagogical reasons by a class or two ahead, or a class or two behind. Exam 3 will be on the day scheduled by the Registrar's office unless we can all agree on an alternative date. No make ups will be given except for medical reasons strongly backed by a doctor's certificate. Please don't book plane tickets to fly back home and use that as a legitimate excuse to reschedule.
- Please do the readings carefully and diligently before you come to class. This will help you learn the material and do well on the exams.
- No food in class.
- Have fun.

See next page for a tentative syllabus and time-table.

**Tentative and Ambitious Syllabus and Time - Table**  
**Will Pare Back if Needed**

Day	Date	Topic	Chapter (some partial) in text. These are only indicative – specific readings will be posted on Moodle.
Thursday	1/16	Initial Class	
Monday	1/20	What's Game Theory?	Chapter 1
Wednesday	1/22	Nash Equilibrium	Chapter 2, Chapter 11, Chapter 12, and Chapter 3
Monday	1/27	Nash Equilibrium	Chapter 2, Chapter 11, Chapter 12, and Chapter 3
Wednesday	1/29	Nash Equilibrium	Chapter 2, Chapter 11, Chapter 12, and Chapter 3
Monday	2/3	Nash Equilibrium	Chapter 2, Chapter 11, Chapter 12, and Chapter 3
Wednesday	2/5	Mixed Strategy Nash Equilibrium	Chapter 4
Monday	2/10	Mixed Strategy Nash Equilibrium	Chapter 4
Wednesday	2/12	Mixed Strategy Nash Equilibrium	Chapter 4
Monday	2/17	Exam 1	
Wednesday	2/19	Early Sem Break	Early Sem Break
Monday	2/24	Extensive Games with Perf Info	Chapter 5, Chapter 6, and Chapter 7
Wednesday	2/26	Extensive Games with Perf Info	Chapter 5, Chapter 6, and Chapter 7
Monday	3/2	Extensive Games with Perf Info	Chapter 5, Chapter 6, and Chapter 7
Wednesday	3/4	Extensive Games with Perf Info	Chapter 5, Chapter 6, and Chapter 7
Monday	3/9	Repeated Games: The Prisoner's Dilemma	Chapter 14
Wednesday	3/11	Repeated Games: The Prisoner's Dilemma	Chapter 14
Monday	3/16	Spring Break	Spring Break
Wednesday	3/18	Spring Break	Spring Break
Monday	3/23	Bayesian Games	Chapter 9
Wednesday	3/25	Bayesian Games	Chapter 9
Monday	3/30	Bayesian Games	Chapter 9
Wednesday	4/1	Exam 2 (or maybe a take home, in which case no class)	
Monday	4/6	Extensive Games with Imperfect Information - Signaling	Chapter 10
Wednesday	4/8	Extensive Games with Imperfect Information - Signaling	Chapter 10
Monday	4/13	Extensive Games with Imperfect Information - Signaling	Chapter 10
Wednesday	4/15	Bargaining	Chapter 16
Monday	4/20	Bargaining	Chapter 16
Wednesday	4/22	Bargaining	Chapter 16
Monday	4/27	Auctions	Chapter 3 and Chapter 9

Wednesday	4/29	Auctions	Chapter 3 and Chapter 9
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**EXAM 3 (FINAL) - Monday, May 4, 2020, at 4.30 p.m.**