ECON 670: Probability and Statistics
Professor Mohitosh Kejriwal
Fall 2021

Lectures: Tuesdays and Thursdays, 1:10-2:40pm in RAWLS 2079

Office Hours: via Zoom by appointment

Email: mkejriwa@purdue.edu

Office: KRAN 371

TA/Grader: Linh Nguyen

Email: nguye535@purdue.edu

Course Schedule: The course runs from August 24 to October 7 (the last day of class).

Classroom Guidance Regarding Protect Purdue: The Protect Purdue Plan, which includes the Protect Purdue Pledge, is campus policy and as such all members of the Purdue community must comply with the required health and safety guidelines. Please refer to https://protect.purdue.edu/ as well as the Protect Purdue information on Brightspace for current protocols. Face masks are required in the classroom. No eating or drinking is allowed in the classroom. We will take a five minute break during each lecture in which you can get a drink, use the restroom, etc. Any student who has substantial reason to believe that another person is threatening the safety of others by not complying with Protect Purdue protocols is encouraged to report the behavior to and discuss the next steps with their instructor. Students also have the option of reporting the behavior to the Office of the Student Rights and Responsibilities. See also Purdue University Bill of Student Rights and the Violent Behavior Policy under University Resources in Brightspace.

Attendance Policy: This course follows Purdue's academic regulations regarding attendance, which states that students are expected to be present for every meeting of the classes in which they are enrolled. When conflicts or absences can be anticipated, such as for many University-sponsored activities and religious observations, the student should inform the instructor of the situation as far in advance as possible. For unanticipated or emergency absences when advance notification to the instructor is not possible, the student should contact the instructor as soon as possible by email.

Emergency Preparation: 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. You are expected to read your @purdue.edu email on a frequent basis.

Academic Guidance in the Event a Student is Quarantined/Isolated: In the event that you need to quarantine/isolate, please reach out to me via email so that we can communicate about how you can maintain your academic progress. We will make arrangements based on your particular situation. Please note that, according to *Details for Students on Normal Operations for Fall 2021* announced on the Protect Purdue website, "individuals who test positive for COVID-19 are not guaranteed remote access to all course activities, materials, and assignments."

Academic integrity: Academic Integrity is one of the highest values that Purdue University holds. The Purdue Honor Pledge states "As a boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together - we are Purdue". More information is available at https://www.purdue.edu/odos/osrr/honor-pledge/about.html. 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. Details are available on the course Brightspace table of contents, under University Policies.

Mental Health Statement: 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 office of the second floor of the Purdue University Student Health Center (PUSH) during business hours. A link to CAPS is on the Brightspace shell, under the Student Services and Resources section.

Nondiscrimination Statement: Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life. More details are available on our course Brightspace table of contents, under University Policies.

Accessibility: Purdue University strives to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, you are welcome to let me know so that we can discuss options. You are also encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone: 765-494-1247. More details are available on our course Brightspace under Accessibility Information.

Course Overview: This course provides a rigorous introduction to probability and mathematical statistics that is essential for the study of econometrics. The topics that will be covered include Probability, Univariate and Multivariate Random Variables, Parametric Distributions, Sampling and Large Sample Results. It is important to grasp a firm understanding of the statistical tools we will cover in this course as they will lay the foundation for subsequent courses in Econometrics.

Learning Outcomes: By the end of the course, you will be able to (i) develop close familiarity with several statistical concepts that are useful for economists through class discussion; (ii) appreciate the relevance of these concepts when dealing with economic problems through regular problem sets and practice exercises; (iii) develop a broad picture of the subject by logically connecting the various topics through class discussion.

Problem Sets and Practice Exercises: Problem sets will be assigned on a regular basis. You may choose to work in groups (not exceeding 3 members) on the problem sets. Please submit only one copy per group (be sure to write each group member's name on it) by email to **Linh Nguyen at nguye535@purdue.edu**. Problem sets are not to be turned in during class. In addition, I will post practice exercises from time to time. These will not be graded and you are not required to turn them in. Time permitting, we will talk about some of them in class and you will be expected to try the rest of the problems yourself.

Exams: There will be two exams - a midterm and a final. The midterm will be held **during the week of September 13-17** and the final will be held during the week of **October 11-15** (Please mark your calendars). Please note that the final exam is cumulative and will be based on all material that will be covered during the course.

Grading: Course grades will be based on problem sets (20%), a closed-book midterm (30%) and a closed-book final (50%).

Course Website: All material related to the course will be available through Brightspace at purdue.brightspace.com.

Required Textbook: The textbook for this course is "**Probability and Statistics for Economists**," **by Bruce Hansen.** The book can be downloaded for free at

$$https://www.ssc.wisc.edu/\tilde{}bhansen/probability/Probability.pdf$$

Useful References: (1) "Statistical Inference," by G. Casella and R.L. Berger; (2) "Mathematical Statistics for Economics and Business," by R.C. Mittelhammer.

Lectures and Class Notes: The lectures will primarily be based on a subset of topics covered in the textbook. However, for certain topics, I might cover some additional material in class if the textbook coverage is not adequate. A set of lecture notes will be provided

for each topic. These notes are not exhaustive in that they are intended to provide a basic outline of the lecture material and will not contain the formal derivations of most results. These derivations will be covered in class.

Course Topics [Sections refer to Hansen's textbook]:

1. Basic Probability Theory: Sections 1.1-1.10 (2 lectures)
2. Univariate Random Variables: Sections 2.1-2.20, 2.23 (2 lectures)
3. Multivariate Random Variables: Sections 4.1-4.21 (3 lectures)
4. Parametric Distributions: Sections 3.1-3.4, 3.6, 3.8-3.9, 3.12-.3.14, 3.16-3.18, 5.1-5.5, 5.7-5.9 (3 lectures)
5. Sampling and Asymptotic Theory: Sections 6.1-6.11, 6.18-6.22, 7.1-7.5, 8.1-8.10 (3 lectures)