E370 - Statistical Analysis For Business and Economics
Spring 2023
Indiana University, Department of Economics

Syllabus
Section 8006

Instructor:	Ryan Byun
Office Location:	Wylie Hall (WY) 344
E-mail:	rbyun@indiana.edu
Class Dates:	01/09/23 – 05/05/23
Class Time:	M/W 3:00PM – 4:15PM
Class Location:	Ballantine Hall (BH) 340
Office Hours (in-person & virtual):	M 4:30PM – 5:30PM,
	Th 3:00PM – 4:00PM and by appointment

1. GENERAL INFORMATION

Course Description: The overall goal of this course is to introduce you to the discipline of statistics as a science of understanding and analyzing economic data and not as a branch of mathematics. The class is designed to *provide you with the tools* needed to answer real-world questions and better understand the process of statistical inference in economics. While a good understanding of these universal statistical tools is its own reward and can find applications in many areas[1], our course will mostly discuss examples pertaining to the economics and business world (you are welcome to think about other applications and consult with me if necessary). Additionally, our focus in this course is not an in-depth analysis of a specific field of economics but *the tools* used in different areas. Therefore, be ready to see examples from different fields of economics (health, education, labor, etc.).

Our journey will start from graphical, tabular, and numerical summaries of different types of data and will take us through the topics of probability theory, population and sampling distributions, hypothesis testing, and regression analysis.

Course Objectives: At the completion of the course, you are expected to be able to:

- Translate between plain English and statistical terms and concepts before applying statistical tools. In other words, you are expected to be able to identify key information in the description of the economic problem and write down this information in statistical language/notation (regardless of the wording of the economic situation);
- Select a suitable statistical approach to analyze a new situation;
- Represent data using tables and graphs, and summarize data using a variety of numerical measures;

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[1]For example, by introducing a variety of ways to summarize data in the large datasets, our course develops data analysis and presentation skills, and teaches you to express ideas in a language broadly understood by the researchers in biology, physics, sociology, and other areas.

- Understand (and implement) the process of statistical inference;
- Understand (and perform) basic model building using regression tools;
- Understand the role of underlying assumptions in statistical analyses;
- Use Excel to produce graphs and calculate numerical measures in relation to your analysis. Proficiently read outputs produced by Excel add-ins;
- Interpret quantitative results of statistical analyses for the audience in plain English.

Prerequisites: MATH-M 118 (or equivalent) is required.

2. TEXTBOOK

Recommended Textbook: Robert A. Donnelly. *Business Statistics*, Pearson. 3rd Edition, 2019 (ISBN-13: 978-0134685267).

Please note that eText is included as a part of this course and can be accessed on Canvas through the link *"IU eTexts (Unizin Engage)"* on the left-sidebar. If you prefer, you can purchase a print version of the textbook. In case of a print version, 2nd edition of the textbook is also available for purchase. Textbook materials of 2nd and 3rd editions are very similar.

Optional Reading: Optional readings (articles recommended for boosting your interest in the subject) will sometimes be referenced on the lecture slides. These are non-technical (and fun) readings to demonstrate the use of statistics and help you develop intuition.

3. TECHNOLOGY AND SOFTWARE

Students are expected to have access to Canvas on a regular basis to keep abreast of course evolution as some important announcements and all assignments will be posted on Canvas. Additionally, students are expected to have access to *MS Excel* outside the class to be able to perform calculations in their assignments.

Excel: We will utilize *MS Excel* (Office 2013 or later is recommended) to perform cumbersome calculations. Excel can be accessed for free through IUB Citrix Cloud (`https://uits.iu.edu/iuanyware`). Alternatively, you can download Microsoft Office through IUB at `https://iuware.iu.edu/`, which includes Excel for your platform.

Note: Some Excel calculations in our class will require Data Analysis add-in of Excel. Mac users might find that general Excel instructions cannot be used to get Data Analysis running on their devices. I will post instructions on loading the Analysis ToolPak in Excel for Mac users on Canvas. If these instructions do not work on your device, please try an alternative source: `https://support.office.com/en-us/article/load-the-analysis-toolpak-in-excel-6a63e598-cd6d-42e3-9317-6b40ba1a66b4#OfficeVersion=MacOS`. Alternatively, you can use Excel available through IUanyWare at `https://uits.iu.edu/iuanyware`. While it should be straightforward to log in and use Excel through IUanyWare, if you experience difficulties, please, contact IU tech support (different ways of contacting IU tech support team are listed on IUanyWare home page).

Computers and Other Devices: As an instructor, I will use Excel during the class to demonstrate some calculations and Excel features. Lecture slides on Canvas (*Files - Slides*)

include information relevant to these discussions (screenshots, Excel function descriptions, etc.). Pre-recorded videos demonstrating solutions to some exercises on the slides will be posted on Canvas. Additionally, Excel files with solutions to all the exercises on the slides will be posted on Canvas (*Files - Solutions to Excel Problems (Slides)*).

You are not required to bring a calculator or a laptop to the class. But you are welcome to have your laptop and follow the steps of the analysis performed in Excel during the lecture. This will allow you to practice along, save you some time on the Excel assignments, and make it easier to understand where you have questions and ask them right away in the class. *Note:* No electronic devices are allowed during the exams except calculators.

Canvas: The course will use Canvas for posting class announcements, HWs, quizzes, grades, exam information, and any additional material. I will send messages through Canvas often, so please make sure to **read these messages carefully and check Canvas regularly**.

4. COURSE ASSIGNMENTS

Our course includes several types of assignments:

- Excel assignments. These assignments ask you to submit Excel files with your work for each chapter. Excel assignments are graded *on completion* meaning that the main requirement for getting a grade is that you complete all the work in the assigned problems.

    ○ If time allows, I will discuss and demonstrate how to solve some of the exercises from the Excel assignments during the class.

    ○ You will be able to find pre-recorded videos demonstrating how to solve all exercises from the Excel assignments on Canvas (to locate the videos, look for a content *"Videos with Excel Exercises (Chapter #)"* in the weekly modules).

    ○ Excel files with suggested solutions will be posted on Canvas shortly after the deadline (Files - folder *Solutions to Excel Problems (Slides)*).

- Reading assignments. While reading in statistics may sound like a difficult task, in our class the selected readings are non-technical, easy to read, and even fun. The main goal is to discuss some important concepts in an intuitive way and develop a deeper intuition. On the reading assignments, you will be required to write a short reflection on the reading or answer questions related to the reading. Reading assignments are graded *on completion*.

- Homeworks. Homework assignments will be graded on accuracy in this course. They are constructed to prepare you for the exams and include various types of questions that may as well require short answers and extensive explanations. There may be questions requiring you to analytically, graphically or numerically with the help of Excel analyze a problem. Suggested solutions to the HWs will be posted on Canvas shortly after the deadline.

- Exams. Exams are a culmination of your work on a particular topic (-s). Obviously, exams are graded on accuracy.

- Occasional extra credit activities are possible in the class. Extra credit points will be added to the total score you earn in the class and, therefore, should be regarded as an opportunity to improve your grade (you should not, however, expect that it will be a significant portion of the grade). Extra credit activities may include, but are not limited to, extra credit questions on the HWs and exams, Canvas quizzes, etc. No makeups or deadline extensions will be given for extra credit activities.

- Ungraded self-assessment quizzes (Quick Checks). Theses quizzes are optional and the main goal is to give you an opportunity to check your understanding before you start working on your assignments.

Collaboration: Discussion of class assignments with peers is permissible, could be highly beneficial, and is encouraged. However, your answers submitted for a grade should represent your own work. Note that **offering** and **accepting** Excel files with solutions and answers to the assignment questions on Canvas from others (including students in your class, former students, or any other people) is an academic misconduct and **all involved parties will be penalized** following IU Code of Student Rights, Responsibilities, & Conduct[2]. Please submit your own work.

NO COLLABORATION IS ALLOWED DURING EXAMS!

5. COURSE GRADE

Your course grade will be based on the score (out of **total 1,000 points**) you earn for:

- Departmental Final Exam (comprehensive, multiple choice, maximum 254 pts which is 25.4% of the grade);
- Three midterm exams (multiple choice, maximum 486 pts in total which is 48.6% of the grade);
- Eight homework assignments (maximum 20 pts for each HW or 160 pts in total which is 16% of the grade). There will be nine homework assignments in total, each worth 20 pts. The lowest homework score will be dropped and eight best scores will be counted towards your final grade;
- Eight Excel assignments showing your work on the assigned Excel exercises for each chapter (maximum 10 pts for each assignment or 80 pts in total which is 8% of the grade). There will be nine Excel assignments in total, but the lowest assignment score will be dropped and 8 best scores will be counted towards your final grade;
- Two reading assignments (maximum 10 pts for each assignment or 20 pts in total which is 2% of the grade).

Missed assignments are counted as zero points towards your final grade.

Grade Scale: The final letter grade for the course will be based on the following scale:

								F	(Below 500)
A+	(970 - 1000)	B+	(870 - 899)	C+	(760 - 789)	D+	(620 - 649)		
A	(920 - 969)	B	(820 - 869)	C	(680 - 759)	D	(550 - 619)		
A-	(900 - 919)	B-	(790 - 819)	C-	(650 - 679)	D-	(500 - 549)		

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[2]According to this policy, submitting Excel files previously posted by any E370/S370 instructors or created and used by former E370/S370 students is an academic misconduct and will be treated accordingly.

I reserve a right to make *advantageous* adjustments to this scale in student's favor (curve). Such adjustments will NOT be applied on an individual basis and will only be applied to all students in the class if necessary. However, you should not rely on a possibility of such adjustment when forming your expectations because curving is neither guaranteed nor is a regular practice in this course.

Scores on the border of the letter grade are decided in student's favor towards a higher letter grade. Please, note that this bumping up rule applies only if the **total points** (not the percentage!) are exactly on the border of the letter grade[3].

No grade pleading will be entertained in this class. I very well understand difficulties of the situations faced by the students when I receive their individual requests about raising the grade. But I cannot deviate from the rules I apply to other students in the class. To avoid unpleasant grades in the end, please remember that every bit helps. So, do not miss assignments and extra credit opportunities even if they don't offer a lot of points, and work on earning your grade from the start of the class.

Grade Contests: Except for the final exam, any concerns regarding assignment grades must be contested **within a week** of posting. The window to address such concerns for the final exam will be announced later (but you should expect it to be much shorter than a week). The scores become a permanent part of your record if not contested.

6. Timing of the Assignments, Late Submissions, and Makeup Exams

There are several things to keep in mind about timing and assignment submission rules in this class.

Timing: There is no time limit set on any assignments posted on Canvas in this class. This means that you do NOT need to complete HWs, quizzes, etc. in one sitting. For example, you can start working on a HW and leave it without submitting. Canvas will save your answers. Next time when you open your HW, you will see previously entered answers and will be able to continue working on the HW.

Late Submissions:

Extra Credit Quizzes. No late submission is allowed on these types of assignments (no exceptions will be made). All extra credit quizzes (on Canvas or in-class) have to be submitted on/before the announced deadline.

Quick Checks. These are ungraded optional quizzes and do not have deadlines on them. You can refer to them at any point in the class as needed.

HWs, Excel Assignments, and Readings. These assignments will be accepted late within 48 hours of the deadline with some penalty. **Assignments submitted after the deadline will receive a flat point deduction for each 24-hour period following the due date**. Assignments will face the following flat point deduction for each 24-hour period:

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[3]For example, let us imagine a student whose score is close to a border between A- and A. If their total score is equal to or slightly less than 919, then the score is converted into A- (even if the score is 0.1 below 919). At the same time, if the score is anywhere between 919 and 920, it is converted into A (even if the score is 0.1 above 919).

- HWs: 2 points;
- Excel assignments: 1 points;
- Readings: 1 points.

More specifically, students who submit their HW within $0 - 24$ hours after the deadline receive a deduction of 2 points (independent of their earned score on the HW!). Students who submit their HW within $24 - 48$ hours after the deadline receive a deduction of 4 points (2 points for each 24-hour period). After 48 hours, HWs will not be accepted. Late submissions for Excel assignments and readings will be treated in the same way except for a different point deduction.

Note 1: Recall that, in addition to an opportunity to submit HWs and Excel assignments late, there are also policies that allow students drop the lowest score assignments towards the final grade (please, refer to the Course Grade section of the syllabus).

Note 2: It is expected that you submit your work on Canvas. Your work will NOT be accepted via e-mail (unless the instructions specifically say otherwise). For the file submission assignments (like Excel assignments), please attach your files in the designated space of the assignment or the quiz and avoid submitting your files for grading in the Comments to the assignment. It is not guaranteed that your work will be graded if you submit your file via the Comments section of the assignment.

Makeup Exams: Students are expected to attend class and participate in all graded activities, including midterms and final examinations. Missing an assignment or exam earns zero points.

A student who is anticipating being absent from exam or not being able to submit their graded assignments before the deadline due to **official religious holidays** for which the work is not allowed or **university-approved activities** should provide a written notice to the instructor ahead of time. Please see the end of this Syllabus (Some Policies and Class Rules) for more details. Provided that the instructor was notified on time, students who miss their exam due to these reasons will be granted accommodations in the form of a makeup exam. The instructor will also determine if other graded assignments can be rescheduled or an equivalent work can be done as a makeup, as determined by the instructor.

If you have a hardship or other significant circumstances (including medical conditions) requiring longer-term absences from classes and assignments, or have a death in your immediate family, please contact the Dean of Students Office to request an absence notification memo. The Office will verify documentation related to your absence and contact your instructors, including me, requesting to develop accommodations for these circumstances.

I reserve a right to pick a time and location for the makeup exam depending on proctor and classroom availability. The only acceptable reason for requesting an alternative time for a makeup exam is a class scheduled at the time suggested for a makeup (students will be asked to confirm that they have a schedule conflict by providing a copy of their class schedule).

While the topical coverage of the makeup exam is guaranteed to be the same as the original exam, **makeup exam is not guaranteed to preserve the same format.** Makeup exams will utilize some short-answer and open-ended questions while the original exams will include all multiple-choice questions.

It is imperative that your schedule permits you to take the final exam. **No alternative schedule will be considered for the Final Exam in this class**. Students who fail to attend the final exam because of catastrophic occurrence, which is beyond the student's control and necessitates their absence, and who have a passing grade up to that point should contact me as soon as possible.

Please bring your Indiana University ID to each exam.

7. EXAM DATES

Exam dates are tentatively set in the syllabus and are subject to change in the extreme circumstances:

Exam 1	February 8 (W)
Exam 2	March 8 (W)
Exam 3	April 12 (W)
Final Exam	**May 2 (Tu) 12:40–2:40PM**

All midterm exams will take place during regular class hours. Topics covered in the midterms will be specified prior to each exam. The midterm exams are not cumulative and cover only the part of the course that was not tested in the previous exams. The midterms are scheduled during regular class time. **The Final Exam is cumulative** and covers all topics discussed in the class.

Please note that the final exam for our class is Department-wide. The time for the Departmental final exams is determined by the IU Office of the Registrar and is outside of my control. Therefore, no alternative schedule for the final exam will be considered (please plan your travel at the end of the semester carefully accounting for the schedule of your E370/S370 final exam!).

8. IMPORTANT DATES

Course Deadlines: You are responsible for changing your status in the course (drop or withdraw) within school established time period. I will not be able to drop the course for you if you miss the deadline. Some important deadlines are listed below and additional information is available at `https://utilities.registrar.indiana.edu/calendars/official-calendar/`.

Add/Drop Deadline (no W grade)	Jan 15, 2023
Course Withdrawal Deadline (automatic W)	Apr 28, 2023
Complete Session Withdrawal Deadline	Apr 28, 2023

Other Important Dates:

MLK day	Jan 16, 2023 (no classes)
Spring Break	March 12 – March 19, 2023 (no classes)

Tentative Course Schedule

Week	Topic	Assignments
Week 1	Course Introduction. Ch 1. Statistics and Data.	
Week 2	Ch 2. Displaying Descriptive Statistics.	Excel Assgnmt (Ch 2) Reading (Ch 2) HW1
Week 3	Ch 3. Calculating Descriptive Statistics.	Excel Assgnmt (Ch 3) HW2
Week 4	Ch 4. Introduction to Probability. Ch 5. Discrete Probability Distributions (Binomial Distribution).	Excel Assgnmt (Ch 5) HW3
Week 5	Ch 5. Discrete Probability Distributions (Binomial Distribution). Exam 1	
Week 6	Ch 6. Continuous Probability Distributions (Normal Distribution).	Excel Assgnmt (Ch 6) HW4
Week 7	Ch 7. Sampling and Sampling Distributions.	HW5
Week 8	Ch 7. Sampling and Sampling Distributions.	Excel Assgnmt (Ch 7)
Week 9	Exam 2	
Week 10	SPRING BREAK	
Week 11	Ch 8. Interval Estimation.	Excel Assgnmt (Ch 8) HW6
Week 12	Ch 9. Hypothesis Testing, Single Parameter (Mean).	Excel Assgnmt (Ch 9, P1) Reading (Ch 9) HW7
Week 13	Ch 9 Hypothesis Testing, Single Parameter (Proportion).	Excel Assgnmt (Ch 9, P2) HW8
Week 14	Exam 3	
Week 15	Ch 14. Simple Linear Regression.	Excel Assgnmt (Ch 14) HW9
Week 16	Ch 15. Multiple Regression.	Excel Assgnmt (Ch 15)

Note 1: The schedule may be adjusted as needed (changes will be announced in class and on Canvas).

Note 2: We will strive to maintain the following deadlines to make it easier for you to remember when to submit your work (deviations from this tentative rule are possible and specific deadlines depend on our progress in the class):

○ Extra credit quizzes, Excel assignments, and Readings: Due on Sundays, midnight;

○ HWs: due on Tuesdays of the following week, midnight.

Some Policies and Class Rules

Phones: Please put your cell phones in the silent mode while in class!

Emails: I reserve a right not to respond or reply with a short "Please, check the Canvas page" to the emails asking me to reiterate information from an announcement on Canvas. Make sure you send all of your course-related emails via your IU email or Canvas. Failing to use these tools for email communication might send your email to the spam folder.

Copyright: The instructor of course holds the exclusive right to distribute, modify, post, reproduce, and link to course materials, including all notes, videos, lecture slides, assignments, Excel files with solutions, and exams. You cannot distribute, post, or alter this material. You are encouraged to take notes and make copies of course materials for your own educational use. But you may not, nor may you knowingly allow others, to re-post in other forums, distribute, or reproduce content from this course without the express written permission of the instructor (this also includes providing materials to commercial course material suppliers such as CourseHero and other similar services).

Any violation of this course rule will be reported to the appropriate university offices, including the Dean of Students, as academic misconduct.

Final Exam Policies: You can find IU Final Exam policies at `http://enrollmentbulletin.indiana.edu/pages/finexpol.php` and should appeal to them if you 1) have more than three final exams in one day, 2) have final exams conflicts, 3) missed the final exam.

Disability Accommodations: Accommodations will be made for students registered with Office of Disability Services for Students (DSS). If you need an accommodation for a disability, then it is your responsibility to register with DSS and contact me outside of class to present the written supporting memorandum of accommodation. Note that requests for accommodations for disability must be received and authorized by your instructor in written form no less than two weeks in advance of need, in order to allow adequate time to review and make appropriate arrangements. No accommodations should be assumed until authorized by your instructor. Additional information can be found at `https://studentaffairs.indiana.edu/disability-services-students/`.

Religious Accommodations: Accommodations will be made for students who want to observe their religious holidays provided that the student notifies the instructor no later than two weeks prior to the anticipated absence. Students needing accommodations for a religious observance must submit a request using officially approved form located here: `https://vpfaa.indiana.edu/faculty-resources/teaching-resources/religious-observances-information.html`.

University-Approved Activities: Accommodations will be made for students who miss the schoolwork because of university-approved activities. If you are participating in a university-approved activity (`https://studentaffairs.indiana.edu/student-support/dean-of-students/attendance.html`), please let me know as early in the course as possible so that accommodations can be made (beginning of the semester or at least two weeks in advance of the absence).

Academic Integrity and Ethical Behavior: In addition to skills and knowledge, IU aims to teach you appropriate ethical and professional standards of conduct and inform you of obligations in upholding the highest standards of professional and ethical integrity. You will

find an extensive information on these matters in IU Code of Student Rights, Responsibilities, and Conduct (`http://studentcode.iu.edu/`).

In line with these policies, dishonesty of any kind will not be tolerated in this course. Dishonesty includes, but is not limited to, cheating, plagiarizing, fabricating information, facilitating acts of academic dishonesty by others, having unauthorized possession of examinations, submitting work of another person or work previously used without informing the instructor, or tampering with academic work of other students. Whenever in doubt, ask me about appropriateness of your actions. Students who are found dishonest will receive the most severe academic sanction consistent with IU polices.

FAQ

Why is there so much work in this class? First, in E370/S370 each new concept requires a deep understanding of the previously studied ones. Frequent assignments ensure that you master each part of the course at a sufficient level before we move on. Second, statistics is learned by *doing* it. Assignments ask you to *do* statistics, i.e. focus on actually doing it rather than passively reviewing and reading.

Do I need to remember all formulas for the exams? No! You will be provided with the formula sheet including the most important formulas covered in the course up to the exam date. Sample formula sheets are already posted on Canvas (*Files* link, folder *Exams*). Adjustments are possible depending on the class progress towards the exam date.

How am I going to do complicated calculations that require Excel in the exam? Exam questions are designed to avoid complex and time-consuming calculations including those for which Excel is required. It is achieved through several channels. First, the numbers are selected such that calculations are easy to do on a calculator. Second, questions limit complexity of calculations by reducing the amount of data in the problem. Third, questions formulate a problem with "ready-to-use" numbers calculated in Excel (so that no additional Excel calculations are necessary) and ask you to focus on interpretation. Therefore, you should not worry about Excel calculations aspect of the exams.

Do I need to bring a calculator to the exam? Yes, it is recommended that you have a calculator during the exam. I try to minimize calculations in exams and recommend you to focus on fundamentals and important concepts. Also, majority of calculations in the exams can be done "by hand". However, some of them might be time-consuming to perform manually. To save time (and release stress related to the calculation part), it is recommended that you have a calculator.