

# APPLIED STATISTICS



INF397  
Spring 2021  
Asynchronous

## COURSE DESCRIPTION

This course is an introduction to applied statistics. It is designed to help you develop foundational skills and confidence in quantitative methods for industry or academic jobs. You will learn to use quantitative information to identify, evaluate, and solve problems in logical, empirically-grounded, and accessible ways. These foundational skills will improve your confidence and ability to understand and evaluate quantitative information and research; develop and design basic quantitative research studies; and prepare for future coursework or on-the-job learning.

## COURSE OBJECTIVES

During this course you will be able to:

1. Identify and explain the basic terminology, core concepts, and basic principles of quantitative reasoning (Bayesian & Frequentist)
2. Build a basic statistical toolbox, which includes:
  - a. *Statistical Tools & Techniques* (i.e., identifying & explaining utility & limitations)
  - b. *Data* (i.e., understanding availability, utility, & limitations of data types & sources)
  - c. *Software* (i.e., demonstrating ability to learn new software)
  - d. *Ethics* (i.e., identifying & explaining ethical implications of research decisions and offer recommended course of action)
3. Understand basic steps of effective and ethical quantitative research design to propose a research study
4. Summarize and explain trends in research methods in industry research or academic research area of interest.

## COURSE STRUCTURE

This course is delivered in an asynchronous, online format. Students will complete one module per week which includes a weekly lab and low-stakes assessment. Assignments will be due each Wednesday—except during the first and last weeks of the semester. Students may schedule meetings with the instructor as needed.

## INSTRUCTOR



**Brenda L. Berkelaar PhD**  
she/her/hers

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## COURSE REQUIREMENTS AND ASSIGNMENTS

Whether you are comfortable or familiar with statistics or not, this course is set up to help you succeed. Specifically, the course is designed to give you the foundational skills in quantitative reasoning and research practice needed for industry or academic settings. It's a big area—where going to give you the big picture view with foundational skills so you can continue to grow.

Detailed instructions & rubrics will be available on [Canvas](#).

- **Weekly Lab Assignments** | 40 % | Objectives: 1, 2, 3, 4  
Students will receive weekly lab assignments focused on building your statistical toolbox in terms of statistical tools and techniques, data, software, and ethics. Detailed assignments with instructions will be provided in each Canvas module.
- **Low-Stakes Formative Assessments** | 20 % | Objectives: 1, 2, 3  
Students will complete weekly low-stakes formative assessments that include a reflection (e.g., minute-papers), demonstration component (e.g., online quizzes), or both. Reflection assignments will be graded as complete/incomplete. Quizzes will be online. To encourage retention, quizzes may incorporate questions from current or previous modules. Students will have unlimited chances to take a quiz before the deadline. Each module includes at least one formative assessment.

- **Get Help. Give Help** (AKA Online Discussion) | 20% | Objectives 1, 2  
Research involves being part of a community. It involves asking for advice and help and giving advice and help. To learn how to be part of a research community students will participate regularly in an online discussion. We will be using Slack. Both asking questions and answering questions also are two evidenced-based strategies for encouraging effective, deep, and transferable learning.

Expect to post briefly at least 2 - 3 times throughout the week. We will be using [Slack](#), one of the dominant tools for workplace chats. Your "Get Help. Give Help" grade is based on: (a) Consistent and beneficial contributions to online discussion (pass/fail); (b) Two self-reflections on your online communication (letter grade). Postings might include questions, responses, reflections, and applications of course materials; relevant outside material; or feedback.

- **Final Project** | 20 % | Objectives 1, 2, 3, & 4  
Students will work individually or in small groups (2 - 3 people) to complete a project (5 - 15 pp) with regular milestones incorporated into Canvas modules. Length will depend on audience, context, & genre. Students will choose between:
  - Crafting page white paper or literature review describing & evaluating research methods on topic of choice to provide foundation for developing and demonstrating relevant industry or academic expertise; or
  - Crafting a research proposal with literature review about a question of interest. This proposal will demonstrate the ability to identify an essential question, design a study, and identify opportunities and constraints.

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### SIDEBAR

*Online discussions in courses have an (often understandably) bad reputation. They don't have to be this way.*

*Re-imagine online discussion as a place to get help and give help. Practice getting advice, giving advice, and working through dilemmas.*

*Think of online discussion as a conversation (back-and-forth "intellectual texting" or chatting). Consider your audience and how to connect with them in digital spaces. I chose [Slack](#) because it lets you practice communicating with real-world audiences using one of the dominant workplace tools.*

*Not sure what to do? Ask. I'm happy to help. Plus, if you ask on Slack it also helps your grade and other people in the class will benefit from your curiosity.*

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# COURSE MATERIALS

## REQUIRED

No additional charges required for any course materials

- Stable **computer, internet** connection, and up-to-date browser with backup plan if possible.
- **UT VPN** at <http://vpn.utexas.edu>. Follow instructions at: <https://wikis.utexas.edu/display/engritgpublic/Connecting+to+the+University+of+Texas+VPN> to setup two-factor authentication with Duo and Install the Cisco Secure Mobility Client. Contact the UT or the I-School helpdesks to setup VPN if you are having issues
- **RStudio Server Pro** at <https://rstudio.ischool.utexas.edu/>. | Although RStudio can be installed locally, the use of RStudio Server Pro provides a consistent programming environment that streamlines teaching and learning. Access will be available on first day of class. You will need to be on the UT VPN to access RStudio Server Pro. You are free to play with a local installation; however, I will not be able to support local installations.
- **Canvas** at <http://canvas.utexas.edu> | Readings and resources are available on Canvas at no additional cost. *Introductory Statistics* and *R for Data Science* are freely available.
- **Slack** at [Appliedstats-Sp2021.slack.com](https://appliedstats-sp2021.slack.com) | No additional cost to use application on web, phone, or computer. You will receive an invitation using the email address on record with UT by the first day of class.

*If you have any difficulties getting any of these materials for any reason, let me know. I'm happy to help. We'll find a solution together. Also, if you want recommended resources, I likely have some. Just ask.*

## GRADING POLICIES

### GRADE APPEALS

If you want to appeal a grade, please know within one (1) week so we can get it sorted out. I encourage waiting 48 hours before submitting a grade appeal because this tends to improve people's decision making and communication especially if emotions are running high. (Plus, it's more pleasant for all involved). Please submit your appeal in writing with any relevant information. *You are responsible for keeping grading comments, submission receipts, and assignments through the end of the semester.* If I made a mistake, I'll fix it.

### LATE WORK

Meeting deadlines is an essential part of research. Generally, I don't accept late assignments because it usually just prolongs stress and work for everyone. Instead, I provide students with 2 "golden tickets" for this course which provide 24 hours, no penalty, no questions-asked extension. More information will be provided.

If you are still having difficulty meeting one or more deadlines, let me know as soon as possible, in advance of the deadline unless you have no means of contacting me. The earlier you let me know the more options we have. Plus, being upfront and talking through possible options is good practice for the rest of life as well—because as recent months have made broadly visible—things happen.

### INCOMPLETES

Incompletes are available for cases of last minute medical or similar emergency. Documentation may be required. If you're not sure what to do, please ask. I'm here to help.

Grade	Percentage
<b>A</b>	<b>93.5 - 100%</b>
A-	89.5 - 93.4%
B+	86.5 - 89.4 %
<b>B</b>	<b>83.5 - 86.4%</b>
B-	79.5 - 83.4%
C+	76.5 - 79.4%
<b>C</b>	<b>73.5 - 76.4%</b>
C-	69.5 - 73.4%
D+	67.5 - 69.4%
<b>D</b>	<b>63.5 - 67.4%</b>
D-	59.5 - 63.4%
F	0 - 59.4

## COURSE SCHEDULE

Week/ Module	Start	Due	Topic	Readings	Tasks
1	Tues, Jan 19	Weds, Jan 27	Course Orientation and Setup	<ul style="list-style-type: none"> <li><input type="checkbox"/> Syllabus</li> <li><input type="checkbox"/> Cassie Kozyrkov (2018). <i>Statistics for people in a hurry</i>. (print or audio)</li> <li><input type="checkbox"/> <i>R for Data Science</i>, Ch 1 - 3.5ish (Ignore information on R and RStudio installation we will be using RStudio Server; Ch. 2 is 1 page)</li> <li><input type="checkbox"/> Martin Schwarz (2008) "The importance of stupidity in scientific research"</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Complete Module 1 which includes:               <ul style="list-style-type: none"> <li><input type="checkbox"/> Setup VPN</li> <li><input type="checkbox"/> Access RStudio Server</li> <li><input type="checkbox"/> R-Orientation Lab 1</li> </ul> </li> <li><input type="checkbox"/> Chat on Slack to "Get Help. Give Help"</li> </ul>
2	Thurs, Jan 28	Weds, Feb 3	An Introduction to Statistics & Probability - Good, Bad, & Ugly	<ul style="list-style-type: none"> <li><input type="checkbox"/> <i>R for Data Science</i>, Ch 3.5ish - 5</li> <li><input type="checkbox"/> <i>Introductory Statistics</i>, Ch 3</li> <li><input type="checkbox"/> Cathy O'Neil (2016). <i>Weapons of Math Destruction-excerpt</i> or NPR audio interview</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Complete Module 2 which includes Lab 2</li> <li><input type="checkbox"/> Chat on Slack to "Get Help. Give Help"</li> </ul>
3	Thurs, Feb 4	Weds, Feb 10	What are the fundamentals of probability for applied statistics? (e.g., Types of variables, distributions, calculations, simulations)	<ul style="list-style-type: none"> <li><input type="checkbox"/> <i>R for Data Science</i>, Ch 6 - 7</li> <li><input type="checkbox"/> <i>Introductory Statistics</i>, Ch 4 &amp; Ch 5 Discrete Random Variables; Ch 4: Continuous Random Variables</li> <li><input type="checkbox"/> Gary Hasselbach &amp; Pernille Tranberg (2016). <i>Data ethics: The new competitive advantage</i> - excerpt</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Complete Module 3 which includes Lab 3</li> <li><input type="checkbox"/> Chat on Slack to "Get Help. Give Help"</li> <li><input type="checkbox"/> Propose research topic &amp; problem for the final project</li> <li><input type="checkbox"/> Schedule brief meeting with Dr. B to Are you discuss project</li> </ul>
4	Thurs, Feb 11	Weds, Feb 17	How can we talk about our data? (e.g., distributions, visualizations, and data storytelling)	<ul style="list-style-type: none"> <li><input type="checkbox"/> <i>R for Data Science</i>, Ch. 8 - 9</li> <li><input type="checkbox"/> Sorin Matei (2020). <i>Data Storytelling</i>.</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Complete Module 4 which includes Lab 4</li> <li><input type="checkbox"/> Chat on Slack to "Get Help. Give Help"</li> </ul>
5	Thurs, Feb 18	Weds, Feb 24	What makes a "good" sample? How can we choose one that is powerful enough? (e.g., principles, practices, and techniques of ethical, effective sampling)	<ul style="list-style-type: none"> <li><input type="checkbox"/> <i>R for Data Science</i>, Ch 9 - 10</li> <li><input type="checkbox"/> <i>Jacob Meltcalf &amp; Kate Crawford (2016)</i> Where are the human subjects in Big Data research? The emerging ethics divide</li> <li><input type="checkbox"/> <i>Introductory Statistics</i>, Ch 1, 6, &amp; 7</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Complete Module 5 which includes Lab 5</li> <li><input type="checkbox"/> Submit project outline Chat on Slack to "Get Help. Give Help"</li> </ul>

Week/ Module	Start	Due	Topic	Readings	Tasks
6	Thurs, Feb 25	Weds, Mar 3	How can we describe our data? (e.g., variance, standard deviation, skewness, kurtosis,) How does that fit with data wrangling?	<input type="checkbox"/> <i>R for Data Science</i> , Ch 11 - 12 <input type="checkbox"/> <i>Introductory Statistics</i> , Ch 2	<input type="checkbox"/> Complete Module 6 which includes Lab 6 <input type="checkbox"/> Chat on Slack to "Get Help. Give Help" <input type="checkbox"/> Submit Reflection 1 for Get Help, Give Help
7	Thurs, Mar 4	Weds, Mar 10	What is the difference between Bayesian & Frequentist, and do we have to pick a side?  (Concepts include: Hypothesis testing, p-values, confidence-intervals, prior & posterior probabilities, estimation, prediction; fixed vs. random parameters; type 1 & type 2 error; null hypothesis significance testing, maximum likelihood estimation, etc.)	<input type="checkbox"/> <i>Introductory Statistics</i> , Ch. 9, <i>Hypothesis Testing</i> (frequentist) <input type="checkbox"/> Therese Donovan & Ruth Mickey (2019) <i>Bayesian Statistics for Beginners</i> , Ch. 3 <input type="checkbox"/> <i>R for Data Science</i> , Ch 13 - 14 Recommended: <i>Frequentist &amp; Bayesian Approaches in Statistics</i> (2016)	<input type="checkbox"/> Complete Module 7 which includes Lab 7 <input type="checkbox"/> Chat on Slack to "Get Help. Give Help"
8	Thurs, Mar 11	Weds, Mar 24		<input type="checkbox"/> <i>R for Data Science</i> , Ch 14 - 15 <input type="checkbox"/> Therese Donovan & Ruth Mickey (2019). <i>Bayesian Statistics for Beginners</i> . Ch. 4 <input type="checkbox"/> Christie Aschwanden (2019). We're all 'P-hacking' now. <i>Wired</i> <input type="checkbox"/> Uri Simonsohn, Joseph Simmons & Leif Nelson (2011). <i>False-positive psychology</i> .	<input type="checkbox"/> Complete Module 8 which includes Lab 8 <input type="checkbox"/> Chat on Slack to "Get Help. Give Help" <input type="checkbox"/> Provide feedback on your group
SPRING BREAK   March 15 - 20					
9	Thurs, Mar 25	Wed, Mar 31	How do we choose the right tool for the job? How do we learn that tool? (Preview of concepts & techniques for Bayesian and frequentist stats; e.g., : correlation, t-test, linear regression; independent groups, Chi-Square, MCMC, Joint Likelihood; Specific weeks will emphasize topics selected based on earlier evaluation, final projects, & student interests.)	<input type="checkbox"/> <i>R for Data Science</i> , Ch 16 - 17 <input type="checkbox"/> TBD depending on evaluation, projects, and interests of students	<input type="checkbox"/> Complete Module 9 which includes Lab 9 <input type="checkbox"/> Chat on Slack to "Get Help. Give Help" <input type="checkbox"/> Submit draft of group project
10	Thurs, Apr 1	Wed, Apr 7		<input type="checkbox"/> <i>R for Data Science</i> , 17 - 19 <input type="checkbox"/> TBD depending on evaluation and interests of students	<input type="checkbox"/> Complete Module 10 which includes Lab 10 <input type="checkbox"/> Chat on Slack to "Get Help. Give Help"

Week/ Module	Start	Due	Topic	☐ Readings	☐ Tasks
11	Thurs, Apr 8	Weds, Apr 14		<ul style="list-style-type: none"> <li>☐ <i>R for Data Science</i>, Ch 20 - 21</li> <li>☐ TBD depending on evaluation and interests of students</li> </ul>	<ul style="list-style-type: none"> <li>☐ Complete Module 11 which includes Lab 11</li> <li>☐ Chat on Slack to "Get Help. Give Help"</li> </ul>
12	Thurs, Apr 15	Weds, Apr 21		<ul style="list-style-type: none"> <li>☐ <i>R for Data Science</i>, Ch 22 - 23</li> <li>☐ TBD depending on evaluation and interests of students</li> </ul>	<ul style="list-style-type: none"> <li>☐ Complete Module 12 which includes Lab 12</li> <li>☐ Chat on Slack to "Get Help. Give Help"</li> <li>☐ Schedule final meeting with Dr. B</li> </ul>
13	Thurs, Apr 22	Weds, Apr 28		<ul style="list-style-type: none"> <li>☐ <i>R for Data Science</i>, Ch 24 - 25</li> <li>☐ TBD depending on evaluation and interests of students</li> </ul>	<ul style="list-style-type: none"> <li>☐ Complete Module 13 which includes Lab 13</li> <li>☐ Chat on Slack to "Get Help. Give Help"</li> <li>☐ Submit full draft of project and schedule meeting with Dr. B</li> </ul>
14	Thurs, Apr 29	Weds, May 5	What's next? How can you link these foundations to future work & learning?	<ul style="list-style-type: none"> <li>☐ <i>R for Data Science</i>, selections of Ch 26 - 30</li> </ul>	<ul style="list-style-type: none"> <li>☐ Complete Module 14 which includes Lab 14</li> <li>☐ Chat on Slack to "Get Help. Give Help"</li> <li>☐ Submit Peer Feedback for Teams</li> </ul>
15	TBD				<ul style="list-style-type: none"> <li>☐ Submit Final Project</li> <li>☐ Submit Reflection 2: Get Help. Give Help.</li> </ul>

## LAND ACKNOWLEDGMENT

We would like to acknowledge that we are meeting on Indigenous land. Moreover, we would like to acknowledge and pay our respects to the Carrizo & Comecrudo, Coahuiltecan, Caddo, Tonkawa, Comanche, [Lipan Apache](#), [Alabama-Coushatta](#), Kickapoo, [Tigua Pueblo](#), and all the American Indian and Indigenous Peoples and communities who have been or have become a part of these lands and territories in Texas, here on Turtle Island.”

To learn more, see:

- [Land Acknowledgements](#) from the Committee on Land Acknowledgement, Program in Native American and Indigenous Studies (NAIS), The University of Texas at Austin
- [Beyond Territorial Acknowledgements](#) at [Âpihtawikosisân.com](#); and the
- The [Indigenous Cultures Institute](#)

## POLICIES & SERVICES

### ACCOMMODATIONS FOR DOCUMENTED DISABILITIES

Please let us know if you need accommodations and provide a copy of the letter issued by Services for Students with Disabilities. The University of Texas at Austin provides appropriate academic accommodations, upon request, for qualified students with disabilities. Students who require special accommodations are encouraged to report to the Division of Diversity & Community Engagement, Services for Students with Disabilities, (512) 471-6259 <http://www.utexas.edu/diversity/ddce/ssd/>

### HONOR CODE AND ACADEMIC HONESTY

Students are responsible for conducting themselves with honor and integrity. I expect you to follow the University Honor Code: “The core values of The University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the University is expected to uphold these values through integrity, honesty, trust, fairness, and respect toward peers and community” (Catalog, 2013-2014). You are expected to be familiar with the University's Policy on Academic Honesty, found in the catalog. Students who violate University rules on academic dishonesty are subject to disciplinary penalties, including possibility of failure in the course and/or dismissal from the University. For more information visit the Student Judicial Services site: <http://deanofstudents.utexas.edu/sjs>

### DROP POLICY

There are limits on when and how often you can drop a course. See University Policies (<http://registrar.utexas.edu/docs/catalogs/gi/ut.cat.gi0809.pdf> ) and contact your advisor to determine options.

### UT EMAIL ADDRESS & CANVAS

To avoid missing crucial course or university information, we expect you to check email and Canvas regularly. (We recommend once a business day. University policy requires that you keep your official email address up to date. We use Canvas for communication, submitting assignments, and accessing course materials. All course announcements will be made on Canvas.

### RELIGIOUS HOLIDAYS

If you will be absent to observe a religious holiday, UT requires you notify your instructor at least 14 days prior to dates you will be absent. If you meet this requirement, I will allow one week to complete the missed work.

## **BEHAVIORAL CONCERNS & COVID-19 ADVICE LINE (BCAL)**

If you have concerns about odd or unusual behavior by someone or have questions about COVID-19 and need support and resources, call the BCCAL at: 512-232-5050 or [use the online forms](#).

## **TITLE IX REPORTING REQUIREMENTS**

"Beginning January 1, 2020, Texas Senate Bill 212 requires all employees of Texas universities, including faculty, report any information to the Title IX Office regarding sexual harassment, sexual assault, dating violence and stalking that is disclosed to them. Texas law requires that all employees who witness or receive any information of this type (including, but not limited to, writing assignments, class discussions, or one-on-one conversations) must be reported.

If you would like to speak with someone who can provide support or remedies without making an official report to the university, please email [advocate@austin.utexas.edu](mailto:advocate@austin.utexas.edu). For more information about reporting options and resources, visit <http://www.titleix.utexas.edu/>, contact the Title IX Office via email at [titleix@austin.utexas.edu](mailto:titleix@austin.utexas.edu), or call 512-471-0419."

## **SHARING OF COURSE MATERIALS IS PROHIBITED**

"No materials used in this class, including, but not limited to, lecture hand-outs, videos, assessments (quizzes, exams, papers, projects, homework assignments), in-class materials, review sheets, and additional problem sets, may be shared online or with anyone outside of the class unless you have my explicit, written permission. Unauthorized sharing of materials promotes cheating. It is a violation of the University's Student Honor Code and an act of academic dishonesty. I am well aware of the sites used for sharing materials, and any materials found online that are associated with you, or any suspected unauthorized sharing of materials, will be reported to [Student Conduct and Academic Integrity](#) in the Office of the Dean of Students. These reports can result in sanctions, including failure in the course."

[If you would like to share something from the class with someone else, please ask. We can often find a solution.]

## **CRAFTING ASSIGNMENTS**

In the spirit of [job crafting](#), if you have a different idea for an assignment or want to redesign an assignment in a way that would fulfill the course objectives, let me know. Why? It can encourage engagement, resilience, and thriving. We just need to ensure it is equivalent work towards the same objectives.

## **WRITING COACHING AND TRAINING**

We encourage you to schedule appointments for coaching and feedback from the University Writing Center (<http://uwc.utexas.edu/>) to build on strengths and address opportunities for improvement. Their services are included as part of your tuition and fees.

NOTE: For complete set of university policies please see: <https://policies.utexas.edu/>, in particular the [Institutional Rules on Student Services and Activities](#), the [University Code of Conduct and the University's Student Honor Code](#).