Syllabus: Data Analysis & Visualization

Course & Instructor Information

Course Information

Course Title, Prefix, Number, Section: Data Analysis & Visualization, GEOG 30323, 015 REG

Semester and Year: Fall 2026

Number of Credits: 3

Course Component Type: Lecture

Class Location: Rees-Jones 216

Class Meeting Day(s) & Time(s): Tuesday/Thursday 9:30am-10:50am

Zoom Access Information: N/A

Instructor

Instructor Name: Dr. Kyle Walker

Office Location: Scharbauer 2004E

Office Hours: By appointment

Preferred Method of Contact: Email

Email: kyle.walker@tcu.edu

Response Time: 1 business day

Final Evaluative Exercise & Important Dates

FINAL EVALUATIVE EXERCISE: Exam #2, held in person.
Date and time: Tuesday, December 15, 8:00am–10:30am (the full scheduled final examination period).
Location: Rees-Jones 216.
Format: Students submit the completed Exam #2 notebook at the start of the session, present their analysis to the class, and take part in the discussion of their classmates' work. Attendance and participation in the discussion count for 5 of the exam's 20 points.

Note for students: The syllabus is your first course reading. It provides an orientation to, overview of the flow, and expectations of the course. You should turn to the syllabus for details on assignments and course policies.

Student Resources & Policy Information

Click or scan QR code for resources to support you as a TCU student. Please note section on Student Access and Accommodation, Academic Conduct & Course Materials Policies, and Emergency Response & TCU Alert.

COURSE DESCRIPTION

Catalog Description

This course introduces students to the data analysis process using the Python programming language. Topics covered include obtaining data from a variety of sources, including databases and the Web; cleaning messy datasets and converting data between different formats and types; using exploratory data analysis to summarize and generate insights from data; and producing both static and interactive visualizations to explore data and communicate findings with a wider audience. Students will also gain foundational skills in the Python programming language, one of the most popular languages for data wrangling, data analysis, and data visualization.

Prerequisites & Concurrent Enrollment

None.

Program & Major Connections

Data literacy has emerged as an essential skill of the 21st century workforce across many different professional fields and contexts. In this course, students will gain practical experience with the data analysis process, learning the skills required to obtain, clean, analyze, and visualize data using Python. These skills are directly applicable to careers in industry, research, and government across many disciplines.

COURSE MATERIALS

Required Materials

There are two required texts for this course, both freely available online: Downey, Allen (2024). Think Python: How to Think Like a Computer Scientist (Needham, MA: Green Tea Press), available at https://allendowney.github.io/ThinkPython/; and Wilke, Claus O. (2019). Fundamentals of Data Visualization (Sebastopol, CA: O'Reilly Media), available at https://clauswilke.com/dataviz/. Additional course readings will be made available via TCU Online by web link or PDF. Readings should be completed prior to the week in which they are assigned.

Teaching Philosophy & Methodology

Class sessions will be hybrids of lecture, discussion, applied tutorials, and assignment work. The class will be managed through its corresponding TCU Online website, accessible through the portals at http://my.tcu.edu or http://d2l.tcu.edu. Students will use Google's Colaboratory tool to complete assignments and exams, which will require a Google account. Complete instructions on how to sign up and enable Colaboratory will be provided in class. You will submit your assignments via the TCU Online website, and I'll use the website to post relevant course announcements and lecture notes.

I believe strongly in setting up an environment for student success. All students are capable of succeeding in this course if they come to class prepared and engaged. In my teaching, I encourage students to think about the “big picture” in terms of the skills they learn. We will frequently apply course concepts and activities to potential practical applications in their careers and adult lives.

Learning Outcomes

Course Learning Outcomes

Students in this course will learn how to:

1. Obtain, clean, and wrangle data from a variety of sources using Python;
2. Apply exploratory data analysis techniques to summarize and generate insights from data;
3. Produce both static and interactive visualizations to explore data and communicate findings to a wider audience.

TCU Outcomes: Core Curriculum

Core Curriculum Outcomes: N/A

Course Requirements

Assignments

There are a total of 100 possible points in this course. Evaluation for this course will be based upon regular data analysis assignments, in-class exercises, and two take-home examinations.

Data analysis assignments will give students practical experience with the topics we cover in class. They will consist of problem-solving exercises that employ the analytical and computing skills learned by the students. There will be ten data analysis assignments during the semester, comprising **50 points** of the course grade in total. Assignments are typically released each Thursday and due by the end of the day the following Thursday. Devoted class time will be available most weeks to work on assignments. Late assignments are penalized 10 percent per day past the due date.

The last day to submit data analysis assignments for any credit is the final day of classes, December 9.

In-class exercises are short activities completed during scheduled class time and submitted prior to the end of class for credit. In sum, in-class exercises will comprise **10 points** of the course grade. In-class credit cannot be made up without an excused absence (documented illness or emergency, or a TCU-sanctioned activity).

Examinations comprise **40 points** of the course grade. Each examination consists of a structured set of problems that test students on the computing and analytical skills learned to that point in the course. Deliverables will be Colab Notebooks that show and describe the work completed. Students will receive each prompt approximately two weeks before its due date. Examinations must be submitted by their deadlines to ensure fairness for all students.

- **Exam #1** (**20 points**) will be distributed during Week 7 and is due Friday, October 16 at 11:59pm.
- **Exam #2** (**20 points**) is the **final evaluative exercise** for this course, and it is held in person during our scheduled final examination period, Tuesday, December 15 from 8:00am to 10:30am in Rees-Jones 216. The prompt will be distributed during Week 15. Students submit their completed notebook at the start of the session.

For both exams, an oral component accompanies the submitted notebook: of each exam's 20 points, 15 are earned by the submitted notebook and 5 by the oral component. For Exam #1, each student will sign up for a brief individual meeting with the instructor during Week 9 class sessions (October 20 and 22) to discuss and defend their submitted answers. For Exam #2, students will present their analysis to the class and take part in the discussion of their classmates' work during the final examination period; attendance for the full period is required. Students who miss their scheduled Exam #1 meeting or do not attend the final examination period forfeit the oral-component points and will receive an additional 5-point penalty, except in the case of an excused absence.

Students will submit assignments, view grades, and receive feedback on assignments via the course TCU Online website. Students should check this website regularly for information about course deliverables.

Grading Philosophy & Policy

I do not negotiate grades with students.
A grade of Incomplete (I) is reserved for students who are otherwise passing the course but who, because of a documented emergency or other extraordinary circumstance beyond their control, cannot complete a limited portion of the remaining coursework by the end of the semester. An Incomplete is not a substitute for withdrawing from the course and is not available for work missed through inattention. If you believe your situation warrants an Incomplete, contact me as soon as possible and before the final

evaluative exercise. If I agree that an Incomplete is warranted, we will document in writing the specific work that remains, the date by which you will complete it, and the grade you will receive if the work is not completed. Under University policy an Incomplete must be removed within the first 60 days of the long semester immediately following, or it is changed to an F; any extension requires the written approval of the instructor and the academic dean.

Late work is penalized at a 10 percent penalty for each day it is submitted past the due date.

Assignments	Percentage or Points	Outcomes Measured
Data analysis assignments	50	Course: 1, 2, 3
Take-home examinations (Exam #2 includes the in-person final evaluative exercise)	40	Course: 1, 2, 3
In-class exercises	10	Course: 1, 2
Total	100	

Grading Scale(s)

This course uses plus/minus grading.

The percentage ranges that correspond to specific grades are as follows:

94.00 and up: A	73.00 – 76.99: C
90.00 – 93.99: A-	70.00 – 72.99: C-
87.00 - 89.99: B+	67.00 – 69.99: D+
83.00 – 86.99: B	63.00 – 66.99: D
80.00 – 82.99: B-	60.00 – 62.99: D-
77.00 – 79.99: C+	59.99 and below: F

Course Policies

Technology Policies

This course embraces a technology-rich environment and places no restrictions on the use of technology in the classroom **provided that the technology is used quietly and**

responsibly. Inappropriate use of technology in the classroom -- e.g. disrupting the instructor/other students, viewing inappropriate content, or other behaviors that detract from the learning environment – will require that I revoke these technology privileges.

Absence Policies

Students are expected to attend class, and in-class assignments may not be made up without explicit approval by me based on an excused absence.

Because it is considered an infringement on student privacy for me to have access to student medical records, I cannot accept medical documentation to justify absences. If you believe you have a verifiable absence, you can submit the form here.

Excused Absences or Official University Absences are absences described in the Official University Absence Policy and include the following: Title IX related issues, military leave, holy days, and university related absences. As faculty we may not penalize students for these absences and must allow for the completion of assignments and exams within a reasonable amount of time after the absences. Beyond these, I retain all discretion for consideration of a student's absence, including verified absences.

COURSE SCHEDULE

This calendar represents current course plans. Plans may need to change to enhance the learning opportunities and will be communicated via email.

Dates	Topic	Assigned Content	Labs
Week 1: Aug 25-27	Course introduction		
Week 2: Sep 1-3	Programming I	Think Python, Chs. 1-2	Python basics; intro to Google Colab
Week 3: Sep 8-10	Programming II	Think Python, Chs. 3, 7, 8	Functions and iteration in Python
Week 4: Sep 15-17	Exploratory data analysis I	Fundamentals of Data Visualization, Chs. 6-7	Univariate data analysis
Week 5: Sep 22-24	Exploratory data analysis II	Fundamentals of Data Visualization, Chs. 9 and 12	Multivariate exploratory visualization

Dates	Topic	Assigned Content	Labs
Week 6: Sep 29-Oct 1	Data wrangling I	Wickham (2014), "Tidy Data"	pandas: subsetting, indexing, merging
Week 7: Oct 6	Data wrangling II	**Exam 1 distributed; Thursday Oct 8 canceled (Fall Break)**	
Week 8: Oct 13-15	**Exam 1 work week**		**Exam 1 due Friday, October 16 at 11:59pm**
Week 9: Oct 20-22	Exam 1 meetings	Individual exam meetings during class sessions (sign-up schedule provided in advance)	
Week 10: Oct 27-29	Advanced I/O: databases, web, APIs	McKinney, Python for Data Analysis (3rd ed.), Ch. 6: Data Loading, Storage, and File Formats (free online)	Wrangling data from APIs
Week 11: Nov 3-5	Visualization best practices	Fundamentals of Data Visualization, Chs. 17 and 19	Data visualization
Week 12: Nov 10-12	Geographic data	The Nature of Geographic Information, Ch. 1 Fundamentals of Data Visualization, Ch. 15	Mapping and geospatial data visualization
Week 13: Nov 17-19	Data communication and interactive visualization	Tableau, "Best Practices for Effective Dashboards," Tableau Help (help.tableau.com/current/pro/desktop/en-us/dashboards_best_practices.htm) Tableau Public, "Get Started" video tutorials (public.tableau.com/app/resources) Fundamentals of Data Visualization, Ch. 29	Data dashboards and web UIs (due Tuesday, December 1)

Dates	Topic	Assigned Content	Labs
Week 14: Nov 24-26	**THANKSGIVING BREAK – NO CLASS**		
Week 15: Dec 1-3	Introduction to machine learning; data and AI ethics	"Getting Started," scikit-learn documentation (scikit-learn.org/stable/getting_started.html) Gebru et al. (2021), "Datasheets for Datasets," Communications of the ACM (link on TCU Online)	Ethics in data analysis and AI (due Wednesday, December 9)
Week 16: Dec 8	Course wrap-up	Last regular class meeting Tuesday, December 8	
Finals: Dec 15	Exam 2 submission and final exam presentations	In-person final evaluative exercise, Tuesday, December 15, 8:00am–10:30am, Rees-Jones 216 Exam 2 notebook due at the start of the session Final exam presentations and discussion	