

BANA 4377: Advanced Business Analytics for Economics and Business

Spring 2026 Syllabus

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Meeting Time: MW 9:30 - 10:45 AM
Location: SHB 202
Office: SHB 241-A
Phone: (936) 294-4796
Office Hours: Mondays and Wednesdays, 11:00 am–12:00 pm, or by appointment.
GroupMe (recommended): https://groupme.com/join_group/112496109/U40CY5ME

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1 Instructor Information

Instructor: Dr. Fidel Gonzalez

Title: Professor

Department: Economics and International Business, Sam Houston State University

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Zoom: <https://shsu.zoom.us/my/fidelgonzalez>

Web Page: <https://sites.google.com/view/fidelgonzalez>

Phone: (936) 294-4796

Office: SHB 241-A

Office Hours: Mondays and Wednesdays 11:00 am–12:00 pm, or by appointment (via Zoom or in person). Email for appointments; walk-ins welcome.

2 Course Information

Semester: Spring 2026

Meeting Place: SHB 202

Meeting Time: MW 9:30 - 10.45 AM

Course Number: BANA 4373

Credit Hours: 3

GroupMe (recommended): https://groupme.com/join_group/112496109/U40CY5ME

3 Course Description

Students learn how to analyze data using statistical methods, tools, and software including those used in economic research and policy analysis. Topics include data preparation, data visualization, and deployment of analytics pipelines using the appropriate computer software. Prerequisites: BANA 2372 or MATH 1342.

4 Learning Objectives

By the end of this course, students will be able to:

1. Collect, clean, and merge datasets commonly used in economics and business.
2. Apply reproducible workflows for data science (pipelines, version control, automation).
3. Create effective visualizations and dashboards for communicating economic insights.
4. Conduct applied empirical analysis using real-world datasets.

5. Apply machine learning methods to prediction and classification problems in economics/business.
6. Deploy results in formats useful to decision-makers.

5 Lecture Notes

Lecture notes for each topic will be provided and posted on Blackboard. The textbook should be used as a complement to the lecture notes and not a substitute for them.

6 Software and Tools

- **Primary Language: Python** — data cleaning (pandas), visualization (matplotlib, plotly, seaborn), econometrics (statsmodels), machine learning (scikit-learn).
- **Optional Support: R** — tidyverse, ggplot2, caret, shiny (brief optional equivalents provided; course does not assume dual mastery).
- GitHub for version control and collaboration.
- APIs (FRED, Census, World Bank, etc.) for economic and policy data.

7 Texts and Readings

Required:

- Joel Grus. *Data Science from Scratch: First Principles with Python* (2nd ed., O'Reilly, 2019).

Recommended:

- Hal Varian (2014). “Big Data: New Tricks for Econometrics,” *Journal of Economic Perspectives*.
- Scott Cunningham (2021). *Causal Inference: The Mixtape*. (Yale University Press; free online)
- Matt Taddy (2019). *Business Data Science*. (McGraw-Hill)
- Baumer, Kaplan, Horton (2021). *Modern Data Science with R* (2nd ed., CRC). (For R users)

8 Assessment and Grading

Homework assignments (coding + applied analysis)	30%
Midterm project (individual applied analysis)	20%
Final group project (pipeline + report + presentation)	30%
Quizzes/Participation	20%

8.1 Homework

Homework (6 assignments; 5% each = 30%) Short, hands-on tasks aligned to weekly topics (ETL, visualization, APIs, regression/DiD, text, ML).

- **Deliverable:** Jupyter notebook (.ipynb) + brief written summary (1 page) with key figures/tables.
- **Evaluation (per HW):** Reproducibility (30%), Method correctness (40%), Communication (30%).

8.2 Midterm Project

Midterm Project (20%) — Individual An applied mini-study using one real dataset (e.g., labor, retail, macro, environment).

- **Deliverables:** (i) Clean ETL script; (ii) Exploratory analysis & 2+ core visuals; (iii) One econometric model (e.g., OLS or simple DiD) with interpretation; (iv) **Brief report** (3–5 pages) for a practitioner audience.
- **Suggested datasets:** FRED macro series; BLS CPS/LAUS; Census ACS via API; MRTS retail sales.
- **Rubric:** Data pipeline quality (30%), Model choice & interpretation (40%), Narrative/visuals (30%).

8.3 Final Group Project

Final Group Project (30%) — Teams of 3–4 End-to-end pipeline on an economics/business/policy question. ML use is *optional but welcome*.

- **Milestones:**
 - Week 13: Proposal (1–2 pages; RQs, data sources, methods, division of labor).
 - Week 14: Progress check (working ETL + first results).
- **Final Deliverables (Week 15):**
 - Reproducible repo (code + README with instructions).
 - Analytical report (8–12 pages) or dashboard + 2–3 page executive brief.
 - 12–15 min presentation (stakeholder-ready visuals).
- **Evaluation:** Pipeline & documentation (30%), Analytical rigor (35%), Insight/visual communication (25%), Professionalism & teamwork (10%).
- The final presentation will take place during the final exam time on May 6 from 10:15 am to 12:15 pm in our regular classroom (SHB 202).

8.4 Quizzes and Participation

Quizzes/Participation (20%) Low-stakes checks for understanding and engagement (in-class polls, brief quizzes on concepts and tooling).

8.5 Important Dates

See the assignment schedule for more detail on the assignments.

Post Date	Due Date	Deliverable
Jan. 21	Feb. 2	Homework 1
Jan. 28	Feb. 9	Homework 2
Feb. 16	Mar. 2	Homework 3
Mar. 9	Mar. 23	Homework 4
Feb. 16	Mar. 25	Midterm Project (Individual)
Mar. 30	Apr. 13	Homework 5
Apr. 13	Apr. 27	Homework 6
Apr. 6	Apr. 20	Final Group Project Proposal
Apr. 6	May 6	Final Group Project & Presentations

The final presentation will take place during the final exam time on May 6 from 10:15 am to 12:15 pm in our regular classroom (SHB 202).

9 Academic Integrity

Students are expected to uphold SHSU's standards of academic honesty. Collaboration is encouraged on concepts, but all submitted work must be original.

10 Accessibility

If you have a disability that requires accommodation, please contact the Services for Students with Disabilities (SSD) Office.

11 Make-Up Policy

If you cannot take an exam on time due to medical/family emergency, university athletic activity, or other justifiable reason, contact the instructor to arrange an earlier/later time (reasonable window).

12 Financial Aid Eligibility Validation

Students who receive federal financial aid are required to actively engage in their academic courses, including at the beginning of the semester, as a condition of receiving federal aid. Federal regulations require SHSU to report whether a student has actively engaged in each of their courses or not. A student's lack of engagement in their courses may result in the student losing their eligibility for financial aid and having that aid withdrawn by the federal government. More information on what qualifies as academic engagement may be found on the [Federal Aid Eligibility Validation \(FAEV\) website](#).

13 Additional Extra Credit

There might be additional extra credit assignments. I will provide more information as we progress in the semester.

14 Attendance and Participation Policy

Regular attendance is strongly encouraged, as this course emphasizes hands-on learning, in-class demonstrations, and applied project work. Students are responsible for all material covered in class, regardless of attendance.

- Students may miss up to **three (3) class meetings** during the semester without penalty.
- Each additional unexcused absence beyond these three will result in a **5 percentage point deduction** from the final course grade.
- Absences due to university-sanctioned activities, documented medical emergencies, religious observances, or other officially approved reasons will be considered **excused** and will not count toward the absence limit when appropriate documentation is provided.

Because much of the course involves in-class coding, discussion of case studies, and group project work, students who miss class may find it difficult to fully participate in assignments and team activities. There are no automatic make-up opportunities for in-class activities.

Participation includes attendance, engagement in class discussions, and contribution to group work. Persistent lack of engagement may affect the participation component of the course grade.

Students are responsible for communicating with the instructor in advance whenever possible if an absence is anticipated.

15 Communication

The instructor will send announcements via your SHSU email; ensure it is active. Preferred communication: GroupMe (DM or group) or email. Typical email response within 24 hours (longer on weekends).

GroupMe link: https://groupme.com/join_group/112496109/U40CY5ME

16 University Policies

Academic dishonesty, students with disabilities, and religious holidays: University policies apply. See <http://www.shsu.edu/syllabus>.

17 Disability Statement

Any student with a disability that affects their academic performance should contact the Office of Services for Students with Disabilities to request accommodations.

18 Classroom and Student-provided Technology Devices Policy

Students are responsible for having access to the necessary technology for coursework, including a reliable computer, internet connection, and required software.

Students must have reliable access to a computer (Windows 10/macOS 11 or later), a stable internet connection, and a supported web browser (Chrome, Firefox, Edge, or Safari). Tablets and cell phones are not allowed for exams and they might not provide full functionality for other coursework. Access to Blackboard is essential, along with productivity software like Microsoft Office 365. This online course requires a webcam, microphone, and video conferencing tools (Zoom, Microsoft Teams). Exams use online proctoring software (Respondus Lockdown Browser).

Students are responsible for ensuring that their personal technological devices meet the necessary hardware and software requirements for participation in this course. Failure to maintain a functional device will not be accepted as a valid excuse for incomplete coursework, missed deadlines, or inability to participate in course activities. SHSU Online and the university's IT department provide limited technical support for personal devices.

19 SHSU Online 24/7 Blackboard Support Desk

Students have access to 24/7 technical support for all Blackboard-related needs through the SHSU Online Blackboard Support Desk. Whether assistance is needed with login issues, course access, troubleshooting errors, or navigating Blackboard tools such as discussions, assignments, and tests, the Support Desk is the primary resource for resolving Blackboard-related questions. Additionally, the Support Desk provides guidance on university resources and can help connect students with other departments and services as needed.

Support is available 24/7 via phone ([936-294-2780](tel:936-294-2780)) and email (blackboard@shsu.edu), ensuring students receive timely assistance. Additional resources, including FAQs and troubleshooting guides, can be found on the [SHSU Online website](#). If technical difficulties impact coursework or deadlines, students should promptly notify their instructor.

20 AI Policy

This course prepares students for real-world data science work in economics, business, and policy, where AI-assisted tools are increasingly common. Accordingly, the use of AI tools (e.g., ChatGPT, GitHub Copilot) is permitted in **limited, transparent, and responsible ways**, subject to the guidelines below.

Guiding Principle

AI tools may be used as **assistive tools**, not as substitutes for your own thinking, understanding, or professional judgment. You are always responsible for the correctness, interpretation, and integrity of any work you submit.

Homework Assignments

- AI tools **may be used in a limited way** for:

- Debugging code you wrote
- Understanding error messages
- Clarifying syntax, functions, or documentation
- Exploring alternative technical approaches
- AI tools **may NOT** be used to:
 - Generate complete homework solutions wholesale
 - Write full analytical narratives or economic interpretations
 - Bypass understanding of the methods or results
- You must be able to **explain and justify** any code, model, or result you submit.

Projects (Midterm and Final)

- AI tools are permitted for:
 - Code scaffolding and refactoring
 - Debugging and optimization
 - Drafting documentation (e.g., README files)
 - Improving clarity of written explanations (without changing meaning)
- All substantive analytical decisions — including:
 - Research questions
 - Variable construction and selection
 - Model choice
 - Interpretation of results
 - Policy or business implications

must be your own work and reasoning.

- **Disclosure requirement:** Each project submission must include a brief statement indicating:
 - Whether AI tools were used
 - How they were used (e.g., debugging, syntax help, documentation)

Extra Credit Assignments

- The use of AI tools is **not permitted** on extra credit assignments unless explicitly stated otherwise.
- If widespread or inappropriate AI use is detected, additional monitoring measures may be implemented.

Appropriate vs. Inappropriate Use

Appropriate use includes:

- Asking AI to explain a concept in simpler terms
- Debugging or improving code you understand
- Clarifying documentation or error messages

Inappropriate use includes:

- Submitting AI-generated analysis without understanding it
- Fabricating data, results, or citations using AI
- Presenting AI-generated reasoning or interpretation as your own

Final Responsibility

AI tools can make you faster — but they cannot make you correct.

You are fully responsible for the accuracy, validity, and interpretation of any work you submit, regardless of whether AI tools were used during the learning process.

21 Notification of Course Evaluation Process

Students also welcome and encouraged to share feedback with me at any time, either anonymously or directly, so that I can make adjustments to improve their learning experience.

At the end of the semester, students will receive a notification to complete a short evaluation of the course and my teaching. While completing this evaluation is not required, students' input is greatly appreciated and helps me enhance the course for future students. All responses are confidential and will only be reviewed after final grades have been submitted.

22 Outline of Topics and Weekly Schedule

Week (Dates)	Topics and Details
1. Jan. 12–Jan. 18	Introduction to Data in Economics and Business <ul style="list-style-type: none"> • Role of data in modern economics, business, and policy. • Overview of major sources (FRED, BEA, BLS, Census, World Bank). • Case: Exploring GDP, inflation, unemployment; data dictionaries & metadata.
2. Jan. 19–Jan. 25 (<i>Mon Jan 19: MLK Day – no class</i>)	Data Preparation I (Part A): Getting Started with Real Data <ul style="list-style-type: none"> • What makes economic data “messy” in practice? • File formats (CSV, Excel, JSON) and reading data safely. • Basic checks: variable meanings, units, frequency, missingness.
3. Jan. 26–Feb. 1	Data Preparation I (Part B): Cleaning and Reproducibility <ul style="list-style-type: none"> • Missing data: types of missingness, basic strategies. • Reproducibility: folders, naming conventions, notebooks as reports. • Git/GitHub conceptually: commits, versioning, why it matters.
4. Feb. 2–Feb. 8	Data Preparation II: Working with Economic Datasets <ul style="list-style-type: none"> • Cross-sectional vs. time series vs. panel structures (applied). • Merging and joining datasets; keys and identifiers (FIPS, NAICS). • Reshaping data (wide/long) for analysis.
5. Feb. 9–Feb. 15	Data Preparation II (continued): Building a Panel Dataset <ul style="list-style-type: none"> • Case: County-level unemployment (BLS LAUS) panel assembly. • Data QA: duplicates, coverage gaps, inconsistent coding. • Documentation: creating a mini data dictionary for your cleaned dataset.
6. Feb. 16–Feb. 22	Visualization Fundamentals <ul style="list-style-type: none"> • Principles of effective visualization; avoiding misrepresentation. • Distributions, trends, scatterplots; telling a clear story. • Case: CPS labor force participation by demographics.
7. Feb. 23–Mar. 1	Advanced Visualization & Dashboards <ul style="list-style-type: none"> • Interactive plots (Plotly) and dashboard concepts (Streamlit/Dash). • Design for decision-makers: labels, annotation, scale, context. • Case: Inflation dashboards with CPI components & interest rates.
8. Mar. 2–Mar. 8	Applied Regression in Economics <ul style="list-style-type: none"> • OLS as a workhorse; interpreting coefficients in context. • Diagnostics intuition: outliers, heteroskedasticity; robust SE idea. • Case: Minimum wage and employment outcomes (replication-style).
9. Mar. 9–Mar. 15 (<i>Spring Break – no class</i>)	Spring Break <ul style="list-style-type: none"> • No class meetings.
10. Mar. 16–Mar. 22	Introduction to Causal Inference (Conceptual) <ul style="list-style-type: none"> • Prediction vs. causation; threats to identification. • Intuition for DiD, matching, IV (no heavy proofs). • Case: Card–Krueger NJ fast-food study (DiD demo).
11. Mar. 23–Mar. 29	Text and Unstructured Data <ul style="list-style-type: none"> • Collecting unstructured data: scraping ethics, robots.txt, APIs. • NLP basics: tokenization, TF-IDF, sentiment (conceptual). • Case: FOMC statements or SEC 10-K sentiment and market reactions.

Week (Dates)	Topics and Details (cont.)
12. Mar. 30–Apr. 5	Big Data Tools in Economics <ul style="list-style-type: none"> • Efficient workflows: chunking, parquet, caching. • APIs: Census, World Bank, FRED (parameterization and automation). • Case: Automated county-level ACS pulls; reproducible ETL.
13. Apr. 6–Apr. 12	Introduction to Machine Learning <ul style="list-style-type: none"> • Inference vs. prediction; bias-variance trade-off. • Train/validation/test splits; k-fold cross-validation. • Metrics: MSE/MAE, accuracy, AUC (interpretation). • Case: Forecasting unemployment / retail sales.
14. Apr. 13–Apr. 19	Applied Machine Learning Tools <ul style="list-style-type: none"> • Regularization: LASSO/Ridge (feature selection vs. shrinkage). • Tree-based methods: random forests, gradient boosting (intuition & use-cases). • Case studies: firm distress prediction; environmental health classification; job-posting NLP.
15. Apr. 20–Apr. 26	Deployment and Communication of Results <ul style="list-style-type: none"> • Automated reporting (Markdown/nbconvert → PDF). • Dashboards for non-technical audiences; stakeholder memos. • Best practices: clear claims, uncertainty, and limitations.
16. Apr. 27–May 3	Project Workshop I <ul style="list-style-type: none"> • Team formation; topic selection; scoping and feasibility check. • Proposal drafting: RQs, outcomes, predictors, identification or prediction plan. • Work session: pipeline plan + first ETL steps.
17. May 4–May 6	Project Workshop II + Final Presentations <ul style="list-style-type: none"> • Guided project work: model refinement, validation, figures/tables, narrative. • Peer feedback and polishing deliverables. • Final presentations (in-class) and submission of repo/report/dashboard.

23 Assignment Schedule

This topics covered in each homework are subject to change depending on how fast or slow we progress in the class.

Assignment	Posted	Due	Topics Covered
Homework 1: Data Sources & Metadata	Jan. 21	Feb. 2	Data sources, cross-section vs. time series vs. panel, data dictionaries, meta-data, basic data loading
Homework 2: Data Cleaning & Reproducibility	Jan. 28	Feb. 9	Missing data, cleaning, merges, reproducible workflows, Git/GitHub basics
Homework 3: Visualization for Economic Insight	Feb. 16	Mar. 2	Static and interactive visualization, dashboards, communicating results
Homework 4: Applied Regression & Interpretation	Mar. 9	Mar. 23	OLS regression, interpretation, prediction vs. causation, DiD intuition
Homework 5: Text Data & Big Data Tools	Mar. 30	Apr. 13	Text data, APIs at scale, automation, reproducible ETL pipelines
Homework 6: Machine Learning for Prediction	Apr. 13	Apr. 27	Train/test splits, cross-validation, metrics, applied ML models
Midterm Project (Individual)	Feb. 16	Mar. 25	End-to-end applied analysis: cleaning, visualization, regression, interpretation
Final Group Project (Teams of 3-4)	Apr. 6	May 6	Full pipeline, applied analysis, reproducible repo, presentation

The final presentation will take place during the final exam time on May 6 from 10:15 am to 12:15 pm in our regular classroom (SHB 202).