

ECON 0150 | Spring 2026 | Work Plan

Everything needed to prepare the course for Spring 2026. Organized by part so you can work through it systematically. Target structure is defined in `course_outline.md`.

Overall: Pedagogy & Delivery

Changes that apply across the whole course.

The Learning Flow

Each unit follows a consistent arc:

```
Concept Video (before class)
  ↓
Quiz (start of class) – "Did you watch?"
  ↓
Exercise (in class) – Guided practice with support
  ↓
Homework (after class) – Independent practice
  ↓
Homework Demo (after due date) – Learn from mistakes
```

Key framing: Exercises are homework prep. The exercise and homework use the same skills, but:

- **Exercise:** Done with support (instructor, UTAs, peers). Scaffolded. Okay to struggle.
- **Homework:** Done independently. Similar structure to exercise. Demonstrates mastery.

Students should leave class thinking: "I just practiced exactly what I need to do for homework."

Class Structure

- ✓ **Partial flip model:** record concept videos, do exercises in class
- ✓ **Class flow:** quiz → exercise → mention homework → UTA time between classes

- ✓ **End each part with a data project** using student's own data
- ✓ **Frame exercises as homework prep:** "This exercise prepares you for the homework"

Exercise Design

- ✓ **Better questions:** "use this tool to answer a new question" not "repeat what I did"
- ✓ **Dual platform:** exercises in both Python and Excel
- ✓ **Exercise structure:** permanent blank version, in-class version, solutions version

Building Blocks Tracking

- ✓ **Remind what's been added** to building blocks at each topic (explicit tracking in slides)
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Overall: Examples, Encodings & Transformations

Findings from systematic review of exercises and notebooks.

Visual Encodings Audit

Encoding	Currently Taught	Status	Recommendation
Position (x, y)	All parts	✓ Strong	Keep
Color (categorical)	1.1, 1.4, 5.3	✓ Strong	Keep
Color (sequential/diverging)	2.4 heatmaps (target)	✗ Missing	Add in 2.4
Size (bubble charts)	Not taught	✗ Missing	Add in 2.1 or 2.5
Shape/marker type	Not taught	✗ Missing	Add in 2.1 (distinguish groups)
Line type/pattern	Implicit only	⚠ Weak	Make explicit in 1.3
Faceting/small multiples	Implicit in 1.4	⚠ Weak	Make explicit in 2.4 or 2.5
Log scales	2.2, 4.2, 5.3	✓ Strong	Keep
Error bars	3.3	✓ Strong	Keep

Tasks:

- ✓ Add explicit **size encoding** example (bubble chart: GDP × population × life expectancy)
- ✓ Add explicit **shape encoding** example (distinguish groups when color isn't enough)
- ✓ Add explicit **faceting/small multiples** lesson in 2.4 or 2.5
- ✓ Add **sequential/diverging color scales** for heatmaps in 2.4

Data Transformations Audit

Transformation	Currently Taught	Where	Recommendation
Log transform	✓ Yes	2.2, 4.2, 5.3	Keep — essential
Inflation adjustment	✓ Yes	2.2	Keep — essential
Differencing	✓ Yes	5.1, 6.1	Keep — essential
Per capita	✓ Yes	1.2 (coffee)	Keep — essential
Aggregation/groupby	✓ Yes	Throughout	Keep
Z-scores/standardization	✓ Yes	3.1, 3.3	Keep
Percentage change	△ Implicit	1.4, 6.1	Make explicit
Moving averages	✗ Missing	—	Add to 1.4
Seasonal adjustment	△ Exists but orphaned	5.1-seasons	Move to 1.4
Index (base year = 100)	✗ Missing	—	Add to 1.4 or 2.2
Year-over-year growth	✗ Missing	—	Add to 1.4

Tasks:

- ✓ Add **moving averages** example in 1.4 (smooth noisy time series)
- ✓ Add **index construction** (set base year = 100) in 1.4 — common in economics
- ✓ Add **year-over-year growth rates** calculation in 1.4
- ✓ Make **percentage change** explicit (not just implicit)
- ✓ Decide: integrate seasonal adjustment from 5.1-seasons into 1.4, or cut

Economic Examples Audit

Strong examples (keep and emphasize):

Example	Part	Why It's Strong
Coffee prices (real vs nominal)	2.2	Classic inflation adjustment
Pittsburgh housing prices	5.3	Hedonic pricing model — real estate econ
Gender wage gap	5.1, 5.5	Major labor economics topic
Unemployment & voter turnout	6.1	Political economy, real research
Life satisfaction vs GDP	4.2	Development economics
Starbucks sales patterns	1.4	Business operations, labor scheduling

Moderate examples (consider improving):

Example	Part	Issue	Suggestion
Coffee shops by state	1.1	Interesting but not core econ	Keep — good for categorical
Customer age distribution	1.2	Consumer data, fine	Keep
Amazon book sales	2.3	Tangential to econ	Replace with labor/trade data?
Marriage rates	2.3	Social science, not core econ	Replace or reframe
Wait times	4.1	Service operations	Keep — good for regression intro

Missing economics examples to consider adding:

- ✓ **Trade data** (imports/exports by country) — very relevant, good for panel
- ✓ **Inequality measures** (Gini coefficient, income shares) — major policy topic
- ✓ **Labor force participation** (beyond employment/unemployment)
- ✓ **Minimum wage** (Card & Krueger style) — you mention this in Part 0!
- ✓ **Interest rates / Fed data** — macro relevance
- ✓ **Stock returns** or financial data — if appropriate for course level

Tasks:

- ✓ Consider replacing Amazon book sales example with trade or labor data
- ✓ Add **minimum wage example** somewhere (natural follow-up to Part 0 hook)
- ✓ Add **inequality example** (income distribution, Gini) — could fit in 1.2 or 2.1
- ✓ Consider adding **FRED data** example (unemployment, GDP, interest rates)

Example Consistency & Threads

Currently, **coffee** is a running thread (shops, prices, sales, production). This is good for continuity.

Suggestion: Create a second thread using **labor market data** that builds across parts:

- Part 1: Employment rates by state (categorical), wage distributions (numerical)
- Part 2: Wages over time, real vs nominal wages
- Part 3: Sampling from CPS/census data
- Part 4: Wage regression on education
- Part 5: Gender wage gap with controls
- Part 6: Project using IPUMS/CPS data

Tasks:

- ✓ Consider adding **labor market thread** as second running example
 - ✓ Ensure Card & Krueger minimum wage hook in Part 0 connects to later content
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Overall: Content per Unit

Each unit should have the following content. Use the checklist below to track progress.

Content	When	Purpose
Concept video (~10 min)	Before class	Core ideas, students watch at home
Quiz (2-3 questions)	Start of class	Confirms watching, replaces attendance
Exercise	During class	Apply concepts with support
Exercise video	After class	Recorded exercise or class livestream
Homework demo	After due date	Learn from mistakes, exam prep

Note: If no separate exercise recording, use the class livestream as the exercise video.

Naming Convention

1.1_concept.mp4
1.1_exercise.mp4
1.1_homework_demo.mp4

Content Checklist by Unit

Part 0

- ✓ Day 1 slides + recording
- ✓ Day 2 concept video
- ✓ Day 2 quiz
- ✓ Day 2 exercise video

Part 1

Unit	Concept	Quiz	Exercise Video	HW Demo
1.1	[]	[]	[]	[]
1.2	[]	[]	[]	[]
1.3	[]	[]	[]	[]
1.4	[]	[]	[]	[]

Part 2

Unit	Concept	Quiz	Exercise Video	HW Demo
2.0	[]	[]	[]	[]
2.1	[]	[]	[]	[]
2.2	[]	[]	[]	[]
2.3	[]	[]	[]	[]
2.4	[]	[]	[]	[]
2.5	[]	[]	[]	[]
2.6	[]	[]	[]	[]

Part 3

Unit	Concept	Quiz	Exercise Video	HW Demo
3.1	[]	[]	[]	[]
3.2	[]	[]	[]	[]
3.3	[]	[]	[]	[]
3.4	[]	[]	[]	[]
3.5	[]	[]	[]	[]

Part 4

Unit	Concept	Quiz	Exercise Video	HW Demo
4.1	[]	[]	[]	[]
4.2	[]	[]	[]	[]
4.3	[]	[]	[]	[]
4.4	[]	[]	[]	[]

Part 5

Unit	Concept	Quiz	Exercise Video	HW Demo
5.1	[]	[]	[]	[]
5.2	[]	[]	[]	[]
5.3	[]	[]	[]	[]

Overall: Priority Tasks (from Curriculum Audit)

Tasks identified from systematic review of parts directory against target structure.

High Priority (Core Curriculum Gaps)

- ✓ Create Anscombe's Quartet content for 2.0 — key motivation for "why visualize relationships"

- ✓ **Create Simpson's Paradox intro** for Part 5 opener — motivates controls/confounding
- ✓ **Create explicit Interactions content** for 5.2 — currently no content exists
- ✓ **Migrate 1-4, 1-5, 1-6 content** to Part 2 structure (Panel → 2.3, Relationships → 2.1, Geographic → 2.6)
- ✓ **Relocate current Part 2** (data wrangling) to Part 6 or integrate at point-of-need

Medium Priority (Pedagogical Improvements)

- ✓ **Add S-T-E pattern to Part 0 slides** — framework exists in docs but not operationalized
- ✓ **Add x_it notation to Part 0 slides** — powerful organizing concept not in current materials
- ✓ **Create "Building Blocks Updated" slide template** — use at end of each unit to show what was added
- ✓ **Add "when to use which visualization" guidance** — currently teach *how* but not *when*
- ✓ **Add correlation ≠ causation discussion** in Part 5 — common student misconception
- ✓ **Create long vs wide format content** for 2.4 — mentioned in target but not clearly taught

Lower Priority (Cleanup & Technical Debt)

- ✓ **Consolidate duplicate datasets** — same CSVs copied across 4-5 directories
 - ✓ **Fix Part 4-5 numbering mismatches** — e.g., concept_4_2.qmd says "Part 4.3" in title
 - ✓ **Decide fate of seasonal analysis content** (part-5-1-seasons) — doesn't fit multivariate GLM focus
 - ✓ **Archive old R code** if not being used (HW_4.1.R, HW_4.4.R, etc.)
 - ✓ **Clean up .ipynb_checkpoints** and archived versions scattered throughout
 - ✓ **Remove or use orphaned datasets** (e.g., GlobalLandTemperaturesByCity.csv)
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Overall: Cleanup Tasks

Technical debt to address.

- ✓ Clean up unused datasets (many in data folders aren't used)
 - ✓ Clean up old image naming convention (i_xx → c_xx)
 - ✓ MiniExams don't cover enough material — decide what to add
-

Part 0: Framework (Week 1)

Structure: Day 1 = Show, Day 2 = Name and Do

Day 1: Introduction + Preview

- ✓ Course intro and logistics
- ✓ Preview with **past semester survey data**: "Here's what students looked like last semester..."
 - Show bar charts, histograms, etc. without formally naming them
 - Informally surface variable types—they see before they name
 - Build anticipation: "We'll look at your data on Day 2"

Day 2: Motivation + Framework + Their Data

- ✓ **Card & Krueger hook** (10 min): "In 1992, New Jersey raised minimum wage... economists predicted X... data showed Y... this course is about learning to do that kind of analysis"
 - **Note:** Consider returning to minimum wage data later in course (Part 4 or 5) to show how the analysis actually works — connects opener to payoff
- ✓ Transition: "To get there, we need a framework..."
- ✓ **Framework concepts:**
 - What is data? (realizations of random variables)
 - x_{it} notation, substantive vs index variables
 - Building blocks introduction (variables, structures, operations, visualizations)
 - SELECT-TRANSFORM-ENCODE pattern
 - Course arc overview
- ✓ **Variable types** formally named (categorical: binary, nominal, ordinal; numerical: discrete, continuous)
- ✓ **Exercises:** Current semester survey data (their own class)
 - Use different variables than shown in slides so students can't copy

Content to Prepare

- ✓ Past semester survey visualizations (for Day 1 preview)
- ✓ Card & Krueger slides (brief, motivating)
- ✓ Framework slides (building blocks, S-T-E, x_{it})
- ✓ Current semester survey data ready for exercises

Part 1: Exploring Variables

Current → Target

Current	→	Target
1.0 Variable Types	→	Part 0 (Framework)
1.1 Summarizing Categorical	→	1.1 Cross-section Categorical
1.2 Summarizing Numerical	→	1.2 Cross-section Numerical
1.3 Relationships Through Time (new from old 2.2, 2.3)	→	1.3 Time Series
1.4 Panel Data	→	Move to Part 2
1.5 Bivariate Relationships	→	Move to Part 2
1.6 Relationships In Space	→	Move to Part 2

Note: Variable types (old 1.0) now covered in Part 0. Part 1 starts at 1.1.

Unit 1.1: Cross-section Categorical

- ✓ Update framing to emphasize S-T-E pattern
- ✓ Add examples: binary (employed/not), nominal (coffee shops by state), ordinal (economic optimism)
- ✓ Add visualization guidelines:
 - Pie charts only for binary
 - Bar charts for nominal
 - Ordered bar for ordinal
 - Remove clutter, put info near objects
- ✓ Add tables vs figures discussion

Unit 1.2: Cross-section Numerical

- ✓ Update framing to emphasize S-T-E pattern

- ✓ Keep current example (already good)
- ✓ Consider: where does descriptive statistics (centrality / dispersion) go?

Unit 1.3: Time Series

- ✓ Integrate filtering content from old 2.3
- ✓ Add example: transactions by time of day

Unit 1.4: Time Series Transforms

- ✓ Create from old 2.2 content (log, inflation adjustment, difference)
 - ✓ Add more transformations:
 - ✓ **Moving averages** — smooth noisy time series (e.g., 7-day rolling average)
 - ✓ **Index construction** — set base year = 100, compare to baseline
 - ✓ **Year-over-year growth rates** — percentage change from same period last year
 - ✓ **Per capita adjustments** — divide by population
 - ✓ **Seasonal adjustment** — integrate content from part-5-1-seasons if keeping
 - ✓ Consider: use **FRED data** (GDP, unemployment) as primary example
 - ✓ Cut: GMT timezone parsing, complex string manipulation
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Part 2: Exploring Relationships

Current → Target

Current	→	Target
(new)	→	2.0 Relationships Framework
1.5 Bivariate Relationships	→	2.1 Num × Num
(new from old 2.4)	→	2.2 Num × Cat
1.4 Panel Data	→	2.3 Panel Structure
(new)	→	2.4 Panel Format & Viz
(new)	→	2.5 Panel Relationships
1.6 Relationships In Space	→	2.6 Geographic

Unit 2.0: Relationships Framework

- ✓ Create new: Anscombe's quartet motivation
- ✓ Frame: "why visualize relationships? correlation isn't everything"
- ✓ **Note:** No content currently exists for this — must be created from scratch

Unit 2.1: Num × Num

- ✓ Move old 1.5 content here
- ✓ Find more interesting example (current age vs distance is boring)
 - Consider: **GDP vs life expectancy** (development economics)
 - Consider: **Education vs wages** (labor economics)
- ✓ Convert Jana's R code to Python
- ✓ Add **size encoding** example (bubble chart: show third variable as bubble size)
- ✓ Add **shape encoding** example (distinguish groups when color isn't enough)

Unit 2.2: Num × Cat

- ✓ Create using old 2.4 grouping content
- ✓ May need new examples showing grouped comparison

- Consider: **Wages by education level** (grouped boxplot)
- Consider: **Income distribution by region** (inequality angle)

Unit 2.3: Panel Structure

- ✓ Move old 1.4 content here
- ✓ Introduce long vs wide format

Unit 2.4: Panel Format & Viz

- ✓ Create new: heatmaps, format determines visualization
- ✓ Add **sequential/diverging color scales** for heatmaps
- ✓ Add explicit **faceting/small multiples** lesson
- ✓ Consider: **trade data** example (countries × years × import/export value)
- ✓ Review what exists, determine what's needed

Unit 2.5: Panel Relationships

- ✓ Create new: scatter by group, small multiples
- ✓ Review what exists, determine what's needed

Unit 2.6: Geographic

- ✓ Move old 1.6 content here
- ✓ Use PA income by county dataset for exercise
- ✓ Simplify example (current one is too difficult)

Part 3: Univariate GLM

Current State

- 3.1 (Sampling & Populations) ✓ exists
- 3.2 (CLT) ✓ exists with good examples
- 3.3 (Confidence Intervals) ✓ exists with detailed notes
- 3.4 (Hypothesis Testing) ✓ exists
- 3.5 (Simplest GLM) ✓ exists — introduces $y = \beta_0 + \varepsilon$ framework

Tasks

- ✓ Add **population vs sampling distribution** visual to slides — currently not explicit
 - ✓ Add **ethics in hypothesis testing** section
 - Have students do bad hypothesis testing first
 - Then discuss what went wrong
 - ✓ Consider adding explicit "Assumptions of inference" slide (independence, random sampling)
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Part 4: Bivariate GLM

Current State & Issues

- 4.1 (Numerical Predictors) ✓ exists — wait time regression example
- 4.2 directory contains residuals / diagnostics content (good)
- 4.3 directory contains categorical predictors content (good)
- 4.4 (Time Series) ✓ exists — autocorrelation, lag plots

File naming issue: concept_4_2.qmd title says "Part 4.3 | Model Residuals and Diagnostics"

- Need to fix slide titles to match target numbering

Tasks

- ✓ Fix slide title numbering to match target structure
- ✓ Review for any needed updates (no major changes identified)

- ✓ Consider: add explicit "checking assumptions" checklist slide
-

Part 5: Multivariate GLM

Current State & Issues

- 5.1 (Categorical Controls) ✓ exists — Gender Wage Gap example, good content
- 5.2 (Interactions) ✗ **NO CONTENT EXISTS** — must be created
- 5.3 (Numerical Controls) ✓ exists — Pittsburgh housing example
- 5.4 exists but is "Using GLM Appropriately" (capstone/review, not target content)
- 5.1-seasons exists but doesn't fit multivariate focus

Content to relocate or cut:

- part-5-1-seasons: Seasonal decomposition content — consider moving to 1.4 or cutting
- part-5-4: "Using GLM Appropriately" — could become review/capstone or merge into Part 6

Reframing

- ✓ **New arc:** Start with bivariate relationship, wonder if something else impacts both variables → that's what Part 5 is about
- ✓ Open with **Simpson's paradox** to motivate the whole part — **must create this content**
- ✓ Add explicit **correlation ≠ causation** discussion

Unit 5.1: Categorical Controls

- ✓ Simpson's paradox, fixed effects, seasons
- ✓ Use more than 2 categories in example
- ✓ Current content uses Gender Wage Gap — can extend naturally

Unit 5.2: Interactions

- ✓ Must create from scratch — no content currently exists
- ✓ Use gender wage gap as main example (natural extension from 5.1)
- ✓ Show: "Does the return to education differ by gender?"
- ✓ Interpret interaction coefficients

Unit 5.3: Numerical Controls

- ✓ Gender wage gap with controls
 - ✓ Then Pittsburgh housing example (content exists in current part-5-3)
 - ✓ Interpret "holding constant"
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Part 6: Projects & Data Operations

Content to Migrate Here

Current Part 2 (data wrangling) needs a new home. Options:

1. **Move to Part 6** as "Data Operations Workshop" before projects
2. **Integrate at point-of-need** throughout Parts 1-2

Current Location	Content	Recommended Destination
part-2-1	Data Cleaning	Part 6 (workshop)
part-2-2	Transformations	Part 1.4 (what's needed), Part 6 (rest)
part-2-3	Filtering	Integrate into Part 1.3
part-2-4	Advanced Manipulation	Part 6 (workshop)
part-2-5	Applied Wrangling / Merging	Part 6 (workshop)

Tasks

- ✓ Move data cleaning content here (from old 2.1)

- ✓ Move merging content here (from old 2.5)
- ✓ Add **Tufte's principles** for visualization
- ✓ Create **Data Operations Workshop**: Cleaning, Merging, Reshaping
- ✓ Consider: move "Using GLM Appropriately" (current 5.4) here as capstone
- ✓ Video resource: <https://youtu.be/IHZHujXKQb0>

Current Project Content (Keep)

- part-6-1: Exercise_6.ipynb, project templates
 - part-6-2: Presentation guidelines, Fall 2024 examples
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Content to Cut

Content	Source	Reason
GMT timezone parsing	Old 2.2	Too specialized
Complex string manipulation	Old 2.2	Too specialized

Final Cleanup

- ✓ Archive or delete old Part 2 units (2.1–2.5)
 - ✓ Update course website navigation
 - ✓ Update any references in homework/readings
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Appendix: Full Directory → Target Mapping

Complete mapping of current directories to target structure.

Current Directory	Current Topic	Target Location	Action
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part-0	Welcome, Survey	Part 0	Keep, add framework content
part-1-0	Data Structures	Part 0	Merge into Part 0 Framework
part-1-1	Categorical Viz	1.1	Keep, update framing
part-1-2	Numerical Viz	1.2	Keep, update framing
part-1-3	Time Series	1.3	Keep, integrate filtering
part-1-4	Panel Data	2.3	Move to Part 2
part-1-5	Bivariate Relationships	2.1	Move to Part 2
part-1-6	Geographic	2.6	Move to Part 2
part-2-1	Data Cleaning	Part 6	Move to workshop
part-2-2	Transformations	1.4 + Part 6	Split: transforms to 1.4, rest to 6
part-2-3	Filtering	1.3	Integrate into 1.3
part-2-4	Advanced Manipulation	Part 6	Move to workshop
part-2-5	Merging	Part 6	Move to workshop
part-3-1	Sampling	3.1	Keep
part-3-2	CLT	3.2	Keep
part-3-3	Confidence Intervals	3.3	Keep
part-3-4	Hypothesis Testing	3.4	Keep
part-3-5	Simplest GLM	3.5	Keep
part-4-1	Numerical Predictors	4.1	Keep
part-4-2	Residuals/Diagnostics	4.2	Keep, fix title
part-4-3	Categorical Predictors	4.3	Keep
part-4-4	Time Series Regression	4.4	Keep
part-5-1	Categorical Controls	5.1	Keep
part-5-1-seasons	Seasonal Analysis	1.4 or Cut	Decide: move or remove
part-5-2	(empty)	5.2	Create Interactions content
part-5-3	Numerical Controls	5.3	Keep

part-5-4	GLM Review	Part 6?	Relocate as capstone
part-6-1	Project Planning	Part 6	Keep
part-6-2	Presentations	Part 6	Keep

Content to Create from Scratch

- ✓ **2.0:** Anscombe's Quartet — why visualize relationships
- ✓ **2.4:** Panel Format & Viz — heatmaps, long vs wide
- ✓ **2.5:** Panel Relationships — scatter by group, small multiples
- ✓ **5.2:** Interactions — different slopes by group
- ✓ **Simpson's Paradox** opener for Part 5

Notes

Use this space to track decisions, issues, or ideas as you work.