



EE423

DATA ANALYTICS PROGRAMMING FOR ECONOMISTS

Bachelor of Economics (International Program)

Faculty of Economics, Thammasat University

Semester 2/2025 (January 5 - May 2, 2026)

COURSE INFORMATION

Course Code	EE423 (Section 046401)
Course Title	Data Analytics Programming for Economists
Credit Hours	3 Credits (3-0-6)
Semester	2/2025 (January 5 - May 2, 2026)
Class Schedule	Friday, 09:00-12:00
Classroom	To be announced
Prerequisites	EE325 Introductory Econometrics or equivalent

INSTRUCTOR INFORMATION

Instructor	Asst. Prof. Dr. Monthien Satimanon
Office	Faculty of Economics, Thammasat University
Email	monthien@econ.tu.ac.th
Office Hours	By appointment

COURSE DESCRIPTION

This course introduces students to programming and data analytics essential for modern economic analysis. Students will learn the fundamentals of Python programming and apply them to economic data analysis, statistical computing, econometric modeling, and data visualization. The course emphasizes practical applications using Google Colab and AI tools like Google Gemini to enhance productivity and learning efficiency.

Primary Platform

- Google Colab (cloud-based Jupyter notebooks) - No installation required
- Google Gemini AI Assistant (integrated into workflow)

Prerequisites

- EE325 Introductory Econometrics or equivalent
- Basic understanding of statistics and econometrics
- No prior programming experience required

ALIGNMENT WITH PROGRAM LEARNING OUTCOMES

This course aligns with the following B.E. Program Learning Outcomes:

Knowledge (K)

- K1: Acquiring knowledge and understanding of economic theories and tools
- K2: Ability to apply theoretical knowledge to analyze economic and social issues
- K3: Ability to integrate economic knowledge with other study fields
- K4: Ability to attain lifelong learning and understand world economic changes

Skills (S)

- S1: Intellectual skills to identify research topics and process data
- S2: Analytical and communication skills to interpret and integrate data
- S3: Quantitative and technological skills for research studies

Ethics (E) and Character (C)

- E2: Self-discipline, social responsibility, and good citizenship
- C1: Ability to complete assigned tasks effectively
- C2: Ability to initiate problem analysis independently and in teamwork
- C4: Active learning and personal development
- C5: Interpersonal skills and ability to collaborate and adapt

COURSE LEARNING OUTCOMES (CLOs)

Upon successful completion of this course, students will be able to:

CLO 1: Programming Fundamentals [PLOs: K1, K3, S1, S3, C2, C4]

Write Python code to solve economic and statistical problems, demonstrating understanding of programming logic, data structures, and control flow.

CLO 2: Data Manipulation & Analysis [PLOs: K2, S1, S2, S3, C1, C2]

Import, clean, transform, and analyze economic datasets using pandas and NumPy, applying appropriate data manipulation techniques.

CLO 3: Statistical Computing [PLOs: K1, K2, S1, S3, C2]

Implement statistical methods and econometric models in Python and interpret results in economic contexts.

CLO 4: Data Visualization [PLOs: K2, S2, C1, C4]

Create effective visualizations of economic data and analysis results using Matplotlib, Seaborn, and Plotly.

CLO 5: Research Application [PLOs: K2, K4, S1, S2, E2, C1, C2, C5]

Conduct independent data analysis projects that address economic research questions, demonstrating the ability to apply programming skills to real-world economic problems.

CLO 6: AI-Assisted Programming [PLOs: K4, S3, C4, C5]

Effectively use AI tools (e.g., Google Gemini) to enhance coding productivity, debug programs, and learn new programming concepts.

ASSESSMENT & EVALUATION

Component	Weight	Due Date
Assignment 1: Python Fundamentals & Data Structures	10%	Week 5
Assignment 2: Data Analysis with Pandas	10%	Week 10
Assignment 3: Econometric Analysis & Visualization	10%	Week 14
Take-Home Midterm Exam	30%	Feb 27, 2026
Take-Home Final Exam	35%	May 19, 2026
Class Participation & Engagement	5%	Ongoing
Total	100%	

Grading Scale (Thammasat University Standard)

Grade	Percentage	Points	Additional
A	85-100	4.0	B+: 75-84 (3.5)
B	70-74	3.0	C+: 65-69 (2.5)
C	60-64	2.0	D+: 50-59 (1.5)
D	40-49	1.0	F: 0-39 (0.0)

AUN-QA ASSESSMENT RUBRICS

Performance Levels: 5 = Excellent | 4 = Good | 3 = Satisfactory | 2 = Developing | 1 = Unsatisfactory

Rubric 1: Programming Competence (CLO 1)

Level	Criteria
5 - Excellent	Writes clean, efficient, well-documented code; implements advanced programming concepts; demonstrates strong problem-solving; applies Pythonic idioms
4 - Good	Writes functional, mostly efficient code; uses appropriate programming constructs; code is readable and organized; good understanding of fundamentals.
3 - Satisfactory	Writes working code that meets basic requirements; uses basic constructs correctly; has adequate functionality but may lack efficiency
2 - Developing	Code runs but contains errors or inefficiencies; limited use of programming constructs; organization needs improvement.
1 - Unsatisfactory	Code doesn't run or contains major errors; incorrect use of programming concepts; poor organization and documentation.

Rubric 2: Data Analysis Capability (CLO 2, CLO 3)

Level	Criteria
5 - Excellent	Performs comprehensive, sophisticated data analysis; applies advanced pandas/NumPy operations efficiently; correctly implements and interprets statistical methods
4 - Good	Conducts thorough data analysis; uses pandas/NumPy effectively; implements statistical methods correctly with good interpretation
3 - Satisfactory	Performs adequate data analysis; uses basic pandas/NumPy functions; implements and interprets statistical methods appropriately
2 - Developing	Limited data analysis; basic use of pandas/NumPy with some errors; partial understanding of statistical methods
1 - Unsatisfactory	Insufficient data analysis; incorrect use of tools; poor understanding of statistical methods

Rubric 3: Visualization Skills (CLO 4)

Level	Criteria
5 - Excellent	Creates professional, publication-quality visualizations; excellent use of color, labels, and design principles; visualizations effectively communicate insights
4 - Good	Produces clear, well-designed visualizations; appropriate chart types; good labeling and formatting; effectively communicates data
3 - Satisfactory	Creates functional visualizations; appropriate chart selection; adequate labeling; communicates basic information
2 - Developing	Visualizations present but lack clarity; inappropriate chart types; incomplete labeling; limited effectiveness.
1 - Unsatisfactory	Poor or missing visualizations; incorrect chart types; inadequate labeling; fails to communicate information.

Rubric 4: Economic Application (CLO 5)

Level	Criteria
5 - Excellent	Demonstrates exceptional understanding of economic concepts; insightful interpretation of results; comprehensive analysis with nuanced economic reasoning
4 - Good	Shows strong understanding of economic concepts; clear interpretation of results; good application of economic theory to data
3 - Satisfactory	Demonstrates adequate understanding of economics; reasonable interpretation; appropriate application of economic concepts
2 - Developing	Limited economic understanding; basic interpretation; weak connection between analysis and economic theory
1 - Unsatisfactory	Poor understanding of economics; incorrect interpretation; fails to apply economic concepts appropriately.

Rubric 5: AI Tool Usage (CLO 6)

Level	Criteria
5 - Excellent	Strategic and effective use of AI tools; comprehensive documentation; demonstrates deep understanding of AI-generated code; significant improvements made.
4 - Good	Appropriate use of AI tools; good documentation; clear understanding of AI-generated code; meaningful modifications made
3 - Satisfactory	Acceptable use of AI tools; adequate documentation; basic understanding of AI-generated code; some modifications made
2 - Developing	Limited AI tool usage; incomplete documentation; partial understanding; minimal modifications
1 - Unsatisfactory	Inappropriate AI usage; poor or missing documentation; lacks understanding; no meaningful modifications.

COURSE SCHEDULE - WEEKLY TOPICS

Week 1 (Jan 9): Introduction to Python & Google Colab

- Course overview and setup Google Colab
- Python basics: variables, data types, operators
- Introduction to Google Gemini for coding assistance

Week 2 (Jan 16): Control Flow & Functions

- If-else statements, loops (for, while)
- Functions: definition, parameters, return values
- Economic application: compound interest calculator

Week 3 (Jan 23): Data Structures - Lists & Dictionaries

- Lists: creation, indexing, slicing, methods
- Dictionaries: key-value pairs, operations
- Economic application: GDP data management

Week 4 (Jan 30): NumPy Fundamentals

- Arrays: creation, operations, indexing
- Mathematical operations and statistical functions
- Economic application: time series calculations

Week 5 (Feb 6): Introduction to Pandas I

- DataFrames and Series
- Loading data from various sources
- **DUE: Assignment 1 - Python Fundamentals & Data Structures**

Week 6 (Feb 13): Introduction to Pandas II

- Data selection, filtering, sorting
- Basic data aggregation and groupby operations

Week 7 (Feb 20): Data Cleaning & Preparation

- Handling missing data
- Data type conversion and string operations
- Economic application: cleaning World Bank data

Week 8 (Feb 27): MID-TERM EXAMINATION WEEK

- **NO LECTURE - Take-home Midterm Released**
- **Midterm Due: Friday, February 27, 2026, 09:00**

Week 9 (Mar 6): Data Visualization with Matplotlib

- Line plots, bar charts, histograms
- Customization: labels, titles, legends

Week 10 (Mar 13): Advanced Visualization with Seaborn & Plotly

- Statistical visualizations with Seaborn
- Interactive plots with Plotly
- **DUE: Assignment 2 - Data Analysis with Pandas**

Week 11 (Mar 20): Statistical Analysis with SciPy & Statsmodels

- Descriptive statistics and hypothesis testing
- Correlation and regression analysis

Week 12 (Mar 27): Econometric Analysis in Python

- OLS regression with statsmodels
- Diagnostics and interpretation

Week 13 (Apr 3): Time Series Analysis

- Time series decomposition
- ARIMA models basics

Week 14 (Apr 10): Panel Data Analysis

- Fixed effects and random effects models
- Economic application: labor economics analysis

Week 15 (Apr 24): Machine Learning Basics

- Introduction to scikit-learn
- Linear regression and classification
- **DUE: Assignment 3 - Econometric Analysis & Visualization**

Week 16 (May 1): Advanced Topics & Course Review

- API data access and web scraping basics
- Best practices and course review
- **Final Exam: Tuesday, May 19, 2026, 09:00**

COURSE POLICIES

Academic Integrity

All work submitted must be your own. Plagiarism, cheating, or any form of academic dishonesty will result in an F grade for the course and possible disciplinary action. First offense: zero on assignment + warning. Second offense: F in course + disciplinary action.

AI Usage Guidelines

ACCEPTABLE:

- Using Gemini to learn new concepts and debug code
- Generating code snippets as starting points
- Understanding error messages

NOT ACCEPTABLE:

- Submitting AI-generated code without understanding it
- Not documenting AI assistance
- Using AI to complete entire assignments

Late Submission Policy

- Assignments: 10% deduction per day (max 3 days late)
- Exams: Late submissions only with documented emergency

Attendance and Participation

Regular attendance and active participation in live coding sessions are strongly encouraged. Students are responsible for all material covered in class.

TECHNICAL REQUIREMENTS

Required

- Google account (for Colab and Gemini)
- Stable internet connection
- Modern web browser (Chrome, Firefox, Safari, Edge)
- Computer or laptop (tablets not recommended)

Software Platform

Primary: Google Colab (cloud-based, no installation needed)

Python Packages (pre-installed in Colab): NumPy, Pandas, Matplotlib, Seaborn, Plotly, Statsmodels, SciPy, Scikit-learn

IMPORTANT DATES SUMMARY

Date	Event
January 5, 2026	Semester begins
January 9, 2026	First class
February 6, 2026	Assignment 1 due
February 20, 2026	Midterm exam distributed
February 27, 2026	Midterm exam due (No lecture)
March 13, 2026	Assignment 2 due
April 24, 2026	Assignment 3 due
May 1, 2026	Last class
May 12, 2026	Final exam distributed
May 19, 2026	Final exam due

INSTRUCTOR'S EXPECTATIONS

The instructor expects you to:

- ✓ Attend classes regularly and participate actively
- ✓ Complete assignments honestly and on time
- ✓ Seek help when needed
- ✓ Practice coding regularly outside of class
- ✓ Apply programming skills to economic problems
- ✓ Use AI tools responsibly and ethically
- ✓ Maintain academic integrity
- ✓ Contribute to a positive learning environment

Final Note

Programming is a skill that improves with practice. Don't be discouraged by initial challenges - persistence and regular practice are key to success. Use Google Gemini and other AI tools as learning assistants, but always strive to understand the code you write.

Remember: The goal is not just to complete assignments, but to develop analytical and computational skills that will serve you throughout your career as an economist.

Good luck, and I look forward to working with you this semester!

CONTACT INFORMATION

Instructor

Asst. Prof. Dr. Monthien Satimanon
Email: monthien@econ.tu.ac.th
Office: Faculty of Economics, Thammasat University

Program Coordinator

Miss Pannee Kongkerd
Email: be_academic@econ.tu.ac.th
Tel: +66 (0) 2221 6111 to 3527

Faculty of Economics

2 Prachan Road, Phranakorn, Bangkok 10200 Thailand
Website: www.be.econ.tu.ac.th
Email: BE@econ.tu.ac.th

This syllabus is subject to change. Any modifications will be announced in advance.