POP77184 — Computational Methods for Economics

Module Information	
Module Code	POP77184
Module Title	Computational Methods
Department	POLITICAL SCIENCE
Module Personnel	Dr. Jian Cao
Academic Year	2026-27
Credit Weighting	5 credits
Semester	Semester 2
Contact Hours	8 hours of lectures and 4 hours of tutorials

Module Content	
Module Description	Computational methods are used across every field of economics. This module serves as an introduction to some commonly used methods in Computational Economics. The primary aim is to equip students with the fundamentals needed for a wide range of applications. We will begin with some basics about programming fundamentals and setting up a python environment. We will then study some important numerical methods used in quantitative economics and put them to use simulating economic models. • Reproducible Research & Workflows • Theory & Practice of Missing-Data Methods • Monte Carlo Simulation & Bootstrap • Machine-Learning Tools for Causal Analysis • Penalized Regression & Large-Scale Computation

Module Content	
Module Learning Aims	This module provides students with an introduction to the use of computational methods for solving economic problems. Part of the module will focus on properly setting up an appropriate environment to best leverage modern methods while producing reproducible and reusable code. We will then study various numerical methods that are commonly used in economic modeling and apply them to specific problems.
Learning Outcomes	Upon completing this module students should be able to: • Environment & Workflow: Configure GitHub, Jupyter pipelines for reproducible analysis • Missing Data Methods: Implement appropriate methods to handle various missing data types. • Simulation & Monte Carlo: Design custom data-generating processes for robust simulation • Machine Learning for Causal Inference: Estimate heterogeneous treatment effects using machine learning frameworks. • High-Dimensional Estimation: Fit and interpret penalized regressions with post-selection inference.
Indicative Reading / Resources	Hastie, Trevor, Robert Tibshirani, and Jerome Friedman. The elements of statistical learning, Second Edition. Springer, 2009. Van Buuren, Stef, and Stef Van Buuren. Flexible imputation of missing data. CRC press, 2012.

Assessment	
Assessment Components	Assignments 10%, Project Report 20%, Final Exam 70% (Module Concepts 35% + Project Defence 35%)

Assessment	

Assessment Details	• Assignments (10%): regular problem sets.
	• Project Report (20%): a self-selected project applying course methods.
	• Final Exam (70%), in two equally weighted halves:
	  ◦ Module Concepts (35%): questions on the concepts and techniques taught across the module.
	  ◦ Project Defence (35%): questions on your own project: the choices you made, the methods you used, and how you would interpret or extend your results. The aim is to confirm the work is your own.

Additional Information	
Prerequisites	None
Co-requisites	None
Any other information	None