ECU44291— Quantitative Macroeconomics

Module Information	
Module Code	ECU44291
Module Title	Quantitative Macroeconomics
Department	Economics
Year Group	Senior Sophister
Module Personnel	Joseph Kopecky
Academic Year	2026-27
Credit Weighting	10 ECTS
Semester	Semester 1
Contact Hours	22 hours of lectures and 4 hours of tutorials

Module Content	
Module Description	This module introduces students to the computational toolkit that underpins modern quantitative macroeconomics. Building on the theoretical foundations developed in earlier years, students learn to translate structural macroeconomic models into code and solve them numerically. The module develops proficiency in Python as the primary scientific computing environment, alongside the core numerical methods that macroeconomists rely on in practice: root-finding and optimization, numerical integration, interpolation and function approximation, and the solution of dynamic programming problems via value function and policy function iteration. Emphasis is placed on understanding why these methods work and when they fail, so that students can approach unfamiliar models with confidence rather than treating solution algorithms as black boxes. The second half of the module applies these tools to workhorse structural models, guiding students from a model's equilibrium conditions through to a fully calibrated and solved quantitative implementation. Students learn to calibrate models to data, simulate their dynamics, and interpret the resulting outcomes in the context of substantive

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	macroeconomic questions. Assessment is oriented toward hands-on computational work, with students building, solving, and analyzing models themselves. By the end of the module, students will be able to write clean, well-structured scientific code, implement standard numerical methods from first principles, and use them to answer quantitative macroeconomic questions of their own—a skill set directly relevant to graduate study and to research and policy roles in central banks, government, and the private sector.
Module Learning Aims	
Learning Outcomes	**Learning Outcomes** On successful completion of this module, students will be able to: • Write clean, well-structured Python code for scientific computing, making appropriate use of core numerical libraries. • Implement fundamental numerical methods, including root-finding, optimization, numerical integration, and interpolation, and explain the principles on which they rest. • Solve dynamic programming problems using value function and policy function iteration. • Translate the equilibrium conditions of a structural macroeconomic model into a working computational implementation. • Calibrate quantitative models to data and assess the sensitivity of results to parameter choices. • Simulate model dynamics and interpret the resulting outcomes in relation to substantive macroeconomic questions. • Critically evaluate the strengths and limitations of numerical solution methods, recognizing when a given method is appropriate and when it may fail. • Communicate quantitative results clearly through appropriate visualization and written interpretation.
Indicative Reading / Resources	The more theoretical aspects of methods will generally follow: • Stachurski, John (2009), Economic Dynamics: Theory and Computation, MIT Press, Cambridge, MA. Though I will usually treat the topics in a less mathematically rigorous way. I will also regularly reference freely available online lectures at:

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	• QuantEcon, Quantitative Economics with Python (online lecture series), available at https://quantecon.org (and the Python lectures directly at https://python.quantecon.org).

Assessment	
Assessment Components	Coursework 50%, In-person Exam 50%
Assessment Details	Coursework will take the form of an ongoing computational work that students will be asked to perform throughout the term, building to a final project.

Additional Information	
Prerequisites	ECU33081, ECU33082, ECU33091, ECU33092
Co-requisites	None
Any other information	