EF8091: TOPICS IN COMPUTATIONAL ECONOMICS

Effective Term
Semester A 2025/26

Part I Course Overview

Course Title
Topics in Computational Economics

Subject Code
EF - Economics and Finance
Course Number
8091

Academic Unit
Economics and Finance (EF)

College/School
College of Business (CB)

Course Duration
One Semester

Credit Units
3

Level
R8 - Research Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil

Additional Information
Nil

Part II Course Details

Abstract

The goal of this course is to help students transition from formal training in Econometrics and Theory to practical applications. The course will cover computational methods for solving economic models numerically, programming econometric methods, and presenting empirical results. The course begins with foundational methods, including iterative techniques, numerical integration, and optimization, followed by advanced inference methods and function approximation. Applications will cover both microeconomic models, such as discrete choice and dynamic Markov decision processes, and macroeconomic models, including dynamic programming, market-clearing price determination, life cycle models, social security tax changes, and heterogeneous agent problems with aggregate uncertainty.

This course is ideal for students aiming to conduct research in applied microeconomic fields or for those interested in macroeconomic models involving strategic interactions and heterogeneous agents.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Develop Computational Proficiency: Students will be able to apply various computational methods, such as iterative techniques, numerical integration, and optimization, to solve complex economic models numerically. They will gain hands-on experience with programming languages and tools relevant to econometric analysis.		x	x	x
2	Analyze and Interpret Empirical Results: Students will learn to program and implement econometric methods, including maximum likelihood estimation, simulated moment methods, indirect inference, and bootstrapping. They will develop the skills to analyze and interpret empirical results, making informed conclusions based on data.		x	x	x
3	Apply Economic Models to Real-World Scenarios: Students will be able to apply discrete choice models, dynamic Markov decision processes, and dynamic programming techniques to both microeconomic and macroeconomic contexts. They will gain insights into practical applications such as market-clearing price determination, life cycle models, social security tax changes, and heterogeneous agent problems with aggregate uncertainty.		x	x	x

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lectures	Students will engage with a structured introduction to computational methods in economics through lectures. These sessions will cover key topics such as iterative techniques, numerical integration, and optimization.	1, 2, 3	3 hours/week
2	Readings	Students will deepen their understanding by reading scholarly books and articles related to computational methods in economics. These readings will provide them with a theoretical background and expose them to the latest research and applications in the field.	1, 2, 3	
3	Peer discussions	Students will participate in peer discussions to enhance their knowledge and performance on assessment tasks. These discussions will allow them to share insights, troubleshoot problems, and collaborate on projects.	1, 2, 3	

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Coursework	1, 2, 3	100	The coursework will include homework assignments, each focusing on a different method, to help students become familiar with these techniques and assess their performance and understanding. Here are some sample assignments: 1. using numerical integration methods and fixed-point iteration to solve economics problems, 2. applying inference methods such as maximum likelihood estimation (MLE), simulated method of moments (SMM), and indirect inference, and 3. estimating discrete choice models and dynamic discrete choice models.	Yes

Continuous Assessment (%)

100

Examination (%)

0

Examination Duration (Hours)

0

Minimum Continuous Assessment Passing Requirement (%)

0

Minimum Examination Passing Requirement (%)

0

Assessment Rubrics (AR)

Assessment Task

Coursework

Criterion

Ability to accurately solve numerical and computational problems, apply appropriate methods to various problems, write clear and efficient programming code, provide thorough explanations, and deliver clear presentations.

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal levels

Part III Other Information

Keyword Syllabus

Fortran context, Iterative method, Numerical integration, Optimization, Inference methods, Function Approximation, Discrete choice model, Dynamic Markov decision, Infinite horizon dynamic programming, Finite Time dynamic programming, Computing Transitions, Approximating sequences of distributions

Reading List

Compulsory Readings

	Title
1	Judd, K. L. (1998). Numerical methods in economics. MIT press.
2	Miranda, M. J., & Fackler, P. L. (2004). Applied computational economics and finance. MIT press.

Additional Readings

	Title
1	Press, W. H. (1996). Numerical recipes in Fortran 90: Volume 2, Volume 2 of Fortran numerical recipes: The art of parallel scientific computing. Cambridge university press.
2	Adda, J., & Cooper, R. W. (2003). Dynamic economics: quantitative methods and applications. MIT press.