Syllabus

[cmcd.economia@fgv.br]

Course Name: Computational Methods in Economics
Faculty:

2026 FIRST SEMESTER

COURSE OUTLINE

This course aims to introduce computational tools for numerical analysis in Economics that can be used in a variety of economic problems from different areas. The first part of the course covers several techniques, including interpolation, optimization, root-finding, numerical integration, and differentiation. These tools can be used in fully empirical projects, for instance, interpolation of sparse data, implementation of non-standard estimators, or simulations. The second part of the course applies these tools in programming and solving dynamic models, including structural estimation.

The course also aims to introduce students to scientific computing, using Julia as the main language. However, students are allowed to complete the course using any language of their choice (Fortran, C++, R, Python, Matlab, and others). Special emphasis will be placed on reproducibility when using any computational tool.

COURSE PROGRAM

Part I

- Introduction to scientific computing
- Interpolation
- Optimization
- Root-finding
- Numerical Derivation
- Numerical Integration
- Parallelization

Part II

- Introduction to structural estimation
- Canonical dynamic models
- Models with life-cycle component
- Models with uncertainty
- Simulating
- Estimating

BIBLIOGRAPHY

- Fundamentals of Numerical Computation (Julia Edition) by Tobin A. Driscoll and Richard J. Braun
- Numerical Methods in Economics by Kenneth L. Judd (MIT Press, 1998).
- Introduction to Computational Economics Using Fortran by Hans Fehr and Fabian Kinderman (Oxford University Press, 2018)
- Numerical Recipes in Fortran 77: The Art of Scientific Computing, Second Edition (Volume 1 of Fortran Numerical Recipes) by William H. Press, Saul A. Teukolsky, William T. Vetterling, and Brian P. Flannery (Cambridge University Press, 1992),

The development of this course was highly based on materials provided by professors Tony Smith, Cormac O'Dea, and Monica Costa Dias. I am very grateful to them for sharing their teaching materials.

GRADING

The final grade will be based on three components:

- Problem sets (30%)
- Student presentation (20%)
- Final project (50%)

CONTACT