

EC 580/480: Mathematical Economics Syllabus

Fall 2019

Class Meetings: Tuesday/Thursday 10 am – 11:50 a.m., Parkmill 11 (on the Park blocks at Mill Street)

Professor: John Luke Gallup, jl Gallup@pdx.edu

Office: Cramer Hall 241Q, Office Hours: 12:00 p.m.–1:00 p.m. on Tuesday/Thursday

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CRN: 10995 (480) / 11002 (580)

Course Materials:

Text: Fundamental Methods of Mathematical Economics

by A. C. Chiang, Third Edition, McGraw-Hill, 1984 **OR**

by A. C. Chiang and K. Wainwright, Fourth Edition, McGraw-Hill, 2005.

Other Useful Books:

- 1) *Mathematical Methods and Models for Economists* by Angel de la Fuente, Cambridge University Press, 2000. [somewhat more advanced and comprehensive than Chiang]
- 2) *Optimization in Economic Theory* by A. Dixit, Second Edition, Oxford University Press, 1990. [succinct but thorough treatment of static and dynamic optimization]

Course Description:

Modern economics is based on mathematics to a great extent. EC 580/480 will be an intensive course in the elementary mathematics essential for entering graduate students in a typical MA/MS program in Economics (and similar disciplines), and for advanced undergraduate students aspiring for further studies in Economics. The course will be intended to be a “tools” course, drawing on neoclassical economics. Primarily, the course will focus on the mathematical methods related to linear algebra, calculus, and optimization. From time to time, we will also discuss economic applications of these methods. It is important to emphasize that almost all of the concepts the students learn from this course will be used in our graduate courses on microeconomics and macroeconomics. Class time will mainly be devoted to discussing selected materials from the text and reviewing homework assignments (or other problems we introduce in class).

Grading:

A mid-term and a final will each constitute 45% of the final grade. The remaining 10% of the final grade will constitute homework assignments (5%) and presentation of the same (5%). You are expected to work on the homework assignments and be prepared to present your solutions to class. There will be 3 homework assignments. The midterm will be scheduled during the sixth

week of the fall term.

Course Topics:

Linear Algebra

- Matrix algebra. Determinants, Cramer's rule.
- Quadratic forms, Definiteness, Eigenvalues (characteristic roots).
- References: Chiang: chapters 4, 5.

Differential Calculus

- Functions.
- Limits, Continuity, Differentiability. Differentiation and its rules, Taylor's Theorem. Partial derivative, Implicit functions, Total differential. Curvature of functions, Hypograph, Epigraph, Hessian matrix. Homogeneous functions, Euler's theorem.
- References: Chiang: chapters 6, 7.

Comparative Statics

- Comparative statics using implicit function and total differential. Economic applications.
- References: Chiang, chapter 8.

Optimization

- First order necessary condition(s), Second order sufficient condition(s).
- Local maximum/minimum, Global maximum/minimum.
- Economic applications. Quasiconcave and quasiconvex functions.
- References: Chiang, chapters 9, 11.

Constrained Optimization

- Optimization with linear equality constraint(s). Method of substitution, Lagrange multiplier method.
- Envelope theorem, Interpretation of Lagrange multiplier. Optimization with nonlinear equality constraint(s).
- Optimization with inequality constraint(s), Kuhn-Tucker conditions and sufficiency theorem.
- References: Chiang, chapters 12, and 21(3rd Ed.) or 13 (4th Ed.).

Integral Calculus

- Integration, Economic applications, Differential Equation.
- Other topics: TBA (will be determined depending on the time left).