Class Meetings: TR 2 pm–3:50 pm, Cramer Hall 221
Instructor: Arnab Mitra, E-mail: amitra@pdx.edu
Office: Cramer Hall 241N, Office Hours: TR 12:30 pm–1:30 pm
Teaching Assistant: Rebecca Hanes, E-mail: hanes2@pdx.edu
Office: Economics Computer Lab

Course Materials:
Text: *Fundamental Methods of Mathematical Economics*

Other Useful Books:

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 40% of the final grade. The remaining 20% of the final grade will constitute homework assignments (15%) 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 approximately 4 to 5 homework assignments. The midterm will be tentatively scheduled during the sixth week of the fall term.

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1 This syllabus is subject to change. Please consult the course website on D2L for the latest version.
2 A slightly more advanced and more comprehensive book.
3 A succinct but thorough treatment of static and dynamic optimization.
Course Topics:

1. **Linear Algebra**  
   Matrix algebra.  
   Determinants, Cramer’s rule.  
   Quadratic forms, Definiteness, Eigenvalues (characteristic roots).

References:  
Chiang 3rd edition: chapters 4, 5.

2. **Differential Calculus**  
   Functions.  
   Limits, Continuity, Differentiability.  
   Differentiation and its rules.  
   Partial derivative, Implicit functions, Total differential.  
   Curvature of functions, Hessian matrix.  
   Homogeneous functions, Euler’s theorem.

References:  
Chiang 3rd edition: chapters 6, 7.

3. **Comparative Statics**  
   Comparative statics using implicit function and total differential.  
   Economic applications.

References:  
Chiang 3rd edition, chapter 8.

4. **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 3rd edition, chapters 9, 11.

5. **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.


6. **Integral Calculus**  
   Integration, Differential Equation.  
   Other topics: TBA (will be determined depending on the time left).