



## MATHEMATICS FOR SOCIAL SCIENTISTS I

Instructor: **Pablo Hernandez**  
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**Lectures:** TuThSu 4:00PM - 5:15PM, Room: N-212, DTCN.

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### Pre-requisites

None

### Required text

*Essential Mathematics for Economic Analysis*, (4th edition) by K. Sydsaeter and P. Hammond.

The text is required and has been ordered for student purchase at the bookstore. Although the text will not be followed rigorously, the readings related to the topical coverage in the course have been specified below. The instructor will hand out supplementary notes which together with the text will form the core of knowledge to be assimilated in this course.

The following text is recommended but not required.

Chiang, A. C. and Wainwright, K., *Fundamental Methods of Mathematical Economics*, McGraw-Hill

### Course Content

This course provides an introduction to topics in mathematics immediately relevant for social scientists beginning their studies in Economics, Political Science or Sociology. As such, the course covers tools critical for introductory theoretical and empirical analyses in the social sciences. Beginning with a review of sets and functions, the course covers key topics in calculus and introduces the notation associated with basic linear algebra if time permits. Note that this course is *not* a study of pure mathematics and so results will be presented without rigorous proofs. Instead the course focuses on employing mathematics to formulate and communicate theories within the social

sciences. That is, the course is an introductory study in the *lingua franca* of modern social sciences.

Upon completion of the course students should be able to perform the following tasks:

- describe simple economic problems using mathematical functions and equations,
- identify the objective, the decision variables and the constraints in these problems,
- identify and apply mathematical tools to solve these problems,
- interpret the economic meaning and implications of the solutions to the mathematical models.

The course will consist of weekly lectures (Tuesday and Thursday) briefly reviewing mathematical concepts and techniques used in intermediate level economics followed by analysis of problems utilizing these. As the best way to learn mathematical methods is continuous practice on solving problems, most of the learning in this course will take place through working on take-home assignments and problems sets during the laboratory (lab) sessions on Sunday class.

### **Calculator use**

Please note that calculators are **not to be used** during labs or exams till further notice.

### **Notes**

While the textbook and course material will seem daunting at first, note that not everything in the text will be covered in this introductory course. Students should rely primarily on instructor notes and focus on the process of translating into mathematics that which they can logically say in words. The course will be problem solving oriented and not oriented towards proving mathematical theorems and concepts.

### **Homework, Exams and Evaluation Policy**

There will be two midterm exams and a final exam. The first midterm will be in class while the second midterm will be a take home exam. The final examination will take place at a time and location to be announced. Each of the three exams in this course count for 25% of the final grade. Assignments will be handed out throughout the term (on Thursday and they will be due the following Tuesday) and will count for 20% of the final grade. There will be in class surprise quizzes during the entire semester. This will account for 5% of the grades. Grades are based solely on exams, assignments and quizzes; there will be no extra credit or additional work in exchange for grades.

**The dates of the exams will be announced as we proceed.**

Students are expected to demonstrate their competence in a variety of ways including on examinations, homework exercises and quizzes.

**Class attendance**

Not required but highly recommended. Laptops and cell-phones are not permitted in class.

**Classroom citizenship**

Students are expected to be diligent in the pursuit of their studies and regular in their attendance. As noted above, class attendance is not required; failure to attend is at your own risk. You are responsible for any announcements made or information given during class, no excuses will be accepted. The exams will be based on lecture material and required readings. Some of the lecture material may not be in the readings and the student should have carefully read the material at least once before class. Class participation is strongly encouraged.

**Student grievances and procedures**

Complaints and questions about exam grades must be submitted in writing, written responses will follow.

**Course Outline, list of topics**

The course is divided into five units. The following brief course outline provides the list of broad topics to be covered and the sequence in which these will be covered.

**Units 1 and 2 ending with Midterm I**

1. **Introduction and review of college algebra**
  - Important sets: the natural numbers, the integers, rational numbers
  - Powers, basic rules of algebra, linear and non-linear equations, set theory.
  
2. **Elementary Functions, Graphical Analyses and Economic Applications**
  - Definition
  - Examples of important functions: Linear functions, logarithmic and exponential functions, polynomials.
  - Graphs of functions

**Unit 3 ending with Midterm II**

3. **Univariate Differential Calculus**

- Derivatives, tangent lines and slopes.
- Sum, product and quotient rules
- Chain rule and differentiating the inverse
- **Example:** Economic applications to elasticity.

## **Units 4 and 5 ending with Final Exam**

### **4. Higher order derivatives**

- Second derivative
- Concave and convex functions
- Single variable optimization
- **Example:** Economic applications to profit maximization

### **5. Integral Calculus**

- Anti-derivatives and the definite integral
- Integration by parts and substitution
- Economic Examples: Consumer and producer surplus

A somewhat more detailed list of sub-topics to be covered under each topic, along with the relevant chapter readings for each unit will be posted on the class website when we get to that point.

### **Disability Accommodation**

Anyone who anticipates difficulties with the content or format of the course due to a physical or learning disability should see me immediately in order to work out a plan.

### **Classroom etiquette**

I'd like to provide an excellent learning environment for everyone. This can be ensured if everybody observes certain basic ground rules.

- Do not use laptops or other electronic devices for anything during class time except to take notes.
- If you are attending the lecture, plan on being there for the entire duration of the class. If you absolutely must leave early for a good reason, on any given day, please sit near the door and leave quietly.
- Food or drink within reason is fine.
- It's always welcome to interrupt with questions related to the material being covered.

***This syllabus is subject to change at the discretion of the Instructor.***

**Welcome to MATHEMATICS FOR SOCIAL SCIENTISTS I! Have an  
intellectually stimulating and productive Fall semester!**