Bentley University 

Department of Economics

Quantitative Methods in Economics and Business

Fall 2021

Instructor: Sacha Gelfer

Contact Information:

**Office: AAC 167**

**E-mail:** [**sgelfer@bentley.edu**](mailto:sgelfer@bentley.edu)

Office hours: Monday + Wednesday 1-2:30pm zoom

**Course Description:** This course covers the main mathematical tools used in economics, finance and quantitative business decision making. The main aspect of the course will be focused on teaching and solving optimization problems faced in modern economics and business studies.  Topics include constrained and unconstrained optimization, contemporary and practical techniques of calculus and probability in economic evaluation and business decision making. All topics in this course are taught using currently available, efficient tools and packages of Economics. This course is particularly recommended for students intending to study advanced economics, finance theory, and graduate business courses.

**Learning Objective**

1. **Knowledge Objectives**
   * Understand the matrix algebra operations needed in economic model building and analysis
   * Understand the multivariable calculus needed in economic model building and analysis
   * Comprehend general equilibrium economic models and the time dynamics associated with them
   * Understand and calculate a firm’s optimized business decision, including its objective function and the constraint or constraints it is subject to
2. **Skills Acquired**
   * Build and analyze economic models which provide guidance about economic policies and events
   * Critically read and comprehend academic economic articles and models
   * Use computer software to analyze data related to business decisions and economic policy
3. **Perspectives Gained**
   * View policy decisions in a mathematical perspective by having an informed awareness of the direction and magnitude such policy has on major economic variables

* Familiarize oneself with the mathematical tools and economic modeling techniques to help determine the impact of historical and future economic events

**Course Requirements and Grading:** Your grade in the course will be determined by your performance on five problem sets, midterm exam and final exam.

**Course Grading**:

* Midterm Exam 25%
* Final Exam 25%
* Problem Sets 50%

**Problem Sets:** All problem sets will be assigned on Thursdays of various weeks. All problem sets are due by 9:00 p.m. on the due date and should be submitted online.

**Exams:** All exams must be taken on date assigned, no exceptions.

**Computer Software:** Portions of the problem sets require use of computer software with “canned” optimization routines and functions. I will provide examples in Octave which is available through [https://www.gnu.org/software/octave/#](https://www.gnu.org/software/octave/)

**Textbooks:** There is one **required** text for the course and one *recommended* text

* *Fundamental Methods of Mathematical Economics by Wainwright and Chiang 4th edition 2004. (W+C)*

# Schaum's Outline of Introduction to Mathematical Economics by Edward Dowling, 3rd Edition *(Schaum)*

|  |  |  |  |
| --- | --- | --- | --- |
| Wk | Dates | Topic | Reading |
| 1 | 9/8 (Wed) | * *Linear Economic Models* | * *Ch. 3 (W+C)* * *Ch. 2, 6 (Schaum)* |
| 2 | 9/13  9/15 | * *Static Partial Equilibrium Analysis* * *General Equilibrium Analysis* * *Income and Price Elasticity* | * *Ch. 3 (W+C)* * *Ch. 2, 6 (Schaum)* |
| 3 | 9/20  9/22 | * *Linear Models and Matrix Algebra*    + *Matrix Operations*   + *Determinants*   + *Matrix Inversion*   + *Cramer’s Rule* * ***Problem Set #1 Assigned*** | * *Ch. 10, 11 (Schaum)* |
| 4 | 9/27  9/29 | * **Differential Calculus**    + *Partial derivative*   + *Total differential*   + *Comparative Statics* | * *Ch. 6, 7 (W+C)* * *Ch. 5, 13 (Schaum)* |
| 5 | 10/4  10/6 | * **Economic Models and Comparative Statics**    + *IS/LM Model & Comparative Statics*   + *Production Markets & Comparative Statics* * ***Problem Set #2 Assigned*** | * *Ch. 3 (W+C)* * *Ch. 2, 6 (Schaum)* |
| 6 | 10/11  10/13 | * **No Class 10/11 Fall Break** * *Time Series Models* * ***Problem Set #3 Assigned*** |  |
| 7 | 10/18  10/20 | * *Time Series Models* * *Impulse Response Functions* * *Simulation Methods* * *Descriptive Statistics of Simulations* | * *Ch. 6, 13 (Schaum)* |
| 8 | 10/25  10/27 | * Midterm Review   **Midterm -Wednesday, October 27th** |  |
| 9 | 11/1  11/3 | * **Optimization** * *First-Order Conditions* * *Local max/min* * *Multiple Choice Variables* * *Comparative Static Aspects of Optimization* * *Optimization with linear equality constraint* * *Lagrange multiplier method*   + *Interpretation of Lagrange multiplier* * ***Problem Set #4 Assigned*** | * *Ch. 9,11 (W+C)* * *Ch. 4, 5 (Schaum)* |
| 10-11 | 11/8  11/10  11/15  11/17 | * **Constrained Optimization** * *Optimization with multiple linear equality constraints* * *Optimization with non-linear equality constraint* * *Optimization with linear inequality constraint*   + *Kuhn-Tucker conditions* * *Economic and financial constrained optimization applications*   ***Problem Set #5 Assigned*** | * *Ch. 12,21 (W+C)* * *Ch. 5, 6, 13(Schaum)* |
| 12 | 11/22  11/24 | * *Growth Accounting Rules* * **No Class 11/24 Thanksgiving Break** |  |
| 13-14 | 11/29  12/1  12/6 | * ***Advanced Macroeconomic Modeling***   + *Log Linearization*   + *Log Linearization around a steady state* |  |
| Final | 12/13 | **Finals Exam-Monday, December 13, 3:00-5:00pm** |  |

**Academic Integrity Policy:** *All students are expected to adhere to Bentley’s Academic Integrity policy* which includes Bentley’s Honor Code (details on the policy can be found in the Undergraduate Student Handbook, the Graduate Catalog, and Bentley’s academic integrity course page on Blackboard into which all students and faculty are enrolled). The essence of the policy is that you should not represent someone else’s work as your own (no plagiarism, no cheating on exams, no illicit collaboration on projects, etc.). Failure to adhere to the policy can have serious consequences, including course failure, suspension, or even expulsion from the university. The best way to avoid a problem is to consult with your instructor before taking an action that might constitute a violation.

**Disability Services:**

Bentley University abides by Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 which stipulate no student shall be denied the benefits of an education solely by reason of a disability.  If you have a hidden or visible disability which may require classroom accommodations, please call the Office of Disability Services within the first 4 weeks of the semester to schedule an appointment.  The Office of Disability Services is located in the **Office of Academic Services (JEN 336, 781.891.2004).** The Office of Disability Services is responsible for managing accommodations and services for all students with disabilities.

**Student Behavior and Inclusion**

“Our university does not discriminate on the basis of race, sex, age, disability, veteran status, religion, sexual orientation, color or national origin. Any suggestions as to how to further such a positive and open environment in this class will be appreciated and given serious consideration. Personal and professional courtesies are especially important to me. My class roster has your preferred name, but I will happily address you by an alternate name and/or pronoun. Just let me know your preference early in the semester.

Everyone in this class has different life experiences and perspectives, and all are valid.  As the instructor, I will do my best to behave maturely and respectfully in all our class-related engagements and I expect students to do the same. We are all expected to adhere to Bentley standards of appropriate conduct, known as the ‘Bentley Core Values.’ If you feel that I or anyone in this class has acted outside the Bentley Core Values, please come to me so that we may discuss your experience. If you do not feel comfortable coming to me with your concerns, I encourage you to speak with someone in the Office of Academic Advising: 781.891.2803, [academic\_services@bentley.edu](mailto:academic_services@bentley.edu), Jennison 336. My goal is to work with all of you to create an inclusive educational environment in which different experiences and perspectives enhance learning rather than distract us from it.”

**Bias Incident Response**

The Bias Incident Response Team (BIRT) provides students affected by bias or bias-related incidents with access to appropriate resources. Where appropriate, BIRT assists the University in its response to situations that may impact the overall campus climate related to diversity and inclusion. Working closely with appropriate students, faculty, committees, organizations, and staff, BIRT plays an educational role in fostering an inclusive campus community and supporting targeted individuals when bias or bias-related incidents occur. More information about BIRT and how to file a bias incident report can be found at: [https://www.bentley.edu/offices/student-affairs/birt](https://nam11.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.bentley.edu%2Foffices%2Fstudent-affairs%2Fbirt&data=04%7C01%7CSGELFER%40bentley.edu%7Ce4588bb4830a43812b9708d96d88e27e%7C9030beae3cfc4788a9e2130204ff1f10%7C0%7C0%7C637661256984183320%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=LkKq%2BoMqiYBhoWfSUxirQzdGJP92NJT3CeOnQ6pbHnk%3D&reserved=0)