Instructor:	Dr. Nicholas A. Wright, Assistant Professor
Office:	DM-307A
Email:	nicwrigh@fiu.edu
Class Time	Tues/Thurs. 9:30 a.m. - 10:45 p.m.
Place:	Charles E. Perry, Rm 445
Office Hours:	Tues/Thurs., 1:15 – 2:30 p.m. or by appointment.
TA:	

Overview (CRN: 86617 & 91020)

Description: This course explores the mathematical methods utilized in modern economics. These include: (i) linear methods often used in mathematical modelling, (ii) the portions of mathematical analysis relevant for studying optimization problems, (iii) the construction and solution of optimization problems, and (iv) the solution of difference and differential equations characteristic of modern intertemporal models, as used in both microeconomics and macroeconomics. This course is cross listed as 6405/7405. Since they meet concurrently in the same room, the material covered will be the same.

The first part of the course develops some basic mathematical tools which we will use to solve optimization problems. This covers roughly parts II and III of the text, and may include excerpts from parts VI and VII. The second part (part IV of the textbook) covers classical, calculus-based methods of optimization including Lagrange multipliers and the Kuhn-Tucker theorem. The methods of Lagrange and Kuhn-Tucker have been invaluable in solving many of the problems you will typically encounter in economics (consumer and producer choice, social welfare max, etc.). We then cover the solution of difference and differential equations, and their stability properties (part V). If time permits, we will look at dynamic optimization and the Maximum Principle.

Required Textbooks: Carl Simon and Lawrence Blume, Mathematics for Economists, W. W. Norton, New York, 1994.

Readings – This is a PhD level course. As such, I expect that you will attend classes regularly and read the assigned chapters. Lecture notes will also be posted on Canvas.

Canvas: Important course information will be posted on **Canvas**, including all problem sets, additional readings, and lecture slides. It is your responsibility to check Canvas regularly.

Grading

Problem sets 20% - Homework assignments must be clearly written and should be submitted during class. Each student must submit their own independent work, though you may join with your classmate to work on the assignment.

Two Mid-Term Exams 50% - Each exam is 25% of your grade. The exams will have problems that are similar to the problem sets. <u>No makeups.</u>

Final Exam 30% - The final exam will be administered in our regular classroom during finals week on December 5th.

Course Objectives

- Determine whether a linear system has a solution, and if so, how many.
- Solve linear systems using both determinants and the Gauss-Jordan method.
- Find eigenvalues and eigenvectors. Use the functional calculus.
- Determine whether an optimization problem has a solution.
- Characterize the solutions of optimization problems via the first order conditions.
- Solve unconstrained optimization problems using first and second order conditions.
- Solve constrained optimization problems using the Kuhn-Tucker Theorem.
- Exploit special features such as homogeneity or convexity when solving optimization problems.
- Solve linear difference and differential systems.
- Characterize the long-run behavior of difference and differential systems using eigenvalues.

Lecture outline

Tentative and subject to change, especially if there are hurricanes. It is probably a bit over ambitious, but we'll see. Once the semester is underway, the lecture notes will show what was covered.

Aug. 22: Intro to Linear Algebra (and use in Economics) [Chapter 6]
Aug. 22, 24: Linear Systems [Chapter 7]
Aug. 29: Matrix Algebra [Chapter 8]
Aug. 31: Determinants [Chapter 9 & Chapter 26]
Sept. 5, 7: Euclidean Spaces [Chapter 10]

Sept. 12, 14: Linear Independence, Bases (see also Chapters 27 & 28) [Chapter 11]
Sept. 19: Counting, Limits, and Open Sets [Chapter 12 & Chapter 20]
Sept. 21: Exam #1 — through Chapter 11 + parts of 26, 27, and 28
Sept. 26, 28: Limits and Closed Sets [Chapter 12]
Oct. 3: Continuous Functions [Chapter 13.4]
Oct. 5: Monotone Convergence, Completeness, Compact Sets, Weierstrass Theorem [Chapter 29.1-2, 5 & Chapter 30.1]
Oct. 10: Calculus of Several Variables I [Chapter 14]
Oct. 12: Calculus of Several Variables II, Rolle's Theorem, Mean Value Theorem, Taylor Formulas [Chapter 30 & Chapter 29.3]
Oct. 17: Implicit Functions and their Derivatives [Chapter 15]
Oct. 19: Quadratic Forms and Definite Matrices [Chapter 16]
Oct. 24: Unconstrained Optimization [Chapter 17]
Oct. 26: Exam #2 — Chapters 12-17, 29 & 30
Oct. 31: Constrained Optimization I: First-order Conditions (continued) [Chapter 18]
Nov. 2: Constrained Optimization II: Multipliers and Second-order Conditions [Chapter 19]
Nov. 7: Homogeneous and Homothetic Functions [Chapter 20]
Nov. 9: Concave and Quasiconcave Functions [Chapter 21]
Nov. 14, 16: Eigenvalues and Eigenvectors [Chapter 21]
Nov. 21: Ordinary Differential Equations: Scalar Equations [Chapter 24]
Nov. 23: Thanksgiving Holiday (no class)
Nov. 28: Ordinary Differential Equations: Systems of Equations [Chapter 25]
Nov. 30: Optimal Growth [Chapter 26]

Please note that the Thanksgiving Holiday on Nov. 23 indicates that there won't be a class on that day. Lecture notes adopted from John Boyd will be posted for each lecture.

Course and University Policies

Extra Credit – I reserve the right to provide opt-in extra credit opportunities to the class. These opportunities provide a unique way for students to engage with the concepts covered in the class, while improving your grade for the course.

Curve – I reserve the right to curve grades (this can be upward or downward).

Exams. The exams will not be rescheduled. If a student is unable to attend due to an unexpected emergency, and she/he can provide satisfactory written documentation of the emergency, her/his final exam will be weighed more heavily to make up for the missed exam.

Instructor assessment: Your constructive assessment of this course plays an indispensable role in shaping education at FIU. Upon completing this course, please take time to fill out the online course evaluation.

No electronics. I strongly urge a no electronics policy. This includes cell phones, tablets, etc. Any student needing an exception to this rule is welcome to discuss at office hours to make their case. If an exemption is provided, this will be removed if the item is used in a disruptive manner. Computers are only allowed for note taking.

Attendance: Students are responsible for obtaining any missed lecture notes from their classmates. The presumption of your registration for this course is that you are able to attend class, arrive on time, and stay for the full duration. Only medical emergencies will be considered as an excused absence.

Academic honesty: All students are expected to demonstrate honesty in their academic pursuits. Florida International University is a community dedicated to generating and imparting knowledge through excellent teaching and research, the rigorous and respectful exchange of ideas, and community service. All students should respect the right of others to have an equitable opportunity to learn and to honestly demonstrate the quality of their learning. Therefore, all students are expected to adhere to a standard of academic conduct, which demonstrates respect for themselves, their fellow students, and the educational mission of the University. All students are deemed by the University to understand that if they are found responsible for academic misconduct, they will be subject to the Academic Misconduct procedures and sanctions, as outlined in the Student Handbook. Academic Misconduct includes (but is not limited to) giving or receiving assistance on a test, quiz, or homework assignment for which such assistance is not permitted, falsifying a document to obtain an excusal from a test, having another person use a phony ID to take a test for you, and using unauthorized notes on a test or quiz. I encourage you to read FIU's academic integrity policy: http://integrity.fiu.edu/misconducts.html

Disability Accommodations: If you have a documented disability, please bring your documentation to me as soon as possible so that I can make suitable accommodations for you. If you believe that you have a disability and desire accommodation, please register with the Disability Resource Center, GC 190 as soon as possible. The FIU Disability Resources Center strives to promote student success by working collaboratively with students, faculty and staff to create an inclusive educational environment. The university is committed to advancing students learning and enhancing personal development. Any information provided will be 8 kept confidential. Documentation of your disability will need to be sent to the Disability Resource Center (GC 190).

Religious holidays: Class instructors are required to reasonably accommodate students in class attendance and course work because of religious observances, practices, and beliefs. Students are responsible for any material covered or tested during an excused absence, but shall be given a

reasonable amount of time to complete coursework including course exams and course assignments missed during their prior approved absence. The approved make-up assignment and examination must be equivalent in content, type, and grading scale to the missed coursework. Students who desire to be excused from class or coursework to observe or practice their religious beliefs should notify all instructors preferably upon receipt or access to the syllabus, but in no case later than two (2) weeks before the religious observance or practice. A student who has requested to be excused from class or coursework for a religious observance or practice is not required to provide a second party certification of the reason for the absence.

Nondiscrimination Statement: FIU promotes a culturally diverse and inclusive working and learning environment where current and prospective faculty, staff, and students are treated fairly and valued for their individuality. If any applicant, employee, or student has a good faith belief that they have been discriminated against or harassed based on age, color, disability, gender, marital status, ethnic/national origin, race, religion, retaliation, sexual harassment, or any other protected category, the Office of Civil Rights Compliance and Accessibility (CRCA) encourages him/her to complete the Discrimination, Harassment, and Retaliation Form and submit it to our office on the Modesto A. Maidique Campus in PC-220. CRCA will investigate the complaint in accordance with University Policy and Procedures.

The course syllabus provides a general plan for the course; deviations may be necessary.