THE UNIVERSITY OF TEXAS-PAN AMERICAN

Department of Mathematics

Math 2346.01: Math for EE and CE Fall 2012 MAGC 1.318 MW 13:10-14:25

Contact information

Instructor: Dr. Eleftherios Gkioulekas, Department of Mathematics
E-mail: drlf@hushmail.com
Web: http://faculty.utpa.edu/gkioulekase/index.html
Office hours: M 14:30–16:30 W 14:30-15:30 R 16:00-17:00
Office location: MAGC 3.214

Course information

Prerequisites: CSCI 1380 or CMPE 1370 or CSCI 1370 with a grade of C or better, and MATH 1460 with a grade of C or better.
Corequisites: None.
Course Description: This course covers the essentials of matrix theory, graph theory, numerical methods, and introduction to proofs needed for majors in Electrical and Computer Engineering. Topics include Gauss-Jordan elimination, matrix algebra, determinants, graphs, trees, root finding algorithms, numerical differentiation, numerical integration, numerical matrix methods, propositional and predicate logic, and formal logic proofs.

References

E. Gkioulekas (2009): "Lecture Notes on Mathematics for Electrical Engineers", 268 pp. (textbook)

See course website for hyperlinks.

Outline of Topics

- **Brief introduction to logic and sets**
  Propositions and sets
  Predicates and quantified statements
- **Brief introduction to proof**
  Negation and contrapositive of statements
  Methodology for writing proofs
- **Linear Algebra**
  Matrices
  Basic operations with matrices
  Matrix multiplication
  Matrix inverses
  Exam 1
  Matrix transpose
  Determinants
  Cofactor expansion of determinants
  Simplification of determinants
  $n \times n$ linear systems of equations
  Matrix inverse
  Cramer's rule
  Gaussian elimination
- **Applications of linear systems**
  DC Circuits
  Exam 2
  Superposition principle of circuits
  Least squares fit
- **Eigenvalues and eigenvectors**
  Definitions
  How to find the eigenvalues
  How to find the eigenvectors
  Characteristic polynomial
  Cayley-Hamilton theorem
  Exam 3
- **Graph theory**
  Graphs – Basic terminology

Types of graphs
Relations between graphs
Subgraphs
Graph operations
Connected graphs
The Laplacian matrix
Graph connectivity
Eulerian graphs
Hamiltonian graphs
Adjacency matrix
Shortest path problem
Trees
Minimum spanning tree problem (Kruskal's algorithm)
Planar graphs

- **Misc topics**
  Root finding algorithms
  Finite differences
  Integral approximations

Grading Policies

- **Grading:** There will be 4 major exams, and a comprehensive final exam. The time and location of exams will be announced in class. Exams count for 75% (with lowest exam score dropped) and final exam for 25%. Combined, you get a numerical grade on a scale 0-20. Each exam question is graded on a 0-4 scale with $4 = A$, $3 = B$, $2 = C$, $1 = D$, $0 = F$. Combining all exams, as explained above, gives a weighted average score on a 0-20 scale. This score is then mapped to a letter grade as follows: A: 16-20; B: 12-16; C:10-12; D; 7-10; F: 0-7. If there is a downcurve, I will announce it in class and on the course website.
- **Lectures:** Students are expected to attend each lecture. You're expected to know everything I cover in lecture, regardless of whether or not it is covered properly in your textbook. If you miss any meeting, it is your responsibility to get class notes from another student.
- **Homework:** Homework will be assigned, but will not be collected or graded. Nevertheless, it is crucial to do the homework as part of your preparation for the exams. To keep up, I recommend that **after every lecture you should solve the homework problems corresponding to the material covered on that day's lecture. Thus you need to work on a continuous basis!**
- **Attendance Policy:** Attendance will be taken during most class meetings. **The instructor has the prerogative to drop any student with five (5) or more unexcused absenses.** Two (2) tardies will count as one (1) unexcused absense. A tardy is defined as entering the class late or leaving the class early. **If you miss any major exam (e.g. any 50min or longer in-class exam), you will be dropped from the course.** An attendance extra credit of 5% will apply to your grade with 1% deducted for every unexcused absense.
- **How to Excuse an Absense:** To excuse an absense, you must submit **in writing** the "Notification of a Scheduled Excused Absense form" stapled **with documentation**, before the date you will be absent, or no more than **three (3)** bussiness days after the date. The form should be submitted in person in class, during office hours, or via the Mathematics Department secretary. The form can be downloaded from the course web page. If a major exam is missed during an excused absense, your score for that exam will be replaced with your final exam score.
- **Make-ups:** There are no make-up exams. In the case of **excused** absences the final exam will be used as a make-up exam. **Each student MUST take the final exam at the scheduled date and time.** There will be no make-ups for the final exam, after the official final exam date!
- **Regrading policy:** If you believe that a mistake in grading has been made you may request that your paper be regraded. Such request must be submitted **in writing** within one week from the day the graded test has been returned in class, and must be accompanied by the original (unaltered) paper. If you make any changes to the paper your request will be denied. Please note that if you

request regrading, all problems are subject to review. Thus, your overall grade may be increased or decreased.

Other Policies

- **Course web page:** A course web page will be used to distribute the syllabus, assigned homework, solutions to exams, a copy of my lecture notes, and any other relevant material. A link to that page will be available from my main page at `http://faculty.utpa.edu/gkioulekase/index.html`
- **Extra Help:** You can get additional help during my office hours or from the following locations:
  (1) The *LSAMP Math Lab* is located in room MAGC 3.510 of the Math building. Tutoring hours are Monday - Friday: 8:00 am - 5:00pm All undergraduate math courses are tutored.
  (2) *Math Lab II* is located in room MAGC 3.530 of the Math building. Tutoring hours are Monday - Thursday: 8:00 am - 7:00pm and Friday: 8:00 am - 5:00 pm. All undergraduate math courses are tutored by Math professors and Graduate Assistants (GTAs).
  (3) *The Math Learning Center* is located in the LEAC building (the old Math building), room 114. Tutoring hours are: Monday-Thursday 8:30 am - 6:00 pm and Friday 8:30 am - 4:00 pm. Courses tutored are: MATH 1300; MATH 1334; MATH 1340; MATH 1341; MATH 1342; MATH 1450; MATH 1460; MATH 1470.
- **Departmental Calculator Policy:** A calculator capable of performing basic scientific computations (arithmetic, trigonometric functions, logarithmic and exponential functions) is required for this course. Graphing calculators, calculators that can store formulas or strings, or calculators capable of performing symbolic calculations will not be allowed in quizzes/tests/exams. Electronic equipments such as pocket organizers, handheld or laptop computers, electronic writing pads or pen-input devices, and cell phones will not be permitted during quizzes and exams. Graphing calculators will be permitted for solving homework problems.
- **More about Calculator Usage:** The problems you will encounter in my exams will not require a calculator, and you are better served in the long-term by minimizing your dependence on calculators. Don't use the calculator to approximate roots, exponentials, logarithms, etc. Mathematical problems require **exact** answers. Approximations are reasonable **only** on word problems where the numbers given may be approximate themselves, and thus the best answer that can be deduced is approximate (e.g. the 800 pound gorilla may in fact weigh 799.97356 pounds and not 800 pounds exactly, but the diagonal of a square with side 1 is *exactly* $\sqrt{2}$, not 1.41).
- **Classroom Conduct:** Common courtesy requires that students arrive in class on time, and stay the entire class period. Turn your cellphones and pagers off. You are required to treat your classmate and instructor with respect and courtesy. Use of any electronic devices, except for calculators, is not allowed in class, and I reserve the option to remove you from the classroom without warning for any behaviour that I deem as disrespectful or disruptive. You agree to indemnify and hold harmless the professor with respect to all actions undertaken by the professor to enforce classroom conduct or to properly proctor exams. For example, I may have to close your laptop, turn off your cell phone, temporarily seize a calculator that violates policy during exams, or move a notebook or text away from your desk during a closed notes closed book exam. Taking my course implies your consent to this policy.
- **Revisions:** This syllabus may be revised at any time. If it is revised, this will be announced in class, and logged on the course web site, where the revised syllabus will be made available. The syllabus posted on the professor's course web site is the only copy guaranteed to incorporate all

revisions that may be made under this policy and will thus supersede any other versions posted on other university websites.

- **Email Policy:** Only email sent to my private email account is accessible to me via my Android device, due to the requirement that I permit UTPA systems to be able to remotely wipe my Android device in order to access UTPA email with it. Consequently, email sent to my UTPA email address requires a longer time for me to respond. **Email will not be used by the instructor for any essential announcements.** All necessary announcements will be made in class and via the course web page. Confidential information (e.g. grades) can be emailed only to your UTPA email account.
- **Disability Access Statement:** Students with disabilities are encouraged to contact the Disability Services Office for a confidential discussion of their individual needs for academic accommodation. It is the policy of the University of Texas-Pan American to provide flexible and individualized accommodation to students with documented disabilities that may affect their ability to fully participate in course activities or to meet course requirements. To receive accommodation services, students must be registered with the Disability Services office (DS), University Center # UC 108 (on the first floor), 665-7005, disabilityservices@utpa.edu. The Director of Disabilities is Christine Stuart-Carruthers, 665-5375, carruthers@utpa.edu.
- **Academic integrity:** Student Code of Conduct: Each and every student registered for the section are expected and strictly required to comply at least with the following student conduct code and to observe standards of conduct appropriate for an academic institutions. The following practices are considered unacceptable conduct.
  (1) *Cheating:* Cheating involves: (1) copying from the test paper of another student, engaging in written, oral or any other means of communication with another during a test, or giving aid to or seeking aid from another student during a test; (2) possession and/or use during a test of materials which are not authorized by the person giving the test, such as class notes, books, or specially designed "crib notes"; (3) using, obtaining, or attempting to obtain by any means the whole or any part of an unadministered test, test key, homework solution, or computer program; (4) collaborating with or seeking aid from another student for an assignment without authority; (5) taking an examination for another person, or permitting another person to take an examination of one's self; and (6) falsifying research data, laboratory reports, and/or other academic work offered for credit.
  (2) *Plagiarism:* Any attempt by a student to represent the work of another as his or her own is cosidered as plagiarism. Of course, to prepare the course materials students are not only encouraged to discuss with the concerned instructor, they are allowed to discuss with fellow students, consult any books, journals, articles, internet or any other external resources; but work or answers presented by the students in the quiz, test or exam must be in their own style and written in their own words of understanding. In the academic world, plagiarism by students is a very serious offence that can result in severe punishments such as failing grade on the particular assignment or for the course.

  Plagiarism and Cheating of any kind on an examination, quiz, or assignment will result at least in an "F" for that assignment (and may, depending on the severity of the case, at the instructor's discretion, lead to an "F" for the entire course) and may be subject to appropriate referral to the University Administration.

Student Learning Outcomes

After completing this course students will be able to

(1) Perform the basic operations of matrix algebra.
(2) Solve a system of linear equations using Gauss-Jordan elimination, including augmented matrices and elementary row operations.
(3) Compute matrix inverses when they exist and solve linear systems using matrix inverses where applicable.
(4) Compute determinants of square matrices using the definition, elementary row operations, and cofactor expansion, know the basic properties of determinants, and solve linear systems using Cramer's rule where applicable.
(5) Compute eigenvalues and eigenvectors of a square matrix and apply them to problems in engineering, mathematics, and science.
(6) Know graph terminology, graph connectivity, Euler and Hamilton paths, planar graphs, and some of the major problems of graph theory, such as shortest path problems (solved by Dijkstra's algorithm).
(7) Understand trees, traversals of trees, sorting, and minimal spanning trees (Prim's and Kruskal's algorithms).
(8) Find roots of functions using the bisection, fixed-point, secant, and Newton's methods.
(9) Approximate derivatives of functions using finite differences.
(10) Approximate integrals using midpoint, trapezoid, and Simpson's rules.
(11) Apply formal methods of symbolic propositional and predicate logic.
(12) Know how to use formal logic proofs and logical reasoning to solve problems.
(13) Understand various proof techniques and determine which type of proof is best for a given problem.