

NUMERICAL METHODS FOR ENGINEERS

MECE 2350-01, MECE 2350-A
Summer 2017
M-F 11:20 AM - 12:50 PM, EENGR 1.242
M-F 1:00 - 2:30 PM, EACSB 2.120

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Textbook

Chapra, S.C., Applied Numerical Methods with MATLAB for Engineers and Scientists, 3rd Ed., McGraw-Hill, 2011. [ISBN: 9780073401102]

Course Description

This course offers students an in-depth exposure to the use of numerical methods and programming to solve engineering problems. It covers the following topics: basic programming (including data structures, if-then-else statements, loops, etc.), numerical solution of equations and system of equations, optimization, curve fitting, and numerical calculus. The course content assumes only an introductory previous exposure to engineering concepts and focuses on exposing students to computational skills commonly used in later engineering courses. The course uses a broad range of examples from different subjects for the purpose of demonstration and preparation of students for future needs.

Prerequisites

Credit with a minimum grade of a “C” or concurrent enrollment in MATH 2414 (Calculus II)

Learning Objectives/Outcomes for the Course

Upon the completion of this course, students will be able to

1. Create computer programs using logical programming structures;
2. Apply calculus methods for root finding and optimization problems;
3. Use numerical methods to solve for roots of equations;
4. Solve one- and multi-dimensional unconstrained engineering optimization problems;
5. Perform linear and nonlinear regressions with one- and multi-dimensional data;
6. Perform polynomial and spline interpolations;
7. Perform numerical integration and differentiation.

Grading Policies

Lab Reports	20%
Homework	15%
Quizzes	5%
Exams	4x15%
Extra credit activity*	(*see description below)
Overall grade	A: 100-85, B: 85-75, C: 75-65, D: 65-55, F: 55-0

Homework: All homework assignments should be submitted electronically through the Blackboard course page. Homework assignments submitted past due date will NOT be graded. Homework assignments should be submitted as an electronic document containing a summary of the problem statement, detailed equations, computer codes, output figures, numeric data, and your discussion of the results.

Quizzes: Online quizzes will be given to encourage students to keep up with textbook reading and other course related material. Quizzes will be given either in class or through Blackboard during the lab. A missed quiz cannot be made up or retaken unless otherwise specified by the instructor.

Lab reports: Lab reports should be submitted electronically through the Blackboard course page. Lab reports are due the same day and any lab reports submitted past due date will NOT be graded. Lab reports should be electronic documents and must contain lab number, student’s name, and student ID.

Exams: Exams 1, 2, and 3 will cover incremental course content. Exam 4 will be a comprehensive online exam. All exams will be administered during the lab session and the dates will be announced well in advance of the exam. There is NO final exam.

Extra credit: Extra credit activities will be given to promote the student's ability to successfully comprehend the available topics discussed during lecture and to engage in outsourcing outside resources in order to solve engineering related scenarios. These activities will be in the form of additional assignments, which involve application of numerical techniques.

Emergencies: In the event of a missed exam, for documented legitimate reasons, you must make arrangements with the course instructor PRIOR to the date of absence. You will not be excused for more than one exam.

Lab Exam Policy

- All personal items (except for a pen and a calculator) must be placed alongside the walls.
- Personal electronic or communication devices (e.g. phones, USB drive, internet) are not allowed.
- Electronic files and printouts generated during tests cannot be kept and taken out of the lab.
- Create a single document containing all your answers with your name and student ID number on every page.
- After sending the document to the printer, bring your exam sheet (with your name) for submission.
- You will not be allowed to take the printouts back to your desk.
- Evidences of cheating includes irrelevant codes, wrong problem, tampered outputs, similar code, etc.

Departmental Attendance

- Attendance will be taken every time the class meets. Any student arriving to class 5 minutes after the class has started will not be allowed in class. Students will be allowed a maximum of three absences for the whole semester for classes meeting twice a week, two absences for classes meeting once a week, and one absence for laboratory courses. Five points will be deducted from the total (100%) for each absence exceeding the maximum allowable unless documentation justifying that absence is provided.
- Students will not be permitted to leave the classroom during lectures and exams except for extreme emergencies.

Calendar of Activities

The UTRGV academic calendar and final exam schedule can be found at <https://my.utrgv.edu/home> at the bottom of the screen, prior to login. Some important dates for Spring 2017 include:

June 5	First day of class for semester
June 6	Last day to add a class for semester
June 8	Census date
June 30	Last day to drop (DR grade) a class or withdraw (grade of W)
July 4	Independence Day, NO classes
July 7	Last day of classes for semester
July 10	Study day, NO classes
July 11	Final exams

Drop Policy

Students can withdraw from a course through the Office of the Registrar on or prior to:

- January 30th, 2017, Last day to drop a class before it appears on the transcript and counts toward the "6-drop" limit. Last day to receive a 100% refund for dropped classes (other policies apply when a student is withdrawing from all classes).
- April 13th, 2017, Drop/Withdrawal Deadline; last day for students to drop the course and receive a "DR" grade. After this date, students will be assigned a letter grade for the course that will count on the GPA.

STUDENTS WITH DISABILITIES

If you have a documented disability (physical, psychological, learning, or other disability which affects your academic performance) and would like to receive academic accommodations, please inform your instructor and contact Student Accessibility Services to schedule an appointment to initiate services. It is recommended that you schedule an appointment with Student Accessibility Services before classes start. However, accommodations can be provided at any time. **Brownsville Campus:** Student Accessibility Services is located in Cortez Hall Room 129 and can be contacted by phone at (956) 882-7374 (Voice) or via email at ability@utrgv.edu. **Edinburg Campus:** Student Accessibility Services is located in 108 University Center and can be contacted by phone at (956) 665-7005 (Voice), (956) 665-3840 (Fax), or via email at ability@utrgv.edu.

MANDATORY COURSE EVALUATION PERIOD

Students are required to complete an ONLINE evaluation of this course, accessed through your UTRGV account (<https://my.utrgv.edu/home>); you will be contacted through email with further instructions. Students who complete their evaluations will have priority access to their grades. Online evaluations will be available:

July 2 – July 11

ATTENDANCE

Students are expected to attend all scheduled classes and may be dropped from the course for excessive absences. UTRGV's attendance policy excuses students from attending class if they are participating in officially sponsored university activities, such as athletics; for observance of religious holy days; or for military service. Students should contact the instructor in advance of the excused absence and arrange to make up missed work or examinations.

SCHOLASTIC INTEGRITY

As members of a community dedicated to Honesty, Integrity and Respect, students are reminded that those who engage in scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and expulsion from the University. Scholastic dishonesty includes but is not limited to: cheating, plagiarism, and collusion; submission for credit of any work or materials that are attributable in whole or in part to another person; taking an examination for another person; any act designed to give unfair advantage to a student; or the attempt to commit such acts. Since scholastic dishonesty harms the individual, all students and the integrity of the University, policies on scholastic dishonesty will be strictly enforced (Board of Regents Rules and Regulations and UTRGV Academic Integrity Guidelines). All scholastic dishonesty incidents will be reported to the Dean of Students.

SEXUAL HARASSMENT, DISCRIMINATION, and VIOLENCE

In accordance with UT System regulations, your instructor is a "responsible employee" for reporting purposes under Title IX regulations and so must report any instance, occurring during a student's time in college, of sexual assault, stalking, dating violence, domestic violence, or sexual harassment about which she/he becomes aware during this course through writing, discussion, or personal disclosure. More information can be found at www.utrgv.edu/equity, including confidential resources available on campus. The faculty and staff of UTRGV actively strive to provide a learning, working, and living environment that promotes personal integrity, civility, and mutual respect in an environment free from sexual misconduct and discrimination.

COURSE DROPS

According to UTRGV policy, students may drop any class without penalty earning a grade of DR until the official drop date. Following that date, students must be assigned a letter grade and can no longer drop the class. Students considering dropping the class should be aware of the "3-peat rule" and the "6-drop" rule so they can recognize how dropped classes may affect their academic success. The 6-drop rule refers to Texas law that dictates that undergraduate students may not drop more than six courses during their undergraduate career. Courses dropped at other Texas public higher education institutions will count toward the six-course drop limit. The 3-peat rule refers to additional fees charged to students who take the same class for the third time.

Meeting	Date	Topic	Reading	Lab
M	Jun. 5	MATLAB fundamentals: variables	Ch. 2	Lab 1 & 2: vectors, arrays, plots
T	Jun. 6	MATLAB fundamentals: m-files	Ch. 3	Lab 3 & 4: script and function files
W	Jun. 7	MATLAB programming: decision	Ch. 3	Lab 5: if-elseif-else-end, switch-case
TR	Jun. 8	MATLAB programming: for loop	Ch. 3	Lab 6: for loop
F	Jun. 9			
M	Jun. 12	MATLAB programming: while loop	Ch. 3	Lab 7: while loop
T	Jun. 13	MATLAB: functions, operators	Ch. 3	Lab 8: anonymous, inline, built-in functions, logical operators
W	Jun. 14	Truncation error	Ch. 4	Lab 9: Taylor series
TR	Jun. 15	Problems: Ch. 2, 3, 4		Exam I: Ch. 2, 3, 4
F	Jun. 16	Root finding: Bracketing methods	Ch. 5	Lab 10 & 11: bisection/false-position method
M	Jun. 19	Root finding: Open methods	Ch. 5	Lab 12 & 13: newton-raphson/secant method
T	Jun. 20	Root finding: MATLAB built-in functions	Ch. 6	Lab 14 & 15: fzero, fsolve, roots
W	Jun. 21	Optimization: Golden section search	Ch. 7	Lab 16: golden section search
TR	Jun. 22	Optimization: Calculus method, built-in functions	Ch. 7	Lab 17: fminbnd, fminsearch
F	Jun. 23			
M	Jun. 26	Linear regression: least squares method, linearization	Ch. 14	Lab 18 & 19: least squares regression/linearization
T	Jun. 27	Problems: Ch. 5, 6, 7, 14		Exam II: Ch. 5, 6, 7, 14
W	Jun. 28	General linear regression, multiple regression	Ch. 15	Lab 21 & 22: general linear regression, multiple regression
TR	Jun. 29	Nonlinear regression	Ch. 15	Lab 23: nonlinear regression
F	Jun. 30	Polynomial interpolation	Ch. 17	Lab 24: lagrange interpolation
M	Jul. 3	Spline interpolation	Ch. 18	Lab 25 & 26: built-in function for spline interpolation, bilinear interpolation
T	Jul. 4	Holiday: Independence Day		No Class
W	Jul. 5	Numerical Interpolation	Ch. 19	Lab 27: simpson's rule
TR	Jul. 6	Problems: Ch. 15, 17, 18, 19		Exam III: Ch. 15, 17, 18, 19
F	Jul. 7			
M	Jul. 10	Study Day		No Class
T	Jul. 11	Final Exam		Exam IV: Comprehensive
W	Jul. 12	Grades Due		