

MECE 2350: NUMERICAL METHODS FOR ENGINEERS

FALL 2016

Time/Location: Lab A (2350-A): MW 9:25 – 10:40 AM, ACSB 2.146
Lab B (2350-B): MW 10:50 AM – 12:05 PM, ACSB 2.146
Lab C (2350-C): MW 12:15 – 1:30 PM, ACSB 2.146

Instructor: Mr. Lawrence Cano, lawrence.cano@utrgv.edu
Office: EPOB 1.104C, Office hours: MTWR 1:40-3:00 PM, or by appointment

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

Prerequisites: Credit with a minimum grade of “C” or concurrent enrollment in MATH 2414 or MATH 2488 (Calculus II)

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.

Learning Objectives and Course Outcomes:

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:	Lab Reports	20%
	Homework	15%
	Quizzes	5%
	Exams	60% (15% + 15% + 15% + 15%)
	Extra credit activity*	5% (*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 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 materials. Quizzes will be given either in class or through Blackboard. A missed quiz cannot be made up.
- Lab reports:** Lab reports should be submitted electronically through Blackboard course page. Lab reports are due the same day. 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 given during lab sessions 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 awareness of sustainability and to bring related social and environmental issues to engineering context. These activities will be in the form of additional assignments, which involve application of numerical techniques in sustainability-related problems.
- 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:

- You must attend your own lab section for an exam.
- 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.
- Make a single document containing all your answers with your name and student ID number on every page (in the document header area).
- After sending the document to the printer, bring your exam sheet (write your name) to the TA.
- You cannot bring your printouts back to your desk—TAs keep all printouts during the exam.
- Evidences of cheating includes irrelevant codes, wrong problem, tampered outputs

Attendance:

1. 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.
2. Students **will not** be permitted to leave the classroom during lectures and exams except for **extreme emergencies**.

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.

Drop Policy:

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

- September 14th, 2016, Wednesday: 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).
- November 17th, 2016, Wednesday: 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.

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.

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 accessibility@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 accessibility@utrgv.edu.

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 Evaluation:

Students are required to complete an ONLINE evaluation of this course, accessed through your UTRGV account (<http://my.utrgv.edu>); you will be contacted through email with further instructions. Online evaluations will be available Nov. 16 – Dec. 7, 2016. Students who complete their evaluations will have priority access to their grades.

Tentative Class Meeting Schedule

Meeting	Date	Topic	Reading	Lab
1	Aug. 29	MATLAB fundamentals: variables	Ch. 2	Lab 1: vectors and arrays
2	Aug. 31	MATLAB fundamentals: plot	Ch. 2	Lab 2: making plots
-	Sept. 5	Holiday: Labor Day		
3	Sept. 7	MATLAB fundamentals: m-files	Ch. 3	Lab 3 & 4: script and function files
4	Sept. 12	MATLAB programming: decision	Ch. 3	Lab 5: if-elseif-else-end, switch-case
5	Sept. 14	MATLAB programming: for loop	Ch. 3	Lab 6: for loop
6	Sept. 19	MATLAB programming: while loop	Ch. 3	Lab 7: while loop
7	Sept. 21	MATLAB: functions, operators	Ch. 3	Lab 8: anonymous, inline, built-in functions, logical operators
8	Sept. 26	Example problems: Ch. 2 & 3		Review 1 & 2
9	Sept. 28	Example problems: Ch. 2 & 3		Exam I: Ch. 2 & 3
10	Oct. 3	Truncation error	Ch. 4	Lab 9: Taylor series
11	Oct. 5	Root finding: Bracketing methods	Ch. 5	Lab 10: Bisection method
12	Oct. 10	Root finding: Bracketing methods	Ch. 5	Lab 11: False-position method
13	Oct. 12	Root finding: Open methods	Ch. 6	Lab 12: Newton-Raphson method
14	Oct. 17	Root finding: Open methods	Ch. 6	Lab 13: Secant method
15	Oct. 19	Root finding: MATLAB built-in functions	Ch. 6	Lab 14 & 15: fzero, fsolve, roots
16	Oct. 24	Optimization: Golden section search	Ch. 7	Lab 16: Golden section search
17	Oct. 26	Optimization: Calculus method, built-in functions	Ch. 7	Lab 17: fminbnd, fminsearch
18	Oct. 31	Example problems: Ch. 4, 5, 6, 7		Review 3 & 4
19	Nov. 2	Example problems: Ch. 4, 5, 6, 7		Exam II: Ch. 4, 5, 6, 7
20	Nov. 7	Linear regression: least squares method	Ch. 14	Lab 18: least squares regression
21	Nov. 9	Linear regression: linearization	Ch. 14	Lab 19 & 20: polyfit, linearization
22	Nov. 14	General linear regression, multiple regression	Ch. 15	Lab 21 & 22: general linear regression, multiple regression
23	Nov. 16	Nonlinear regression	Ch. 15	Lab 23: nonlinear regression
24	Nov. 21	Polynomial interpolation	Ch. 17	Lab 24: Lagrange interpolation
25	Nov. 23	Spline interpolation	Ch. 18	Lab 25 & 26: built-in function for spline interpolation, bilinear interpolation
26	Nov. 28	Numerical Integration	Ch. 19	Lab 27: Simpson's Rule
27	Nov. 30	Example problems: Ch. 14, 15, 17, 18		Review 4, 5, 6
28	Dec. 7	Example problems: Ch. 14, 15, 17, 18		Exam III: Ch. 14, 15, 17, 18, 19
29	Dec. 6	Semester review		Exam IV: Comprehensive