

# Computational Methods in EE

*University of Texas at El Paso  
College of Engineering  
Department of Electrical and Computer Engineering*

*Course Syllabus for*

## **EE-4386/5301** **Computational Methods in EE**

Spring 2023

CRN 27451/27452

### **COURSE INFORMATION**

Course Prefix and Number:	EE-4386/5301
Course Title:	Computational Methods in Electrical Engineering
Course Website:	<a href="https://empossible.net/academics/emp4301_5301/">https://empossible.net/academics/emp4301_5301/</a>
Meeting day and time:	M/W, 12:00pm – 1:20pm
Meeting Venue:	Psychology Building, Room 307
Final Exam:	Friday, 12 May 2023, 1:00pm – 3:45pm
CRN:	27451 (EE-4386), 27452 (EE-5301)
Credit hours:	3
Lecture hours:	3

**Catalog Description** – A presentation of the fundamental numerical techniques used in engineering, including solution of systems of linear and nonlinear equations, interpolation and curve-fitting, solution of ordinary and partial differential equations.

**Course Rationale** – This course is intended to teach how to do basic numerical computations on a computer and how to visualize the results. In addition to the methods, the course teaches best practices and the philosophy of computation and visualization. With this course, the student will be able to do root-finding, curve fitting, optimization, solve differential equations, and visualize the results.

## INSTRUCTOR INFORMATION

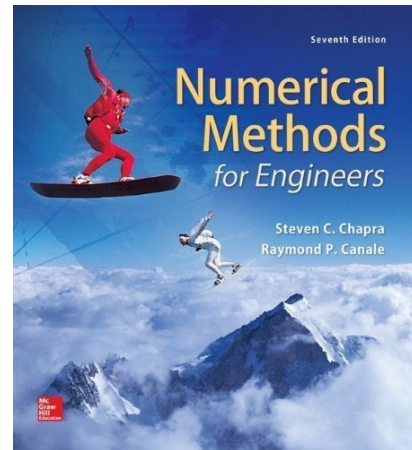
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 Research Website: <https://raymondrumpf.com/research/>  
 Academic Website: <https://empossible.net/academics/>

## COURSE MATERIALS

The following items are required for this course:

- Access to the internet
- Working UTEP e-mail account
- Access to computer with MATLAB 2022 or later installed. A manual for this software is available at:  
<http://www.mathworks.com/help/techdoc/>
- Access to a computer with Microsoft Office installed with a minimum of Word and PowerPoint.
- Engineering graph paper
- TI85 scientific calculator, or equivalent
- Textbook:  
 Numerical Methods for Engineers, 7<sup>th</sup> Edition  
 Steven C. Chapra  
 McGraw Hill  
 ISBN-13: 978-0073397924  
 ISBN-10: 007339792X



You can install MATLAB on your laptop or computer following the UTEP link:

[https://www.utep.edu/technologysupport/ServiceCatalog/SOFTWARE\\_PAGES/soft\\_matlab.html](https://www.utep.edu/technologysupport/ServiceCatalog/SOFTWARE_PAGES/soft_matlab.html)

You will be required to create a Mathworks account to download both the software and the license using your UTEP username and password. If a student has no computer with access to the internet, from UTEP's Technology Support Center has borrowing services for laptops and tablets:

[https://www.utep.edu/technologysupport/TSCenter/TSC\\_EQ\\_LaptopsTablets.html](https://www.utep.edu/technologysupport/TSCenter/TSC_EQ_LaptopsTablets.html)

If you encounter technical difficulties beyond your scope of troubleshooting, please contact the [UTEP Help Desk](#) as they are trained specifically in assisting with technological needs of students. Please do not contact the course instructor for this type of assistance. The Help Desk is much better equipped to assist you in this regard!

### UTEP Technology Support

Web: <https://www.utep.edu/technologysupport/>  
Phone: 915-747-4357 (HELP)  
Chat: [Chat With Us](#)  
Library: Room 300  
Online: [Submit a Service Request](#)

Students should maintain a well-organized notebook that archives their syllabus, lecture notes, homework problems, and tests. Students are also encouraged to purchase a USB Drive or use a cloud service like Dropbox or OneDrive to save their homework, lecture notes, tests, and other digital work.

### PREREQUISITES

By Course (with grade of “C” or better):

- MATH 2326 – Differential equations
- EE 2353 – Continuous Time Signals and Systems

By Topic:

- Linear Algebra
- Differential equations
- MATLAB
- Basic programming skills

### COREQUISITES

None.

### COURSE OUTLINE

Topics covered in this course include:

1. Introduction to MATLAB
2. Review of linear algebra
3. Roots of equations
4. Curve fitting and interpolation
5. Numerical differentiation and integration
6. Finite-difference method
7. Optimization

### LEARNING OUTCOMES

After this course, students will demonstrate a rich and deep understanding of computational methods, including the ability to produce high-quality graphics and visualizations. The following items are the specific *student learning outcomes* for this course:

By the end of the semester, the student will demonstrate the ability to:

- Use MATLAB proficiently.
- Have a basic understanding of linear algebra and basic matrix operations.
- Find roots of equations.
- Fit curves to data.
- Perform numerical differentiation and integration.
- Solve differential equations using the finite-difference method
- Perform basic optimizations

### *Contribution to Professional Component*

EE-4386 is a senior level core course that will give the student the ability to use a computer to solve engineering problems and analyze data.

### *Relationship to (ABET) Program Outcomes*

- Ability to apply knowledge of mathematics, science, and engineering:  
*Students use concepts from physics and calculus in the analysis of engineering problems.*
- Ability to identify, formulate, and solve engineering problems:  
*Students solve problems numerically and observe simulations of transmission line problems.*
- Ability to communicate effectively:  
*Students solve problems and give oral individual presentations summarizing their work.*
- Ability to use computers to enhance problem solving:  
*Students will use MATLAB to solve problems and visualize solutions.*

## TEACHING METHODOLOGIES

This is NOT an online class, but many of the lectures and demonstrations are prerecorded and made available to you 24/7 at any time during the semester. Some information will be supplemented with excerpts from other sources and made available on the course website or via e-mail. The course is intended to have a close relationship between the student and professor, especially when getting computer codes to work in MATLAB. The notes are highly visual to better understand the underlying mathematics.

## RULES AND POLICIES

### *Homework Policy*

Homework will be assigned on a weekly basis and graded on a 100-point scale. Show all work! Homework is due no later than 4:59pm on the assigned due date. Homework must be submitted as a paper document and no electronic submissions will be accepted. In order to provide solutions in a timely manner, no late homework assignments will be accepted. Homework must be completed with a high level of professionalism and be formatted properly. Points will be deducted for sloppy work, incorrect formatting, or if not all of the work is shown.

**Always do your own work. Do not ever copy work from others, from the internet, or from any source other than yourself. Students suspected of cheating or copying homework will be promptly submitted to the Office of Student Conduct and Conflict Resolution and the incident will remain part of your permanent record at UTEP.**

### *Formatting Requirements*

Points will be deducted and/or answers will be graded as incorrect if any of the following requirements are violated.

- Unless otherwise indicated, all homework assignments will be submitted as a single paper document stapled in the upper left corner with no additional binding.
- If spiral bound paper is included in your homework, the rough edges must be completely removed.
- The first page must be a cover sheet with the student's name, student's 800 number, date of the assignment, course information, and assignment number. No problems or work shall appear on the cover sheet.
- (Optional) For your own records, it is recommended that you include a copy of the original assignment after the cover page and before your work.
- Double-sided pages are acceptable unless you are using engineering paper. The back side is very difficult to read. Anything written on the back of engineering paper will be ignored and considered missing from the assignment.
- You must staple the assignments at the upper-left corner at least 3 millimeters away from the edge of the paper to ensure the assignment remains stapled. No additional binding will be accepted.
- Homework shall be neat, well organized, writing clear, and graphics professional.
- Finish all calculations. Unfinished calculations will be graded as incorrect. For example,  $3\pi$ ,  $\sqrt{14}$ , and  $\sin(0.2)$  are not final answers. Instead, these should be given as 9.4248, 3.7417, and 0.1987, respectively.
- Answers must include proper units or the answer will be graded as incorrect.
- You must clearly identify final answers by drawing a box around them or it will be graded as incorrect.
- Never draw a box around intermediate answers or it will be assumed you do know what is the real final answer and it will be graded as incorrect.
- Graphics should be professional and of high-quality by meeting all of the items identified in the *Graphics Checklist*.  
See <https://empossible.net/wp-content/uploads/2021/08/Graphics-Checklist.pdf>.
- Answers and work must be provided in the order the problems were asked in the original assignment.
- Unless asked to do otherwise, all computer codes must be provided and placed in an Appendix at the end of the assignment and not intermixed with the answers.

### *Graphics*

The key to computation is visualization. For this reason, creating professional graphics is a strong theme of this course. All graphics produced during this course must be of

professional quality and suitable for publication. Diagrams should be made as small as possible while still being understandable and easily viewed. Ensure linewidths are sufficient to be easily visible, but not overpowering. Fonts should be of a professional type and of sufficient size to be easily readable without being overpowering. Axes must be labeled and legends provided for plots conveying multiple pieces of information. Graphics must be of sufficient resolution that they are not pixelated. If submitting your assignments in black and white, be sure the graphics are suitable to be accurately read and interpreted in black and white. To ensure professional graphics, complete and sign the Checklist for Graphics and Diagrams and attach it to the end of your assignment. The checklist may be revised during the semester so always download the latest version at the following link:

<https://empossible.net/wp-content/uploads/2021/08/Graphics-Checklist.pdf>

### *Exam Policy*

Exams during the semester will be given in the same format as the homework so they will have the same formatting and professionalism requirements as the homework. Information tested on the midterm exams will be mostly focused on the material covered since the last exam. The final exam will be a project presented to the class.

A missed exam can be made-up **ONLY IF**: (1) the reason for missing the exam is beyond the student's control, e.g. such as a medical excuse, jury duty, death in the family or automobile accident, or (2) prior consent must be obtained from the instructor for missing the exam based on a non-frivolous excuse, e.g. such as a job interview or out-of-town job related travel. In either case, the student must submit a written and signed statement describing the reasons for missing the exam, with appropriate documentation, and petition for a makeup exam. **A missed exam will carry zero grade if these conditions are not met.**

### *Project Policy*

The purpose of the project is to self-learn something outside of what is taught in the class or apply what is taught in class to something not discussed in class, and to share this knowledge with the class so that all students can benefit from the experience. Project topics and the submission materials must be approved by the instructor by the middle of the semester. It is highly recommended to begin working on your project early. All materials (codes, PowerPoint slides, multimedia files, etc.) for the project must be submitted to the course instructor 24 hours before the final exam session or a score of zero will be given.

### *Participation Policy*

The following items are expected from students as part of their participation grade:

- Ask questions! Despite how “silly” or “dumb” you may think your question is, it is very likely that other students have the same question. Confusion on even small details in course material can cause bigger problems and hold you back. If you are truly embarrassed by your question, send an anonymous e-mail to the course instructor. I promise I will respond!

- Participate in class activities. They are designed to challenge you and to teach you.
- Complete any reading assignments, video watching, or other learning activities before class.
- Respond honestly to poles and provide real-time feedback to instructor about the course. This will contribute greatly to the quality of the course and your success in it.
- If needed, visit the course instructor during office hours, or by appointment.
- Treat e-mail correspondence as a professional exchange of information.
- Always turn off cell phones, pagers, or anything else that may distract the class.
- Show proper etiquette during class. Do not talk, make excessive noise, or otherwise distract the class. You will be asked to leave, and it will affect your grade.
- Maintain your notebook. Keep everything well organized.
- The grading rubric for class participation will be based on the frequency and quality of the contributions to class:
  - 18 - 20%: Attends class regularly and often contributes to class participation by raising thoughtful questions or asks for clarification if something is not clear, responds seriously and honestly to surveys and questions, builds on other students' ideas or questions, and actively participates in class assignments by working in groups to solve problems or to explain/help a fellow classmate.
  - 15% - 17%: Attends class regularly and sometimes contributes to class participation in the aforementioned ways.
  - 11% - 14%: Attends class regularly but rarely contributes to class participation in the aforementioned ways.
  - < 10%: Attends class regularly but never contributes to class participation in the aforementioned ways.

### Grading Policy

Student achievement in the course objectives will be assessed using a combination of homework, exams, class attendance and participation. Student grades are protected by the Privacy Act of 1974. The final course grade will be determined by the weighted performance in the following categories:

Homework .....	40%	90% – 100% → <b>A</b>
Participation .....	20%	80% – 89% → <b>B</b>
Midterm Exams.....	20%	70% – 79% → <b>C</b>
Final Exam .....	20%	60% – 69% → <b>D</b>
.....		0% – 59% → <b>F</b>

**Please note the 40% weight assigned to homework! The homework is critical for this class!!!**

## EXPECTATIONS

*What should you expect from the course instructor?*

- Instructor will do all that they can to ensure your learning and success in this class.



- Instructor will provide students with clear instructions and expectations.
- Homework will be graded and feedback on your performance will be provided as quickly as possible after the due date.
- Solutions to the homework will be provided after all homework has been collected and graded.
- Instructor will respond to student e-mails within 24 hours.

### *What should the instructor expect from students?*

- At the start of the course, students shall review the syllabus, calendar, and course material.
- Students should plan to study/work for a minimum of six hours per credit hour each week of the course. This includes reviewing the notes, reading supplemental material, completing the homework, and other assignments such as the final project.
- Students will be active participants in the class and provide the instructor feedback of their understanding of course material and progress on course assignments.
- Students are expected to behave professionally at all times. Bullying, verbal abuse, insubordination, or personal attacks will not be tolerated in any form. Inappropriate behaviors may result in an administrative withdrawal from the course and/or dismissal from the course and from the program.

## **ACADEMIC DISHONESTY**

Academic dishonesty is prohibited and is considered a violation of the UTEP [Handbook of Operating Procedures](#) (HOOP). As an entity of The University of Texas at El Paso, the Department of Electrical and Computer Engineering is committed to the development of its students and to the promotion of personal integrity and self-responsibility. The assumption that a student's work is a fair representation of the student's ability to perform is the basis for departmental and institutional quality. All students within the Department are expected to observe appropriate standards of conduct. Acts of scholastic dishonesty such as cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in the 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 will not be tolerated. Any case involving academic dishonesty will be referred to the Office of Student Conduct and Conflict Resolution (OSCCR) and will remain part of your permanent record at UTEP. OSCCR staff will investigate the charge and alert the student as to its disposition. Consequences of academic dishonesty may be as severe as dismissal from the University.

*Office of Student Conduct and Conflict Resolution*

<https://www.utep.edu/student-affairs/osccr/>

Phone: (915) 747-8694

E-Mail: [studentconduct@utep.edu](mailto:studentconduct@utep.edu)



You can also refer to the IEEE website for information on our code of ethics:

<http://www.ieee.org/about/corporate/governance/p7-8.html>

### *Plagiarism Detecting Software*

Some of your course work and assessments may be submitted to *SafeAssign*, a plagiarism detecting software, or other similar tools. *SafeAssign* may be used to review assignment submissions for originality and will help you learn how to properly attribute sources rather than paraphrase.

## CAMPUS RESOURCES FOR LEARNING

UTEP provides a variety of student services and support:

### *Technology Resources*

- [Help Desk](#): Students experiencing technological challenges (email, Blackboard, software, etc.) can submit a ticket to the UTEP Helpdesk for assistance. Contact the Helpdesk via phone, email, chat, website, or in person if on campus.

### *Academic Resources*

- [UTEP Library](#): Access a wide range of resources including online, full-text access to thousands of journals and eBooks plus reference service and librarian assistance for enrolled students.
- [University Writing Center \(UWC\)](#): Submit papers here for assistance with writing style and formatting, ask a tutor for help and explore other writing resources.
- [Math Tutoring Center \(MaRCS\)](#): Ask a tutor for help and explore other available math resources.
- [History Tutoring Center \(HTC\)](#): Receive assistance with writing history papers, get help from a tutor and explore other history resources.
- [RefWorks](#): A bibliographic citation tool; check out the RefWorks tutorial and Fact Sheet and Quick-Start Guide.

### *Individual/Well-Being Resources*

- [Military Student Success Center](#): Assists personnel in any branch of service to reach their educational goals.
- [Center for Accommodations and Support Services](#): Assists students with ADA-related accommodations for coursework, housing, and internships.
- [Counseling and Psychological Services](#): Provides a variety of counseling services including individual, couples, and group sessions as well as career and disability assessments.

## POLICY RELATING TO DISABILITY/PREGNANCY/CASS

It is the responsibility of the student to inform the Center for Accommodations and Support Services (CASS) so that written guidelines from CASS for accommodations are submitted to the course instructor PRIOR to the start of the course. CASS' staff are the only individuals who can validate and authorize accommodations for students.

**All accommodations must be *specific and quantitative*.** For example, “Extended time for course work” is not an acceptable accommodation because it does not specify how much time and does not specify what course work it applies to. Instead, one way this accommodation could be made acceptable is “Up to three homework assignments during the semester shall be accepted up to 24 hours past the regularly scheduled due date/time before penalties are applied.” Other examples of accommodations that are not acceptable are “Absence consideration” and “Tardiness consideration” because they do not specify how many absences or tardiness events should be accepted. Instead, one way this accommodation could be made acceptable is “Student is permitted to be up to 10 minutes late to all classes and permitted to be absent up to three times during the semester before penalties are applied.” Please work with CASS to determine reasonable accommodations, but be sure the accommodations are specific and quantitative.

The UTEP Disabled Student Services Office was established for the purpose of providing appropriate and reasonable accommodations as mandated in Section 504 of the Rehabilitation Act of 1973 (<http://www.dol.gov/oasam/regs/statutes/sec504.htm>) and the Americans with Disabilities Act (<http://www.ada.gov/>). For addition help, contact the Center for Accommodations and Support Services (CASS):

(915) 747-5148

[cass@utep.edu](mailto:cass@utep.edu)

<http://sa.utep.edu/cass/>

## DISCRIMINATION

I do not discriminate, nor will I allow discrimination, on the basis of age, gender, color, ethnicity, national origin, religion, disability, sexual orientation, or favorite sports team. Members of the UTEP community are protected from discrimination and harassment by the State and Federal Laws.

## IMPORTANT DATES

Jan 17	Classes begin
Jan 18	First day of CMEE!!! 😊
Mar 13-17	Spring Break – no classes 😞
Mar 30	Course drop/withdraw deadline
Mar 31	Cesar Chavez Day – no classes 😞
May 4	Last day of classes 😞
May 5	Dead day
May 12	Final Presentations, Friday, 12 May 2023, 1:00pm – 3:45pm

## COPYRIGHT STATEMENT FOR COURSE MATERIALS

All materials used in this course are protected by copyright law. The course materials are only for the use of students currently enrolled in this course and only for the purpose of this course. They may not be further disseminated.