ENME303 Computational Methods for Engineers

Fall 2021, MonWed 9:00am – 9:50am

UMBC

Instructor

Dr. TseHuai Wu
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Prerequisite

- MATH 225
- MATH 251
- ENME 220
- ENME 221

Course Hours & Location

- 01-LEC: MoWe 9:00am - 9:50am, Information Technology 104 (In-Person)
- 02-LAB: Fr 1:00pm - 2:50pm, ILSB 118 (3-ft distancing cap: 70 students)
- 03-LAB: Fr 3:00pm - 4:50pm, ILSB 118

Course Description

This is an undergraduate course in linear algebra and numerical methods for students of Mechanical Engineering. Linear algebra is the study of linear systems of equations, vector spaces, and linear transformations, and it has a wide range of applications in many disciplines. Students will learn to solve the linear algebra problems by hands and on a computer. The goal of this course is to provide essential math and programming background for many upper level ENME courses.

Course Objectives

After this course, students will be able to

- Solve linear equations;
- Perform matrix algebra, calculating determinants and inverses;
- Be familiar with the concept of orthogonality of vectors;
- Have solid base of understanding the concept of vector spaces;
- Be comfortable with MATLAB programming.

Textbook

- S, Lipschutz and M.L, Lipson *Schaum's Outline of Linear Algebra*, Sixth Edition, McGraw-Hill Education, 2018
- Additional reading:
  - Jean Kiusalaas, *Numerical Methods In Engineering With MATLAB*, 2015
  - G. Strang, *Linear Algebra and Its Applications*, 4th edition, 2006

Class Schedule*

Lecture Schedule:

Week	Date	Topics
1	9/1	Course Introduction
2	9/6, 9/8	Vectors & General Programming Concepts
3	9/13, 9/15	Systems of Linear Equations & Gaussian Elimination
4	9/20, 9/22	Matrix Notation & Matrix Multiplication
5	9/27, 9/29	Inverses & Tranposes
6	10/4, 10/6	Vector Space
7	10/11, 10/13	Trace & Determinants
8	10/18 10/20	Review & Midterm Exam
9	10/25, 10/27	Inner Products & Orthogonality
10	11/1, 11/3	Linear Transformations
11	11/8, 11/10	Eigenvalue & Eigenvectors
12	11/15, 11/17	Newton-Raphson method & Secant method
13	11/22, 11/24	Interpolation
14	11/29, 12/01	Splines
15	12/06, 12/08	Fourier Series

Lab Schedule:

Week	Date	Topics
1	9/3	MATLAB Intro & Basic Syntax
2	9/10	Control Flow – I
3	9/17	Control Flow – II
4	9/24	Control Flow – III
5	10/1	Vectors
6	10/8	Matrix – I
7	10/15	Matrix – II
8	10/22	No Lab (Midterm Study Week)
9	10/29	Functions
10	11/5	2D Plotting
11	11/12	Importing/Exporting Data
12	11/19	Executable
13	11/26	Thanksgiving
14	12/3	Splines
15	12/10	Fourier Series

*Class and lab schedule are subject to revision.

Expectations

Throughout the entire semester, students are expected to

- Pay attention to classroom announcements;
- Join the office hours when you feel you need support or assistance;
- Be familiar with Blackboard Ultra;
- Help your classmates on the Discord server.

CAUTION: The Discord server is for student discussions. It is informal and it may NOT be monitored all the time.

Office Hours

Dr. Wu's office hours:

- **Monday 10:30am-11:30am**, ENG218. Wear a mask to attend office hours.
- 1-to-1 meeting may be available upon request.

Ms. Karla's (kan6@umbc.edu) office hours:

- **Friday 11:30am-12:30am** on Webex (`https://umbc.webex.com/meet/kan6`)

Assignment & Exam Policy

- Homework must be submitted to Blackboard and/or the shared folder on Dr. Wu's Google drive. Email submission is not accepted under any circumstances.
- Homework can be turned in late until 5:00 pm of the following day with 20% penalty. No homework is accepted after that.
- Make-up exams will not be given except under extraordinary circumstances such as documented illness. University make-up exam policy is available here (Sec. 14.6).
- If an exam or quiz is simply missed, then a grade of zero will be recorded.
- If a student shall have a conflict of schedule, the student must inform the instructor in writing with supporting documents at least a week ahead of time.
- In-class quizzes can be deployed without any prior notices.
- Mobile phones must remain in your backpack during the midterm and the final exam.
- "Handling – even touching – your phone during an exam is grounds for me to collect your exam and dismiss you from the lecture hall, without further opportunity to work on the exam" – E. F. Charles LaBerge
- All questions and problems regarding grades must be presented in writing (email) within two week (i.e., 14 calendar days) after the test, homework, or project has been returned.

TIPS: Do not wait until the last minute! It is the student's responsibility to seek timely discussions with the instructor regarding issues with assignments and exams.

General Polices and Procedures

- Students being disruptive in class to the extent that it is distractive to the instructor other students may be asked to leave the classroom.
- Turn your phones off or put them on silent before class begins.
- Do not record video or audio in the class without the permission of the instructor.
- Keep at least 1 meter (3 feet) distance with other individuals when you are in the classroom.
- The instructor and all the students will be expected to comply with all testing and monitoring protocols in place during the semester.

Assessment/Evaluation

Assessment is done based on the following categorizes. The percentage is an estimate and may be fine tuned at the end of the semester. Extra points may be available when students answer Dr. Wu's questions.

- 20%: midterm exam;
- 35%: final exam;
- 40%: assignment and lab work;
- 5%: in-class quizzes and lab attendance.

Total Points	Final Grades
90% up	A
79% – 90%	B
68% – 78.99%	C
60% – 67.99%	D
below 60%	F

Academic Integrity Code

It is expected that students' work in this course will comply with the provisions of the UMBC honor statement: `https://academicconduct.umbc.edu/`. It is not a violation of the honor code to discuss assignments and solutions with other students. However, representing someone else's work as your own, in any form, constitutes an honor code violation. It is also a violation of the honor code to "render unauthorized assistance to another student by knowingly permitting him or her to see or copy all or a portion of an examination or any work to be submitted for academic credit."

Info: Dr Wu will prosecute honor code violations if they come to his attention. If in doubt what is allowed, please ask.

Accommodations

- If you have a documented disability and need to request academic accommodations in your courses, please refer to the SDS website at `https://sds.umbc.edu`
- Dr. Wu believes pregnant and parenting students deserve support. Don't hesitate to contact him if you have dependent.

Support for Students Outside the Classroom

Any student who has experienced sexual harassment or assault, relationship violence, gender discrimination, and/or stalking is encouraged to seek support and resources. Faculty are required to report any/ all available information regarding conduct falling under

the Policy and violations of the Policy to the Title IX Coordinator. If you need to speak with someone in confidence, who does not have an obligation to report to the Title IX Coordinator, UMBC has a number of Confidential Resources available to support you:

- The Counseling Center (`https://counseling.umbc.edu/`)
  Regular hour: (410)-455-2472;
  After-hours support line: (410)-455-3230
- University Health Services (`https://uhs.umbc.edu/`)

Other resources:

- Mikhel A. Kushner, Title IX Coordinator (she/her/hers)
  410-455-1250 (direct line), kushner@umbc.edu
- The Woman's Center (`https://womenscenter.umbc.edu/`)
- For after-hours emergency consultation, call the police at (410)-455-5555.
- UMBC policies and resources for students during COVID-19 is available here.