Engineering Mathematics

ENME 303

Instructor

Asst. Prof. Soobum Lee
Department of Mechanical Engineering, UMBC
Email: sblee@umbc.edu
Office: Engineering, Room 214.
Office Hours: MoWeFr 1:30 PM – 2:30 PM.
(or by appointment if your courses overlap with these hours)

Teaching Assistants/Teaching Fellows with Office Hours (ENG229B)

Patrick Mangan	pmangan1@umbc.edu	Mo 5:30 PM – 6:30 PM
Weijie Xian	xiaw1@umbc.edu	Mo 2:30 PM – 3:30 PM
Meridth Sperling	mersper1@umbc.edu	TBD
Joshua Fernandez	fe5@umbc.edu	TBD
Mena Abdelsayed	menabde1@umbc.edu	TBD

Lecture Hours and Location

MoWe 10:00 AM – 10:50 AM
Information Technology, Room 102

Final Exam: TBD

Laboratory Meetings Hours and Location

ENME 303-02: Th 12:00 – 1:50 PM Engineering 114 (Joshua Fernandez)
ENME 303-03: Th 2:00 – 3:50 PM Engineering 114 (Weijie Xian)
ENME 303-04: Th 4:00 – 5:50 PM Engineering 114 (Mena Abdelsayed)
ENME 303-05: Th 12:00 – 1:50 PM Engineering 112 (Meridth Sperling)

Textbook

Numerical Methods for Engineers, 7th edition
by Steven C. Chapra, Raymond P. Canale
The ConnectPlus feature from McGraw Hill (which includes the electronic textbook) is required for online assignments. Please access it through Assignments in Blackboard.

Course Motivation: This course is an introduction to numerical methods and their application to solving engineering problems through computational programming.

Course Objectives: The student will learn practical numerical methods used to solve engineering problems. The primary focus will be on the use and solution of linear algebra problems, determination of eigenvalues and eigenvectors, curve fitting to data, finding roots of equations, numerical evaluation of differentials and integrals, and numerical solution of ordinary differential equations. To implement the methods covered in class, the student will learn basic programming, pseudocode representation, and programming in the MATLAB environment.

Course Outline

Note: The topics covered per week and exam dates are approximate and subject to change.

Week	Topic	Sections
(08/29 – 09/4)		
1	Introduction	PT1.1 – PT1.2
	The Matlab environment.	(Bb notes)
	Use of built-in functions; graphics.	
(09/5 – 09/11)		
2	Mathematical Modeling; Engineering Problem Solving	1.1 – 1.2
	Programming in MATLAB	2.1 – 2.5
(09/12 – 09/18)		
3	Approximation and Round off Errors	3.1 – 3.4
	Truncation Errors and the Taylor Series	4.1 – 4.4
(09/19 – 09/25)		
4	Roots of Equations; Bracketing Methods	5.1 – 5.4
	Open Methods; Newton-Raphson Method	6.1 – 6.2
(09/26 – 10/2)		
	10/1 Exam 1	
5	Secant Method	6.3
(10/3 – 10/9)		
6	Matrices (Review); Linear Algebra Intro	PT3.1 – PT3.2
	Naïve Gauss Elimination	9.1 – 9.3
(10/10 – 10/16)		
7	Gauss Elimination with Partial Pivoting	9.4
	Special Matrices and Gauss-Seidel	11.1 – 11.2
(10/17 – 10/23)		
8	Least-Squares Regression	17.1
	Polynomial Regression; Multiple Linear Regression	17.2 – 17.3
(10/24 – 10/30)		
9	Interpolation; Newton's Divided Difference	18.1
	Lagrange Polynomials; Reverse Interpolation	18.2, 18.4
(10/31 – 11/6)		
	11/5 Exam 2	
10	Spline Interpolation	18.6
	Numerical Integration; Trapezoid Rule	21.1

(11/7 – 11/13)

11	Simpson's rule	21.2
	Numerical Differentiation, Ordinary Diff. Eq.;	23.1 - 23.2
	Euler's Method	25.1 - 25.2

(11/14 – 11/20)

12	Runge-Kutta Methods	25.3 – 25.4

(11/21 – 11/27)

13	Boundary-Value and Eigenvalue Problems	27.1 – 27.2

(11/28 – 12/4)

12/3 Exam 3

(12/5 – 12/10)

14 Review (if time permits).

Grading Scheme

Grades will be based on a combination of lab quizzes, short tests, and homework (30%), partial exams (45%), and a final exam (25%). Homework and reports turned in late will receive a 25% per day penalty starting immediately after the time that the assignment is due.

Final grades are distributed as follows:
90 – 100 ….**A**
80 – 89.5 ....**B**
70 – 79.5 ....**C**
60 – 69.5 ....**D**
0 – 59.5.....**F**

Attendance

Students are expected to attend all class and laboratory sessions, and are responsible for noting all material covered. There is a reasonable effort to communicate with the students through email and/or Blackboard, particularly in cases when inclement weather or otherwise force cancellation of class. However, the student is responsible for noting any announcement or correction to the material made only in class.

Students with disabilities

Students with disabilities should contact the instructor as soon as possible to accommodate particular needs in the course materials, lectures, and classroom.

Academic Integrity

By enrolling in this course, each student assumes full responsibility of as a participant in UMBC's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. Cheating, fabrication, plagiarism, and helping others to commit these acts are all forms of academic dishonesty. Academic misconduct could result in disciplinary action that may include, but is not limited to a grade of zero on the particular work, a grade of F in the class, suspension or dismissal. To read the full Student Academic

Conduct Policy, consult the UMBC Student handbook, the Faculty Handbook, or the UMBC Policies section of the UMBC Directory. See also https://fdc.umbc.edu/resources/adjunct/academic-integrity/