



ECGR4102/5102 “Engineering Simulation”

Department of Electrical and Computer Engineering
UNC Charlotte, Fall 2014

Catalog Copy: *ECGR 4102/5102. Engineering Simulation. (3/3G) Prerequisite: ECGR 2103 or permission of the department. A wide range of simulation related topics will be introduced including the theory of simulation, characteristics of simulators, and trade-offs in simulation studies. Continuous and discrete simulation with primary emphasis on application of simulation techniques to engineering problems. Simulation of actual problems based on students' interest and experience areas.*

Required Reference: Cleve B. Moler, “Numerical Computing With Matlab”, Siam Publishing, 2008. ISBN-13: 9780898716603,
Free e-copy is at <http://www.mathworks.com/moler/chapters.html>

Optional Reference: Autar Kaw, Egwu Eric Kalu, Duc Nguyen, “Numerical Methods with Applications”, 2nd Edition, 2011. ISBN-13: 9780578057651
Free e-copy is at http://numericalmethods.eng.usf.edu/topics/textbook_index.html

MATLAB tutorial: http://www.mathworks.com/academia/student_center/tutorials/launchpad.html

Required Background: Differential and integral calculus, differential equations, linear algebra, and familiarity with MATLAB.

Helpful Background: Electromagnetic fields theory and vector calculus.

Class Schedule: This class meets MW 9:30-10:45am in EPIC-2230.

Course Learning Outcomes: The objectives of this course are to help students learn to formulate complex engineering problems for numerical solution and graphical representation, and to analyze engineering systems using computer simulations with MATLAB.

Class Topics

Introduction to MATLAB and Course Foundation:

Motivation, classification of problems, computer arithmetic, numerical convergence and errors, introductory MATLAB examples.

Zeros and Roots:

Bisection, Secant, and Newton’s root-finding methods; golden section search optimization.

Numerical Integration and Differentiation:

Various integration and differentiation techniques will be studied.

Ordinary Differential Equations:

Single-step and multistep methods.

Linear Equations:

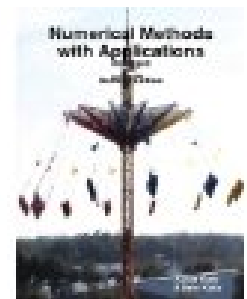
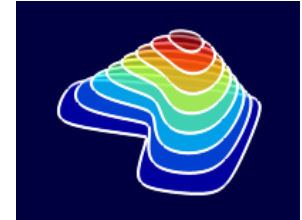
Gaussian elimination, Gauss-Jordan, and LU factorization methods; Jacobi iterative method.

Interpolation:

Interpolating polynomials, piecewise linear interpolation, and cubic spline.

Least-Squares:

Models and curve fitting, rank deficiency.



❑ **Fourier Analysis:**

Fourier approximation of periodic data, discrete and fast Fourier transforms.

❑ **Partial Differential Equations:**

Finite-difference method.

❑ **Optimization** (time-permitting).

Grading: There will be homework, in-class quizzes, and two take-home tests for all, and one project for graduate students only. The weight of each item in determining the final grade is as follows:

Item	% of Grade for Undergraduates	% of Grade for Graduate Students
Homework	25	25
Quizzes	25	25
Midterm	25	20
Final (Dec. 11, 8:00-10:30am)	25	20
Project + oral presentation for graduate students only		10

Grading Scale for Undergraduate Students:

100 – 90 A 89– 80 B 79 – 70 C 69 – 60 D 59 – 0 F

Grading Scale for Graduate Students:

100 – 90 A 89– 80 B 79 – 70 C 69 – 0 U

Academic Integrity: Students are obligated to conduct themselves in accordance with the UNCC’s Code of Student Academic Integrity as stated in the 2011-2012 Undergraduate Catalog at <http://catalog.uncc.edu/sites/catalog.uncc.edu/files/media/Undergraduate-Catalogs/11-student%20conduct.pdf>

Instructor: Dr. Mehdi Miri, ECE Department, UNC Charlotte.
Office Hours: MTWR 11:00-12:00, or by appointment.
Office Location: EPIC-2337
Tel. & email: 704-687- 8416 & miri@uncc.edu

Dates to be aware of:

- ✓ Last day to register, add, drop a class with no grade via the web Aug. 27, 2014 (11:59pm)
- ✓ Census date for spring enrollment Aug. 29, 2014
- ✓ Labor Day - University Closed Sept. 1, 2014
- ✓ Deadline to apply for December 2014 graduation Sept. 15, 2014 (11:59pm)
- ✓ Student Recess - no classes Oct. 6-Oct. 7, 2014
- ✓ Unsatisfactory grades due Oct. 10, 2014 (noon)
- ✓ Last day to withdraw from course (s); grade subject to Withdrawal Policy Oct. 20, 2014 (11:59pm)
- ✓ Thanksgiving Break - no classes Nov. 26-29, 2014
- ✓ Last day of classes Dec. 3, 2014
- ✓ Reading day Dec. 4, 2014