ECE 280-001: Electrical Engineering Analysis Fall 2017

Instructors: Profs. J. Ren (email: renjian@egr.msu.edu) and F. Salem (email: salem@egr.msu.edu)

Class time: MWF, 10:20–11:10 am, 1145 Engineering Building

Class website: D2L: `https://d2l.msu.edu/`

Office and Help Room Hours

Prof. J. Ren	2211 EB	MW 1-1:50 pm, and by appt.
Prof. F. Salem	2308D EB	MW 1-1:50 pm, and by appt.
MATLAB help room (Jiajia Wu)	2220 EB	MW: 3-5:30pm
ECE help room (Ziyu Lin & Yi-wei Zhang)	2220 EB	MW 3-6pm, Tu 9-11am, F 6-8pm
Grader	Zixiao Yu	yuzixiao@msu.edu

Topic Coverage and Recommended Texts

ECE 280 covers three fundamental sets of analytical techniques that are used throughout the ECE curriculum. These three fundamental topics comprise the three "modules," or "parts," of the course:

- PART 1: Probability and Random Variables (21 classes, Aug. 30 – Oct. 18). **Recommended Texts**:
  1. A.L. Garcia, *Probability and Random Processes for EE*, (Sections from Chapters 2, 3, 4 and 5)
  2. Hwei P. Hsu, *Probability, Random Variables and Random Processes, Schaum's Outlines, McGraw Hill, Third Edition*

- PART 2: Linear Algebra (11 classes, Oct. 20 – Nov. 13). **Recommended Texts**:
  1. Lipschutz & Lipson, *Schaum's Outline of Linear Algebra, Fifth Edition*, `https://www.mheducation.ca/professional/products/9780071794565/schaum%27s+outline+of+linear+algebra,+5th+edition/`

- PART 3: Vector Calculus (10 classes, Nov. 15 – Dec. 8). **Recommended Texts**:
  1. Joseph Edminister, *Schaum's Outline of Theory and Problems of Electromagnetics, Second Edition*, `http://catalog.lib.msu.edu/record=b4332209~S39a`

Prerequisites:
MTH 234 (Multivariable Calculus) and ECE 201 (Circuits and Systems I) or concurrently

MATLAB resources

1. MATLAB software is available on computers in the Engineering computer labs. You can access these remotely from your own computer. See
`http://www.egr.msu.edu/decs/remote-desktop-services`

2. You can obtain a free copy of MATLAB for your own computer from the MSU Computer Store. See `https://cstore.msu.edu/software/mathworks-matlab-student-license-0`

3. An excellent set of educational tools is available from MathWorks (the producer of MATLAB). These include a self-paced tutorial, videos, and links to documentation. You should start with the introductory video, and follow along on your own computer. See `https://www.mathworks.com/support/learn-with-matlab-tutorials.html`

4. MATLAB Onramp is a tutorial specifically designed for students. It is available through the MATLAB Academy. This is a good resource to use after watching the introductory videos. See `http://www.mathworks.com/academia/student_center/tutorials/mltutorial_launchpad.html?s_tid=ac_ml_tut_til`

Class Policies:

1. **Evaluation**

  (a) There will be eight homework assignments. Homework is due at the beginning of class. No late homework will be accepted unless prior arrangements have been made. The lowest homework grade will be dropped when computing your homework grade average.

  (b) There will be four 50-minute "hour" exams (two exams for Part 1, one exam for Part 2, and one exam for Part 3). There will also be a one hour MATLAB exam during the final exam period. **You are required to take the MATLAB exam to pass the course.**

2. **Grade Distribution**

  (a) Homework: 10%

  (b) Hour exams: 20% each

  (c) MATLAB exam: 10%

3. **Homework Schedule**

Homework	Course Part	Due Date
1	Probability	9/15
2	Probability	9/22
3	Probability	9/29
4	Probability	10/11
5	Linear Algebra	11/3
6	Linear Algebra	11/10
7	Vector Calculus	11/24
8	Vector Calculus	12/1

4. **Exam Policy and Schedule**: Missed exams will only be excused for health emergencies and require a doctor's note. Appropriate notification must be provided **before** the exam. Makeup exams will be given during the final exam period. Unexcused missed exams will receive a zero grade. **All exams are closed book and closed notes.** Students may bring one 8.5 by 11 hand written formula sheet. **Calculators, cell phones, and other electronic devices are NOT allowed.**

Exam	Course Part	Date
1	Probability	9/22 (10:20-11:10 am)
2	Probability	10/13 (10:20-11:10 am)
3	Linear Algebra	11/17 (10:20-11:10 am)
4	Vector Calculus	12/8 (10:20-11:10 am)
5	MATLAB	12/15 (8-9am)

5. **Holidays** There is no class on 9/4 (Labor Day) and on 11/24 (Thanksgiving).

6. **University and Department Policies**: Students with disabilities should contact the Resource Center for Persons with Disabilities to establish reasonable accommodations. For an appointment with a disability specialist, call 884-7273 (voice), 355-1293 (TTY), or visit www.rcpd.msu.edu

  Article 2.3.3 of the Academic Freedom Report http://www.vps.msu.edu/SpLife/afr2.htm states that "The student shares with the faculty the responsibility for maintaining the integrity of scholarship, grades, and professional standards." In addition, the Department of Electrical and Computer Engineering adheres to the policies on academic honesty as specified in General Student Regulations 1.0, Protection of Scholarship and Grades; the all-University Policy on Integrity of Scholarship and Grades; and Ordinance 17.00, Examinations. (See Spartan Life: Student Handbook and Resource Guide http://www.vps.msu.edu/SpLife/index.htm and or the MSU Web site: www.msu.edu).

7. **Classroom Behavior**: You are expected to show up to class on time and prepared. The lecture notes will be posted on D2L prior to class. Please print them out, bring them to class and take notes during the lectures. You are not allowed to use any cell phones, laptops or tablets during class.

8. **Tentative Schedule**

Dates	Book Sections	Topics
8/30–9/8	LG 1.1, 1.5, 2.1, 2.2, 2.4	Probability Models in Engineering, Specifying Random Experiments
9/20–9/15	LG 2.5, 2.6, 3.1, 3.2	Axioms of Probability, Conditional Probability (Bayes' Rule), Independent Events, Binomial Law
9/18–9/22	LG 3.3, 3.4, 3.6	Random Variable, Cumulative Distribution function, Probability Density Function, Discrete and Continuous Random Variables
9/25–9/29	LG 4.2, 4.3	Expected Value and Variance, Pairs of Random Variables, Joint and Marginal Distributions, Independence
10/2–10/6	LG 4.4, 4.7	Conditional Probability, Conditional Expectation, Expected Value of Functions of Random Variables (Correlation and Covariance)
10/9–10/13	LG 4.8, 5.1	Jointly Gaussian Random Variables, Sums of Random Variables, Sample Mean, Law of Large Numbers
10/16–10/18	LG 5.3, 5.4	Central Limit Theorem, Confidence Intervals
10/20–10/27	2.1, 2.2, 2.7, 2.10; 1.2, 1.3; 2.3, 4.2, 4.4, 4.8	1. Basic Definitions; 2. Fundamental Linear Operations; 3. Focus on Vectors
10/30–11/3	2.5, 2.6	4. More Elementary Operations; 5. Some Examples
11/6–11/10	2.7, 8.1–8.10; 9.4, 9.5	6. Focus on Square Matrices;
11/13–11/17	1.1–1.4	Definitions, notation, length, unit vectors, Cartesian components, addition, subtraction, Dot product, projection, cross product, position vector, vector fields, Cartesian coordinates, cylindrical coordinates, spherical coordinates
11/20–11/24	problem 1.14	Coordinate transformations, differentiation of vectors
11/27—12/5	1.5, 3.1, 3.3, 5.1; 4.1-4.4, 5.6, 9.4	Volume integrals, flux integrals, line integrals, gradient, divergence, curl, divergence theorem, Stokes theorem, Helmholtz theorem, identities