Michigan State University
ECE 202 - Circuits and Systems II – Fall 2012

Course Information

Instructor: Dr. Tongtong Li
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Class Hours: MWF: 9:10 AM - 10:00 AM
Classroom: 1145 Engineering Building
Instructor’s Office Hours: MWF, after class till 11:00 AM or by appointment
Course Website: https://angel.msu.edu/default.asp

Required Text


Exams, Homework and Grading Policies

- **Midterm Exams: 50%** The best two “scores” (25% each) of three exams:
  - Exam one: Monday, Sept. 24
  - Exam Two: Monday, Oct. 29
  - Exam Three: Monday, Nov. 26

  There will be **NO MAKE UP EXAMS**.

- **Final Exam: 40%** (Covering all course material) Monday, December 10, 7:45-9:45 a.m., in the classroom. You must receive a passing grade on the Comprehensive Exam to pass the course.

- **Homework: 10%** Homework assignments will be posted on the Angel website regularly, together with their due dates. Posting of new assignments will be announced in class. You must submit your homework before the class on the due date. **No late homework will be accepted.** The lowest homework score will be dropped when computing your average homework grade. You must receive a passing grade on the Homework to pass the course. Homework solutions must be original copies in the students own handwriting. No other submissions will be graded. Solutions must be clear and neatly written to receive credit. Whenever possible, the correct answer is to be circled or boxed. You may work with other students (list all names below yours) but the work you submit must be done by you.
Assignments which are identical will all receive a grade of zero. You must type and run all of your own computer work.

- **Grading Scale:**
  
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  \begin{align*}
  \geq 90\% & \quad = 4.0 \\
  \geq 85\% & \quad = 3.5 \\
  \geq 80\% & \quad = 3.0 \\
  \geq 75\% & \quad = 2.5 \\
  \geq 70\% & \quad = 2.0 \\
  \geq 65\% & \quad = 1.5 \\
  \geq 60\% & \quad = 1.0 \\
  < 60\% & \quad = 0.0 
  \end{align*}
  \]

  The above scale is guaranteed. The instructor reserves the right to adjust each grading transition as she sees fit at the end of the semester.

**Other Policies**

- **General Policy:** Article 2.3.3 of the Academic Freedom Report 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, and in the all-University Policy on Integrity of Scholarship and Grades, which are included in Spartan Life; Student Handbook and Resource Guide.

- **Attendance Policy:** An 85% attendance rate is required to pass the course, that is, you cannot miss more than 6 classes. Please keep your own record of absences.

- **Classroom Policy:** “The student’s behavior in the classroom shall be conducive to the teaching and learning process for all concerned.” This means that I do not appreciate late arrivals, sleeping, reading the paper, ringing cell phones, rude interruption of the lecture, etc. Please try to develop your professional skills while in this class.

- **E-Mail Policy:** All e-mails to me regarding this course MUST start the subject with “ECE 202”. If you wish to request a meeting with me via e-mail, I suggest e-mailing me more than 24 hours in advance. Please send me three days/times that you can meet.

- **Calculator Policy:** Only simple (non-programmable/graphing) calculators are allowed in class.

**Course Material**

- Chapter 8: Sinusoidal Steady-State Response
  
  - 5.4 The Sinusoidal Waveform: Cycle, Period, Frequency, Amplitude, Phase Angle
  - 8.1 Sinusoids and Phasors: Vector Representation of Sinusoids, Euler’s Formula, Complex Numbers, Rectangular and Polar Form, Phasor Transform, Inverse Phasor Transform, Addition-Subtraction-Multiplication-Division of Complex Numbers
  - 8.2 Phasor Circuit Analysis: Kirchhoff’s Current Law, Kirchhoff’s Voltage Law, Resistance in Phasor Form, Capacitance in Phasor Form, Inductance in Phasor Form, Impedance, Admittance
  - 8.3 Basic Circuit Analysis with Phasors: Series Equivalence of Impedances, Reactance, Phasor Analysis Algorithm, Voltage Divider Rule, Parallel Equivalence of Impedances,
Susceptance, Current Divider Rule, SPICE, Resonant Frequency of an Impedance, Series Resonance, Parallel Resonance

- 8.4 Circuit Theorems with Phasors: Superposition, Source Transformations, Thevenin and Norton Equivalent Circuits
- 8.5 General Circuit Analysis with Phasors: Node-Voltage Method, MATLAB, Mesh-Current Method
- 8.6 Energy and Power: Average Power for a Resistance, Inductance and Capacitance, Root-Mean-Square

- Chapter 9: Laplace Transforms
  - 9.1 Signal Waveforms and Transforms: Definition of the Laplace Transformation, Step Function, Impulse Function, Inverse Transformation, Uniqueness Property
  - 9.2 Basic Properties and Pairs: Linearity, Integration Property, Ramp Function, Differentiation Property, Nth Derivative, S-Domain Translation Property, Time Domain, Translation Property, Table of Transform Pairs
  - 9.3 Pole-Zero Diagrams: Definition of pole and zero, Sketches, MATLAB
  - 9.4 Inverse Laplace Transforms: Rational Function, Partial Fraction Expansion, Residues, Complex Poles, Sum of Residues
  - 9.5* Some Special Cases: Improper Rational Function, Multiple Poles, MATLAB

- Chapter 10: S-Domain Circuit Analysis
  - 10.1 Transformed Circuits: Element Constraints in the S-Domain, Sources, Connection Constraints, Examples of the Complete Response of RC and RL switching circuits
  - 10.2 Basic Circuit Analysis in the S-Domain: Phasors revisited
  - 10.3 Circuit Theorems in the S-Domain: Proportionality, Superposition, Norton Equivalent Circuits
  - 10.4 Node-Voltage Analysis in the S-Domain: S-Domain Node Equations by Inspection
  - 10.5 Mesh-Current Analysis in the S-Domain: S-Domain Mesh Equations by Inspection

- Chapter 11: Network Functions
  - 11.1 Definition of a Network Function: Natural and Forced Response, Stability
  - 11.2 Network Functions of One- and Two-Port Circuits: Driving Point Impedance, Transfer Functions
  - 11.3 Network Functions and Impulse Response: Definition, Pspice Example of an Impulse Response
  - 11.4 Network Functions and the Step Response: Definition
  - 11.6 Impulse Response and Convolution: Definition of Convolution, Causal and Non-Causal Signals, Equivalence of S-Domain and t-Domain Convolution, Graphical Approach
- 11.7 Network Function Design: Synthesis, First Foster RC Forms, NAB Equalizer Design, Magnitude Scaling

• Chapter 12: Frequency Response
  - 12.1 Frequency Response Descriptors: Types of Filters, Pass Bands, Stop Bands
  - 12.2 Bode Diagrams: Product of Terms, Decibel, First-Order Inspections Forms, Making Log Paper and Reading Points

• Chapter 13: Fourier Series
  - 13.2 Fourier Coefficients: Fourier Series, Sawtooth Example, Fundamental Frequency, Harmonics, Alternative Form of the Fourier Series

• Chapter 15: Mutual Inductance
  - 15.1 Coupled Inductors: Magnetic Flux, V-I Characteristics
  - 15.2 The Dot Convention: Examples of Coupled Coils
  - 15.3 Energy Analysis: Coupling Coefficient
  - 15.4 The Ideal Transformer: Perfect Coupling, Equivalent Input Resistance

• Chapter 16: Power in Sinusoidal Steady-State
  - 16.1 Average and Reactive Power
  - 16.2 Complex Power: Apparent Power, Power Factor, Reactive Power Factor, Power Factor Angle, Power Triangle, Complex Power and Load Impedance