Michigan State University
ECE 201: Circuits and Systems I, Section 001, Spring 2019

Course Information
Instructor: Dr. Tongtong Li
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Email: tongli@egr.msu.edu
Class Hours: MWF: 1:50 PM – 2:40 PM
Classroom: 2243 Engineering Building
Instructor’s Office Hours: MW, 10:30 AM – 11:45 AM or by appointment
Course Website: https://d2l.msu.edu/d2l/home

Course Description

Course Objectives
At the completion of this course, each student should be able to do the following:

1. Understand and describe the properties of basic circuit elements including resistors, capacitors, inductors, controlled sources and op-amps.
2. Apply element constraints, connection constraints, and network theorems for circuit analysis.
3. Apply network theorems for circuit analysis
4. Analyze DC circuits.
5. Analyze first order RL and RC circuits, and second order RLC circuits. Calculate the transient response of first and second order circuits.
6. Enter netlists of basic circuits into Spice software and obtain simulation results.
7. Understand electrical safety.

Required Text

Exam Schedule and Policies
• Midterm Exams: 45% (Three 50-min exams, 22.5% each, the lowest grade will be dropped.)
  – Exam one: Monday, Feb. 11, 2019
  – Exam Two: Monday, Mar. 18, 2019
  – Exam Three: Monday, Apr. 15, 2019

There will be NO MAKE UP EXAMS. The midterm exams will be held in the classroom during the regularly scheduled class time. Exams are closed book and notes. There are NO formula sheets, NO crib sheets for the exams. The exam dates are tentative. Changes will be informed two weeks before the exams if any.
• Final Exam: 40% (Covering all course material)  Final Exam: Monday, Apr 29, 2019 3:00pm - 5:00pm in 2243 Engineering Building  
You must receive a passing grade on the Comprehensive Final Exam to pass the course.

Students who do not take the final exam will receive a score of 0.0 in the class. Students who request a rescheduled ECE 201 Final Exam based on the MSU “3-exam in 1 day policy” must request rescheduling by sending an email to the instructor. The request must be made prior to the last regularly scheduled class day and approval of the request is based on confirmation of enrollment in the classes having concurrent exams, and consistency of the final exam schedules as listed at: https://reg.msu.edu/roinfo/calendar/FinalExam.aspx

• Special Notice: No phones can be used during the exams. For the integrity of scholarship, all phones have to be turned off and put into your schoolbag during the exams.

Homework and Classroom Activity Policies

• Homework: 10%  
Homework assignments will be posted on the MSU D2L 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. Points will be deducted for late homework as follows:
  
  – Homework received after the start of class ⇒ 10% deducted  
  – Homework received after the end of class ⇒ 30% deducted  
  – Homework received one hour or more after class ⇒ homework not accepted (score of zero entered)

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 student’s own handwriting. 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.

• Classroom Activities: 5%  
Classroom exercises will be given and collected in classes as needed. Generally, short exercises are given after an important concept or technique/method is introduced or a representative example has been explained. Classroom exercises will not be accepted after class.

Grading Policies

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\begin{array}{cccc}
90.1-100\% & = & 4.0 & 85.1-90\% & = & 3.5 & 80.1-85\% & = & 3.0 & 75.1-80\% & = & 2.5 \\
70.1-75\% & = & 2.0 & 65.1-70\% & = & 1.5 & 60.1-65\% & = & 1.0 & < 60\% & = & 0.0
\end{array}
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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:** Classroom attendance is expected. Classroom activities will be graded. It is the student’s responsibility to obtain notes for any missed classes.

• **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 201”. 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.

**ECE 201 Course Material**

• **Chapter 1: Introduction**
  – 1-1 About the Book
  – 1-2 Symbols and Units
  – 1-3 Circuit Variables
    Current, Voltage, Power, Passive Sign Convention, Ground, Conservation of Energy, Conservation of Power
  – 1-4 Computational and Simulation software: PSPICE and MATLAB

• **Chapter 2: Basic Circuit Analysis**
  – 2-1 Element Constraints
    Electrical Network, Circuit, Resistance, Ohm’s Law, V-I Characteristics, Conductance, Power, Resistor, Color Code, Precision Resistors, Ratings, Open and Short Circuits, Switches, Independent Voltage Sources, Independent Current Sources
  – 2-2 Connection Constraints
    Kirchhoff’s Current Law, Kirchhoff’s Voltage Law
  – 2-3 Combined Constraints
    Examples using KCL, KVL, Assigning Reference Marks
  – 2-4 Equivalent Circuits
    Series Resistance, Parallel Resistance, Special Cases, Approximations, Equivalent Voltage Sources, Equivalent Current Sources, Source Transformations, Delta-to-Wye and Wye-to-Delta Transformations, Redundant Elements
  – 2-5 Voltage and Current Division
    Voltage Divider Rule, Special Cases, Potentiometers, Current Divider Rule, Special Cases, Meter Movements, Wheatstone Bridge

• **Chapter 3: Circuit Analysis Techniques**
  – 3-1 Node-voltage analysis
    Element Inspection Rule, Writing Node Equations by Inspection, Cramer’s Rule, Evaluating Determinants, Node Analysis with Voltage Sources, Supernode
  – 3-2 Mesh-Current Analysis
    Element Inspection Rule, Writing Mesh Equations by Inspection, Mesh Analysis with Current Sources, Supermesh
– 3-3 Linearity Properties
  Superposition Principle, Proportionality Property, Transfer Function, Unit Output Method
– 3-4 Thevenin and Norton Equivalent Circuits
  Thevenin’s Theorem, Norton’s Theorem, Relationships
– 3-5 Maximum Signal Transfer
  Maximum Power Transfer Theorem, Maximum Efficiency Theorem
– 2-7 Computer-Aided Circuit Analysis: SPICE, MATLAB

• Chapter 4: Active Circuits

– 4-1 Linear Dependent Sources
  Voltage Controlled Sources, Current Controlled Sources, SPICE Models
– 4-2 Analysis of Circuits with Dependent Sources
  Node-Voltage Analysis, Mesh-Current Analysis, Thevenin and Norton Equivalent Circuits
– 4-4 The Operational Amplifier
  Notation, Ideal and Commercial Op-Amps, Non-inverting Amplifier, Zero Volt - Zero Current
  Property, Modeling a Non-inverting Amplifier, Limitations Due to the Power Supply, Voltage
  Follower, Inverting Amplifier and Model, Differential Amplifier and Model, Op-Amp Circuit
  Analysis, Bridge-T Amplifier

• Chapter 6: Capacitance and Inductance

– 6-1 The Capacitor
  V-I Relationship of Capacitance, Plotting Power and Energy with SPICE, Capacitor, Modeling
  a Capacitor with Ideal Elements
– 6-2 The Inductor
  V-I Relationship of Inductance, Plotting Power and Energy with SPICE, Inductor, Modeling
  an Inductor with Ideal Elements
– 6-4 Equivalent Capacitance and Inductance
  Series and Parallel Combinations of Capacitance, Series and Parallel Combinations of Inductance

• Chapter 7: First- and Second-Order Circuits

– 7-2 First-Order Circuit Step Response
  Step Response of an RC Circuit, Algorithm for any One Capacitance Circuit, Time Constant,
  Interpretation of the Time Constant, Step Response of an RL Circuit, Algorithm for any One
  Inductance Circuit, Time Constant, Sequential Switching, Algorithm for Sequential Switching,
  PSpice Simulation with Switches
– 7-4 First-Order Circuit Sinusoidal Response
  Natural and Forced Response, RC Circuits
– 7-5 The Series RLC Circuit
  Natural Response, Characteristic Equation, Overdamped, Critically Damped and Under-
  damped Response
– 7-6 The Parallel RLC Circuit
  Natural Response, Characteristic Equation, Overdamped, Critically Damped and Under-
  damped Response
– 7-7 Second-Order Circuit Step Response
  Complete Response of a Series RLC Circuit with a Step Input