Contact Information

• **Instructor:** Daniel Costinett
  
  • Office: MK504
  
  • OH: **W 2:00-3:00 & R 10:00-11:00**, by appointment
  
  • E-mail: Daniel.Costinett@utk.edu
  
  • Please use [ECE 202] in the subject line
  
  • Email questions will be answered within 24 hours (excluding weekends)
Textbook and Materials

Textbook
  – ISBN: 1264149913
  – required
• Course covers Chapters 10-17

Course Website
• [http://web.eecs.utk.edu/~dcostine/ECE202](http://web.eecs.utk.edu/~dcostine/ECE202)

Software
• MATLAB
• LTSpice
# Course Schedule

Updated 13:25 January 22, 2024. Tentative lecture schedule, including links to lecture slides and notes, and links to assignments. The schedule is subject to change, please check frequently.

<table>
<thead>
<tr>
<th>Monday</th>
<th>Wednesday</th>
<th>Friday</th>
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</thead>
<tbody>
<tr>
<td>Jan. 22</td>
<td>L1 - Jan. 24</td>
<td>L2 - Jan. 26</td>
</tr>
<tr>
<td>Snow Day</td>
<td>Course Introduction</td>
<td>Mutual Inductance</td>
</tr>
<tr>
<td>L3 - Jan. 29</td>
<td></td>
<td>Sections 13.1-13.2 (ignore &quot;phasor&quot; notation)</td>
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<tr>
<td>Coupling Coefficient</td>
<td>Transformer</td>
<td>Transformer Reflection</td>
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<tr>
<td>The Transformer</td>
<td>Equivalent Circuits</td>
<td>Examples of Transformer and Coupled Inductors</td>
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<tr>
<td>Ideal Transformer Model</td>
<td>Sections 13.3 (ignore &quot;phasor&quot; notation)</td>
<td></td>
</tr>
<tr>
<td>Sections 13.4 (ignore &quot;phasor&quot; notation)</td>
<td></td>
<td>Homework 1 Due</td>
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</tbody>
</table>
Grading

• **Homework: 20%**
  – Weekly, due on Fridays *before* the start of lecture
  – Covers lectures up to and including Monday of the current week
  – The one lowest homework grade will be dropped

• **Quizzes: 10%**
  – In-class, open-book, open-note & calculator

• **Labs: 15%**
  – Completed outside of class

• **Midterms (2): 30%**

• **Final: 25%**
  – All exams open-book, open-note & calculator
Assignments

• Submission
  – Homeworks and Labs should be submitted by uploading a **single pdf** to canvas
    ▪ Physical copy submitted prior to the due date/time loses 5% credit
    ▪ [https://libanswers.utk.edu/faq/103187](https://libanswers.utk.edu/faq/103187)
Lab Experiments

• Completed in groups of 2-3
• May be completed using either
  – Analog Discovery Studio
  – Equipment in MK333
Course Policy

• No late work will be accepted except in cases of documented medical emergency
• Collaboration encouraged on Labs and Homework
  – Must submit your own work on all assignments
  – Adhere to Student Code of Conduct
• Attendance is required in all lectures
How to Succeed in ECE202

• Attend all lectures
• Read associated sections in the book, as listed on the course schedule
• Work collaboratively (in person or virtually) to understand homework assignments
  – Complete your own work
  – Self-assess solution process
  – Review any incorrect answers
• Actively participate in lab sessions
• Review material in advance of quizzes and tests
• Ask questions in lecture / office hours / e-mail after having made an attempt at the material on your own
INTRODUCTION TO ECE202
ECE 201 Review

- KCL, KVL, Series/Parallel Circuits (Chapter 3)
- Nodal and Mesh Analysis (Chapter 4)
- Linearity/Superposition, Source Transform (Chapter 5)
- Ideal Op-amps (Chapter 6)
- Capacitors and Inductors (Chapter 7)
- RLC Circuits, Resonance, Damping (Chapter 8-9)
  - Differential Equations approach
\[ L \frac{d^2i}{dt^2} + R \frac{di}{dt} + \frac{1}{C} i = 0 \]

\[ v(t) = A_1 e^{s_1t} + A_2 e^{s_2t} \]

\[ s_1, s_2 = -\frac{R}{2L} \pm \sqrt{\left(\frac{R}{2L}\right)^2 - \frac{1}{LC}} \]
Example Application: Wireless Power Transfer

Commercial

Samsung
Fast charging wireless stand 2018
And wireless charger duo
Wireless Power Transfer (WPT)
Wireless Power Transfer (WPT)
Wireless Power Transfer (WPT)
Wireless Power Transfer (WPT)
Example Coil
TDK Part Number: WR282840-37K2-LR3
3 x 3 cm, 37 turns, $L = 46 \, \mu H$, $f_s = 100 \, kHz$
WPT Compensation
Receiver Side
A Slightly More Complicated System

A Slightly More Complicated System
Course Content

• Magnetically Coupled Circuits (Ch 13)
• Sinusoidal Steady-State Analysis (Ch 10)
• AC Circuit Power Analysis (Ch 11)
• Fourier Circuit Analysis (Ch 17)
• Circuit Analysis in the s-Domain (Ch 14)
• Frequency Response (Ch 15)
• Two-Port Networks (Ch 16)
• Polyphase Circuits (Ch 12) [ECE 325]
ECE 202 Core Concepts

• Continued development of fluency with circuit analysis
  – Solving circuits *without* resulting to Nodal/Mesh Analysis
• Linear, Time Invariant (LTI) systems
  – Superposition and shift independence
  – Transformation-based solutions to complex circuits
• Frequency-domain analysis