Contact Information

• **Instructor:** Daniel Costinett
  - Office: MK504
  - OH: W 2:30-4:00, R 10:30-12:00, 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: 0073545511
  - 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
**Grading**

- **Homework: 20%**
  - Weekly, due on Fridays *before* the start of lecture
  - The one lowest homework grade will be dropped
- **Quizzes: 10%**
  - In-class, open-book, open-note & calculator
- **Labs: 15%**
  - Completed outside of class (by scheduling with TA)
- **Midterms: 30%**
- **Final: 25%**
  - All exams open-book, open-note & calculator
Assignments

• Submission
  –Homeworks and Labs should be submitted by uploading a pdf to canvas
    ▪ Physical copy submitted prior to the due date/time loses 5% credit
    ▪ https://www.eecs.utk.edu/resources/it/eecs-it-knowledge-base/using-the-scanner/
    ▪ https://libanswers.utk.edu/faq/103187

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 and scheduled lab time
Fall 2021: UTK Coronavirus Precautions

https://www.utk.edu/coronavirus/guides/requirement-to-wear-face-coverings

• The best way to be protected from serious illness from COVID-19 is to get vaccinated, which the university strongly recommends.

• Students, staff, and faculty will be required to wear masks in classrooms and labs, and for indoor academic events required for students.

• The need for masks will be continually re-evaluated based on COVID-19 case counts in our community.

• Masks are expected to be worn in health care facilities and on public transportation, including the T.

• Any individual can choose to wear a mask anywhere on campus, regardless of their vaccination status.

Course Slack

• http://utk-ece202.slack.com/

• Invitation link:
  - https://join.slack.com/t/utk-ece202/signup
  - Can signup without invitation from @vols.utk.edu e-mail address

• Collaboration, Q&A, OH video call
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 through Slack, etc.) to understand homework assignments
  – Complete your own work
  – 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

End of ECE201

\[ L \frac{d^2i}{dt^2} + R \frac{di}{dt} + \frac{1}{C} i = 0 \]

\[ v(t) = A_1 e^{s_1 t} + A_2 e^{s_2 t} \]

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

Wireless Power Transfer (WPT)

Research

Commercial

Samsung
Fast charging wireless stand 2018
And wireless charger duo

Transmission Coils

Faraday: $\mathcal{E} = -\frac{\partial \Phi}{\partial t}$

$N_{tx} = N \cdot \frac{d}{dt} \Phi,t$ $\Phi,t$ = $\Phi$ + $\Phi,t$

$N_{tx} = -\frac{d}{dt} \Phi,t$

$U_{tx} = N - \frac{d}{dt} N_{tx}$

$U_{tx} = -N^2 a \frac{\partial \Phi}{\partial t}$

Amplifier $f_s \sim 100kHz$

$L$
Wireless Power Transfer (WPT)

Wireless Power Transfer (WPT)

\[ v_{rx} = -N_r \frac{d\delta_r}{dt} \]
Wireless Power Transfer (WPT)
Example Coil

TDK Part Number: WR282840-37K2-LR3
3 x 3 cm, 37 turns, $L = 46 \, \mu H$, $f_s = 100 \, kHz$

Charge cell phone @ 5A, 20W

Let's say $i_{tx} = I_A \sin(wst)$, $I_A = 5A$

\[ V_{A} = (4\pi wt)(2\pi 100kHz)(5A) = 141V \]

\[ V_{tx} = L \frac{di_{tx}}{dt} + \frac{1}{C} \int i_{tx} \, dt \]
\[ V_{tx} = Lw_0 I_A \cos(wst) - \frac{1}{w_0 C} I_A \cos(wst) \]
\[ V_{tx} = \frac{1}{Lw_0 C} I_A \cos(wst) \]

Design so $Lw_0 = \frac{1}{w_0 C}$

$V_{tx}$ amplitude can be $< 0$
Receiver Side

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]