EE 202: Electric Circuits II

Term: Fall 2026
Credits: 3.0
Lecture Times & Location: Tuesday & Thursday 1:00–2:15 p.m., Rowan Engineering Center 110
Modality: In-Person

Instructor Information

- **Instructor:** Dr. Julien Pierce (Assistant Professor of Electrical & Computer Engineering)
- **Email:** jpierce@university.alkimi.ai
- **Office:** Rowan Engineering Center 218
- **Office Hours:**
  - Monday & Friday: 11:30 a.m.–1:00 p.m. (In person, Rowan Engineering Center 218)
  - Wednesday: 3:00–4:00 p.m. (Virtual via Zoom; link posted in Canvas)
  - Also available by appointment.

Course Description

Sinusoidal steady-state analysis, phasors, AC power, three-phase circuits, frequency response, filters, and Laplace transform circuit analysis. EE 202 continues the study of electric circuits, transitioning from basic resistive and transient circuits to alternating current (AC) steady-state network analysis and advanced frequency-domain techniques. Students master phasor algebra, complex power calculations, balanced three-phase distribution systems, and magnetically coupled coils. The second half of the course examines network frequency response, active and passive filter design, Bode magnitude and phase plots, and complete transient and steady-state circuit analysis using the Laplace transform.

Prerequisites

EE 201; MATH 340 (prior or concurrent).

Measurable Student Learning Outcomes

Upon successful completion of EE 202, students will be able to:

1. **Analyze Sinusoidal Steady-State Networks:** Transform time-domain sinusoidal circuits into phasor domain representations and apply nodal, mesh, and Thévenin/Norton network reduction techniques.
2. **Calculate AC Power and Power Factor:** Compute instantaneous, real, reactive, and complex power, calculate power factors, and size capacitor banks for power factor correction in inductive loads.
3. **Solve Balanced Three-Phase Systems:** Analyze balanced three-phase Wye-Wye and Wye-Delta circuits, calculating line and phase voltages, currents, and total real and reactive power.
4. **Design and Characterize Filters:** Determine network transfer functions, sketch asymptotic Bode diagrams, calculate resonance frequencies and quality factors, and design passive and active filtering circuits.

5. **Apply Laplace Transforms to Circuit Dynamics:** Formulate s-domain equivalent circuit representations with initial condition sources, solve for circuit responses via partial fraction expansions, and evaluate two-port network parameters.

Required Course Materials & Approximate Costs

1. **Alexander, Charles K., and Matthew N. O. Sadiku. *Fundamentals of Electric Circuits*. 7th ed., McGraw-Hill, 2021.** Approx. $75 digital rental ($185 purchase; reserve copies available in Alkimi Library).
2. **LTspice and MATLAB/Python student software (available for student download and campus workstations).** Free open/educational licenses.
3. **Total estimated cost:** Approx. $0 (library reserve & campus tools) to $75 (digital rental).

Generative AI Policy (AI Level 2: AI Permitted with Disclosure for Specified Tasks)

In accordance with Alkimi University Academic Policies (Student Handbook §5.8), EE 202 operates under **AI Level 2**.

- **What is permitted:** Students may use AI tools to generate scripts for complex number matrix manipulation, plot frequency responses and Bode diagrams in MATLAB or Python, and clarify mathematical properties of Laplace transform pairs.
- **What is prohibited:** AI models must not be used to solve assigned circuit analysis problems, generate completed phasor diagrams, or perform mesh/nodal network derivations on graded homework. The use of any AI or computational assistants during examinations and quizzes is strictly forbidden.
- **Disclosure:** Whenever automated software or generative AI assists in writing code for circuit simulation projects, students must include an acknowledgement outlining the prompt, the code generated, and the verification methods used against SPICE simulations.

Grading Components and Weights

- **Weekly Homework Problem Sets:** 15% (Due Wednesdays at 11:59 p.m. in Canvas (weeks 2–14; lowest dropped))
- **Biweekly Concept & Phasor Quizzes:** 10% (Administered in class on alternate Thursdays (weeks 3, 5, 9, 13; lowest dropped))
- **Midterm Exam 1 (Phasors, AC Power & Coupled Circuits):** 20% (In class, Thursday, October 1)
- **Midterm Exam 2 (Three-Phase & Frequency Response):** 20% (In class, Thursday, November 5)
- **Active Filter Design & SPICE Simulation Project:** 10% (Due Friday, November 20 at 11:59 p.m.)
- **Comprehensive Final Examination:** 25% (Monday, December 14, 2026, 1:00–3:00 p.m.)

Grading Scale (Alkimi University Standard)

- **A:** 93–100% | **A-:** 90–92%
- **B+:** 87–89% | **B:** 83–86% | **B-:** 80–82%
- **C+:** 77–79% | **C:** 73–76% | **C-:** 70–72%
- **D+:** 67–69% | **D:** 60–66% | **F:** Below 60%
- **Extra credit:** No extra credit assignments are offered in EE 202.

Course Schedule (Fall 2026)

Week	Dates	Topics & Readings	Assignments & Deadlines
Week 1	Aug 27	**Sinusoids, Phasors, and Impedance:** Sinusoidal excitation, Euler's formula, phasor domain transformation, impedance and admittance of R, L, and C elements, and Kirchhoff's laws in frequency domain. *Reading: Alexander & Sadiku Ch. 9.1–9.6*	*First day of classes: Wed Aug 26.*

Week	Dates	Topics & Readings	Assignments & Deadlines
Week 2	Sep 1, 3	**AC Nodal and Mesh Analysis:** Phasor circuit nodal and mesh equations, supernodes, supermeshes, source transformations, and Thévenin and Norton equivalent circuits with complex impedances. *Reading: Alexander & Sadiku Ch. 10.1–10.6*	*Wed Sep 2: Add/section change deadline.*
Week 3	Sep 8, 10	**AC Power Analysis: Real and Reactive Power:** Instantaneous power, average (real) power, effective (RMS) values of sinusoidal waveforms, apparent power, and the complex power triangle (P, Q, S). *Reading: Alexander & Sadiku Ch. 11.1–11.5*	*Mon Sep 7: Labor Day (no classes). Wed Sep 9: Census date (last day to drop without a W).*
Week 4	Sep 15, 17	**Power Factor Correction and Maximum Power Transfer:** Power factor calculation (lagging and leading), parallel shunt capacitor sizing for power factor correction, and maximum average power transfer theorem. *Reading: Alexander & Sadiku Ch. 11.6–11.8*	—
Week 5	Sep 22, 24	**Magnetically Coupled Circuits and Transformers:** Mutual inductance, dot convention, energy in coupled circuits, linear transformers, ideal transformers, and reflected impedance formulations. *Reading: Alexander & Sadiku Ch. 13.1–13.6*	—
Week 6	Sep 29, Oct 1	**Coupled Inductors Synthesis and Midterm Exam 1:** Autotransformers, three-winding transformers, application synthesis, and administration of Midterm Exam 1 during Thursday class. *Reading: Alexander & Sadiku Ch. 13.7–13.9*	**Midterm Exam 1 (Phasors, AC Power & Coupled Circuits) (in class).**
Week 7	Oct 6, 8	**Balanced Three-Phase Systems: Wye and Delta:** Three-phase generation, balanced three-phase voltages, analysis of balanced Wye-Wye and Wye-Delta connections, line-to-line vs. phase voltages, and per-phase equivalents. *Reading: Alexander & Sadiku Ch. 12.1–12.5*	—
Week 8	Oct 15	**Three-Phase Power and Unbalanced Networks:** Power in balanced three-phase loads, two-wattmeter method for power measurement, and introduction to unbalanced three-phase configurations. *Reading: Alexander & Sadiku Ch. 12.6–12.9*	*Oct 12–Oct 13: Fall break (no classes). Fri Oct 16: Midterm grades due.*
Week 9	Oct 20, 22	**Network Frequency Response and Transfer Functions:** Concept of transfer function H(s), decibel scales, logarithmic frequency plots, and systematic sketching of asymptotic Bode magnitude and phase diagrams. *Reading: Alexander & Sadiku Ch. 14.1–14.4*	—
Week 10	Oct 27, 29	**Resonance and Quality Factor:** Series resonant circuits, parallel resonant circuits, resonant frequency, half-power bandwidth, quality factor (Q), and selectivity. *Reading: Alexander & Sadiku Ch. 14.5–14.6*	—
Week 11	Nov 3, 5	**Passive and Active Filters and Midterm Exam 2:** Low-pass, high-pass, band-pass, and band-stop passive filter circuits, op-amp active filters (Sallen-Key topologies), and Midterm Exam 2 in Thursday class. *Reading: Alexander & Sadiku Ch. 14.7–14.9*	*Fri Nov 6: Last day to withdraw (W) or elect Pass/No Pass.* **Midterm Exam 2 (Three-Phase & Frequency Response) (in class).**
Week 12	Nov 10, 12	**Introduction to the Laplace Transform in Circuits:** Definition of the unilateral Laplace transform, functional transforms, operational properties, and the inverse Laplace transform via partial fraction expansions. *Reading: Alexander & Sadiku Ch. 15.1–15.5*	—
Week 13	Nov 17, 19	**s-Domain Circuit Analysis and Transients:** Circuit element models in the s-domain with initial energy storage (inductor initial currents, capacitor initial voltages); Filter Project due Friday. *Reading: Alexander & Sadiku Ch. 16.1–16.4*	**Active Filter Design & SPICE Simulation Project due Fri Nov 20 at 11:59 p.m.**
Week 14	Nov 24	**Transfer Functions and Convolution in the s-Domain:** Impulse response, step response, network stability poles and zeros, and time-domain convolution integral representation. *Reading: Alexander & Sadiku Ch. 16.5–16.7*	*Nov 25–Nov 27: Thanksgiving break (no classes).*

Week	Dates	Topics & Readings	Assignments & Deadlines
Week 15	Dec 1, 3	**Two-Port Networks:** Impedance (z) parameters, admittance (y) parameters, hybrid (h) parameters, transmission (ABCD) parameters, and interconnection of two-port systems. *Reading: Alexander & Sadiku Ch. 19.1–19.6*	—
Week 16	Dec 8	**Course Synthesis and Final Examination Review:** Comprehensive review integrating AC power calculations, three-phase systems, Bode analysis, and Laplace transform transient solutions. *Reading: Review Alexander & Sadiku Ch. 9–14, 16*	*Wed Dec 9: Last day of classes. Thu Dec 10: Reading Day.*
Finals	Dec 14	**Comprehensive Final Examination:** Monday, December 14, 2026, 1:00–3:00 p.m., Rowan Engineering Center 110.	Comprehensive.

Course Policies

Attendance Policy

Consistent attendance at every lecture is expected. Circuit analysis techniques, especially phasor transformations and s-domain models, require continuous guided practice. If an unavoidable absence arises due to illness or approved university events, notify Dr. Pierce in advance of class. Students who miss the first two class meetings without notifying the instructor may be dropped. Students may miss class for religious observance without penalty if they notify the instructor in writing within the first two weeks of the semester (by Wednesday, September 9, 2026). Absences for university-sponsored activities (athletics, performances, conferences) are excused with a letter from the sponsoring office at least one week in advance.

Late Work Policy

Homework problem sets submitted after the deadline incur a 15% penalty per 24 hours, accepted up to 48 hours late. After 48 hours, solutions are released and no submissions will be accepted. To accommodate unforeseen personal circumstances, the lowest homework score and lowest quiz score are dropped.

Final Exam Policy

The final examination (Monday, December 14, 2026, 1:00–3:00 p.m.) is scheduled by the University Registrar and can't be moved without the Dean's written approval (Faculty Handbook §5.5). A student with three or more final exams on the same calendar day may reschedule one of them. Requests go to the instructor of the middle exam by the last day of classes. For this term, send the request by Wednesday, December 9, 2026 (Student Handbook §6.4).

Academic Integrity

Alkimi University is an academic community devoted to rigorous scholarship, open intellectual inquiry, and uncompromising ethical conduct. All students are subject to the regulations of the Alkimi University Academic Integrity Policy. Academic dishonesty—including plagiarism, cheating on examinations, unauthorized collaboration, fabrication of empirical data, and unauthorized submission of academic work generated by artificial intelligence—undermines the integrity of the university and carries severe disciplinary sanctions. Sanctions range from a failing grade on an assignment or exam to an administrative course failure recorded as an 'XF' on the official transcript, academic suspension, or expulsion. Suspected violations are formally investigated and resolved through the Office of Academic Integrity in accordance with Faculty Handbook §6. For detailed information, consult the Office of Academic Integrity, Lovell Hall 315, (555) 555-0163, integrity@university.alkimi.ai.

Accessibility Services

Alkimi University is committed to providing equitable educational access and reasonable accommodations for all students with documented disabilities, including physical, sensory, psychological, learning, and chronic health conditions. Students requesting academic accommodations must formally register with the

Office of Accessibility Services, Harlan Hall 204, (555) 555-0155, access@university.alkimi.ai. Once approved, students will receive an official Faculty Accommodation Letter detailing approved accommodations. Students should present this letter to the instructor as early in the semester as possible, and at least one week prior to any exam or assignment requiring accommodation. Accommodations cannot be applied retroactively.

Student Wellness and Mental Health

Your physical health, psychological well-being, and mental health are essential to your academic success. If you experience heightened stress, anxiety, depressive symptoms, personal trauma, or academic burnout, free, confidential counseling and medical care are available through the Hollis Health & Counseling Center, located in the Hollis Center. Routine appointments are available Monday–Friday 8:00 a.m.–6:00 p.m. and Saturday 10:00 a.m.–2:00 p.m. during the semester by calling (555) 555-0190 or emailing health@university.alkimi.ai. Urgent, 24/7 crisis psychological counseling is accessible immediately at (555) 555-0199.

Campus Student Support Services

- **Academic Advising Center:** Lovell Hall 101 | (555) 555-0158 | advising@university.alkimi.ai
- **Writing Center:** Whitcombe Library 3rd Floor | Free consultations on papers, reports, and research projects at any stage.
- **Whitcombe Library:** Whitcombe Library, Main Floor | (555) 555-0170 | askalibrarian@university.alkimi.ai
- **Hollis Health & Counseling Center:** Hollis Center | (555) 555-0190 | 24/7 Counseling Line: (555) 555-0199 | health@university.alkimi.ai
- **Electrical Engineering Peer Tutoring:** Rowan Engineering Center 140 | Drop-in circuit analysis and LTspice tutoring available Monday and Wednesday 5:00–8:00 p.m.