

Course Details

Course Overview:

Course Code: EENG281 – Introduction to Electrical Circuits, Electronics and Power, Sections A

Semester Year: Fall 2024

Credit Hours: 3

Class Meeting Times: MWF 10 – 10:50 am

Class Location: Hill Hall 202

Instructor: Dr. Yiyang Li **Email:** Yiyang.li@mines.edu

Office Hours: 8 – 9:30 am MWF **Office Hour Location:** Brown 330 O

Additional Support options:

Office Hours

	Monday	Tuesday	Wednesday	Thursday	Friday	Location
Dr. Li	0800-0930		0800-0930		0800-0930	BB330O
Dr. Prado	1330-1500		1330-1500			BB330 P
Dr. Morris	1300-1400		1300-1400		1300-1400	Brown Hall W475
Ghazaleh			1600-1800	1500-1700		Brown Hall 310A
Mahzad	1400-1600				1000-1200	Brown Hall 314G

Online support forum: Access through Canvas or directly at <https://edstem.org/us/courses/62721/discussion/>

Pre-requisites:

PHGN200

Required Technology:

Scientific calculator capable of entering and solving complex simultaneous equations

Laptop, computer and network access for homework and other on-line resources

Welcome to EENG281 – Introduction to Circuits for Electrical Engineers.

Course Description:

Electrical circuits are an essential part of engineering. Circuit analysis provides the foundation for all areas of specialization within the electrical engineering field of study. EENG 281: Introduction to Electrical Circuits, Electronics and Power is targeted to provide the required coverage of electric circuits needed to prepare engineering students for their chosen profession. Emphasis will be placed on the concepts underpinning circuit analysis and the tools for problem solving and applications. DC and AC (single-phase and three-phase) networks are presented. Transient analysis of RC and RL circuits is studied as is the analysis of circuits operating in sinusoidal steady-state using phasor concepts.

Learning Outcomes:

At the completion of the course, you will be able to:

- Define basic electrical circuit components and explain how they are used to create functional electrical circuits.
- Analyze DC RLC circuits using the circuit analysis techniques of the Node-Voltage method, the Mesh-Current method, Thevenin & Norton Equivalent Source Transformations, and Superposition.
- Solve DC circuits containing Operational Amplifiers using both the ideal and the practical Op Amp models.
- Analyze RC, RL, and RLC circuits for their transient natural and step responses.
- Analyze AC, DC and transient circuits for basic power and energy concepts.
- Perform sinusoidal steady-state analysis of AC RLC circuits using the frequency domain concepts of phasors and impedance.
- Employ the Node-Voltage Method, Mesh-Current Method, Thevenin & Norton Equivalent Source Transformations, Delta-Wye Transforms and Superposition applied to AC circuits.
- Solve AC circuits including those containing linear and ideal transformers using phasor methods.
- Describe and analyze balanced three-phase circuits.

Required Text and On-line Text/Homework Environment:

We are using Mastering Engineering to support this class. This can be accessed through Canvas once you are registered for the Pearson content. To register, follow the **VitalSource Course Materials** link on Canvas to receive a registration code. Then follow the **Pearson Access** link in Canvas to enable your access. Once you have completed your registration, you'll have access to an electronic version of the textbook (ISBN-13: 9780137648221) and the homework environment for the duration of the course. A physical copy of the textbook is not mandatory. However, should you wish to purchase one the book is: Electric Circuits, by James W. Nilsson and Susan A. Riedel, Pearson/Prentice-Hall, 12th Edition (ISBN: 9780137648375). This is the same textbook that you'll have electronic access to via the Mastering Engineering site. The electronic book should be used to supplement the lecture material. Carefully reading the text and working the example problems are fundamental to learning the topics of this course.

Assessments:

The assessments for this course include homework assignments, two mid-terms and a final. A full listing of the assignment weighting, numerical grading scale, homework due dates as well as likely dates for mid-terms and final exam are included at the end of the syllabus.

Homework will be assigned per the class schedule (see end of the syllabus), consisting of an online assignment (submitted using the Mastering Engineering site). **No late assignments will be accepted.** All of the online homework assignments are due at 11:59 pm on the date listed on the course schedule.

Policies and Campus Resources

Absences:

The primary commitment of students at Mines is to their academics. Class attendance is required of all students unless the student has an excused absence granted by the school or the student's professor. An excused absence awarded by the school or professor comes after a student's request or initiative. To review the Excused Absence Policy and/or to request an excused absence, please visit <https://www.mines.edu/student-life/student-absences/>.

The Mines default position is to trust students. Please do not abuse this trust. As long as your number of short-term illnesses is low, we will not require anything beyond the answers to the questions below to mark you as excused, and you can work through what you missed for your own understanding. However, if you end up requesting a large number of excused absences, suspicious absences, or opportunistic absences, then we may follow-up and require you to submit proof that you have worked through the missed material before excusing you (in part, to make sure you are not falling behind). If we determine that you are violating the intent of this policy, then we will treat it as Academic Misconduct or a Code of Conduct matter.

Information to provide in email to instructor:

1. *Name and CWID*
2. *Course Name*
3. *Section and/or Time*
4. *Class day missed*
5. *Do you certify that you are indeed not feeling well and that after submitting this request will be limiting your activity to recover and/or lessen exposure to others as much as possible until you feel better?*

Diversity and Inclusion:

At Colorado School of Mines, we understand that a diverse and inclusive learning environment inspires creativity and innovation, which are essential to the engineering process. We also know that in order to address current and emerging national and global challenges, it is important to learn with and from people who have different backgrounds, thoughts, and experiences.

Our students represent every state in the nation and more than 90 countries around the world, and we continue to make progress in the areas of diversity and inclusion by providing [Diversity and Inclusion programs and services](#) to support these efforts.

Disability Support Services:

The Colorado School of Mines is committed to ensuring the full participation of all students in its programs, including students with disabilities. If you anticipate or experience any barriers to learning in this course, please feel welcome to discuss your concerns with me. Students with disabilities may also wish to contact Disability Support Services (DSS) to discuss options to removing barriers in this course, including how to register and request official accommodations. Please visit their [website](#) for contact and additional information. If you have already been approved for accommodations through DSS, please meet with me at your earliest convenience so we can discuss your needs in this course.

Accessibility within Canvas:

Read the [Accessibility Statement](#) from Canvas to see how the learning management system at the Colorado School of Mines is committed to providing a system that is usable by everyone. The Canvas platform was built using the most modern HTML and CSS technologies, and is committed to W3C's Web Accessibility Initiative and Section 508 guidelines.

Discrimination, Harassment, and Sexual Misconduct:

Discrimination, Harassment, and Sexual Misconduct of any type, including sexual harassment, sexual assault, dating violence, domestic violence, and stalking, are prohibited under the Policy Prohibiting Unlawful Discrimination and the Policy Prohibiting Sexual Harassment, Sexual Assault, and Interpersonal Violence. As a participant in this course, we expect you to respect your instructor and your classmates. As your instructor, it is my responsibility to foster a learning environment that supports diversity of thoughts, perspectives and experiences, and honors your identities. I am also a mandatory reporter as an instructor at Mines, and if I receive a disclosure of Discrimination, Harassment, and/or Sexual Misconduct, I am required to report it to the Title IX Coordinator. You can also make a report if you are witness to or impacted by Discrimination, Harassment, and/or Sexual Misconduct. If something is said or done in this course (by anyone, including myself) that made you or others feel uncomfortable, or if your performance in the course is being impacted by your experiences outside of the course, please report it to me (if you are comfortable doing so), to the <https://www.mines.edu/institutional-equity-title-ix/reporting/>, and to <https://www.mines.edu/institutional-equity-title-ix/submit-report/> (an anonymous option). You can also contact the Mines Title IX Coordinator, Carole Goddard, directly at 303.273.3260 or titleix@mines.edu for more information. It's on us, all of the Mines community, to engineer a culture of respect.

Preferred First Name Project

In order to foster a more inclusive environment for students and faculty who use Canvas to teach, learn and collaborate, ITS implemented the use of preferred first names throughout the entire Canvas learning management system at Mines last year. This change transitioned Canvas to fully utilize preferred first names regardless of feature, function, or user. You can add a preferred first name by [following the steps on the Preferred First Name website](#).

Why Are Preferred First Names important? Calling a person by their preferred name shows respect. Using preferred names contributes to the University's goal of providing an empowering, safe and nondiscriminatory

educational and work environment. Someone's name is an extremely important part of a person's identity. We encourage everyone to utilize a person's preferred name and pronouns whenever addressing or referring to them.

CARE @ Mines:

If you feel overwhelmed, anxious, depressed, distressed, mentally or physically unhealthy, or concerned about your wellbeing overall, there are resources both on- and off-campus available to you. If you need assistance, please ask for help from a trusted faculty or staff member, fellow student, or any of the resources below. As a community of care, we can help one another get through difficult times. If you need help, reach out. If you are concerned for another student, offer assistance and/or ask for help on their behalf. Students seeking resources for themselves or others should visit care.mines.edu.

Additional suggestions for referrals for support, depending on comfort level and needs include:

- CARE at Mines: care.mines.edu for various resources and options, or to submit an online "CARE report" about someone you're concerned about, or email care@mines.edu
- CASA - <https://www.mines.edu/casa/> for academic advising, tutoring, academic support, and academic workshops
- Counseling Center – <https://www.mines.edu/counseling-center/> or students may call 303-273-3377 to make an appointment. There are also online resources for students on the website. Located in the Wellness Center 2nd floor. Located at 1770 Elm St.
- Health Center - <https://www.mines.edu/student-health/> or students may call 303-273-3381 for appointment. Located in Wellness Center 1st floor.
- Colorado Crisis Services - For crisis support 24 hrs/7 days, either by phone, text, or in person, Colorado Crisis Services is a great confidential resource, available to anyone. <http://coloradocrisisservices.org>, 1-844-493-8255, or text "TALK" to 38255. Walk-in location addresses are posted on the website.
- Food and/or Housing - Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact the Dean of Students for support. Furthermore, please notify your professor if you are comfortable in doing so. This will enable your professor to provide resources that may be available.

All of these options are available for free for students. The Counseling Center, Health Center, and Colorado Crisis Services are confidential resources. The Counseling Center will also make referrals to off-campus counselors, if preferred.

In an emergency, you should call 911, and they will dispatch a Mines or Golden PD officer to assist.

Center for Academic Services and Advising (CASA):

CASA (<https://www.mines.edu/casa>) provides a variety of services to support students during their time at Mines.

- **Academic Advising:** All students are advised by Academic Advising Coordinators in CASA throughout their undergraduate studies at Mines.

- **Academic Support Services:** CASA offers a wide variety of support services designed to assist students throughout their undergraduate degree. Examples include pre-finals workshops, major exploration events, and the specific support services listed below.
 - **Tutoring:** Tutoring services are offered for all core curriculum courses and many major courses by peers. Tutoring is offered Sunday through Thursday in CASA (Aspen Hall), the Library, and via zoom.
 - **Core Review Sessions:** Core Review Sessions are group review sessions held by a peer facilitator before common core course exams. Peer facilitators also host regular office hours for more individualized assistance.
 - **Academic Coaching:** Students can work with CASA Advisors to develop the skills and technique of studying well in college, such as test-prep and cognitive learning development, in a one-on-one setting.
 - **Faculty in CASA:** Faculty from various departments host their regular office hours in CASA. Students are encouraged to utilize these professors for assistance with material and/or questions on course planning.

Policy on Academic Integrity/Misconduct:

The Colorado School of Mines affirms the principle that all individuals associated with the Mines academic community have a responsibility for establishing, maintaining and fostering an understanding and appreciation for academic integrity. In broad terms, this implies protecting the environment of mutual trust within which scholarly exchange occurs, supporting the ability of the faculty to fairly and effectively evaluate every student's academic achievements, and giving credence to the university's educational mission, its scholarly objectives and the substance of the degrees it awards. The protection of academic integrity requires there to be clear and consistent standards, as well as confrontation and sanctions when individuals violate those standards. The Colorado School of Mines desires an environment free of any and all forms of academic misconduct and expects students to act with integrity at all times.

Academic misconduct is the intentional act of fraud, in which an individual seeks to claim credit for the work and efforts of another without authorization or uses unauthorized materials or fabricated information in any academic exercise. Student Academic Misconduct arises when a student violates the principle of academic integrity. Such behavior erodes mutual trust, distorts the fair evaluation of academic achievements, violates the ethical code of behavior upon which education and scholarship rest, and undermines the credibility of the university. Because of the serious institutional and individual ramifications, student misconduct arising from violations of academic integrity is not tolerated at Mines. If a student is found to have engaged in such misconduct sanctions such as change of a grade, loss of institutional privileges, or academic suspension or dismissal may be imposed.

The complete policy can be found in the [Mines' Policy Library](#).

Coursework Return Policy:

Online homework will be immediately graded, and marks made available to the student on the Mastering Engineering website. Mid-term scores will be provided within two weeks of their submission, along with suitable commentary and/or materials that will enable students to understand how to improve their learning performance.

Course Issues and Concerns:

As part of good professional practice, students are encouraged to speak with the faculty directly to raise issues and concerns with regards to the course professionally in compliance with the student code of conduct. Students can also reach out to the Peter Aaen if there is one or the associate head of the Dr. Abd Arkadan Electrical Engineering Department. The associate department head can investigate and work with the faculty member to resolve course-related concerns. Students' final point of contact is the Dr. John Berger who can make any final decisions.

Participating in this Course

Profile in Canvas:

As part of the learning experience at the Colorado School of Mines, our class will be utilizing online learning resources and experiences through the Canvas learning management system. In order to help build community in this online learning environment, you are encouraged to upload your profile picture to Canvas. Photos should be similar to the photos taken for passports or state identification cards.

Expectations of online etiquette or netiquette:

A few do's and don'ts about communicating through emails or in online discussion forums:

- Do...
 - Ask questions and engage in conversations as often as possible—feel free to contact the instructor via the discussion forum for questions or via email or other communication.
 - Be patient and respectful of others and their ideas and opinions they post online.
 - Remember to be thoughtful and use professional language. Keep in mind that things often come across differently in written text, so review your writing before posting.
 - Be prepared for some delays in response time, as "virtual" communication tends to be slower than "face-to-face" communication.
 - Contact the instructor if you feel that inappropriate content or behavior has occurred as part of the course.
 - Check the syllabus and course policies stated by your instructor to know what to expect about your instructor's turnaround time for responding.
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- Do NOT...
 - Use inappropriate language—this includes, but is not limited to, the use of curse words, swearing, or language that is derogatory.
 - Post inappropriate materials—for example, accidentally posting/showing a picture that is not appropriate for the course content.
 - Post in ALL CAPS, as this is perceived as shouting and avoid abbreviations and informal language ("I'll C U L&R").
 - Send heated messages even if you are provoked. Likewise, if you should happen to receive a heated message, do not respond to it.
 - Send an email or post to the entire class, unless you feel that everyone must read it.

Course Schedule (will be updated as needed)

Class	Date	Lecture Topic	Reading	Homework Assignment Due
1.	Monday, August 19 th	Course Introduction Circuit Fundamentals	Ch. 1 through 1,5 Pages 2 – 15	
2.	Wednesday, August 21 st	Power & Energy	Ch. 1 through end Pages 15-19	
3.	Friday, August 23 rd	Voltage & Current Sources Resistors & Ohm's Law	Ch. 2 through 2.3 Pages 26 – 38	HW0 Tutorial 1
4.	Monday, August 26 th	Kirchhoff's Laws	Ch. 2 through end Pages 39 – 50	HW1
5.	Wednesday, August 28 th	Simple Resistive Circuits Series & Parallel Voltage and Current Dividers	Ch. 3 through 3.4 Pages 58 – 70	Tutorial 2
6.	Friday, August 30 th	Measurements Delta-Wye Transforms	Ch. 3 through end Pages 70 – 80	HW2
	Monday, Sept 2 nd	Labor Day Holiday		
7.	Wednesday, Sept 4 th	Introduction to the Node-Voltage Method	Ch. 4 through 4.4 Pages 92 – 103	Tutorial 3
8.	Friday, Sept 6 th	Introduction to the Mesh-Current Method	Ch. 4 through 4.7 Pages 104 – 111	HW3
9.	Monday, Sept 9 th	Node-Voltage Method vs. Mesh-Current Method	Section 4.8 Pages 112 – 115	
	Wednesday, Sept 11 th	Career Days	No Lecture	
10.	Friday, Sept 13 th	Source Transformations	Section 4.9 Pages 115 – 118	Tutorial 4
11.	Monday, Sept 16 th	Thévenin & Norton Equivalent Circuits	Sections 4.10-4.11 Pages 118 – 126	HW4
12.	Wednesday, Sept 18 th	Thévenin and Norton Equivalent Circuits (cont.)	Sections 4.10-4.11 Pages 118 – 126	
13.	Friday, Sept 20 th	Maximum Power Transfer Superposition Principle	Chapter 4 to end Pages 126 – 135	
14.	Monday, Sept 23 rd	Introduction to Operational Amplifiers	Ch. 5 through 5.4 Pages 150 – 160	Tutorial 5
15.	Wednesday, Sept 25 rd	Operational Amplifier Applications	Sections 5.5-5.6 Pages 160 – 167	HW5
	Friday, Sept 27 th	Review for Mid-term 1		
	Monday, Sept 30 th	Optional Review Session		
	Monday Sept 30th	Common Midterm I (Ch. 1-4)	7pm, 70 minutes Room TBD	

Class	Date	Lecture Topic	Reading	Homework Assignment Due
16.	Wednesday, Oct 2 nd	Operational Amplifier Applications (cont.)	Sections 5.5-5.6 Pages 160 – 167	
17.	Friday, Oct 4 th	Inductance and Capacitance	Ch. 6 through 6.3 Pages 182-198	Tutorial 6
18.	Monday, October 7 th	Magnetically Coupled Circuits	Chapter 6 to end Pages 199 – 209	HW6
19.	Wednesday, October 9 th	Transient Response First-Order Circuits	Ch. 7 through 7.3 Pages 220 – 240	
20.	Friday, October 11 th	Transient Analysis Step-by-Step Procedure	Section 7.4-7.9 Pages 241 – 246	Tutorial 7
	Monday, October 14 th	Fall Break		
21.	Wednesday, October 16 th	Transient Analysis Sequential Switching	Sections 7-11-7.12 Pages 246 – 251	HW7
22.	Friday, October 18 th	RLC Circuits	Ch. 8 through 8.4 Pages 272-303	
23.	Monday, October 21 st	Sinusoidal Sources & Complex Numbers	Ch. 9 through 9.2 Pages 318 – 324 & Appendix B	Tutorial 8
24.	Wednesday, October 23 rd	Phasors & Impedance	Sections 9.3-9.4 Pages 324 – 332	HW8
25.	Friday, October 25 th	Phasors & Impedance	Sections 9.5-9.7 Pages 332 – 343	
26.	Monday, October 28 th	Sinusoidal Steady-State Analysis	Sections 9.8-9.9 Pages 344 - 347	Tutorial 9
27.	Wednesday, October 30 th	Linear Transformers	Sections 9.10-9.11 Pages 347 – 356	HW9 (longest)
	Friday, November 1 st	Mid-term Review		
	Monday, Nov 4 th	Optional Review		
	Tuesday, Nov 5th	Common Mid-Term II (Ch. 5, 6, 7, 9 thru 9.9)	7pm, 70 minutes Room TBD	



Class	Date	Lecture Topic	Reading	Homework Assignment Due
28.	Wednesday, November 6th	Ideal Transformers		
29.	Friday, November 8 th	Sinusoidal Steady-State Power	Ch. 10 through 10.3 Pages 374 – 384	
30.	Monday, November 11 th	Power Calculations Complex Power	Sections 10.4-10.5 Pages 384 – 392	
31.	Wednesday, November 13 th	Power Calculations Power Triangle		Last day to withdraw
32.	Friday, November 15 th	Power Calculations Power Factor Correction	Chapter 10 to end Pages 393 – 401	Tutorial 10
33.	Monday, November 18 th	Balanced 3 Φ Circuits Wye and Per phase	Ch. 11 through 11.3 Pages 412 – 421	HW10
34.	Wednesday, November 20 th	Balanced 3 Φ Circuits Power calculations	Section 11.5 Pages 425 – 430	
35.	Friday, November 22 nd	Two-port circuits	Ch.18 through 18.2 694-704	Tutorial 11
36.	Monday, November 25 th	Analysis of two-port circuits		HW11
	November 27 th - 29 th	Thanksgiving Break		
	Mon, Dec 2 nd	Review for Final Exam		
	Wed, Dec 4 th	Review for Final Exam		
	Tuesday, December 10th	Final Exam	120 minutes	Date/Time/Location to be Confirmed

Grading Policy:

The grade you receive in this course will be based on the following contributions:

Assignment	Fraction
Mastering Engineering Homework	25%
2 Mid-Term Exams @ 25% each	50%
Final Exam	25%
Total	100%

Grade allocation for the course will be as shown in the table below:

Grade	Lower	Upper
A	93	100
A-	90	<93
B+	87	<90
B	83	<87
B-	80	<83
C+	77	<80
C	73	<77
C-	70	<73
D+	67	<70
D	63	<67
D-	60	<63
F	0	<60