Although the schedule for the presentation of topics is subject to minor changes, the **dates and times when all exams are scheduled are fixed.** Please plan accordingly.

Prefix/Number: EE 261
Title: Electrical Circuits I
Description: Application of fundamental concepts of electrical science in linear circuit analysis; mathematical models of electric components and circuits.
Credits: 3
Prerequisites: MATH 315 with a C or better or concurrent enrollment; 4 credits of PHYSICS 202 with a C or better, or PHYSICS 202 and 212, each with a C or better, or PHYSICS 206 with a C or better.

Instructor: John B. Schneider
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Phone: (509) 335-6457
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Office Hours: MWF 4:00–5:00 p.m., EME 221

Teaching Asst.: Kaung Myat Lwin
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Teaching Asst.: Joseph Porter
Email: `joseph.porter@wsu.edu`
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Teaching Asst.: Henry Shaw
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Office Hours: Wednesdays 4:30–5:30, Dana 149

Website: `eecs.wsu.edu/~schneidj/ee261`
Importantly, ***course material also available via Canvas.***
Not all material duplicated at both locations.

Text: *Electric Circuits*, 12th ed., J. W. Nilsson & S. A. Riedel,
Note: Electronic version of text is available "automatically" via Canvas
(cost is part of the tuition/course fee).
Reduced price available for loose-leaf version of text.
We will often refer to this text as "N&R."

iClicker: You must have either an iClicker 2 physical remote *or* purchase an iClicker
Student app subscription. Subscription prices start at $15.99 for six months.
(Purchase of a new physical remote previously came with five years of free
digital access, but that may no longer be the case. But, if you have a remote
you do not need a subscription, i.e., digital access.)

Grading: Cumulative score determined by the following:

Exam #1	19%
Exam #2	19%
Exam #3	19%
Final	21%
Homework	14%
iClicker Questions/Attendance	8%

Details provided below regarding homework and iClicker scores.

Cumulative scores have the corresponding letter grade:

≥ 92:	A
≥ 88 and < 92:	A-
≥ 84 and < 88:	B+
≥ 78 and < 84:	B
≥ 74 and < 78:	B-
≥ 70 and < 74:	C+
≥ 61 and < 70:	C
≥ 57 and < 61:	C-
≥ 50 and < 57:	D
< 50:	F

Note: Scores for *individual items* (i.e., assignments, tests, iClicker responses) will
be available via Canvas, but *Canvas does not provide a meaningful overall score*.

For the midterm and final grade, I calculate the overall score "off line" using a spreadsheet that accounts for factors Canvas does not. Scores are calculated to one decimal place and there will be no further rounding i.e., no rounding beyond that which gives the score to one decimal place.

Scores are calculated solely based on the metrics listed above. *There are no opportunities for individual extra credit nor for boosting one's score beyond that which is obtained by weighting one's performance as listed above.* For example, a score of 69.9 is a C and will not be rounded up to 70.0 (which is a C+). Grading may be adjusted for the class as a whole in a manner to enhance grades. But, such an adjustment is never done on an individual basis.

Homework: Handwritten work submitted as a PDF file via Canvas.
"Mastering" assignments done via Pearson website.
Approximately one handwritten and one Mastering assignment per week.
Handwritten and Mastering work carry equal weight when both assigned.
Weight for each assignment (Mastering plus handwritten) is equal.
Lowest two Mastering scores dropped.
Lowest two handwritten scores dropped.
No late work accepted.
Solution for handwritten assignments posted shortly after due-date.

iClicker Questions/Attendance:
Equal weight.
Missed lectures cannot be made up.
Lowest three scores dropped.
50% credit merely for participating.
Merely coming to class is not considered participating. You must answer at least one question to receive credit for participating.
After calculating score in accordance with above, 15 points added to obtain final score although score is not to exceed 100% (hence a "raw" score of 85 and above effectively translates to a perfect score).

Homework: As noted above, homework will typically be assigned each week. Homework may consist of a "handwritten" component, a component administered via Mastering (from Pearson), or, most often, both. Assignments are of equal weight (regardless of relative difficulty). The 14 points that homework counts toward the final grade is split equally between the handwritten and Mastering components.

The number of days between when an assignment is posted and when it is due and the day of the week on which assignments are due will vary. Thus, do not assume that you will always have a week between when an assignment is posted and when it is due. The date and time when homework is due will be specified within the assignment. *You must submit your handwritten work via Canvas as a PDF file.*

Solutions to handwritten assignments will be posted shortly after the due-date. If you submit work after the due-date/time, it will get zero credit. **There are no exceptions to this policy.** Low scores will be dropped as noted above.

Note that the two dropped scores are provided in recognition that "life happens." So, if you have to miss an assignment because of things such as illness or car troubles or court dates or any number of other circumstances, that does not entitle you to additional dropped scores. However, I reserve the right to provide additional drops under extreme extenuating circumstances. But, if you miss one or two assignments for nearly any reason, those will almost certainly be the scores you drop and you will not be granted additional drops. Extenuating situations may start to enter the picture if you must miss three or more assignments.

Attendance and iClicker Questions: You are expected to attend class in person as we are committed to "face-to-face" delivery of this course. Nevertheless, I will attempt to record lectures. I make no promises as to the quality of these recordings nor even that they will be created. In general, I will *not* publish the URLs for these recordings as you should be in class. However, I may provide links to individual recordings on request if you miss class for a good reason (such as sickness). Note, however, in lieu of these recordings, the lecture slides, on their own, largely tell the story of the lecture *if you view them in presentation mode*. I use incremental reveals on every slide and if you genuinely think about what changes from one reveal to the next, you will have garnered the bulk of the lecture.

"Quizzes" will be administered frequently in the form of in-lecture "clicker questions," i.e., question where you respond using technology from iClicker. There will typically be at least one clicker question per lecture. Unless instructed otherwise, answers to questions should be your own (although this will not be enforced). For a quiz, partial credit (50%) will be awarded merely for "being present." Specifically, you will be awarded **four points** merely for responding to a single question, i.e., *to be counted as present, you must respond to at least one question*. If you are physically in class but unable to respond to any of the clicker questions, you will not be consider present.

Another **four points** are awarded in accordance with how well you answer the questions. Each quiz is worth a total of **eight point**. Your total points on the quiz is obtained by summing your attendance points and the points you received for your answers. (This is then normalize to a 100-point scale.)

As an example, assume there are four questions during a particular lecture. Each question would be worth one point if answered correctly and zero points otherwise. If you answered two of these questions correctly, you would have a score of 75% (two points for correct answers; four points for participating; yielding six points out of a possible eight). As another example, if there were eight questions during a particular lecture, each would be worth half a point if answered correctly. If you answered five questions correctly, that would translate to four points for attendance and 2.5 points for the answers yielding a total of 6.5 out of eight point, i.e., 81.25%. Low scores will be dropped as noted above. *You cannot make up missed classes.*

Similar to the policy with homework, the three dropped scores are provided in recognition that "life happens." So, again, if you have to miss a class because of things such as illness or car troubles or court dates or any number of other circumstances, that does not entitle you to additional dropped scores. However, I reserve the right to provide additional drops under extreme extenuating circumstances. But, if you miss class, one, two, or three times, for nearly any reason, those will almost certainly be the scores you drop and you will not be granted additional drops. Extenuating situations may start to enter the picture if you must miss four or more lectures. (A documented requirement to attend an official WSU event will be treated as an exception to this policy.)

If you are using the physical remote (and do not also have a digital subscription) and forget to bring it to class or the batteries die, you will be considered absent that day, i.e., you'll have to use that as one of your drops. So, please don't forget to bring that and perhaps have spare batteries on hand.

Clicker questions are not especially hard in that they typically do not require much or, in fact, any calculation, but they do require thought and you will almost certainly miss more questions than you would have anticipated given their seeming "simplicity." The goal is for these questions to reveal any weaknesses in your understanding in a "low stakes" setting. It's okay and even expected that you will mess up on the clicker questions. The cost of wrong answers to the clicker questions is very low. But, *when you do get things wrong, the important thing is to learn from the mistakes and ensure you don't make the same mistakes again (and especially not on the exams).* At times it may seem that the clicker questions are "trick questions." However, I would argue that they serve to make you aware of potential pitfalls or areas of weakness. Thus, please pay attention to them.

If you have an iClicker digital subscription, you could potentially respond to polls even if you are not physically in attendance. *Do not do that!* I consider that cheating. iClickers have the possibility of providing GPS data to provide location data when you respond. I have the possibility of using this to determine if a student is giving responses when not actually in class. I may also simply be able to see if a student was not in class and yet responded to a poll. Because such behavior is a violation of academic integrity, the minimum consequence is to receive an overall clicker score of zero and I reserve the right to provide a failing grade for the course and report the incident to

Student Affairs.

Email: Any email regarding this class will be sent to your WSU address (i.e., your "`wsu.edu`" address). Email sent to the entire class may discuss things such as a change in the homework or things to note prior to an exam. It is important that you receive such email in a timely manner. Thus, please do pay attention to your WSU email.

When I send email to the entire class, it will employ Canvas even though I consider Canvas a sub-optimum communication channel. When I communicate directly with individuals, I will typically avoid Canvas. If not too inconvenient, when you need to send me email, I would prefer you avoid Canvas too (and stick to using Outlook or some other mailer). In my replies to individual email from students, if I notice that it was sent from a non-WSU address, I will redirect my reply to the student's WSU address (so as to ensure privacy).

I try to respond to email in a timely manner and email is often the best way to contact me. However, please be reasonable in terms of your expectation for response time, especially for email sent in the evening or on weekends. So, for example, if you have a question about the homework that you send at 1:00 a.m., it would be best not to expect a reply until several hours later.

Test Policy: There will be three "midterm" exams on which you will have 50 minutes to complete the work (assuming you are present when the exam starts). The final exam will be approximately twice as long (both in terms of content and duration) as the midterm exams.

These exams are not races! The goal is to do the work correctly, not quickly. If you are absolutely certain you have everything correct, you may turn in an exam early. However, I reserve the right to scale up the value of the points missed if you turn in an exam early. My policy is to multiply the points you missed by a factor of three. Thus, if you miss 20 points, 60 would be subtracted from the exam resulting in a score of 40. Therefore, if you find you have finished early, the best thing to do is check and recheck your work. If you are stuck, do not give up and turn in an exam on which you know there are errors—please keep working on it!

All exams will be in-person involving pencil and paper (and a calculator). Although the schedule shown later is tentative in terms of topics, the exam dates are fixed. Please plan accordingly!

As you will see, the material covered largely builds on previously covered material, i.e., you cannot purge from your memory any of the material we cover. However, the midterm exams will typically emphasize the material that has been covered since the previous exam (or since the start of class for the first exam). The final exam will be comprehensive such that some problems may intentionally focus exclusively on concepts or techniques that were covered earlier in the semester.

You will be allowed a calculator and one sheet of notes (front and back of an $8.5'' \times 11''$ sheet of

paper) per exam. The notes are "cumulative" so that you may use only one sheet of notes for the first exam, two sheets of notes for the second exam, and so on, up to four sheets for the final exam. (Since you can write on the front and back, this is effectively eight pages of notes.)

If you miss an exam, you will receive a zero. At the discretion of the instructor, accommodations can be made when an exam must be missed for a recognized legitimate reason.

Behavior/Lecture Format: Out of courtesy to your classmates, chronic tardiness, (excessive) talking in class, and other disruptions will not be tolerated. Cell phones must be turned off or placed in vibrate mode prior to lectures. Please don't even think about answering any buzzing in your pocket, purse, or pack. Do not engage in any texting while in lecture.

Some students find it helpful to take notes on a laptop or tablet. *If you bring a laptop or tablet to lecture, do not surf the Web, play games, or use the computer for anything other than work related to EE 261.* Doing otherwise is discourteous and distracting to those around you. In fact, research has shown that "multitasking" on laptops hinders not only the laptop owner's learning, but also the learning of nearby peers!

The lectures themselves typically entail my working through a series of PowerPoint slides that employ "incremental reveals" (i.e., elements of a slide will be unveiled in a series of steps to help ensure we're all focused on the same thing). I may also employ a writing tablet to mark-up the slides. To facilitate your taking notes, I will typically make most of my slides available prior to lecture. The "pre-release" slides will lack iClicker questions. But that material will be available in the post-lecture release of the slides. The pre-release slides will only be available at the course website (i.e., the one I maintain that is independent of Canvas and mentioned at the top of the second page of this syllabus).

At times, a document camera may be used to present material. As the semester progresses, videos (produced by myself, former TAs, and perhaps the current TAs) will be posted that work through various problems. Additionally reading assignments will be posted where the expectation is that you *do the reading prior* to class. In this way, the lectures (and iClicker quizzes) builds on top of this material.

If you have suggestions for how to improve our interactions, or any aspect of the course, I encourage you to contact me or one of the TAs via email or during office hours to share your thoughts.

Office Hours: Office hours will be held at the times noted above. John will be physically available at that time in EME 221, i.e., my office. If you cannot make to my office, you can send email and we can set up a Zoom meeting. Office hours for TAs are as noted on the first page.

Collaboration and AI: You are allowed to collaborate with your classmates on the homework.

In fact, if you are struggling with an assignments, *I strongly encourage you to seek help from your classmates.* You are, of course, free to contact me with any question you have, but my own experience is that you can greatly benefit from working with fellow students. This benefit can accrue either from assisting your classmates or from receiving assistance from them. Either scenario can serve to strengthen your understanding of the material. However, collaboration must result in enhanced learning and should not simply be a means for completing assignments with the least amount of effort.

Granted, the problems assigned via the Pearson Mastering platform do not always readily lend themselves to collaboration (there are both good and bad aspects to this). Still, I do strongly encourage you to explore ways to connect with your fellow students.

There are AI tools available that can solve circuit problems. The primary goal of this course is to ensure you understand the fundamentals of electrical circuits, i.e., the governing equations and the basic components and their operation. A secondary goal is to enhance your problem-solving skills. You will solve circuit problems in this class, but the disciplined approach you take to solving these problems can be translated to any number of other disciplines. If you resort to using AI to solve homework problems for you, you will not develop nor hone these skills and you will pay a price for this on the exams. The homework (which constitutes less than a quarter of your grade) is designed to help ensure your success on the exams (which constitutes over three-quarters of your grade). If you honestly and diligently do the homework, you will undoubtedly do well in this course. A word to the wise: avoid using AI on the homework.

There are three ways to "go wrong" on the homework assignments:

1. If you do not collaborate with anybody or do not seek help and yet you are unable to complete an assignment, then you are getting nothing from the assignment! Make an effort to get help if you are struggling.

2. If your "collaboration" takes the form of one person or an AI doing the work and the other person (or persons) merely copying that work, that is clearly cheating. A successful collaboration will involve an exchange of ideas (perhaps this "exchange" will be primarily in one direction—that's okay) such that all the collaborators will be confident (or at least relatively confident) that they know how to solve a problem. On the homework it is permissible to compare answers, but the work leading to the answers should be primarily your own. (Comparison of answers with some of the questions presented via the Pearson Mastering platform won't be of any use as different values are used for components and thus there are different correct answers. For such questions, as with all questions, the important thing will be to understand the path to the correct answer.)

3. You may *not* use online or previously published solutions to assigned work. Doing so is cheating and, if detected, will result in a score of zero and possible failure of the course. You may use the Web (or, of course, the library and other textbooks) to seek other information related to this course. You should not, however, use the Web or other published sources to seek full solutions to problems.

Note that there is absolutely ***no collaboration permitted on the tests***.

Academic Integrity: Cheating will not be tolerated. As noted, *you may collaborate with your classmates on the homework,* but collaboration does not mean copying nor having somebody else do the work! If you have access to the solutions of others (including the solution manual for N&R, work published at sites such as Chegg, or solutions generated by others, including generative AI) and merely copy that, that is cheating and may, as mentioned, result either in a score of zero for an individual assignment or failure of the entire class.

Be savvy about the amount of collaboration you do. You can get input from me, your classmates, or perhaps other students who are familiar with the material (for example, I encourage you to seek help from the VCEA Tutoring Center). However, keep in mind that when it comes to the tests, you will be better prepared if you have mastered most of the homework on your own (but if you can't master some aspect on your own, seek help). The Teaching Assistants will be focused on grading the handwritten work you submit. If you have a question on the grading of a homework assignment, you should reach out to the appropriate TA. (If, after consulting with the TA, you and the TA cannot see eye-to-eye on the homework, I am available to arbitrate.) The graduate and undergraduate TAs may also be able to address more general questions during their office hours.

All work on the tests, including the final exam, must be your own. Receiving, giving, or seeking any help on the tests is considered cheating and will result in a failing grade. Additionally, the incident will be reported to the Office of Student Affairs. Such infractions may affect your ability to graduate, so please act with honesty and integrity.

If I suspect you have not adhered to the collaboration guidelines for an assignment or that the work on a test is not completely your own, you may be asked to explain your work and/or demonstrate your understanding of the relevant material. If you cannot adequately explain your work and/or your understanding of the material, that may be taken as evidence of cheating and will be handled accordingly.

WSU's Official Academic Integrity Statement: "Academic integrity is the cornerstone of higher education. As such, all members of the university community share responsibility for maintaining and promoting the principles of integrity in all activities, including academic integrity and honest scholarship. Academic integrity will be strongly enforced in this course. Students who violate

WSU's Academic Integrity Policy (identified in Washington Administrative Code (WAC) 504-26-010(4)) will fail the course, will not have the option to withdraw from the course pending an appeal, and will be reported to the Office of Student Conduct.

"Cheating includes, but is not limited to, plagiarism and unauthorized collaboration as defined in the Standards of Conduct for Students, WAC 504-26-010(3). You need to read and understand all of the definitions of cheating: http://app.leg.wa.gov/WAC/default.aspx?cite=504-26-010. If you have any questions about what is and is not allowed in this course, you should ask course instructors before proceeding.

"If you wish to appeal a faculty member's decision relating to academic integrity, please use the form available at https://communitystandards.wsu.edu/. Make sure you submit your appeal within 21 calendar days of the faculty member's decision."

(TENTATIVE) SCHEDULE (BUT EXAM DATES AND TIMES FIXED)

Week	Date	N&R Material	Topic
Week 1	Jan. 6	Sec. 1.1	Class overview and format. Electrical circuits overview.
	Jan. 8	Secs. 1.2–1.4	Current. Voltage. Power. Energy. Passive sign convention. Schematics (wires).
	Jan. 10	Secs. 1.5–1.6	Resistors. Ohm's Law. Independent sources.
Week 2	Jan. 13	Secs. 2.1–2.3	Series and parallel elements. Valid and invalid circuits.
	Jan. 15	Secs. 2.4–2.5	Kirchhoff's Laws. Dependent sources.
	Jan. 17	Ch. 2	Chapter 2 review.
Week 3	Jan. 20		**Martin Luther King Jr. Day**
	Jan. 22	Secs. 3.1–3.2	Resistors in series and parallel.
	Jan. 24	Secs. 3.3–3.4	Voltage and current division.
Week 4	Jan. 27	Secs. 3.5–3.7	Measurements. Delta-to-wye.
	Jan. 29	Ch. 3	Chapter 3 review.
	Jan. 31		**Test #1, Spark G45, 7:00 p.m.**
Week 5	Feb. 3	Secs. 4.1–4.4	Node-voltage analysis.
	Feb. 5	Secs. 4.5–4.8	Mesh current analysis.
	Feb. 7	Secs. 4.9–4.10	Thévenin and Norton source transformations.
Week 6	Feb. 10	Secs. 4.11-4.12	More source transformations. Max power transfer.
	Feb. 12	Sec. 4.13, Ch. 4	Superposition. Chapter 4 review.
	Feb. 14	Secs. 5.1–5.2	Operational amplifiers.
Week 7	Feb. 17		**Presidents' Day**
	Feb. 19	Secs. 5.3–5.4	Inverting- and summing-amplifier circuits.
	Feb. 21	Secs. 5.5–5.7	Other op-amp circuits.
Week 8	Feb. 24	Ch. 5	Chapter 5 review.
	Feb. 26		**Test #2, Spark G45, 8:00 p.m.**
	Feb. 28	Secs. 6.1–6.3	Inductors. Capacitors.
Week 9	Mar. 3	Secs. 6.1–6.3	More on inductors and capacitors.
	Mar. 5	Secs. 6.4–6.5	Mutual inductance.
	Mar. 7	Ch. 6	Chapter 6 review.

Week	Date	N&R Material	Topic
	Mar. 10		
	Mar. 12		**Spring Break!**
	Mar. 14		
Week 10	Mar. 17	Secs. 7.1–7.2	Natural response of RL and RC circuits.
	Mar. 19	Secs. 7.3–7.4	Step response of RL and RC circuits.
	Mar. 21	Secs. 7.5–7.7	Switching. Unbounded response. Integrating amplifier.
Week 11	Mar. 24	Ch. 7	Chapter 7 review.
	Mar. 26	Secs. 8.1–8.2	Natural response of parallel RLC circuit.
	Mar. 28	Secs. 8.3–8.4	Step response of parallel RLC circuit.
Week 12	Mar. 31	Sec. 8.4	Comments on step response of series RLC circuit.
	Apr. 2	Chs. 1–8	Review.
	Apr. 4		**Test #3, Spark G45, 7:00 p.m.**
Week 13	Apr. 7	Notes	Review of complex numbers.
	Apr. 9	Secs. 9.1–9.3	Sinusoidal signals and the phasor.
	Apr. 11	Secs. 9.4–9.6	Elements and circuit laws in the frequency domain.
Week 14	Apr. 14	Secs. 9.7–9.9	Source transformations and circuit analysis in the frequency domain.
	Apr. 16	Secs. 9.10–9.12	Ideal transformer. Phasor diagrams.
	Apr. 18	Ch. 9	Chapter 9 review.
Week 15	Apr. 21	Secs. 10.1–10.3	Instantaneous, average, and rms power.
	Apr. 23	Secs. 10.4–10.6	Complex power. Max power transfer.
	Apr. 25	Ch. 10	Chapter 10 review.

Final Exam: Wednesday, April 30, 1:30 p.m. to 3:30 p.m.

Dates that I hope will not be of interest:

- February 4th: Last day to drop course (i.e., without appearing on transcript; see Academic Regulation 67).

- April 11th: Last day to use regular withdrawal (withdraw appears on transcript; you are limited to a total of four withdrawals at WSU; see Academic Regulation 68).

Specific goals for the course (corresponding ABET student outcomes in parentheses): At the completion of the course, a student will be able to

- Understand and apply basic circuit-engineering definitions and constructs (1a-1e, 6a, 7b, 7f).

- Create linear mathematical models of electric circuits consisting of power sources and resistors (1a-1e,6a,7b,7f).

- Create linear mathematical models of electric circuits consisting of power sources and passive circuit elements (resistors, inductors, capacitors) (1a-1e,6a,7b,7f).

- Create linear mathematical models of simple electric circuits consisting of power sources, passive elements, and ideal operational amplifiers (1a-1e,6a,7b,7f).

- Perform electrical circuit analysis for arbitrary resistive circuits (1a-1e,6a,7b,7f).

- Perform electrical circuit analysis for first- and second-order circuits with power sources, passive elements, and ideal operational amplifiers (including sinusoidal steady-state and transient analyses) (1a-1e,6a,7b,7f).

Brief list of topics to be covered:

- Definitions and units; independent power sources; resistors and Ohm's law; Kirchhoff's laws; series and parallel circuit elements and circuit reduction.

- Nodal analysis; mesh analysis; superposition; Thévenin and Norton equivalent circuits; maximum power transfer.

- Dependent power sources and operational amplifiers.

- Energy storage elements; capacitors and inductors; first-order systems; natural and step responses of first-order electric circuits.

- Complex exponentials; second-order circuits; natural and step responses of second-order circuits.

- Steady-state sinusoidal response; phasor analysis; impedance method for AC analysis.

- Sinusoidal steady state power analysis; complex power; power triangles; power factor correction.

WSU Syllabus: Please visit this URL to obtain information common to all WSU courses. This includes information about accommodations, Lauren's promise, and student resources.