EENG/MENG 2104: ELECTRIC CIRCUITS

Course Instructor

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Course Information

Prerequisite: PHYS 2644
Credit Hours: 4 semester hours (3 lecture hrs./week, 2 laboratory hrs./week)

CLASS SCHEDULE

Days	Time	Location
Monday	—	—
Tuesday	8:00 – 9:50 AM (Lecture) 1:30 – 3:20 PM (Lab A) 3:30 – 5:20 PM (Lab B)	MY 207 (Lecture) MY 140 (Lab)
Wednesday	—	—
Thursday	8:00 – 9:50 AM (Lecture)	MY 207
Friday	—	—

OFFICE HOURS

Days	Time	Location
Monday	8:00 – 11:00 am	Martin 113
Tuesday	10:00 – 11:00 am	Martin 113
Wednesday	8:00–11:00 am, 3:00–5:00 pm	Martin 113
Thursday	10:00 – 11:00 am	Martin 113
Friday	By appointment	Martin 113

Additional office hours are available by appointment
MY = McCoy and MH = Martin Hall

Catalog Description

This course covers the fundamental components and concepts of analog electric circuits. An introduction to units and laws of physics is included, along with an overview of complex variables and basic first- and second-order ordinary differential equations. The focus of this course is DC series and parallel circuits, Kirchhoff's laws, network theorems, and AC circuits. Simulation-based circuit analysis via Multisim, together with hands-on laboratory experiments, is included in the laboratory section of this course.

Required Textbook

Introductory Circuit Analysis by Boylestad, R. L. (14th Edition) Pearson/Prentice-Hall, 2022.

Reference Materials

Additional materials, including lecture slides, handwritten study notes, and problem sets, are distributed electronically throughout the semester.

List of Topics Covered*

The course is organized into two modules, progressing from DC circuit fundamentals to AC circuit analysis.

Module 1 — DC Circuits

- Units, physical laws, and engineering notation
- Voltage, current, and resistance; Ohm's Law, power, and energy
- Series, parallel, and series-parallel DC circuits

Module 2 — AC Circuits

- Sinusoidal alternating waveforms and phasor representation
- Complex variables and impedance of R, L, and C elements

- Kirchhoff's Voltage and Current Laws
- Methods of analysis (mesh and nodal) and network theorems (Thévenin, Norton, Superposition, Maximum Power Transfer)
- Capacitors and RC transients; inductors and RL transients
- Magnetic circuits
- Series and parallel AC circuits; AC methods of analysis and network theorems
- AC power: real, reactive, and apparent power; power factor correction
- Resonance, filters, and Bode plots
- Transformers and polyphase (three-phase) systems

**Other topics may be included as time permits.*

Attendance Policy

The instructor adheres to the policies stated in the MSU Student Handbook regarding class attendance, classroom behavior, academic dishonesty, and student rights. Students who do not have a copy of the handbook may obtain one from the Office of Student Services.

Grading Scheme

The final course grade is determined from six components, weighed as shown below.

Table 1: Percentage contribution of each grade item to the overall grade.

Grade Item	Contribution	Details
Final Exam	30%	Comprehensive, cumulative
Laboratory	20%	Attendance, lab reports, paper & presentation
Midterm 1	15%	Covers Module 1 — DC Circuits
Midterm 2	15%	Covers Module 2 — AC Circuits
Quizzes	10%	Short, in-class assessments
Assignments	10%	Weekly homework problem sets

Quizzes and Assignments are drawn directly from the weekly problem sets distributed throughout the semester; Midterm 1 and Midterm 2 are scheduled at the end of Module 1 and Module 2, respectively. The Final Exam is comprehensive.

Letter Grade Scale

Table 2: The final numerical course average is converted to a letter grade as follows.

Letter Grade	Numerical Average	GPA Points	Description
A	90 – 100	4.0	Excellent
B	80 – 89.9	3.0	Good
C	70 – 79.9	2.0	Satisfactory
D	60 – 69.9	1.0	Poor
F	Below 60	0.0	Failing

Final Exam

As scheduled in the official MSU Final Exam Schedule.

Use of Artificial Intelligence (AI) Tools

Students may use generative AI tools (e.g., ChatGPT) for brainstorming and study support in the same manner one might use a search engine, provided that all submitted work reflects the student's own understanding and effort. The use of any artificial intelligence tool or AI-enabled device — including, but not limited to, AI chatbots, AI-enabled wearable devices such as smart glasses, and other similar technologies — is strictly prohibited during quizzes and examinations. Use of such tools during a quiz or examination will be treated as a violation of academic integrity.

General Education Statement

- Students must demonstrate competency in basic use of computer word processing and spreadsheets (including computer graphing) through the formal preparation of laboratory experiments.
- Writing will be checked for grammar and spelling during the grading of all laboratory and homework submissions.

Conflict Resolution Process

Students who have an issue with the course or the instructor should follow this process:

1. Contact the instructor directly, face-to-face or via email, to discuss the issue. A resolution is sought through this conversation.

2. If the issue remains unresolved, notify the instructor again via email.

3. If still unresolved, contact the Chair of the McCoy School of Engineering to discuss the issue. The Chair will discuss the matter with the instructor and report back to the student.

4. If the issue persists, notify the Chair via email.

5. The Chair will contact the Dean to help resolve the conflict. If the conflict concerns a student's grade, the case will be forwarded to the Grade Appeals Committee if necessary.

Course Organization and Assessment

Examinations and Make-Up Policy:

- A test missed due to an excused absence may be made up within two weeks (four class periods) of the originally scheduled test date.
- No absence from a test will be regarded as excused unless the student presents the instructor with a valid written excuse, either before the exam or within one week of the missed exam date.

Laboratory Policy:

- All groups are expected to report to lab at the start of their scheduled lab period, whether or not they are first to perform.
- Students must remain in the lab for the full period — preparing the lab report, performing the experiment, observing teammates, or analyzing results.
- Lab reports may be collected immediately at the end of the lab session or at the start of the next lecture or lab.
- Some lab reports must be handwritten; others must be typed and printed, including graphs and tables, as specified by the instructor.
- Labs cannot be made up, due to the instructor's limited available time.
- Each student submits their own lab report individually, with a title page listing their name first, followed by teammates' names.

Homework and Assignment Policy:

- Homework is due on the date specified on the assignment sheet.
- Each homework problem must be numbered with its chapter and problem number.
- Problems should be worked on the front side of the paper only.

Disability Support Services:

Students with a disability must be registered with Disability Support Services before classroom accommodation can be provided.

Campus Carry:

Senate Bill 11, passed by the 84th Texas Legislature, allows licensed handgun holders to carry concealed handguns on campus, effective August 1, 2016. Areas excluded from concealed carry are appropriately marked in accordance with state law. For more information, refer to the University's webpage at mwsu.edu/campus-carry/rules-policies.

Course Objectives in Relationship to ABET Student Outcomes

Table 3: Course objectives matched with the ABET student outcomes (1–7).

Course Objectives	***1***	***2***	***3***	***4***	***5***	***6***	***7***
Given an in-class discussion, students will associate characteristics of circuit analysis with appropriate units.	**X**					**X**	
Given a circuit diagram, students will use Kirchhoff's laws to determine the governing equations for the voltage and current.	**X**					**X**	
Given a circuit and relevant hardware (multi meter, potentiometer, oscilloscope, function generator) students will be able to wire and analyze circuits by using instrumentation.	**X**					**X**	
Given capacitors and inductors, students will use relevant hardware to fully describe the characteristics and functions.		**X**					
Given a waveform, students will analyze the transient and steady state characteristics using an oscilloscope.	**X**					**X**	
Students will be able to analyze circuits using a variety of circuit theorems, such as Thevenin, Norton, Superposition and Maximum Power Transfer theorem.	**X**	**X**				**X**	
Students will be able to perform circuit analysis using Multisim software.	**X**	**X**	**X**		**X**	**X**	

Table 4: Detailed descriptions of the ABET student outcomes (1–7) listed in Table 3.

ABET Outcome	***Description***
1	An ability to identify, formulate, and solve complex engineering problems by applying the principles of engineering, science, and mathematics.
2	An ability to apply engineering design to produce solutions that meet specified needs, with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3	An ability to communicate effectively with a range of audiences.
4	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, considering the impact of engineering solutions in global, economic, environmental, and societal contexts.
5	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.