South Dakota School of Mines & Technology
Energy Systems
Fall 2026
EE 330-M01 3 credits

Instructor Information

Instructor's Name- Thomas Montoya

Instructor's Contact Information- (605) 394-1219, Thomas.Montoya@sdsmt.edu, EEP 314

Office Hours- 2-4 pm MWF, or when available (open door policy). No appointments.

As I do not always notice voicemails in a timely fashion, e-mails or in-person are the preferred contact methods. Unless I am traveling or it arrives after 5 pm, I typically respond to e-mails the same day.

Course Information

Course Start/End Dates- 8/24/2026 to 12/16/2026

Course Final Exam Date and Time- Thursday, December 10, 2026 from 11-12:50 pm, EEP 254

Course Meeting Times and Location- MWF from 9-9:50 am in EEP 254

Course Delivery Method- The course will be delivered in-person for lectures, quizzes, and exams. Course information will be posted on D2L and/or my webpage http://montoya.sdsmt.edu. E-mail will be used to notify students of course-related information/events (**check daily**) using your first.last@Mines.sdsmt.edu address.

Course Description

Production, transmission, and utilization of energy in systems with major electrical subsystems, with particular emphasis on electromagnetic and electromechanical systems and devices.

Course Prerequisites- EE 221 with a grade of "C" or higher.

Course Corequisites- EE 330L.

Student Learning Outcomes

Student Outcomes (SOs)

Student Outcomes are defined in ABET's accreditation standards for engineering programs:

1. An ability to identify, formulate, and solve complex engineering problems by applying 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, which must consider 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

Course Learning Outcomes (CLOs)

Upon completion of this course, students should demonstrate the ability to:

A. Analyze single-phase and three-phase circuits to determine currents, voltages, and power. (SOs 1, 2)
B. Understand the basic operation of single-phase and three-phase transformers as well as their use in energy systems. (SOs 1, 2)
C. Understand the basic operation, parameters, and properties of AC machinery such as synchronous machines and induction motors. (SOs 1, 2)
D. Understand the basic parameters and properties of transmission lines. (SOs 1, 2)
E. Analyze and describe the components and structure of electrical power systems, including generation, transmission, and distribution. (SOs 1, 2)

Course Goals

The goal of this course is to introduce students to the power engineering field before taking EE 431/531 Power Systems and/or EE432/532 Power Electronics. By the end of this course, students are expected to understand the fundamentals of AC power, transformers, and AC machinery and introduce them to power systems. Also, this course aims to help EE students prepare for future careers in the following areas: 1. Power industry, 2. Power-related component manufacturers, 3. EV companies, 4. EV Charging infrastructure manufacturers, and/or 5. Renewable energy sectors.

Course Topics

See attached schedule (subject to revision).

Course Materials

Required Textbook(s) and Materials

S. J. Chapman, *Electric Machinery and Power System Fundamentals*, McGraw-Hill Higher Education, 2002, ISBN-13 978-0-07-229135-3, ISBN-10 0-07-229135-4.

Supplementary Materials

S. J. Chapman, *Electric Machinery Fundamentals*, 5th Edition, McGraw-Hill Higher Education, 2012, ISBN 978-0-07-352954-7.

A. E. Fitzgerald, C. Kingsley, Jr., and S. D. Umans *Electric Machinery*, 6th Edition, McGraw-Hill Higher Education, 2003, ISBN 978-0-07-366009-4.

Technology Equipment and Skills Needed for the Course

The course requires use of a laptop computer and a scientific calculator (capable of complex number operations). Ability to navigate D2L and internet, upload/download files (e.g., pdf files), use MS-Office programs, communicating via email, and possibly connecting computer audio/video and using tools such as Zoom. MATLAB and/or MathCad may be used/useful for some assignments.

Course Grading

Coursework

- Course instruction will be delivered in lectures.
- Bring notes, text, and calculator to every class. Most quizzes will be unannounced and require a calculator (no smartphones/computers/tablets). Occasionally, a quiz may be open book/notes (no borrowing/sharing).
- To facilitate grading, homework shall meet the following specifications (see example on course web page):

(a) Use the front side (i.e., single-sided) of 8.5" × 11" engineering graph paper or plain white paper (NO pages torn from spiral notebooks) for assignments. Hardcopy only!

(b) At the top of **each** page should be the date, course number, problem number(s), your name, and the page numbering (i.e., page *x* of *y* or *x*/*y* formats in the right-hand corner). Ensure problems & pages are in order.

(c) All work exceeding one page should be stapled - no paper clips, folded corners, or folders.

(d) Write-out problem descriptions, copy/draw figures, and **show all** work so it can be understood without the text. No work (i.e., "magic" answer) → no credit.

(e) **Reference equations** derived in the text (e.g., **equation number** or page number if not numbered). 'Notes' is not considered a reference if equation is found in text. Fundamental equations (e.g., Maxwell's equations, Ohm's Law ...) are excluded from this requirement.

(f) Use notation, especially for vectors, and conventional engineering units & prefixes (i.e., MKS) as given in class and text. Answers with incorrect notation and/or incorrect/missing units are incomplete/incorrect.

(g) Writing/figures/graphs must be legible and large enough to read → illegible = no credit.

(h) Answers should be boxed/double underlined, in **decimal format** (if numeric), and the variables, values & units (if any) included. For example, $d = 3.4896$ m ***NOT*** $d = 7\sqrt{42}/13$ m. Use lead zeros for decimal answers, e.g., 0.4 ***NOT*** ".4". Typically, ~5 significant digits are used.

(i) Work problems sequentially in a **single** vertical column with subparts clearly labeled, e.g., a), b) ... Leave a space (e.g., 1/2") between consecutive parts of a problem, and draw a line across the page at the end of each problem if there is more than one. No 'checker boarding'.

(j) **No** more than **two** problems on any single page.

Attendance Policy

Excused absences will be handled in accordance with South Dakota Mines Policy 3-1. Attendance is required. Notify instructor in advance (when possible) if you will be absent from class.

Late/Make-up Assignment Policy

- Homework (HW) is due in hardcopy form at the beginning of class on the specified days (up to 20% penalty for being late). SDM Policy 3-1 will usually not apply as HW assignments are given at least 3 business days in advance. If you know that you will be missing a class, it may be turned in early. HW will **not** be accepted or graded after solutions are posted.
- Missed quizzes will **not** be made up for unexcused absences. See SDM Policy 3-1 for excused absences.
- If 2/3 of quizzes and 2/3 of HW are completed at a **passing** level and **no** excused make-up quizzes are taken, the lowest HW grade and lowest two quiz grades will be dropped (no questions asked). If not, **all** quizzes and HW will count (no drops).

Academic Integrity

South Dakota Mines is committed to academic honesty and scholarly integrity. The South Dakota Board of Regents (BOR) Policy 2.9.2 provides a comprehensive definition of "Academic Dishonesty", which include cheating and plagiarism. All Instructors at South Dakota Mines are required to report allegations of academic misconduct to the Student Conduct Officer. BOR Policy 3.4.1 provides detailed information regarding key definitions, policy information, prohibited conduct, and the Student Conduct process adhered to at South Dakota Mines. Any student suspected of violating academic integrity standards will be reported in accordance with the process outlined on the South Dakota Mines website.

- Students are encouraged to discuss homework with classmates in general terms. However, direct copying/plagiarism … is not acceptable and will be penalized (e.g., grade of zero).

Grading and Assessment

Student learning is assessed by a combination of in-person exams and quizzes as well as homework.

Description	Percent
Three (3) Hourly exams	45%
Quizzes	20%
Homework	15%
Final exam	20%
TOTAL	**100%**

Special Note Regarding Final Exams: Per South Dakota Mines Policy (2-8), if you are scheduled to take three or more final/last exams on the same day during finals week, you may request that the middle exam(s) of the day be rescheduled. ***You are required to make this request of your Instructor(s) at least 30 days prior to the last day of regular classes***.

Grading Scale- 100 > A > 90, 89 > B > 80, 79 > C > 70, 69 > D > 60, F < 60.

Academic Freedom Statement

Academic Freedom is the cornerstone upon which higher education is built. Academic freedom, as defined by BOR Policy 1.6.1, is fundamental to the advancement of truth, development of critical thinking, promotion of civil discourse, and contribution to the public good. Each course includes the freedom to discuss relevant matters and present various scholarly views in the classroom, as determined by the subject-matter expertise of the instructor. Students are encouraged to develop the capacity for critical thinking and to pursue the truth, debate ideas, express and evaluate their opinions, and draw conclusions. Students are free to take reasoned exception to the views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled.[1]

[1] *Language adapted from the American Association of University Professors "Joint Statement on Rights and Freedoms of Students".*

Complaint Process

While we hope that every student has a meaningful and positive experience at South Dakota Mines, should a concern arise, students are encouraged to first attempt to resolve their concern directly with the person or office directly involved. Following that attempt, should the concern remain unresolved, students are encouraged to reach out to the Dean of Students office at DeanOfStudents@sdsmt.edu or 605.394.2416. Additionally, students may access the online form to submit their complaint, appeal, or grievance.

Grade Appeal Policy

In alignment with BOR Policy 2.9.1,and SDSMT Policy 2-21, students who wish to appeal their final course grade shall first discuss the matter with the course instructor. If the concerns are unresolved following that discussion, students may appeal to the instructor's department head or supervisor for a decision. If the student is dissatisfied with the supervisor decision, the student may then utilize the online form to submit "Appeal – Academic" for a "Grade Dispute".

Opportunity for All - Student Success Services and Support

Students are provided a one-stop source for information regarding all the services and supports to ensure success. Visit the Opportunity Center page to learn more.

Accessibility Accommodations

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and the Accessibility Services office at 605.394.2533 or DisabilityServices@sdsmt.edu as early as possible in the semester.

South Dakota Board of Regents Required Syllabus Statements

The following statements may be found online in South Dakota Board of Regents Academic Affairs Council Guideline 2.7.3.A(1):

- Freedom in Learning
- Americans with Disabilities Act
- Academic Dishonesty and Misconduct
- Acceptable Use of Technology
- Emergency Alert Communications

Electronic Devices Policy

Please silence/turn off your cell phone before class starts. No text messaging or headphones in class. You may use a laptop/tablet in class for purposes of note taking (NOT allowed for exams or quizzes). No other use of any other electronic/computer media, other than calculators, is allowed during class time.

Generative Artificial Intelligence Tool Utilization

To fully support the development of your independent thinking and creativity in this course, the use of generative Artificial Intelligence (genAI) tools is only allowed on the specific assignments and other course-related work expressly identified by the instructor. In instances where you are not specifically told it is acceptable to use a genAI tool, embrace the challenges of learning, scholarship, and personal growth and complete the assignment without the support of a genAI tool.

It is important to be aware of the risks of utilizing genAI tools in courses:

- Data privacy: genAI tools collect and store a significant amount of personal data from students. This raises concerns about how this data is used and protected, as well as the potential for misuse or unauthorized access. When you copy your own work into the genAI tool, keep in mind that your work no longer belongs to you, and it can be used in the genAI tool's learning.
- Bias in algorithms: genAI tools may be trained on bias data sets, which will then result in the algorithm reproducing that bias in the responses.
- Feedback loop inaccuracies: genAI models rely on feedback to improve their accuracy over time. If the feedback provided by students or instructors is incorrect, the genAI model may make inaccurate predictions based on faulty information.
- Hallucinations: Artificial intelligence systems may generate erroneous or misleading information that is not based on real data or patterns.
- Lack of transparency: The AI algorithm and decision-making processes are often complex and opaque, making it difficult for students to understand how their interactions with the genAI tool are being evaluated and assessed.
- Lack of training data: AI models require large amounts of high-quality training data to learn and make accurate predictions. If the training data used to build the AI model is incomplete or biased, the model may not be able to accurately predict answers.
- Limited context awareness: genAI tools lack the ability to understand the full context of an assignment, which can lead to inaccurate recommendations, responses, or assessments.

Topics/Course Schedule: See attached tentative schedule (subject to revision).

Tentative Course Schedule

Class | Date	Topics/Activities	Reading/Text
1 | 8/24/26 2 | 8/26/26 3 | 8/28/26 4 | 8/31/26 5 | 9/2/26 6 | 9/4/26	**Mechanical and Electromagnetic Fundamentals -** Electric Machines & Power Systems; Rotational motion, velocity, acceleration, torque, work & power; Magnetic Field; Faraday's Law; Induced force on wire; Induced voltage on conductor; Real, Reactive, & Apparent Power (single-phase/1ϕ); Power Factor (PF) correction	• 1.1 - 1.2 • 1.3 - 1.4 • 1.4 - 1.5 • 1.5 - 1.7 • 1.8 & notes • notes
9/7/26	**Holiday**	
7 | 9/9/26 8 | 9/11/26 9 | 9/14/26 10 | 9/16/26 11 | 9/18/26	**Three-Phase Circuits -** Generation of Three-Phase (3ϕ) Voltages and Currents; Voltages and Currents in 3ϕ Circuit (wye/Y & delta/Δ connections); Power Relationships in 3ϕ Circuits; Analysis of Balanced 3ϕ Systems; One-Line Diagrams; Using Power Triangle	• 2.1 - 2.2 • 2.2 - 2.3 • 2.3 • 2.4 - 2.5 • 2.6
12 | 9/21/26 13 | 9/23/26 14 | 9/25/26[M] 15 | 9/28/26 16 | 9/30/26	**Transformers -** Why; Types & Construction of Transformers; Ideal Transformer; Theory of Operation of Real 1ϕ Transformers; Equivalent Circuit of a Transformer; Per-Unit System; Transformer Voltage Regulation & Efficiency; Transformer Voltage Taps & Voltage Regulation; Autotransformer	• 3.1 - 3.3 • 3.4 - 3.5 • 3.5 • 3.6 - 3.8 • 3.9
17 | 10/2/26	**Exam #1**- Covers material from Chap. 1 - 3 (thru 1ϕ transformers) & notes	
18 | 10/5/26 19 | 10/7/26 20 | 10/9/26	**cont. -** Autotransformer cont.; 3ϕ Transformers; Transformer Ratings & Related Problems; Instrument Transformers	• 3.9 - 3.10 • 3.10 • 3.11 - 3.12
10/12/26	**Holiday**	
21 | 10/14/26 22 | 10/16/26 23 | 10/19/26 24 | 10/21/26	**AC Machinery Fundamentals -** Rotating Magnetic Field; MMF & Flux Induced Voltage; Induced Torque; Winding Insulation; AC Machine Power Flows & Losses; Voltage & Speed Regulation	• 4.1 - 4.2 • 4.3 • 4.4 - 4.5 • 4.6 - 4.7
25 | 10/23/26 26 | 10/26/26 27 | 10/28/26 28 | 10/30/26	**Synchronous Machines -** Synchronous Machine Construction; Speed of Rotation; Internal Generated Voltage; Equivalent Circuit; Phasor Diagram; Power and Torque; Measuring Model Parameters; Operating Alone; Synchronous Motors; Steady-State Synchronous Motor Operation	• 5.1 - 5.3 • 5.4 - 5.6 • 5.7 - 5.8 • 5.8 - 5.10
29 | 11/2/26	**Induction Motors -** Construction; Basic Concepts; Equivalent Circuit	• 7.1 - 7.3
30 | 11/4/26	**Exam #2**- Covers material from Chapters 3 (after 1ϕ transformers) - 5	
31 | 11/6/26 32 | 11/9/26	**cont. -** Equivalent Circuit cont.; Power and Torque; Speed Characteristics; Variations Torque-Speed Characteristics; Starting; Speed Control	• 7.3 - 7.4 • 7.5 - 7.8
11/11/26	**Holiday**	
33 | 11/13/26	**cont. -** Determining Circuit Model Parameters	• 7.9
34 | 11/16/26 35 | 11/18/26 36 | 11/20/26 37 | 11/23/26	**Transmission Lines -** Resistance; Inductance and Inductive Reactance; Capacitance and Capacitive Reactance; Transmission Line (TL) Models; Short TL; TL Characteristics; Two-Port Networks and ABCD Model; Medium-Length TL; Long TL	• 9.1 - 9.3 • 9.4 - 9.6 • 9.7 - 9.8 • 9.8 - 9.9
11/25 - 11/27	**Holiday**	
38 | 11/30/26	**Power System Rep. and Eq'ns -** One-Line Diagrams; Equivalent Circuits	• 10.1 - 10.2
39 | 12/2/26	**Exam #3**- Covers material from Chapters 5 & 9	
40 | 12/4/26 41 | 12/7/26	**cont. -** Node Equations for Equivalent Circuits; Solving Power System Node Equations w/ MATLAB; review for final exam	• 10.2 - 10.3 • 10.3 - 10.4
	Final Exam- Thursday, December 10, 2026 from 11-12:50 pm, EEP 254	