Agricultural and Biosystems Engineering 358: Electrical Energy Applications in Agriculture
Fall 2024 Syllabus
Credit: 3;

Instructor: Clairmont Clementson, clairmont.clementson@ndsu.edu, 701-231-1810 (office)
Teaching Assistant – Laboratory:
Learning: **Lecture** Monday and Wednesday, 11:00 –11:50 a.m. LADD 209
Laboratory Monday 2:00 – 4:30 pm. LADD 318
Student Hours: Wednesday 1:00 pm. to 2:00 p.m. or as arranged.

Prerequisites: Phsyics 252 or ECE 301.
Course Description: This course introduces students to the fundamental principles of electricity and applications of electrical systems in agriculture.

Learning Objectives: Students are expected to develop an understanding of:

1) Basic electrical principals (DC and AC) and
2) Electrical wiring
3) Electrical power generation and distribution system
4) Plan a farm electrical service (single- or three-phase)
5) Understand motors, standby electric power generation, electrical controls, lighting,
6) Solar and wind power principles
7) Solid state and digital electronics
8) Electrical safety
9) Basics of Variable Frequency Drives (VFD)

Course Text:

- Fundamentals of Electricity in Agriculture, Gustafson and Morgan, 3rd edition 2004, and
- Electrical Engineering: Principles and Applications, Allan Hambley, 7th Edition

Modes of Presentation:

- Lecture with Power Point
- Video Presentation
- Problem-solving/ demonstrations

Other References:

- Gerrish, H. H., W. E. Dugger, and R. M. Roberts. 2009. Electricity and Electronics, 10th Edition.

Resources needed by the Students:

- Access to Blackboard for lecture materials. Skim slides in BB prior coming to class.
- Notes/slides should be printed/downloaded ahead of class so that you can add to them.
- Some materials may be distributed in class to facilitate discussion.
- During class there will be an group work assignment or worksheet that is completed, to facilitate discussion (not graded) or to earn points

- Blackboard will be used for announcements, homework assignments, class presentations, and temporary grades.
- The textbook and a calculator

Taking notes and in-class material:

- There happens to be no "perfect" text for this course. The class does not follow the required text chapter-by-chapter, but may skip around. Lecture and discussion will clarify where information can be found.
- Skim slides in BB prior to coming to class. Notes/slides should be printed/downloaded ahead of class so that you can add to them. Not all information needed for exams and assignments is given explicitly on each slide.
- Some materials may be distributed in class and BB to facilitate discussion or to earn points.

Grading:

You will have the following categories of work in the course. Your final grade in the course will be determined by a grade percentage ranging from 0 to 100%. The weighted grade percentage will be converted to a letter grade using the following straight grading scale.

Item	**% of total grade**
Test #1	15%
Test #2	15%
Final Exam	30%
Class Review	10%
Homework	10%
Quizzes	10%
Lab	10%
Total	**100%**

The cut off for letter grades are: 90% = A; 80% = B; 70% = C; 60% = D

Exams, Group Project, HW Assignment, Quizzes, Class Activities and Participation Policies: There will be two tests and a final exam during the semester (see schedule). These will be based on lectures, in-class discussions, homework, and other activities. The exams will be combinations of types of questions, which may include short answer, problem-solving, multiple-choice and rational, and fill in the blank questions, depending on what works best for the material covered. The final exam will be comprehensive. **Tests and Final exam will be in-person @ Room ABEN 201.** Quizzes will be given throughout the semester and would be announced via Blackboard.

Class Project: Students will work together in completing the class project.

Homework and Assignments are a critical component in learning course concepts, as they assess students understanding of subject matter prior to taking an exam. Homework (HW) and assignment will be given throughout the semester. All work and calculations used must be shown in an organized manner. **Marks would be awarded based on the steps outlined. No late submission of homework willbe accepted.**

In-Class Activities and Participation will be assessed in the form of in-class worksheets (google docs), quizzes, and informal discussion.

Attendance: Your attendance and full participation is expected, volunteering answers to questions, asking appropriate questions, thoughtful evaluation of a team oral presentation, and by helping to create a spirit of cooperation within the class.

Attendance Expectations Class attendance is expected in accordance with NDSU University Senate Policy 333: Class Attendance Policy and Procedure (https://www.ndsu.edu/fileadmin/policy/333.pdf). All class materials will be posted on the BB.

- Students are expected to attend every class lecture.
- Students are expected to attend the lab and three exams in person.
- While the late participation policy for this course is outlined below, please note that I will be flexible regarding deadlines for students who are experiencing illness or other challenges related to COVID-19. Please contact me as early as possible if you think you may not be able to complete an assignment or participate in the course due to illness.

Copyright of Course Materials

Refer to NDSU Policy 190 on Intellectual property.

In this course recording the lectures is prohibited with your own personal devices (without prior express approval from the instructor).

In this course recording the lectures for anything other than personal use is prohibited.

Additional Resources for Students

As a member of the NDSU community, resources are available for you should you need help in dealing with adverse reactions to things happening in the world today. A variety of resources are listed below:

For students on campus and remotely (telehealth):
Counseling Services: 701-231-7671; https://www.ndsu.edu/counseling/
Disability Services: 701-231-8463; https://www.ndsu.edu/disabilityservices/
Student Health Service: 701-231-7331; https://www.ndsu.edu/studenthealthservice/
Dean of Students Office: 701-231-7701; https://www.ndsu.edu/deanofstudents/ In a crisis or emergency situation:
Call University Police: 701-231-8998
Call 9-1-1
Go to a Hospital Emergency Room
Go to Prairie St. Johns for a Needs Assessment: 701-476-7216 (510 4th St. S.) Call the FirstLink Help Line: 1-800-273- TALK (8255)

Important Notification:

Academic Honesty

The academic community is operated on the basis of honesty, integrity, and fair play. NDSU Policy 335: Code of Academic Responsibility and Conduct applies to cases in which cheating, plagiarism, or other academic misconduct have occurred in an instructional context. Students found guilty of

academic misconduct are subject to penalties, up to and possibly including suspension and/or expulsion. Student academic misconduct records are maintained by the Office of Registration and Records. Informational resources about academic honesty for students and instructional staff members can be found at www.ndsu.edu/academichonesty.

Students with special requirements
Any students with disabilities who need accommodations in this course are invited to share these concerns or requests with the instructor and contact the Center for Accessibility and Disability Resources as soon as possible.

Veterans and military personnel
Veterans or military personnel with special circumstances or who are activated are encouraged to notify the instructor as early as possible and are encouraged to provide Activation Orders.

Family Educational Rights and Privacy Act (FERPA)
Your personally identifiable information and educational records as they relate to this course are subject to FERPA.

Important Dates (Full NDSU dates/deadlines can be found here)

Jan 1	Mon	HOLIDAY — New Year's Day (offices closed)
Jan 8	Mon	Classes begin at 4:00 p.m.
Jan 9	Tue	First full day of classes
Jan 15	Mon	HOLIDAY — Martin Luther King, Jr. Day (no classes, offices closed)
Jan 16	Tue	Last day to be added to Campus Connection Wait Lists
Jan 18	Thu	Last day to Add classes via Campus Connection
Jan 18	Thu	Last day for no-record Drop of classes @ 100% refund
Jan 18	Thu	Last day to Withdraw to Zero Credits @ 100% refund
Jan 24	Wed	Payments due for NDSU account balances
Jan 29	Mon	Last day to submit requests to Audit, Pass/Fail
Feb 19	Mon	HOLIDAY — Presidents' Day
Feb 19	Mon	Last day to Withdraw to Zero Credits @ 75% refund
Mar 4-8	Mon-Fri	Spring Break Week (no classes, offices open)
Mar 15	Fri	Late fee applied to unpaid account balances (11:59 p.m.)
Mar 21	Thu	Last day to Withdraw to Zero Credits @ 50% refund
Mar 29-Apr 1	Fri-Mon	HOLIDAY -- Spring Recess
Apr 5	Fri	Last day to Drop classes with 'W' record
Apr 5	Fri	Last day to Withdraw to Zero Credits for Spring
Apr 15	Mon	Late fees applied to unpaid account balances (11:59 p.m.)
Apr 29-May 3	Mon-Fri	Dead Week
May 6-10	Mon-Fri	Final Examinations
May 11	Sat	Commencement ceremony

Dead Week Policy: The NDSU Dead Week policy is available at http://www.ndsu.edu/registrar/dates/deadweek/

Week	Month	Date	Topic
1	Jan	10(W)	Introduction and electrical energy applications
2		15(M)	**Martin Luther King Jr Day**
		17(W)	Basic terms and definitions/ electrical energy application
3		22(M)	Resistive circuits: Resistors in series & parallel, Voltage & current divider
		24(W)	Resistive circuits: Thevenin and Norton equivalents, Superposition
4		29(M)	Inductive circuits
		31(W)	Capacitive circuits
5	Feb	5(M)	Circuits, phase relations, and power factor
		7(W)	Circuits, phase relations, and power factor
6		12(M)	Exam Review
		14(W)	**Exam 1**
7		19(M)	Sinusoidal Steady-State Power calculation: Instantaneous power, Average and Reactive power
		21(W)	Sinusoidal Steady-State Power calculation: rms valve and power calculations, maximum power
8		26(M)	Power generation, transmission and distribution
		28(W)	Electric Motors: DC Machines
	March	4(M)	SPRING BREAK
		6(W)	SPRING BREAK
9		11(M)	Electric Motors: AC Machines
		13(W)	Standby power units
10		18(M)	Exam Review
		20(W)	**Exam 2**
11		25(M)	Solar systems
		27(W)	Solar systems
12	April	1(M)	Holiday: Recess

		3(W)	Electrical safety
13		8(M)	Electrical controls
		10(W)	Relay based controls
14		15(M)	PLC
		17(W)	Sensors
15		22(M)	Wind Power systems
		24(W)	Wind Power systems
16		29(M)	Stray current
	May	1(W)	Exam Review
		7(Tu)	Exam 3