MECHANIZED SYSTEMS MANAGEMENT 245  
Fundamentals of Electrical Systems  
Spring 2022  
COURSE OUTLINE

Description:
MSYM 245 Fundamentals of Electrical Systems (3 cr)
Prerequisite: MSYM 109 or high school physics.

Basic theory of electrical circuits, utilization of electric energy in production, processing, and residential applications will be studied in this course. Theory and application of direct current (DC) and alternating current (AC) principles, switch and outlet wiring, wiring installations, selection of safe and adequate circuit devices, service equipment sizing, conductor sizing, electric motor operation and their control are covered. Students will develop switch and relay circuit schematics and build both DC and AC functional circuits. Ladder logic diagrams will be studied to understand the basic controls implemented in industrial automation.

Instructor:
Santosh K. Pitla  
205 L.W. Chase Hall  
spitla2@unl.edu

Teaching Assistant:
TBD

Office Hours:  
Meet by appointment

Course level learning goals
1. Understand the theory of DC electricity and develop circuit schematics consisting of DC power sources, circuit protection devices and resistive networks.
2. Build DC circuits on breadboards to demonstrate the understanding of DC electricity principles.
3. Understand the theory of voltage divider circuits, potentiometers and automotive relays
4. Understand the theory of AC electricity and develop hand wiring diagram circuits and schematics by following the correct use of electrical terminology and National Electric Code (NEC) recommendations
5. Build AC circuits to demonstrate the understanding of AC wiring principles and NEC recommendations
6. Describe the physical characteristics of electrical energy supplied to consumers and systems for distributing this energy in the United States and contrast these to the characteristics and systems in other countries.
7. Describe the operating principles of generators, alternators, transformers and motors
8. Determine electrical loads for branch circuits, the service entrance and feeder circuits, and select safe and adequate conductors and components for an electrical system.
9. Describe the action of power and control circuits for electric motor applications using schematic and wiring diagrams and properly wire these circuits for safe operation.
10. Demonstrate understanding of various types of switching circuits, ladder logic and relay based control systems.
Methods:
Two one-hour lectures per week will use visual aids and class discussion. Lectures will include in-class activities for problem solving and conceptual discussion. One two hour laboratory will expand on the lecture material through problem solving and “hands-on” experiences using circuit development activities.

References:


Schinstock, J. L. 2008. Farmstead Electricity Laboratory Manual, Agricultural Engineering Plan Service, Lincoln, NE (LM) (will be provided)


Grading System:
1. Grading Outline
   a. Homework Problems (approx. One per week)  (25% of the grade)
      • Late Homework will be penalized
   b. 2 Exams during the semester and 1 Final Exam  (50% of the grade)
   c. Laboratory Exercises (One per week)  (15% of the grade)
   d. Class Participation  (10% of the grade)

2. Letter Grade:
   A+, A, A-  90%
   B+, B, B-  80%
   C+, C, C-  70%
   D+, D, D-  60%
Tentative Topic Outline (Subject to Change):

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COVID Face Covering Policy:

- An individual in this course has a documented need for face coverings to be required in this course. Without divulging personal or identifying information, such a documented need might be that a member of their household is unable to be vaccinated or has a health condition that makes vaccines less effective for them. As a result, the College of Agricultural Sciences and Natural Resources has determined that face coverings will be required in this course. If you are unwilling to comply with this requirement, please visit with your advisor about different sections or possible alternative courses that you might take in lieu of this one.
Students in this course must work in close physical proximity to one another for extended periods of time in order to achieve the academic goals of the course. For this reason, the Department of Biological Systems Engineering and the College of Agricultural Sciences and Natural Resources have determined that face coverings will be required in this course. If you are unwilling to comply with this requirement, please visit with your advisor about possible alternative courses that you might take in lieu of this one.

**Academic Dishonesty:**

Students are expected to adhere to guidelines concerning academic dishonesty outlined in Section 4.2 of the University’s Student Code of Conduct ([http://stuafs.unl.edu/DeanofStudents/Student%20Code%20of%20Conduct%20May%20Rev%202014%20a.pdf](http://stuafs.unl.edu/DeanofStudents/Student%20Code%20of%20Conduct%20May%20Rev%202014%20a.pdf)). The BSE Department process for grade and academic dishonesty appeals can be found at [http://bse.unl.edu/academicadvising-index](http://bse.unl.edu/academicadvising-index). Students are encouraged to contact the instructor for clarification of these guidelines if they have questions or concerns.

**Mobile Devices:**

Cellular phones must be silenced and not used/consulted while in the classroom/laboratory.

- **Fire Alarm (or other evacuation):** In the event of a fire alarm: Gather belongings (Purse, keys, cell phone, N-Card, etc.) and use the nearest exit to leave the building. Do not use the elevators. After exiting notify emergency personnel of the location of persons unable to exit the building. Do not return to building unless told to do so by emergency personnel.

- **Tornado Warning:** When sirens sound, move to the lowest interior area of building or designated shelter. Stay away from windows and stay near an inside wall when possible.

- **Active Shooter**
  - Evacuate: if there is a safe escape path, leave belongings behind, keep hands visible and follow police officer instructions.
  - Hide out: If evacuation is impossible secure yourself in your space by turning out lights, closing blinds and barricading doors if possible.
  - Take action: As a last resort, and only when your life is in imminent danger, attempt to disrupt and/or incapacitate the active shooter.

- **UNL Alert:** Notifications about serious incidents on campus are sent via text message, email, unl.edu website, and social media. For more information go to: [http://unlalert.unl.edu](http://unlalert.unl.edu).

- Additional Emergency Procedures can be found here: [http://emergency.unl.edu/doc/Emergency_Procedures_Quicklist.pdf](http://emergency.unl.edu/doc/Emergency_Procedures_Quicklist.pdf)

**Students with Special Needs**

- Students with disabilities are encouraged to contact the instructor for a confidential discussion of their individual needs for academic accommodation. It is the policy of the University of Nebraska-Lincoln to provide flexible and individualized accommodation to students with documented disabilities that may affect their ability to fully participate in course activities or to meet course requirements. To receive accommodation services, students must be registered with the Services for Students with Disabilities (SSD) office, 132 Canfield Administration, 472-3787 voice or TTY.

**Additional useful information can be found here:**

[http://casnr.unl.edu/pictures/PDFs/Faculty/Syllabus%20Information%202016.pdf](http://casnr.unl.edu/pictures/PDFs/Faculty/Syllabus%20Information%202016.pdf)