

MSYM 109– Physical Principles in Agriculture and Life Sciences
Course Syllabus – Fall 2021

Instructor:

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Course Info:

(ACE 4) [ES] 109. **Physical Principles in Agriculture and Life Sciences** (4 cr I, II) Lec 3, Rec 1.
Prerequisites: MATH 101 or 103 with a grade of C or better completed within the last 11 months; or placement in MATH 102 or 104 (or higher) within the last 11 months. *Students cannot receive credit for both MSYM 109 and another first course in physics.*

Objectives:

Fundamental principles of mechanics, heat, electricity, magnetism and their relationships to energy utilization and conservation will be applied to agricultural and life sciences situations.

Upon completion of this course a student should be able to:

- Define common terminology used in physics.
- Interpret technical data and apply it to practical problems.
- Explain and demonstrate principles of mechanics, heat, and electricity applied to agriculture and life sciences.
- Demonstrate quantitative problem-solving skills by setting up and solving problems related to agricultural and life sciences situations in a logical and systematic manner.

Materials:

- College Physics, Urone, Hinrich, OpenStax ISBN-10: 1938168003 (free pdf available online: <https://openstax.org/details/books/college-physics>)
- Canvas access (required)
- Calculator with trigonometric functions (required)

Course Website:

Canvas will be used to post lecture materials, assessments and grades/feedback for graded work throughout the semester. Access canvas via <http://canvas.unl.edu>

Grading:

Grades will be determined by points earned on concept quizzes, homework assignments, exams, and recitation assignments.

• Concept and Homework Assessments	30 %
• Recitation Assessments	20 %
• Examinations	<u>50 %</u>
Total:	100 %

Final grades:

Final grades will be based upon accumulated points as a percentage of the total points available. Canvas will show raw scores and provide totals from which students can track their progress throughout the semester. Letter grades and percentages required for respective grades are:

<u>Average</u>	<u>Grade</u>	<u>Average</u>	<u>Grade</u>	<u>Average</u>	<u>Grade</u>
96.7 – 100%	A+	83.3 – 86.7%	B	70.0 – 73.3%	C-
93.3 – 96.7%	A	80.0 – 83.3%	B-	66.7 – 70.0%	D+
90.0 – 93.3%	A-	76.7 – 80.0%	C+	63.3 – 66.7%	D
86.7 – 90.0%	B+	73.3 – 76.7%	C	60.0 – 63.3%	D-
				0 – 60.0%	F

Pass/no pass option:

Students choosing this grading option must achieve at least a 73.3% (C) to receive a passing grade. Students have the responsibility to determine if this grading option is acceptable for their respective major and academic program.

Course Policies:

Attendance

Each student is responsible for all material covered in the course. All lecture materials are recorded and posted on Canvas for the student to access at their preferred time and place.

Concept and Homework Assessments

Assignments will be assigned most weeks, please pay close attention to the due dates on the syllabus and canvas. Assignments will be due by 8:00 AM on the scheduled due date. **Late work will not be accepted.** All assignments are available through Canvas using Mobius software. Each student will have multiple attempts to demonstrate proficiency of the assignments while they are available.

Recitation Assessments

The weekly recitation assessment will be assigned most weeks, please pay close attention to the due dates on the syllabus and canvas. The assessment will primarily focus on application of the scientific method and problem solving to varying circumstances with agricultural or life sciences topics related to that week's respective topics. All assessments will be distribute in recitation. Assessments will be due by the end of the weekly recitation. **Late work will not be accepted.**

Exams

Five exams will be conducted during the course. A student will be allowed up to 3 attempts per exam to achieve a desired grade. The best score will be counted towards the final grade. Only 4 of the 5 unit exams will count towards the final letter grade. Exams will be closed book and closed notes. Students will be provided with an equation sheet and necessary tables for each exam. **Make-up exams without prior notification will only be allowed for medical reasons with a doctor's note.**

Exams can be completed at the UNL digital learning testing center. For available dates and times please see the following websites: <http://its.unl.edu/dlc>
<http://its.unl.edu/dlc/student-policies>

Discussion Board) All students are encouraged to post in the discussion board any questions during the course, especially when seeking guidance outside of office hours or from other students. This is also a helpful resource if you are stuck on a problem as another student may have already posted on the board regarding your specific question earlier. If you are uncomfortable using your name please use the anonymous option to post questions.

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/ja/code/>). The BSE Department process for grade and academic dishonesty appeals can be found at <http://bse.unl.edu/academicadvising-index>. Students are encouraged to contact the instructor for clarification of these guidelines if they have questions or concerns.”

Ace Learning Outcome:

(see ACE Governing Document #4, Section VII, A.)

Student Learning Outcome 4: Use scientific methods and knowledge to pose questions, frame hypotheses, interpret data, and evaluate whether conclusions about the natural and physical world are reasonable.

Ace Learning Opportunities:

Opportunities to achieve the learning objective are embedded in the course through lectures, assigned readings, problem sets, and class demonstrations. A comprehensive process of repetitive problem solving, designed to manifest a thorough understanding of relationships between physical systems and their behavior, and to hone use of scientific methods, will provide the framework for the course. This process will be comprised of four distinct phases. The first phase will consist of discerning what is the system and its components, what data are available (which are obtained from the problem statement, a diagram, a graph, a reference table, or some combination of all), and what key physical principles and laws apply to the system. The second phase will hypothesize which physical principles and laws, and data are applicable in order to develop a plan (i.e., what is the best way to approach the problem, what mathematical relations and methods are required, what can be inferred from existing data, what intermediate information must be obtained, what defines a solution?). The plan will be implemented in the third phase through detailed analysis including accurate execution of the mathematical relations relevant to the underlying physical principles. Critical evaluation of how realistic the solution is will constitute the fourth and final phase of problem solving. Within the evaluation will be checking of units, reconfirmation of quantities via back calculations, and judgment on whether the magnitude of quantities of the solution are within reasonable physical limits. Students will have the opportunity to learn the principles and process of science through the considered use of number of engagement pedagogies. Lectures and assigned readings will be integrated to convey content knowledge that is essential for students to apply basic physics concepts to solve agriculture and life science-based problems. Furthermore, problem sets and lecture demonstrations will provide opportunities for the application of various aspects of the scientific method and problem solving. The weekly problem sets will require students to employ formulas and physical principles (interpretation) to generate solutions (analysis) to the problem sets. Weekly recitation materials will reinforce lecture and reading materials, and promote interactive learning. Exams and problems sets will also require students to make inferences and determine if solutions are reasonable.

Ace Learning Assessment:

In order to assess student achievement recitation assignments will be collected. Each week, homework that requires the application of the previous week's principles but also requires the retention of earlier ideas will be administered. Exams will assess the students learning of core ideas and the ability to apply quantitatively in an agriculture and life science-based situation that they may experience. The students will be expected to use the problem-solving process and its traits of inquiry, interpretation, and analysis to organize the information given, correctly convert units, recognize concept equations and then prepare a solution. Following the solution, students will make deductions from the data and determine if their answer is in fact reasonable for the given situation.

ADA Statement:

The University strives to make all learning experiences as accessible as possible. If you anticipate or experience barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can discuss options privately. To establish reasonable accommodations, I may request that you register with Services for Students with Disabilities (SSD). If you are eligible for services and register with their office, make arrangements with me as soon as possible to discuss your accommodations so they can be implemented in a timely manner.

SSD contact information: 117 Louise Pound Hall Bldg.; 402-472-3787

Mental Health and Wellbeing Resources:

UNL offers a variety of options to students to aid them in dealing with stress and adversity. Counseling and Psychological & Services (CAPS) is a multidisciplinary team of psychologists and counselors that works collaboratively with Nebraska students to help them explore their feelings and thoughts and learn helpful ways to improve their mental, psychological and emotional well-being when issues arise. CAPS can be reached by calling 402-472-7450. Big Red Resilience & Well-Being provides one-on-one well-being coaching to any

student who wants to enhance their well-being. Trained well-being coaches help students create and be grateful for positive experiences, practice resilience and self-compassion, and find support as they need it. BRRWB can be reached by calling 402-472-8770.

Emergency procedures

Consult UNL emergency planning site for current emergency procedures: <https://emergency.unl.edu/>

All faculty, staff, and students on campus are expected to follow all campus policies and procedures related to Covid-19 which can be found at <https://covid19.unl.edu/>. Please visit this website which includes information about testing, vaccinations, and use of the Safer Community App for access to campus buildings and activities

TENTATIVE COURSE SCHEDULE:

Week 1: 8/23 – 8/27

Topics Covered: Math Review, Units, Significant Digits, Vectors
Assessments: Math Review Assignment, Concept Check 1.1, Recitation 1

Week 2: 8/30 – 9/3

Topics Covered: Vectors, 1D Kinematics
Assessments: Concept Check 1.2, 1.3, 1.4, Homework 1, Recitation 2

Week 3: 9/6 – 9/10 (No Class 9/6 for Labor Day)

Topics Covered: 1D, 2D Kinematics
Assessments: Concept Check 1.5, 1.6, 1.7, Homework 2, Recitation 3

Week 4: 9/13 – 9/17

Topics Covered: Newton's Laws, Forces and Equilibrium, Frictional Forces
Assessments: Exam 1

Week 5: 9/20 – 9/24

Topics Covered: Elastic Forces, Uniform Circular Motion, Torque
Assessments: Concept Checks 2.1, 2.2, 2.3, Homework 3, Recitation 4

Week 6: 9/27 – 10/1

Topics Covered: Forces, Equilibrium and Motion
Assessments: Concept Checks 2.4, 2.5, 2.6, 2.7, 2.8, Homework 4, Recitation 5

Week 7: 10/4 – 10/8

Topics Covered: Mechanical Energy, Momentum
Assessments: Exam 2

Week 8: 10/11 – 10/15

Topics Covered: Simple Machines, Fluid Statics
Assessments: Concept Checks 3.1, 3.2, 3.3, 3.4, 3.5, Homework 5, Recitation 6

Week 9: 10/18 – 10/22 (No Class 10/18 – 10/19 for Fall Break)

Topics Covered: Fluid Dynamics
Assessments: Concept Checks 3.6, 3.7, 3.8, Homework 6, Recitation 7

Week 10: 10/25 – 10/29

Topics Covered: Temperature, Calorimetry, Heat Transfer
Assessments: Exam 3

Week 11: 11/1 – 11/5

Topics Covered: Gas Laws, Thermodynamics
Assessments: Concept Checks 4.1, 4.2, 4.3, 4.4, 4.5, Homework 7, Recitation 8

Week 12: 11/8 – 11/12

Topics Covered: Psychrometrics

Assessments: Concept Checks 4.6, 4.7, 4.8, Homework 8, Recitation 9

Week 13: 11/15 – 11/19

Topics Covered: Fundamental of Electricity, Electrical Circuits

Assessments: Exam 4

Week 14: 11/22 – 11/26 (No Class 11/24 – 11/26 for Thanksgiving Break)

Topics Covered: None

Assessments: None

Week 15: 11/29 – 12/3

Topics Covered: Review

Assessments: Concept Checks 5.1, 5.2, 5.3, Homework 9, Recitation 10

Week 16: 12/6 – 12/10

Topics Covered: None

Assessments: Exam 5 (Cumulative Final Exam)