

Washtenaw Community College Comprehensive Report

PHY 211 Analytical Physics I Effective Term: Spring/Summer 2020

Course Cover

Division: Math, Science and Engineering Tech

Department: Physical Sciences

Discipline: Physics

Course Number: 211

Org Number: 12340

Full Course Title: Analytical Physics I

Transcript Title: Analytical Physics I

Is Consultation with other department(s) required: No

Publish in the Following: College Catalog , Time Schedule , Web Page

Reason for Submission: Three Year Review / Assessment Report

Change Information:

Consultation with all departments affected by this course is required.

Rationale: A recent Course Assessment was completed, and based on the Assessment results and review of the current Master Syllabus, no changes to the Master Syllabus are deemed necessary at this time.

Proposed Start Semester: Fall 2019

Course Description: This is the first of a two-course sequence in calculus-based Newtonian physics for students intending to major in science or engineering. Physics 211 develops the concepts of mechanics (kinematics, forces, work-energy, impulse, translational and angular momentum, fluids), vibration (and waves) and fundamental thermodynamics. Laboratory exercises are included to assist students in understanding the above topics and to develop skills in data analysis methods.

Course Credit Hours

Variable hours: No

Credits: 5

Lecture Hours: Instructor: 60 **Student:** 60

Lab: Instructor: 45 **Student:** 45

Clinical: Instructor: 0 **Student:** 0

Total Contact Hours: Instructor: 105 **Student:** 105

Repeatable for Credit: NO

Grading Methods: Letter Grades

Audit

Are lectures, labs, or clinicals offered as separate sections?: NO (same sections)

College-Level Reading and Writing

College-level Reading & Writing

College-Level Math

Requisites

Prerequisite minimum grade "C"

high school physics

or

Prerequisite

PHY 111 minimum grade "C"

and

Prerequisite

MTH 191 minimum grade "C"

General Education**MACRAO**

MACRAO Science & Math

MACRAO Lab Science Course

General Education Area 4 - Natural Science

Assoc in Applied Sci - Area 4

Assoc in Science - Area 4

Assoc in Arts - Area 4

Michigan Transfer Agreement - MTA

MTA Lab Science

Request Course Transfer**Proposed For:**

Central Michigan University

College for Creative Studies

Eastern Michigan University

Ferris State University

Grand Valley State University

Jackson Community College

Lawrence Tech

Michigan State University

Oakland University

University of Detroit - Mercy

University of Michigan

Wayne State University

Western Michigan University

Student Learning Outcomes

1. Apply the appropriate physical principles to solve problems pertaining to mechanics, wave motion and heat.

Assessment 1

Assessment Tool: Written exam

Assessment Date: Winter 2022

Assessment Cycle: Every Three Years

Course section(s)/other population: All sections

Number students to be assessed: All students in up to three sections or a random selection of 60% of students from all sections

How the assessment will be scored: Departmentally-developed rubric

Standard of success to be used for this assessment: 75% of the students should achieve a score of 75% or higher (3.0 or better on a 4.0 rubric scale) on the outcome-related questions.

Who will score and analyze the data: Departmental full-time Physics faculty

2. Collect data, perform calculations and draw conclusions based on the results of the calculations.

Assessment 1

Assessment Tool: Laboratory reports

Assessment Date: Winter 2022

Assessment Cycle: Every Three Years

Course section(s)/other population: All sections

Number students to be assessed: All students or a random selection of 60% of students from all sections

How the assessment will be scored: Departmentally-developed rubric

Standard of success to be used for this assessment: 75% of the students should achieve a score of 75% or higher

Who will score and analyze the data: Full-time Physics faculty

Course Objectives

1. Define displacement, velocity, and acceleration.
2. Derive equations for displacement, velocity, and acceleration from definition for one and two dimensional motion using algebra, trigonometry, and calculus.
3. Solve kinematics problems (English and/or metric) similar to those selected from the problems in the text.
4. State and explain Newton's three laws of motion as well as the concepts of mass and weight.
5. Discuss the attributes of gravitational, elastic, and frictional forces and the modeling of these forces. Identify the existence of these forces in problem situations.
6. Apply their knowledge of forces to solve problems similar to those seen in class and those selected from the problems in the text.
7. Demonstrate the application of the definition of work and power to solve problems similar to those seen in class and those selected from the problems in the text.
8. Derive kinetic, gravitational, and elastic energy as well as the work-energy theorem.
9. Demonstrate how and when to efficiently apply work-energy concepts to solve problems similar to those seen in class and those selected from the problems in the text.
10. Explain the components of Impulse-momentum and how they differ from $F=ma$.
11. Explain the components of a non-mass conservative ("flow") $F=ma$.
12. Demonstrate how and when to efficiently apply impulse-momentum concepts and non-mass-conservative $F=ma$ to solve problems similar to those seen in class and those selected from the problems in the text.
13. Describe the properties of the center of mass of a system of particles.
14. Describe the properties not attributable to the center of mass of a system of particles.
15. Demonstrate how and when to efficiently apply center of mass concepts to solve problems similar to those seen in class and those selected from the problems in the text.
16. Define angular displacement, velocity, and acceleration.
17. Derive equations for angular displacement, velocity, and acceleration from definition using algebra, trig, and calculus.
18. Solve angular kinematics problems (English and/or metric) similar to those selected from the problems in the text.
19. State and understand the circular to angular transformations.
20. Describe the concept of moment of inertia and its relationship to angular acceleration.
21. Demonstrate the application of the definition of torque to solve problems similar to those seen in class and those selected from the problems in the text.
22. Apply their knowledge of forces and torques to solve problems similar to those seen in class and those selected from the problems in the text.
23. Demonstrate the application of the definition of angular work and power to solve problems similar to those seen in class and those selected from the problems in the text.
24. Derive angular kinetic energy.
25. Demonstrate how and when to efficiently apply work-energy concepts to solve problems similar to those seen in class and those selected from the problems in the text.
26. Explain the components of angular impulse-momentum.
27. Demonstrate how and when to efficiently apply angular impulse-momentum concepts to solve problems similar to those seen in class and those selected from the problems in the text.
28. Define density and pressure.
29. Apply force concepts to a fluid material
30. Apply work-energy concepts to a fluid.

31. Define common terms used in the description of vibration and wave motion.
32. Apply force and energy concepts to vibration and wave motion problems similar to those seen in class and those selected from the problems in the text.
33. Define common terms and constants used in thermodynamics.
34. Recognize the first and second laws of thermodynamics.
35. Apply the principles of thermodynamics to a gas-system.
36. Compute the heat required to change a material's temperature and phase.

New Resources for Course

Course Textbooks/Resources

Textbooks

Hailday, Resnick, and Walker. *Fundamentals of Physics*, 10th ed. Wiley, 2014, ISBN: 9781118233764.

Manuals

Periodicals

Software

Equipment/Facilities

Level III classroom

<u>Reviewer</u>	<u>Action</u>	<u>Date</u>
Faculty Preparer: <i>Danette Bull</i>	<i>Faculty Preparer</i>	<i>Aug 20, 2019</i>
Department Chair/Area Director: <i>Suzanne Albach</i>	<i>Recommend Approval</i>	<i>Aug 20, 2019</i>
Dean: <i>Victor Vega</i>	<i>Recommend Approval</i>	<i>Sep 17, 2019</i>
Curriculum Committee Chair: <i>Lisa Veasey</i>	<i>Recommend Approval</i>	<i>Jan 22, 2020</i>
Assessment Committee Chair: <i>Shawn Deron</i>	<i>Recommend Approval</i>	<i>Jan 27, 2020</i>
Vice President for Instruction: <i>Kimberly Hurns</i>	<i>Approve</i>	<i>Jan 29, 2020</i>

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Reason for Submission:

Change Information:

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Rationale: Three year review

Proposed Start Semester: Spring/Summer 2018

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Prerequisite

PHY 111 minimum grade "C"

and

Prerequisite

MTH 191 minimum grade "C"

General Education

MACRAO

MACRAO Science & Math

MACRAO Lab Science Course

General Education Area 4 - Natural Science

Assoc in Applied Sci - Area 4

Assoc in Science - Area 4

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University of Detroit - Mercy

University of Michigan

Wayne State University

Western Michigan University

Student Learning Outcomes

1. Apply the appropriate physical principles to solve problems pertaining to Mechanics, Wave motion and Heat

Assessment 1

Assessment Tool: Written Exam

Assessment Date: Winter 2018

Assessment Cycle: Every Three Years

Course section(s)/other population: All Sections

Number students to be assessed: Random selection of students from all sections

How the assessment will be scored: Departmentally-developed rubric

Standard of success to be used for this assessment: 75% of the students should achieve a score of 2.5 out of 4 or better per question.

Who will score and analyze the data: Departmental full-time Physics faculty

2. Collect data, perform calculations and draw conclusions based on the results of the calculations.

Assessment 1

Assessment Tool: Laboratory reports

Assessment Date: Winter 2018

Assessment Cycle: Every Three Years

Course section(s)/other population: All Section

Number students to be assessed: Random selection of students from all sections

How the assessment will be scored: Departmentally-developed rubric

Standard of success to be used for this assessment: 75% of the students should achieve a score of 75% or higher

Who will score and analyze the data: Full time Physics faculty

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4. State and explain Newton's three laws of motion as well as the concepts of mass and weight.
5. Discuss the attributes of gravitational, elastic, and frictional forces, their modeling, and identify the existence of these forces in problem situations.
6. Apply their knowledge of forces to solve problems similar to those seen in class and those selected from the problems in the text.
7. Demonstrate the application of the definition of work and power, to solve problems similar to those seen in class and those selected from the problems in the text.
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18. Solve angular kinematics problems (English and/or metric) similar to those selected from the problems in the text.
19. State and understand the circular to angular transformations.
20. Describe the concept of Moment of inertia and its relationship to angular acceleration.
21. Demonstrate the application of the definition of Torque to solve problems similar to those seen in class and those selected from the problems in the text.
22. Apply their knowledge of forces and torques to solve problems similar to those seen in class and those selected from the problems in the text.
23. Demonstrate the application of the definition of angular work and power to solve problems similar to those seen in class and those selected from the problems in the text.
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Software

Equipment/Facilities

Level III classroom

<u>Reviewer</u>	<u>Action</u>	<u>Date</u>
Faculty Preparer: <i>Amir Fayaz</i>	<i>Faculty Preparer</i>	<i>Oct 25, 2017</i>
Department Chair/Area Director: <i>Kathleen Butcher</i>	<i>Recommend Approval</i>	<i>Nov 21, 2017</i>
Dean: <i>Kristin Good</i>	<i>Recommend Approval</i>	<i>Nov 27, 2017</i>
Curriculum Committee Chair: <i>David Wooten</i>	<i>Recommend Approval</i>	<i>Jan 27, 2018</i>
Assessment Committee Chair: <i>Michelle Garey</i>	<i>Recommend Approval</i>	<i>Jan 29, 2018</i>
Vice President for Instruction: <i>Kimberly Hurns</i>	<i>Approve</i>	<i>Jan 30, 2018</i>