

ITT Technical Institute  
**PH2530**  
**Physics**  
**Onsite and Online Course**

**SYLLABUS**

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**Credit hours:** 4.5


**Contact/Instructional hours:** 56 (34 Theory Hours, 22 Lab Hours)

**Prerequisite(s) and/or Corequisite(s):**

Prerequisites: MA1310 College Mathematics II or equivalent

**Course Description:**

This course introduces students to the principles of general physics. Practical applications demonstrate the theory. This course includes a laboratory component.



## COURSE SUMMARY

### COURSE DESCRIPTION

This course introduces students to the principles of general physics. Practical applications demonstrate the theory. This course includes a laboratory component.

### MAJOR INSTRUCTIONAL AREAS

1. Classical Mechanics
2. Electromagnetism
3. Thermodynamics
4. Modern Physics

### COURSE LEARNING OBJECTIVES

By the end of this course, you should be able to:

1. Use units and measurements to solve conversion problems.
2. Apply concepts of kinematics and dynamics to solve problems involving motion.
3. Apply Newton's three laws to solve problems.
4. Use energy and momentum concepts to solve motion problems.
5. Apply pressure, density, buoyancy, and Pascal's Principle to solve problems.
6. Apply the concepts of density, pressure, temperature, and heat to different phases of matter.
7. Use the concepts of electric and magnetic fields to solve problems in electrostatics, electric current, and magnetism.
8. Apply properties of waves to sound and light.
9. Use the principles of modern physics to explain basic ideas of quantum mechanics.

## COURSE OUTLINE

### MODULE 1: MOTION AND NEWTON'S LAWS

#### COURSE LEARNING OBJECTIVES COVERED

- Use units and measurements to solve conversion problems.
- Apply concepts of kinematics and dynamics to solve problems involving motion.
- Apply Newton's three laws to solve problems.

#### TOPICS COVERED

- Motion, Speed, and Velocity
- Forces, Gravity, and Acceleration

MODULE LEARNING ACTIVITIES	GRADE D	OUT-OF- CLASS TIME
<b>Reading:</b> Ewen, E., Schurter, N., & Gundersen, E., Chapters 4 and 5	No	4 hr
<b>Lesson:</b> Study the lesson for this module.	No	1 hr
<b>Discussion:</b> Participate in the discussion titled "Newton's Laws and Your Car."	Yes	N/A
<b>Exercise:</b> Submit the exercise titled "Motion and Newton's Laws."	Yes	2 hr
<b>Quiz:</b> Prepare for Quiz 1.	No	2 hr

Total Out-Of-Class Activities: 9 Hours

## MODULE 2: CONSERVATION OF ENERGY AND MOMENTUM

### COURSE LEARNING OBJECTIVES COVERED

- Use energy and momentum concepts to solve motion problems.

### TOPICS COVERED

- Momentum and Impulse
- Conservation of Mechanical Energy
- Vectors and Forces in Two Dimensions

MODULE LEARNING ACTIVITIES	GRADE D	OUT-OF- CLASS TIME
<b>Reading:</b> Ewen, E., Schurter, N., & Gundersen, E., Chapters 6, 7, and 8	No	3.5 hr
<b>Reading:</b> ITT Tech Virtual Library> School of Study> General Education Information> Tutorial Links> The Physics Classroom> Multimedia Studios> <ul style="list-style-type: none"> <li>• Momentum and Collisions</li> <li>• Work and Energy</li> <li>• QuickTime Movies&gt; Momentum and Collisions</li> </ul>	No	3.5 hr
<b>Lesson:</b> Study the lesson for this module.	No	2 hr
<b>Exercise:</b> Submit the exercise titled "Forces and the Conservation of Energy and Momentum."	Yes	3 hr
<b>Lab 1:</b> Complete the lab titled "Energy."	Yes	N/A
<b>Lab 2:</b> Complete the lab titled "Forces."	Yes	N/A
<b>Quiz:</b> Take Quiz 1.	Yes	N/A
<b>Quiz:</b> Prepare for Quiz 2.	No	2 hr

Total Out-Of-Class Activities: 14 Hours

## MODULE 3: THERMODYNAMICS

### COURSE LEARNING OBJECTIVES COVERED

- Apply pressure, density, buoyancy, and Pascal's Principle to solve problems.
- Apply the concepts of density, pressure, temperature, and heat to different phases of matter.

### TOPICS COVERED

- Properties of Matter
- Density
- Temperature

MODULE LEARNING ACTIVITIES	GRADE D	OUT-OF- CLASS TIME
<b>Reading:</b> Ewen, E., Schurter, N., & Gundersen, E., Chapters 12-14	No	7.5 hr
<b>Reading:</b> ITT Tech Virtual Library> School of Study> General Education Information> Tutorial Links> The Physics Classroom> Physics Tutorial> Thermal Physics	No	3.5 hr
<b>Lesson:</b> Study the lesson for this module.	No	2 hr
<b>Discussion:</b> Participate in the discussion titled "Pascal's Principle."	Yes	N/A
<b>Exercise:</b> Submit the exercise titled "Thermodynamics."	Yes	3 hr
<b>Lab 1:</b> Complete the lab titled "Gas Properties."	Yes	N/A
<b>Lab 2:</b> Complete the lab titled "Temperature and Heat."	Yes	N/A
<b>Quiz:</b> Prepare for Quiz 2.	No	2 hr

Total Out-Of-Class Activities: 18 Hours

## MODULE 4: ELECTROMAGNETISM

### COURSE LEARNING OBJECTIVES COVERED

- Use the concepts of electric and magnetic fields to solve problems in electrostatics, electric current, and magnetism.

### TOPICS COVERED

- Electric Charges
- Electric Field
- Magnetic Effects of Current

MODULE LEARNING ACTIVITIES	GRADE D	OUT-OF- CLASS TIME
<b>Reading:</b> Ewen, E., Schurter, N., & Gundersen, E., Chapters 17 and 18	No	5 hr
<b>Reading:</b> ITT Tech Virtual Library> School of Study> General Education Information> Recommended Links> Physics> The Mechanical Universe...and Beyond> Individual Program Descriptions> <ul style="list-style-type: none"> <li>• Gravity, Electricity, Magnetism</li> <li>• Magnetism</li> <li>• Electromagnetic Induction</li> </ul>	No	3.5 hr
<b>Lesson:</b> Study the lesson for this module.	No	2 hr
<b>Exercise:</b> Submit the exercise titled "Electromagnetism."	Yes	3 hr
<b>Lab 1:</b> Complete the lab titled "Electricity."	Yes	N/A
<b>Lab 2:</b> Complete the lab titled "Electromagnetic Lab."	Yes	N/A
<b>Quiz:</b> Take Quiz 2.	Yes	N/A
<b>Quiz:</b> Prepare for Quiz 3.	No	2 hr

Total Out-Of-Class Activities: 15.5 Hours

## MODULE 5: WAVES, SOUND, AND LIGHT

### COURSE LEARNING OBJECTIVES COVERED

- Apply properties of waves to sound and light.

### TOPICS COVERED

- Characteristics of Waves
- Electromagnetic Waves
- Nature of Light
- Mirrors and Images

MODULE LEARNING ACTIVITIES	GRADE D	OUT-OF- CLASS TIME
<b>Reading:</b> Ewen, E., Schurter, N., & Gundersen, E., Chapters 16, 20, and 21	No	5 hr
<b>Reading:</b> ITT Tech Virtual Library> School of Study> General Education Information> Recommended Links> Physics> The Mechanical Universe...and Beyond> Individual Program Descriptions> <ul style="list-style-type: none"> <li>• Waves</li> <li>• Optics</li> <li>• Resonance</li> </ul>	No	3.5 hr
<b>Lesson:</b> Study the lesson for this module.	No	2 hr
<b>Exercise:</b> Submit the exercise titled "Light and Sound Waves."	Yes	3 hr
<b>Lab 1:</b> Complete the lab titled "Waves."	Yes	N/A
<b>Lab 2:</b> Complete the lab titled "Quantum Theory."	Yes	N/A
<b>Quiz:</b> Take Quiz 3.	Yes	N/A

Total Out-Of-Class Activities: 13.5 Hours

## MODULE 6: MODERN PHYSICS

### COURSE LEARNING OBJECTIVES COVERED

- Use units and measurements to solve conversion problems.
- Apply concepts of kinematics and dynamics to solve problems involving motion.
- Apply Newton's three laws to solve problems.
- Use energy and momentum concepts to solve motion problems.
- Apply pressure, density, buoyancy, and Pascal's Principle to solve problems.
- Apply the concepts of density, pressure, temperature, and heat to different phases of matter.
- Use the concepts of electric and magnetic fields to solve problems in electrostatics, electric current, and magnetism.
- Apply properties of waves to sound and light.
- Use the principles of modern physics to explain basic ideas of quantum mechanics.

### TOPICS COVERED

- Quantum Theory
- The Atom
- Atomic Structure and Atomic Spectra

MODULE LEARNING ACTIVITIES	GRADE D	OUT-OF- CLASS TIME
<b>Reading:</b> Ewen, E., Schurter, N., & Gundersen, E., Chapter 23	No	2 hr
<b>Lesson:</b> Study the lesson for this module.	No	2 hr
<b>Discussion:</b> Participate in the discussion titled "Quantum Computing."	Yes	N/A
<b>Final Exam:</b> Prepare for the final exam.	No	5 hr
<b>Final Exam:</b> Take the final exam.	Yes	N/A

Total Out-Of-Class Activities: 9 Hours



## EVALUATION AND GRADING

### EVALUATION CRITERIA

The graded assignments will be evaluated using the following weighted categories:

CATEGORY	WEIGHT
Lab	30%
Discussion	15%
Exercise	20%
Quiz	15%
Final Exam	20%
TOTAL	100%

### GRADE CONVERSION

The final grades will be calculated from the percentages earned in the course, as follows:

GRADE	PERCENTAGE
A (4.0) )	90-100%
B+ (3.5) )	85-89%
B (3.0) )	80-84%
C+ (2.5) )	75-79%
C (2.0) )	70-74%
D+ (1.5) )	65-69%

D )	(1.0	60-64%
F )	(0.0	<60%

## LEARNING MATERIALS AND REFERENCES

### REQUIRED RESOURCES

#### COMPLETE TEXTBOOK PACKAGE

- Ewen, E., Schurter, N., & Gundersen, E. (2012). *Applied physics*. Upper Saddle River, NJ: Prentice Hall.
- Wright, B. (2012). *Physics lab manual (Custom 2nd ed.)*. Boston, MA: Pearson Learning Solutions.

#### OTHER

- PhET Interactive Simulations, University of Colorado  
<http://phet.colorado.edu/en/simulations/category/new>

### RECOMMENDED RESOURCES

- Books and Professional Journals
  - Benenso Benenson, W., Harris, J. W., Stöcker, H., & Lutz, H. (2006). *Handbook of physics*. New York, NY: Springer Publishing Co
  - Physics World.com  
Physics news and resources including the online version of Physics World  
<http://physicsworld.com/>
- Professional Associations
  - American Institute of Physics
  - Institute of Physics
- ITT Tech Virtual Library (accessed via Student Portal | <https://studentportal.itt-tech.edu>)
  - School of Study> General Education Information> Tutorial Links
    - Get the Math
    - The Physics Classroom
  - Basic Search> Browse> Browse by Format> Books> Books24x7
    - Kodicek, D. (2005). *Mathematics and physics for programmers*. Stamford, CT: Cengage Charles River Media.
- Other References

- Center for History of Physics: <http://aip.org/history-programs>  
This American Institute of Physics website provides information about the history of modern physics and allied fields including astronomy, geophysics, and optics.
- ComPADRE.org: <http://www.compadre.org/>  
The ComPADRE Digital Library is a network of free online resource collections supporting faculty, students, and teachers in Physics and Astronomy Education.
- Fear of Physics: <http://www.fearofphysics.com/>  
Information about the laws of physics; topics include speed and acceleration, sound, friction, gravity, and more. See illustrations of principles using data you insert into the demonstration.
- Free Online MIT Course Materials: <http://ocw.mit.edu/OcwWeb/Physics/index.htm>  
Portal page for course materials such as videos, lecture notes, assignments and solutions, images, and online textbooks for various physics courses taught at MIT

Related videos:

Lewin's MIT Physics 8.01 video: Classical Mechanics

Lewin's MIT Physics 8.02 video: Electricity and Magnetism

Lewin's MIT Physics 8.03 video: Vibrations and Waves

- Free online math videos: <http://www.cosmolearning.com/courses/math-110-college-algebra-406/>
- Free online math and physics videos and practice: <http://www.khanacademy.org/about>
- Institute of Physics: Resources for the classroom: <http://www.iop.org/education/teacher/resources/index.html>  
This site offers links to several interactive web-based activities and teaching tools like Practical Physics, Advanced Physics, and Medical Physics.
- Jefferson Lab: <https://www.jlab.org/education-students>  
Jefferson Lab is a U.S. Department of Energy national laboratory for nuclear physics research.
- NIST Physics Portal: <http://www.nist.gov/physics-portal.cfm>  
This site provides information from the National Institute of Standards and Technology.
- Physics Central: <http://www.physicscentral.com/>

- Physics information provided by the American Physical Society. The site offers multimedia demonstrations of concepts, updates on physics in the news, and more.
- Physics for the 21st Century: <http://www.learner.org/courses/physics/>  
An online course that explores the frontiers of physics. The 11 units, accompanied by videos, interactive simulations, and a comprehensive Facilitator's Guide, work together to present an overview of key areas of rapidly-advancing knowledge in the field, arranged from the sub-atomic scale to the cosmological.
  - Physics Interactive Simulations: <http://phet.colorado.edu/en/>  
From the University of Colorado at Boulder, PhET provides fun, interactive, research-based simulations of physical phenomena.
  - Physics To Go: <http://www.compadre.org/informal/index.cfm>  
A collection of sites where you can learn physics on your own, through games, webcasts, and online exhibits and activities; produced by the American Physical Society
  - Physics: Demonstration Lab: <https://sharepoint.umich.edu/lisa/physics/demolab/SitePages/Home.aspx>  
Physics demonstrations from the University of Michigan's Physics Department; links to other university physics demonstrations also.
  - PhysicsWorld.com: <http://physicsworld.com/>  
Physics news and resources including the online version of PHYSICS WORLD.
  - PhysLink.com: Physics & Astronomy Online: <http://physlink.com/>  
Physics-related information including articles, a glossary, equations, and other reference materials.
  - Practical Physics: <http://www.nuffieldfoundation.org/practical-physics>  
From the Nuffield Foundation in partnership with the Institute of Physics, "this website is for teachers of physics in schools and colleges. It is a collection of experiments that demonstrate a wide range of physical concepts and processes."
  - Physics Forums: <http://www.physicsforums.com/>  
A discussion forum for questions and answers, guidance, and links to tutorials
  - Physics Today: <http://www.physicstoday.org/>  
The web site of *Physics Today magazine*, a publication of the American Institute of Physics, with news about related science, politics, and policy
  - Scientific American Magazine: <http://www.scientificamerican.com/sciammag/>  
Web site of the 150-year-old magazine covering science and technology issues
  - The Physics Classroom: <http://www.physicsclassroom.com/>

The Tutorial written by Tom Henderson, science teacher at Glenbrook South High School in Glenview, Illinois, covers basic physics topics using informative graphics and an easy-to-understand language.

- The Mechanical Universe...and Beyond:

<http://www.learner.org/resources/series42.html>

A video instructional series on physics for college classrooms and adult learners; 52 half-hour video programs. Registration required (free).

## INSTRUCTIONAL METHODS AND TEACHING STRATEGIES

The curriculum employs a variety of instructional methods that support the course objectives while fostering higher cognitive skills. These methods are designed to encourage and engage you in the learning process in order to maximize learning opportunities. The instructional methods include but are not limited to lectures, collaborative learning options, use of technology, and hands-on activities.

To implement the above-mentioned instructional methods, this course uses several teaching strategies, such as lessons and hands-on labs. Your progress will be regularly assessed through a variety of assessment tools including discussion, lab, quiz, exercise, and final exam.

## OUT-OF-CLASS WORK

For purposes of defining an academic credit hour for Title IV funding purposes, ITT Technical Institute considers a quarter credit hour to be the equivalent of: (a) at least 10 clock hours of classroom activities and at least 20 clock hours of outside preparation; (b) at least 20 clock hours of laboratory activities; or (c) at least 30 clock hours of externship, practicum or clinical activities. ITT Technical Institute utilizes a “time-based option” for establishing out-of-class activities which would equate to two hours of out-of-class activities for every one hour of classroom time. The procedure for determining credit hours for Title IV funding purposes is to divide the total number of classroom, laboratory, externship, practicum and clinical hours by the conversion ratios specified above. A clock hour is 50 minutes.

A credit hour is an artificial measurement of the amount of learning that can occur in a program course based on a specified amount of time spent on class activities and student preparation during the program course. In conformity with commonly accepted practice in higher education, ITT Technical Institute has institutionally established and determined that credit hours awarded for coursework in this program course (including out-of-class assignments and learning activities described in the “Course Outline” section of this syllabus) are in accordance with the time-based option for awarding academic credit described in the immediately preceding paragraph.

**ACADEMIC INTEGRITY**

All students must comply with the policies that regulate all forms of academic dishonesty or academic misconduct. For more information on the academic honesty policies, refer to the Student Handbook and the School Catalog.

**INSTRUCTOR DETAILS**

Instructor Name	
Office Hours	
Contact Details	

*(End of Syllabus)*