

# Course Syllabus

## Course Information

**Course Title:** Physics (without) Calculus 1

**Subject and Number:** PHY 2053

**Course Description:** An introduction to the basic principles of physics. PHY 2053 covers mechanics, sound and thermodynamics. Prerequisite: MAC 1114 or MAC 1147; corequisite: PHY 2053L.

**Class Number:** LOREM IPSUM

**Term and Year:** LOREM IPSUM

**Course Modality:** [MDC Modalities](https://www.mdc.edu/registration/options/default.aspx)

## Instructor Information

**Name:** LOREM IPSUM

**Department and Campus:** LOREM IPSUM

**Office location:** LOREM IPSUM

**Office hours:** *(communicate course office hours with students)*

**Phone number:** 123-456-7890

**Email:** LOREM IPSUM

**Communication Policy:** *(Faculty will establish protocols for communication with students)*

## Required Textbook, Course Materials, and Technology

**Required course materials:** *(Textbook(s), library reserves, shark pack, and/or other required readings. Include ISBN Number and author(s))*

**List optional/supplemental materials/OER:** LOREM IPSUM

**Technology & Technical Skill Requirements:** *(Technology tools or equipment students need to complete this course are included)*

## Grading Policy & Assessment Methods

*List all activities, papers, quizzes, tests, etc. including grading scale used for final grade calculation. Relationships between the final grade and the learner’s accumulated points or percentages/weights breakdown for each assessment or component of the course grade.*

*Include policy on late submissions.*

*For MDC Live and MDC Online courses, include policy regarding exams (e.g., ProctorU, Respondus Lockdown and Monitor, etc.)*

*If applicable, include guidelines for extra credit.*

**Incomplete Grades:** [View the college’s procedures for Incomplete Grades](https://www.mdc.edu/procedures/Chapter8/8381.pdf)

## Miami Dade College Policies

**Attendance Policy:** *(Faculty include precise statements about illnesses/emergencies/ tardiness, missed assignments/make-up.)*

**Students Rights and Responsibilities:** *Policies addressing academic integrity and plagiarism, code of conduct, grade appeals, religious observations, services for students with special needs, student complaints, and other.*

[For more information, visit the Student’s Rights and Responsibilities page](https://www.mdc.edu/rightsandresponsibilities/)

## Available Support Services & Resources

* [Tutoring Labs and Technology – Learning Resources](https://www.mdc.edu/learning-resources/tutoring-labs-technology/)
* [Virtual Tutoring through Learning Resources or Smarthinking Online Tutoring](https://libraryguides.mdc.edu/BbLTutoring)
* [ACCESS: A Comprehensive Center for Exceptional Student Services](https://www.mdc.edu/access/)
* [Advisement](https://www.mdc.edu/advisement/)
* [Password and Login Technical Support](https://www.mdc.edu/registration/password.aspx)
* [Technical Support for MDC Live and MDC Online Courses](https://www.mdc.edu/online/resources/tech-support.aspx)
* [SMART Plan](https://www.mdc.edu/smart/)

*(Faculty select from the above if applicable and include additional course/campus specific resources)*

## Available Support Services & Resources

* [Public Safety - Services](https://www.mdc.edu/safety/services/)
* [Hurricane and Other Natural Disasters:](https://www.mdc.edu/safety/in-case-of-emergency/) In the event of a hurricane or other disaster, the class follows the schedule established by the College for campus-based courses. Please visit the MDC website or call the MDC Hotline (305-237-7500) for situation updates.

## Course Description

**PHY2053 | Physics (without) Calculus 1 | 3 credits**

An introduction to the basic principles of physics. PHY 2053 covers mechanics, sound and thermodynamics. Prerequisite: MAC 1114 or MAC 1147; corequisite: PHY 2053L.

## Course Competencies

### Competency 1:

The student will demonstrate knowledge, comprehension, application and synthesis of units and dimensions by:

* Stating or recognizing the fundamental dimensions of mass, length, and time.
* Expressing the dimensions of physical quantities in terms of these fundamental dimensions.
* Evaluating the consistency of formulas through consideration of the dimensions involved.
* Stating or recognizing the decimal pattern and prefixes used in the metric system.
* Stating or recognizing the units of all the physical quantities discussed in this course.
* Expressing the units of complex physical quantities discussed in this course in terms of simpler units.
* Stating approximate measurements of ordinary objects using either SI or British units.
* Converting between different units of measure.
* Deriving the conversion factors for area and volume units from the related length conversion factors.

Learning Outcomes

* Critical thinking
* Information Literacy
* Numbers / Data

### Competency 2:

The student will demonstrate comprehension and application of scientific notation by:

* Converting between scientific and standard notation.
* Performing calculations with scientific notation.
* Demonstrating comprehension and application of significant figures.
* Keeping track of the proper number of significant figures when expressing values of physical quantities.
* Performing mathematical operations.

Learning Outcomes

* Critical thinking
* Information Literacy
* Numbers / Data

### Competency 3:

The student will demonstrate knowledge, application, and analysis of the relationship between two directly proportional variables by:

* Recognizing analytically or graphically when two quantities are in direct proportion.
* Obtaining graphically or analytically the constant of proportionality between those quantities.
* Calculating unknown values of directly proportional quantities using known values of those quantities.

Learning Outcomes

* Critical thinking
* Information Literacy
* Numbers / Data

### Competency 4:

The student will demonstrate knowledge, comprehension, application and evaluation of vectors by:

* Stating or recognizing the definition of vector quantities.
* Distinguishing between vectors an scalars.
* Representing vectors graphically in polar coordinates in rectangular coordinates.
* Converting between polar and rectangular representations of vectors.
* Adding and subtracting vectors graphically and analytically.
* Multiplying a vector times a scalar graphically and analytically.

Learning Outcomes

* Critical thinking
* Information Literacy
* Numbers / Data

### Competency 5:

The student will demonstrate knowledge, comprehension, and application analysis and evaluation of translational kinematics by:

* Stating, recognizing and applying the definitions of the fundamental kinematics quantities -- position, displacement, distance, velocity, speed, and acceleration.
* Distinguishing between the concepts of instantaneous and average change in general and as they apply to displacement, velocity, speed, acceleration and power.
* Plotting position, displacement, velocity, or acceleration vs. Time graphs from given data.
* Calculating instantaneous and average velocities from position or displacement vs. time graphs.
* Calculating instantaneous and average accelerations from velocity vs. time graphs.
* Calculating velocity changes from acceleration vs. time graphs.
* Calculating displacements form velocity vs. time graphs.
* Solving problems involving the kinematics (in one and two dimensions) of motion with constant speed motion with constant velocity motion with constant acceleration free-fall projectile motion uniformly circular motion.
* Stating or recognizing the Galilean transformation.
* Applying the Galilean transformation to solve relative motion problems.
* Stating or recognizing the limitations in velocity imposed by the special theory of relativity.

Learning Outcomes

* Critical thinking
* Information Literacy
* Numbers / Data

### Competency 6:

The student will demonstrate knowledge, comprehension, application and evaluation of translational dynamics by:

* Stating, recognizing and applying the definitions of force, mass and weight.
* Distinguishing mass and weight.
* Stating, recognizing and applying Newton’s three laws of motion and law of universal gravitation.
* Stating, recognizing and applying the definitions of the normal force, the tension exerted by a string, and the forces of static and kinetic friction.
* Stating, recognizing and applying Hooke’s law.
* Solving problems involving forces and their effects by identifying the forces involved, drawing a free body diagram and applying Newton’s laws.
* Distinguishing between centripetal and centrifugal force.
* Solving problems involving centripetal force.
* Stating, recognizing and applying the definitions of work, kinetic energy, potential energy, and power.
* Distinguishing between conservative and non-conservative forces.
* Stating or recognizing the work-energy theorem and principle of conservation of energy.
* Solving dynamics problems using work-energy methods.
* Distinguishing between rest energy, total energy and kinetic energy using results from the special theory of relativity.
* Stating, recognizing, and applying the definition of power.
* Stating or recognizing the definition of momentum, and impulse.
* Stating or recognizing the impulse-momentum theorem.
* Stating or recognizing the principle of conservation of momentum.
* Solving problems involving impact forces using the impulse- momentum theorem.
* Solving collision, explosion, and propulsion problems using work- energy and momentum-impulse methods.

Learning Outcomes

* Critical thinking
* Information Literacy
* Numbers / Data

### Competency 7:

The student will demonstrate knowledge, comprehension, and application of rotational kinematics by:

* Stating, recognizing, and applying the definition of the fundamental quantities of rotational kinematics --angular displacement, angular speed, angular velocity and angular acceleration.
* Stating, recognizing, and applying the relationship between the fundamental kinematic angular quantities and their translational counterparts.
* Solving problems involving rotational kinematics.

Learning Outcomes

* Critical thinking
* Information Literacy
* Numbers / Data

### Competency 8:

The student will demonstrate knowledge, comprehension, application and evaluation of translational dynamics by:

* Stating, recognizing, and applying the definition of the fundamental quantities of rotational dynamics --moment of inertia, torque, rotational kinetic energy, and angular momentum.
* Stating or recognizing the relationships between torque and angular acceleration and solving rotational dynamics problems using these relationships.
* Solving rolling motion problems using rotational kinetic energy and the conservation of energy principle.
* Stating or recognizing the principle of conservation of angular momentum and the conditions for its applicability.
* Solving problems involving the conservation of angular momentum.
* Stating or recognizing the relationship of angular momentum to Kepler’s second law of planetary option.
* Stating or recognizing the role of angular momentum in the quantum theory of the hydrogen atom.
* Stating or recognizing the conditions for rotational and translational equilibrium.
* Solving statics problems involving rotational and translational equilibrium.

Learning Outcomes

* Critical thinking
* Information Literacy
* Numbers / Data

### Competency 9:

The student will demonstrate knowledge, comprehension, and application of elasticity by:

* Stating, recognizing, and applying definition of stress and strain.
* Stating, recognizing, and applying the definition of Young’s modulus, shear modulus, and bulk modulus.

Learning Outcomes

* Critical thinking
* Information Literacy
* Numbers / Data

### Competency 10:

The student will demonstrate knowledge, comprehension, and application of fluid statics by:

* Stating or recognizing the definition of a fluid.
* Stating, recognizing, and applying the definition of density and pressure.
* Stating or recognizing the basic principles of fluid statics --Pascal’s principle and Archimedes principle.
* Stating or recognizing the relationship between the buoyant force and the variation of pressure with depth in a fluid.
* Solving problems involving pressure and buoyant force.

Learning Outcomes

* Critical thinking
* Information Literacy
* Numbers / Data

### Competency 11:

The student will demonstrate knowledge, comprehension, and application of fluid dynamics by:

* Stating or recognizing the conditions for ideal fluid flow.
* Stating, recognizing, and applying the definition of flow rate.
* Stating or recognizing the basic principles of fluid dynamics --the equations of continuity and Bernoulli’s principle.
* Solving problems involving the equation of continuity and Bernoulli’s principle.

Learning Outcomes

* Critical thinking
* Information Literacy
* Numbers / Data

### Competency 12:

The student will demonstrate knowledge, comprehension, application and evaluation of simple harmonic motion by:

* Stating or recognizing the definition of simple harmonic motion and the conditions under which it occurs.
* Stating, recognizing, and applying the definitions of period, amplitude, frequency, and phase as they relate to simple harmonic motion.
* Stating or recognizing the conditions under which a simple pendulum executes simple harmonic motion.
* Stating, recognizing, and applying the equations for the period of a simple pendulum and a simple harmonic oscillator.
* Solving simple harmonic motion problems using energy principles.
* Distinguishing between natural and forced oscillations.
* Distinguishing between damped and undamped oscillations.
* Stating or recognizing the concept of resonance.

Learning Outcomes

* Critical thinking
* Information Literacy
* Numbers / Data

### Competency 13:

The student will demonstrate knowledge, comprehension, application and evaluation of wave motion by:

* Stating or recognizing the definition of a wave.
* Distinguishing between transverse and longitudinal waves.
* Stating or recognizing the concepts of period, frequency and amplitude as they apply to waves.
* Stating, recognizing, and applying the principle of superposition as it applies to waves.
* Distinguishing between constructive and destructive interference.
* Stating or recognizing how waves transport energy and momentum.
* Distinguishing between amplitude and intensity.
* Solving problems involving the relationship between amplitude and intensity and energy transport.
* Stating or recognizing the following wave phenomena: Interference The Doppler effect The beat phenomenon.

Learning Outcomes

* Critical thinking
* Information Literacy
* Numbers / Data

### Competency 14:

The student will demonstrate knowledge, comprehension, and application of sound by:

* Stating or recognizing the definition of a sound wave.
* Stating or recognizing the relationship between the physical properties of a medium and the speed of sound in that medium.
* Stating or recognizing the concepts of wave motion as they relate to sound.
* Stating or recognizing the relationship between frequency, wavelength, pitch and timbre.
* Solving problems involving the decibel scale of sound intensity.
* Stating or recognizing details of the production of sound by strings and pipes.
* Solving problems involving interference, the Doppler effect and the brat phenomenon as they apply to sound waves.

Learning Outcomes

* Critical thinking
* Information Literacy
* Numbers / Data

### Competency 15:

The student will demonstrate knowledge, comprehension, and application of temperature and kinetic theory by:

* Stating or recognizing the definition of temperature.
* Describing the operation of the mercury thermometer.
* Stating or recognizing the Celsius, Fahrenheit, and Kelvin temperature scales.
* Converting between the different temperature scales.
* Stating or recognizing the law of thermal expansion of materials in its linear, area, and volume form.
* Stating or recognizing the conditions under which a gas is an ideal gas.
* Stating or recognizing the equation of state of ideal gases.
* Describing the operation of the constant volume ideal gas thermometer.
* Stating or recognizing the relationship between molecules and moles.
* Solving problems involving the equations of state.
* Solving problems involving the relationship of temperature and pressure and molecular motion in ideal gases.

Learning Outcomes

* Critical thinking
* Information Literacy
* Numbers / Data

### Competency 16:

The student will demonstrate knowledge, comprehension, application and evaluation of the theory of heat by:

* Stating or recognizing the definition of heat.
* Stating or recognizing the definition of the internal energy of an ideal gas.
* Distinguishing between heat, temperature and internal energy.
* Stating or recognizing the definition of heat capacity.
* Solving problems involving heat capacity and the mixture of substance at different temperatures.
* Stating or recognizing the definition of latent heat.
* Solving problems involving changes in the state of substances.
* Stating or recognizing the definition of heat transfer by conduction, convection, and radiation.
* Distinguishing between heat transfer by conduction, by convection and by radiation.
* 1Solving problems involving heat transfer by conduction.

Learning Outcomes

* Critical thinking
* Information Literacy
* Numbers / Data

### Competency 17:

The student will demonstrate knowledge, comprehension, application and evaluation of thermodynamics by:

* Stating or recognizing the definition of a thermodynamic process.
* Stating or recognizing the definition isobaric, isothermal, adiabatic, and isochoric processes.
* Distinguishing between reversible and irreversible processes.
* Stating or recognizing the definition of a heat engine.
* Relating the concept of heat, work, and internal energy to thermodynamic processes and heat engines.
* Stating or recognizing the first and second law of thermodynamics.
* Stating or recognizing the definition of efficiency as it applies to heat engines.
* Solving problems involving simple processes and heat engines by applying the first and second law of thermodynamics.
* Applying the laws of thermodynamics to the Carnot cycle.
* Calculating the efficiency of engines operating in a Carnot cycle.
* Relating the maximum possible efficiency of heat engines to the second law of thermodynamics, reversibility, and entropy, and to the Carnot cycle.
* Stating or recognizing the definition of entropy.
* Calculating the entropy change of simple thermodynamic processes.
* Relating reversibility to entropy.
* Relating order and disorder to entropy.

Learning Outcomes

* Critical thinking
* Information Literacy
* Numbers / Data