
Course Prefix/Number:	PHY 222
Course Title: University	Physics II
Lecture Hours/Week:	3.0
Laboratory Hours/Week:	3.0
Credit Hours/Semester:	4.0

[Distance Learning Attendance/VA Statement](#)
[Textbook Information](#)

COURSE DESCRIPTION

This course is a continuation of a calculus-based treatment of the following topics: thermodynamics, kinetic theory of gases, electricity and magnetism, including electrostatics, dielectrics, electric circuits, magnetic fields, and induction phenomena. Physics 222 includes a calculus-based treatment of the following topics: Thermodynamics, kinetic theory of gases, electricity and magnetism, including electrostatics, dielectrics, electric circuits, magnetic fields and induction phenomena. Optics will also be included as a part of the course.

COURSE COMPETENCIES / PERFORMANCE OBJECTIVES

Upon completion of the course, the student should be competent to perform the following tasks:

Module1: Static Equilibrium

- Demonstrate an understanding of the requirements for equilibrium.
- Define center of gravity, indeterminate structure.
- Prepare force diagrams and determine forces on a body using concepts of static equilibrium.
- Obtain data in the laboratory manually and with transducers and a graphing calculator interface to verify concepts introduced in this module, and properly report results of laboratory work.

Module 2: Fluids

- Define fluid, density, pressure, specific gravity.
- State commonly used units of pressure.
- Apply the hydrostatic equation to determine pressures in liquid columns.
- Apply Pascal's Principle to problems in hydraulics.
- Define buoyant force, apparent weight.
- Apply Archimedes' Principle to problems involving floating and submerged objects.
- Demonstrate an understanding of the Equation of Continuity and apply this concept to fluids in conduits.
- Utilize Bernoulli's Equation to estimate pressures in closed conduits.
- Obtain data in the laboratory manually and with transducers and a graphing calculator interface to verify concepts introduced in this module, and properly report results of laboratory work.

Module 3: Temperature, Heat, Gas Laws and Thermodynamics

- Know four scales used to indicate temperature and be able to convert temperatures from one scale to another.
- Determine changes in length, area and volume given a change in temperature.

- Explain the unique behavior of water as it approaches its freezing point.
- Explain triple point of water as a reference temperature.
- Apply the equivalence of heat and mechanical energy in the solution of problems involving heat and work.
- Define specific heat, latent heat of fusion and latent heat of vaporization, and apply these concepts to problems in calorimetry.
- State three method of heat transfer, and be aware of variables involved with each method.
- Define ideal gas, atomic mass, atomic number, molecule, moles, kinetic theory, RMS average.
- Demonstrate an understanding of and apply the ideal gas law to determine volume, pressure, temperature, mass and number of molecules.
- Explain pressure and temperature in terms of the ideal gas theory.
- Give examples of macroscopic and microscopic properties, define thermodynamic system, internal energy, isobaric process, isochoric process, isothermal process, adiabatic process, Carnot engine, thermal efficiency, cycle, ideal work, entropy.
- State to zeroth, first, and second laws of thermodynamics.
- Apply the first and second laws of thermodynamics to processes.
- Calculate temperature, heat flow and efficiency of Carnot engines.
- Graph pressure, temperature and volume relationships for heat engines and determine work in or out of a cycle.
- Relate basic thermodynamic processes to practical applications involving steam and the compression of gases.
- Determine changes in entropy for processes.
- Relate entropy to probability and statistics, and its implications to philosophical concepts such as the "arrow of time," and heat death of the universe.
- Safely and properly use equipment in the laboratory in order to verify concepts introduced in this module.
- Properly report results of laboratory work.

Module 4: Electricity and Magnetism

- Give practical applications involving static electricity.
- Define electric charge, insulator, conductor, charging by induction, electric field, neutron, electric dipole, dipole moment, electric potential, electron volt, capacitance, permittivity constant, quanta of charge, dielectric, time constant, electric current, resistance, internal resistance, saturation, magnetic domain.
- Apply Coulomb's law to problems involving electric charges.
- Compare properties of electric fields, gravitational fields and strong fields.
- Be aware of classic and modern concepts of fields.
- Determine electric field for point charges and charged plates.
- Determine electric field for an electric dipole.
- Apply Gauss' Law to determine electric field.
- Determine electric potential and work in situations involving point charges and charged surfaces.
- Demonstrate an understanding of relationships between charge, potential difference and capacitance.
- Determine capacitance of capacitors in combination.
- Apply Ohm's law in direct current circuits.
- Determine resistance of resistors in combination.
- Determine power and energy in series and parallel electric circuits.
- Explain the atomic view of the nature of a dielectric
- Explain the nature of magnetism in terms of atomic theory and domains.
- Demonstrate an understanding of relationship between electric current and magnetic field.

- Use “right-hand rules” to determine direction of field, current, and force.
- Determine magnetic forces on moving charges.
- Use Ampere’s Law to find magnetic field.
- Determine torque on a current loop.
- Apply Faraday’s Law of Induction to problems involving conductors and magnetic fields.
- Apply Lenz’s Law to determine electric and magnetic polarity.
- Define electromotive force and magnetic flux and apply these concepts to generators and motors.
- Calculate electromotive force and magnetic flux for rotating conductors, and graph these relationships versus angle and time.
- Describe a typical transformer and determine input and output relationships between voltage and current.
- Safely and properly use equipment in the laboratory in order to verify concepts in electricity and magnetism.
- Properly report results of laboratory work.

Module 5: Optics

- Demonstrate an understanding of models of light.
- Define angle of incidence, angle of reflection, specular reflection, diffuse reflection, index of refraction, total internal reflection, thin lens, focal length, focal point, virtual image, real image, inverted image, dispersion, constructive and destructive interference, primary colors, chromatic aberration.
- Apply the law of reflection in ray diagrams.
- Apply Snell’s law to problems involving refraction.
- Determine object and image relations for convex and concave lens by ray tracing and by using the thin lens equation.
- Determine ray paths for convex, concave and parabolic mirrors.
- Apply the lens maker’s equation to determine index of refraction and focal length.
- Demonstrate an understanding of how lenses are used to correct nearsighted and farsighted vision.
- Demonstrate an understanding of Huygen’s Principle and applications in wave optics involving reflection and refraction.
- Safely and properly use equipment in the laboratory in order to verify concepts in optics.
- Properly report results of laboratory work.

MINIMAL STANDARDS

Minimal standards of performance for receiving credit for the course are indicated by 60% accuracy on all evaluation instruments (see evaluation strategies listed below) that address the performance objectives listed above.

COURSE REQUIREMENTS

Attendance Policy

Students are responsible for attending meetings in the course until they have completed all course requirements. Students are responsible for all material covered and for all assignments made in all classes. Students who are absent from a course more than 10 percent of the total contact hours assigned may be withdrawn in accordance with attendance policy of York Technical College.

Withdrawal from the Course

A student may withdraw from a course after the drop/add period by notifying the instructor or division office of intent to withdraw. If withdrawal is initiated by midterm, the student will receive

a grade of "W". Withdrawals after midterm may result in either a grade of "W" or "WF" depending upon the student's academic performance and attendance in the course at the time of the withdrawal

Student Conduct

Students are expected to conform to all standards of conduct as specified in the York Technical College Handbook and Catalog. Students found guilty of academic dishonesty such as cheating or plagiarism will be given a grade of zero or may be subject to further disciplinary action.

EVALUATION STRATEGIES/GRADING

Assessment for each module shall consist of

- Comprehensive exam covering material introduced in the module
- Homework and quizzes relevant to material in the module
- Assignments in the laboratory (amounting to 25 percent of the total grade for the module)

The weighting of the final grade for the course shall be as follows:

Module 1: 10%

Module 2: 10%

Module 3: 25%

Module 4: 40%

Module 5: 15%

The grading scale is as follows:

A 90 - 100

B 80 – 89

C 70 – 79

D 60 – 69

F below 60

The above requirements and topics are standard and required for the course. Additional requirements and/or policy depend on the instructor for the course; the additional requirements and/or policy are attached.

ENTRY LEVEL SKILLS: None

PREREQUISITES: PHY 221 - University Physics I

CO-REQUISITES: None

Disabilities Statement: Any student who feels s/he may need an accommodation based on the impact of a disability should contact the Special Resources Offices (SR) at 803-327-8007 in the 300 area of Student Services. The SRO coordinates reasonable accommodations for students with documented disabilities.

TOPIC/CONTENT OUTLINE

Static Equilibrium

Fluids

Temperature, Heat, Gas Laws, and Thermodynamics

Electricity and Magnetism

Optics