School of Engineering and Physical Sciences
Department of Mathematics and Physics

Course Name and Course Code	**Physics – I,** PHY 107
Semester	
Instructor Name	
Office & Phone	
Office Hours	
Email Address	
Course Prerequisite(s)	MAT 120 and Physics in HSC/A level
Course Credit Hours	Three (3)
Required Textbooks	Fundamentals of Physics (10th Ed.). Author(s): Halliday, Resnick and Walker (available in the NSU library).
Course Description	This course is designed to introduce the principles of Newtonian mechanics at the freshmen level of undergraduate study for engineering majors or equivalent. The key concepts to be developed throughout the semester are: • Vectors, Kinematic equations, Equations of motion, Newton's laws of motion, • Momentum, Work-Energy theorem, Conservation laws of energy. • Extension of linear motion into Rotational motion. • Gravitation • Oscillations and Waves. • Thermal systems and variables, Energy conservation in a thermal system, Laws of Thermodynamics.
Course Objectives	• Reformulate a physical problem in proper mathematical form, like vector equations, differential equations, etc. • Use elementary vector calculus to solve physical problems in 2D or 3D. • Understand and apply the fundamental conservation laws in mechanics. • Understand the oscillations and waves and relate different applications. • Understand the gravitational laws and field of attraction. • Implement energy conservation law in thermal systems, and estimate the effects of heat and temperature in a mechanical system.
Student Learning Outcomes	After successful completion of the course, a student will achieve certain skills, and these skills are classified as the Course Learning Outcome (CLO)s according to Bloom's Taxonomy. For this course, the CLOs along with their assessment methods and tools are the following.

Mapping of Course Outcomes

CLO-#	Outcome types	Bloom's Taxonomy level	Delivery method	Assessment tools
CLO-1	Remember the definitions of kinematics and vector, use the definition to express the phenomena	C1, C2, P1	Lecture, Demonstration and Discussion	Quiz, Exam
CLO-2	Identify and apply the knowledge of calculus to set up the equation of motion to be solved correctly	C3, C4, P2, P3	Lecture, Demonstration and Discussion	Quiz, Exam
CLO-3	Apply the rules of calculus to solve a mathematical problem in translational and rotational motion, Interpret the result and its consequences	C4, C5, P3, P4	Lecture, Demonstration and Discussion	Quiz, Exam
CLO-4	Use the understanding on mechanics to interpret the gravitational phenomena. Apply the understanding of calculus to interpret oscillations and waves.	C5, C6, P3, P5	Lecture, Demonstration and Discussion	Quiz, Exam

CLO-5	Use the understanding of CLO-4 and connect to the advanced level (or next level)	C6, P1	Lecture, Discussion	Quiz, Assignment

Cognitive domain (knowledge-based): **C** 1: Knowledge, 2: Comprehension, 3 Application, 4 Analysis, 5: Synthesis, 6: Evaluation

The affective domain (emotion-based): **A** 1: Receiving, .2: Responding, 3: Valuing, 4: Organizing, 5: Characterizing

The psychomotor domain (action-based): **P** 1: Perception, 2: Set, 3: Guided response, 4: Mechanism, 5: Complex overt response, 6: Adaptation, 7: Origination.

TEACHING STRATEGY

My main teaching goal is to create an effective learning environment to help students acquire both problems solving skills and a deep conceptual understanding of the subject. I intend to teach according to the state-of-the-art results in physics education research and be especially aware of the student's needs and misconceptions.

- Keep students actively engaged in the class, since an active classroom environment is a prerequisite for knowledge construction.
- Develop and teach cognitive maps of the subject and general problem-solving strategies.
- Students must always be aware of how the goals of a particular topic are related to the big picture of the course.
- Moreover, they must learn to differentiate general strategies to solve problems with the particular techniques involved in each case.
- Foresee conceptual difficulties and deal explicitly with expected student misconceptions.
- Design exam problems that combine qualitative and quantitative analysis of physical phenomena.
- Organize the material around a few fundamental ideas.
- Stress common concepts and avoid covering subjects superficially.
- I would include some of the recent (first half of the twenty century at least) progress in the field adapted to the level of the course.
- I would focus on phenomena rather than abstractions.
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ASSESSMENT STRATEGY AND GRADING SCHEME

In assigning your grade, NSU's grading and performance evaluation policies will be followed. Please note that all final grades are subject to departmental review and approval. A guideline for course assessment is as follows-

Class Attendance	Class Assessment / Assignments	Quiz	Mid Term	Final
10%	10%	20%	25%	35%

CLASSROOM RULES OF CONDUCT

1. The ground rule for our class is respectful, open communication. We have many things to learn from one another. Every single question is appreciated!
2. You become part of a learning community when you come to the class. Please be conscious of your community role, and work toward creating a healthy classroom learning atmosphere.
3. Don't chat during class. If you have to, feel free not to attend the class at the expense of your attendance for the day. The inability to refrain from unnecessary, disruptive chatting may result in a request to leave the classroom.
4. While in class, please switch off your cell phone. The inability to do so may result in some penalty.

Academic Integrity Policy: North South University does not appreciate academic dishonesty by its students. At a minimum, you must not be involved in cheating, copyright infringement, submitting the same work in multiple courses, significant collaboration with other individuals outside of sanctioned group activities, or fabrications. You are advised that violations of the Student Integrity Code will be treated seriously, with particular attention given to repeated offenses. Please refer to the NSU Code of Conduct at http://www.northsouth.edu/student-code-of-conduct.html

EXAMS AND MAKE-UP EXAMS POLICY

- You must prepare for all your exams.
- You must attend the exam on time.
- Being late does not necessarily guarantee that you will get extra time for writing your tests and exam.
- All cell phones must be switched off.
- Any deviation from the standard procedures will not be taken lightly.
- Any unfair means adopted in the tests and exams will be seriously dealt with.
- Academic misconduct or failure to comply with the NSU Examination Code of Conduct may result in F.

LECTURE DETAILS: *The tentative lecture and examination schedule are given below. These may be changed/reordered if necessary.*

L1: Introduction to Measurement, Units, and Dimensions.

L2, L3: Motion along a straight line. Expressions of displacement, speed, velocity, and accelerations, average and instantaneous quantities, Motion with constant acceleration, motion diagrams, examples.

L4, L5: Scalars and vector quantities, vector components, unit vector. Vector addition and multiplication rules, scalar and vector products, examples.

L6: Motion in Two and Three dimensions, position, displacement and acceleration vectors, average and instantaneous quantities.

L7: Free fall, Projectile motion, Uniform circular motion.

L8, L9: Concept of Force and Mass, Newton's 1st law and inertial frames, Newton's 2nd law and different types of forces, free body diagrams. Solving problems on Newton's 2nd law

L10:. Newton's 3rd law, Friction, and Drag forces and examples.

L11: Work done by a constant force, kinetic energy, and work-kinetic energy theorem.

L12: Work done by varying forces, such as gravitational and spring forces, Power, Potential energy of a system, conservative and non-conservative forces

L13: The conservation of mechanical energy, reading potential energy curves, conservation law of energy with and without frictional work.

L14: Centre of mass, Linear Momentum, Newton's 2nd law revisited, conservation law of momentum, Impulse, Collisions.

Midterm Exam

L15: Rotation, rotational equation of motion, the relation between linear and angular or rotational variables.

L16, L17: Torques, torque calculations; Moment of inertia, Parallel axis theorem; The kinetic energy of rotation.

L18: Angular momentum, Newton's 2nd law in angular form, conservation of Angular momentum.

L19: Static Equilibrium, Centre of gravity; Elasticity, stress, strain, elastic limit.

L20: Newton's law of Universal Gravitation, gravitational force and free fall acceleration, gravitational potential energy, Escape velocity.

L21:Planets, and satellites: Kepler's laws of planetary motion.

L22, L23: Simple harmonic motion (SHM), position, velocity, and acceleration of SHM, some oscillating systems, and energy in an SHM.

L24: Travelling waves, expression of the wave function, speed of waves.

L25: Wave equation. Interference of traveling waves, Standing waves.

L26, L27: Thermal equilibrium and temperature (Zeroth Law of Thermodynamics), Thermal variables and systems, 1st law of thermodynamics, and energy conservation law.

L28: Reversible and Irreversible processes and the 2nd law of thermodynamics. Entropy, Statistical view of Entropy, and Boltzmann Entropy Formula.

L29: Reviews.

Final Exam

Final Exam: *The date of the final exam will be announced by the exam controller office near the end of the semester*.Note: Minimum 3 quizzes required