MEDFORD HIGH SCHOOL
COURSE SYLLABUS

Department:	Science
Course Title:	Introductory Physics MCAS Review
Level and/or Grade:	Standard
Prerequisite:	Concurrent enrollment in Introductory Physics; Placement based on previous MCAS performance and/or student selection

Course Description:

The Introductory Physics MCAS Review course prepares students for the Introductory Physics MCAS test. Basic topics such as motion, forces, energy, momentum, heat and heat transfer, waves, electricity, and magnetism will be reviewed. Prerequisite mathematics skills will be reinforced. Students will apply test-taking strategies to the solution of problems. The study of specific topics will also be based on students' prior performance on MCAS as detailed Item Analyses and/or performance on a pretest given at the start of the course.

Learning Standards: *Students will be able to…..*

Motion and Forces:

- Distinguish between vector quantities and scalar quantities; represent vectors in diagrams and graphically.
- Distinguish between, and solve problems involving velocity, speed, and constant acceleration.
- Solve problems involving displacement and distance.
- Create, interpret, and solve problems involving graphs of motion; describe relationships among time, distance, and speed.
- Understand, interpret, and apply Newton's three Laws of Motion: Inertia; Force and Acceleration; Action and Reaction.
- Use a free body force diagram with only co-linear forces to show forces acting on an object, and determine the net force on it.
- Quantitatively distinguish between static and kinetic friction, what they depend on and their effects on the motion of objects.
- Describe and locate the center of gravity; describe the center of mass.
- Understand conceptually Newton's Law of Universal Gravitation.
- Distinguish between rotate and revolve; describe rotational speed; give examples of centripetal and centrifugal forces.

Conservation of Energy and Momentum:

- Define work, power, mechanical energy, potential energy, and kinetic energy; understand, interpret, and provide examples for the law of conservation of energy.
- Provide examples of how energy can be transformed from kinetic to potential and vice versa.

- Apply quantitatively the law of conservation of mechanical energy to simple systems.
- Describe the relationship among energy, work, and power both conceptually and quantitatively.
- Define and calculate momentum; understand, interpret, and provide examples that illustrate the law of conservation of momentum.

Heat and Heat Transfer:

- Explain conduction and its effects; distinguish between conduction and convection; explain how heat is transferred by radiation.
- Explain how heat energy will move from a higher temperature to a lower temperature until equilibrium is reached.
- Describe solid, liquid, gaseous, and plasma stages of matter; explain what happens during a phase change.
- Explain why evaporation is a cooling process and why condensation is a warming process.
- Explain the relationship among temperature change in a substance for a given amount of heat transferred, the amount (mass) of the substance, and the specific heat of the substance.

Waves:

- Describe the properties and characteristics of waves; describe wave motion.
- Distinguish between mechanical and electromagnetic waves.
- Distinguish between transverse waves and longitudinal waves.
- Describe the basic principles of reflection and refraction of waves.
- Describe factors that affect the speed of a wave; explain the relationship between the speed of a wave and the medium it travels through.
- Describe the Doppler effect for sound.

Electromagnetism:

- Recognize the characteristics of static charge, and explain how a static charge is generated.
- Develop a qualitative and quantitative understanding of current, voltage, resistance, and the connection between them
- Analyze circuits using Kirchoff's and Ohm's Laws.
- Interpret and apply Coulomb's Law
- Explain how electric current is a flow of charge caused by a potential difference (voltage) and how power is equal to current multiplied by voltage.
- Explain the difference in concept between electric forces and electric fields.
- Recognize that moving electric charges produce magnetic forces and moving magnets produce electric forces. Recognize that the interplay of electric and magnetic forces is the basis for electric motors, generators, and other technologies.

Electromagnetic Radiation:

- Recognize that electromagnetic waves are transverse waves and travel at the speed of light through a vacuum.
- Describe the electromagnetic spectrum for wavelength and energy; be able to identify specific regions such as visible light; recognize ways in which direction of visible light can be changed.
- Explain how the various wavelengths in the electromagnetic spectrum have many useful applications such as radio, TV, microwaves, and cellular phones.
- Calculate the frequency and energy of an electromagnetic wave from the wavelength.

Course Alignment with High School 21ST Century Learning Expectations:

Students will…

- Become self-directed learners.
- Communicate effectively.
- Apply problem-solving skills and critical and creative thinking.
- Use technology appropriately as a tool for learning, collaboration, presentation, research, and design.
- Act with integrity, respect and responsibility toward themselves, others and the environment.
- Exhibit flexibility and adaptability.
- Collaborate in diverse groups to share knowledge, build consensus, and achieve goals.
- Practice leadership in and service to their community.
- Become contributing citizens in a global society.

Assessment:

- See grading policy attached.