HORRY GEORGETOWN TECHNICAL COLLEGE

INSTRUCTIONAL PACKAGE

PHY 221

University Physics I

Effective Term

Fall 2023/Spring 2024/Summer 2024

INSTRUCTIONAL PACKAGE

Part I: Course Information

Effective Term: Fall 2023/Spring 2024/Summer 2024

COURSE PREFIX: PHY 221 COURSE TITLE: University Physics I

CONTACT HOURS: 3-3 CREDIT HOURS: 4

RATIONALE FOR THE COURSE:

Completion of PHY 221 enables the student to gain an appreciation and working knowledge of fundamental principles in the area of physics. These concepts are approached through the development of problem-solving skills, which helps prepare students for future careers in science fields. Additionally, this course applies concepts learned in calculus to topics in physics, therefore enhancing cross-curriculum instruction.

COURSE DESCRIPTION:

This is the first of a sequence of courses. The course includes a calculus-based treatment of the following topics: vectors, laws of motion, rotation, vibratory, and wave motion. This course is transferable to public senior institutions as part of the South Carolina Commission on Higher Education Statewide Articulation Agreement.

PREREQUISITES/CO-REQUISITES:

(Credit level MAT 130 Minimum Grade of C or Credit level MAT 130 Minimum Grade of TC or Credit level MAT 140 Minimum Grade of C or Credit level MAT 140 Minimum Grade of TC)

***Online/Hybrid** courses require students to complete the DLi Orientation Video prior to enrolling in an online course.

REQUIRED MATERIALS:

Please visit the BOOKSTORE online site for most current textbook information.

Enter the semester, course prefix, number and section when prompted and you will be linked to the correct textbook.

ADDITIONAL REQUIREMENTS:

A scientific calculator and graph paper.
For Hybrid/Online Students Only: Each student will be required to view an orientation PowerPoint presentation during the first week of class. This presentation can be found on the course homepage in D2L under News. After viewing the presentation, all online students must complete the orientation quiz, which can be found under the dropdown assignment menu. A student will not be considered officially enrolled in the course until the presentation has been viewed and the quiz completed with a 100% score. Any submitted work from the student including discussion posts, assignments, etc. will not be given a grade until the presentation has been viewed and the quiz has been submitted. Failure to view the presentation and take the quiz before midnight on the last day to add/drop classes will result in the student being automatically dropped from the course.

TECHNICAL REQUIREMENTS:

Access to Desire2Learn (D2L), HGTC's learning management system (LMS) used for course materials.
Access to myHGTC portal for student self-services.
College email access – this is the college's primary official form of communication.

STUDENT IDENTIFICATION VERIFICATION:

Students enrolled in online courses will be required to participate in a minimum of one (1) proctored assignment and/or one (1) virtual event to support student identification verification. Please refer to your Instructor Information Sheet for information regarding this requirement.

CLASSROOM ETIQUETTE:

As a matter of courtesy to other students and your professor, please turn off cell phones and other communication/entertainment devices before class begins. If you are monitoring for an emergency, please notify your professor prior to class and switch cell phone ringers to vibrate.

NETIQUETTE: is the term commonly used to refer to conventions adopted by Internet users on the web, mailing lists, public forums, and in live chat focused on online communications etiquette. For more information regarding Netiquette expectations for distance learning courses, please visit Online Netiquette.

ACADEMIC DISHONESTY:

All forms of academic dishonesty, as outlined in the Student Code in the HGTC catalog, will NOT be tolerated and will result in disciplinary action. Anyone caught cheating or committing plagiarism (Defined in the code as: "The appropriation of any other person's work and the unacknowledged incorporation of that work in one's own work offered for credit") will be given a grade of a zero for that assignment and reported to the Senior VP of Academic Affairs, in accordance with the student handbook. A second offense will result in the student being withdrawn from the course with a "WF" and charges being filed with the Chief Student Services Officer.

Part II: Student Learning Outcomes

COURSE LEARNING OUTCOMES and ASSESSMENTS*:

<u>A student will demonstrate an understanding of measurement by</u>

identifying the base quantities in the SI system.
naming the most frequently used prefixes for SI units.
changing units (here for length, area, and volume) by using chain-link conversions.
explaining that the meter is defined in terms of the speed of light in a vacuum.
changing units for time by using chain-link conversions.
using various measures of time, such as for motion or as determined on different clocks.
changing units for mass by using chain-link conversions.
relating density to mass and volume when the mass is uniformly distributed.

<u>A student will demonstrate an understanding of motion along a straight line by</u>

Identifying that if all parts of an object move in the same direction and at the same rate, we can treat the object as if it were a (point-like) particle.
Identifying that the position of a particle is its location as read on a scaled axis, such as an x axis.
Applying the relationship between a particle's displacement and its initial and final positions.
Applying the relationship between a particle's average velocity, its displacement, and the time interval for that displacement.
Applying the relationship between a particle's average speed, the total distance it moves, and the time interval for the motion.
When given a graph of a particle's position versus time, determining the average velocity between any two particular times.
When given a particle's position as a function of time, calculating the instantaneous velocity for any particular time.
When given a graph of a particle's position versus time, determining the instantaneous velocity for any particular time.
Identifying speed as the magnitude of the instantaneous velocity.
Applying the relationship between a particle's average acceleration, its change in velocity, and the time interval for that change.
When given a particle's velocity as a function of time, calculating the instantaneous acceleration for any particular time.
When given a graph of a particle's velocity versus time, determining the instantaneous acceleration for any particular time and the average acceleration between any two particular times.
For constant acceleration, applying the relationships between position, displacement, velocity, acceleration, and elapsed time.
Calculating a particle's change in velocity by integrating its acceleration function with respect to time.
Calculating a particle's change in position by integrating its velocity function with respect to time.
For constant acceleration, applying the relationships between position, displacement, velocity, acceleration, and elapsed time.
Calculating a particle's change in velocity by integrating its acceleration function with respect to time.

Calculating a particle's change in position by integrating its velocity function with respect to time.
Determining a particle's change in velocity by graphical integration on a graph of acceleration versus time.
Determining a particle's change in position by graphical integration on a graph of velocity versus time.

<u>A student will demonstrate an understanding of vectors and their components by</u>

Adding vectors by drawing them in head-to-tail arrangements, applying the commutative and associative laws.
Subtracting a vector from a second one.
Calculating the components of a vector on a given coordinate system, showing them in a drawing.
Given the components of a vector, drawing the vector and determining its magnitude and orientation.
Converting angle measures between degrees and radians.
Converting a vector between magnitude-angle and unit-vector notations.
Adding and subtracting vectors in magnitude-angle notation and in unit-vector notation.
Identifying that, for a given vector, rotating the coordinate system about the origin can change the vector's components but not the vector itself.
Converting a vector between magnitude-angle and unit-vector notations.
Adding and subtracting vectors in magnitude-angle notation and in unit-vector notation.
Identifying that, for a given vector, rotating the coordinate system about the origin can change the vector's components but not the vector itself.
Multiplying vectors by scalars.
Identifying that multiplying a vector by a scalar gives a vector, taking the dot (or scalar) product of two vectors gives a scalar, and taking the cross (or vector) product gives a new vector that is perpendicular to the original two.
Finding the dot product of two vectors in magnitude-angle notation and in unit-vector notation.
Finding the angle between two vectors by taking their dot product in both magnitude-angle notation and unit-vector notation.
Given two vectors, using a dot product to find how much of one vector lies along the other vector.
Finding the cross product of two vectors in magnitude-angle and unit-vector notations.
Using the right-hand rule to find the direction of the vector that results from a cross product.
In nested products, where one product is buried inside another, following the normal algebraic procedure by starting with the innermost product and working outward.

<u>A student will demonstrate an understanding of motion in two and three dimensions by</u>

Drawing two-dimensional and three-dimensional position vectors for a particle, indicating the components along the axes of a coordinate system.
On a coordinate system, determining the direction and magnitude of a particle's position vector from its components, and vice versa.
Applying the relationship between a particle's displacement vector and its initial and final position vectors.
Identifying that velocity is a vector quantity and thus has both magnitude and direction and also has components.
Drawing two-dimensional and three-dimensional velocity vectors for a particle, indicating the components along the axes of the coordinate system.

In magnitude-angle and unit-vector notations, relating a particle's initial and final position vectors, the time interval between those positions, and the particle's average velocity vector.
Given a particle's position vector as a function of time, determining its (instantaneous) velocity vector.
Identifying that acceleration is a vector quantity and thus has both magnitude and direction and also has components.
Drawing two-dimensional and three-dimensional acceleration vectors for a particle, indicating the components.
Given the initial and final velocity vectors of a particle and the time interval between those velocities, determining the average acceleration vector in magnitude-angle and unit-vector notations.
Given a particle's velocity vector as a function of time, determining its (instantaneous) acceleration vector.
For each dimension of motion, applying the constant-acceleration equations to relate acceleration, velocity, position, and time.
On a sketch of the path taken in projectile motion, explaining the magnitudes and directions of the velocity and acceleration components during the flight.
Given the launch velocity in either magnitude-angle or unit-vector notation, calculating the particle's position, displacement, and velocity at a given instant during the flight.
Given data for an instant during the flight, calculating the launch velocity.
Sketching the path taken in uniform circular motion and explaining the velocity and acceleration vectors (magnitude and direction) during the motion.
Applying the relationships between the radius of the circular path, the period, the particle's speed, and the particle's acceleration magnitude.
Applying the relationship between a particle's position, velocity, and acceleration as measured from two reference frames that move relative to each other at constant velocity and along a single axis.
Applying the relationship between a particle's position, velocity, and acceleration as measured from two reference frames that move relative to each other at constant velocity and in two dimensions.

<u>A student will demonstrate an understanding of Newton's First and Second Laws by</u>

Identifying that a force is a vector quantity and thus has both magnitude and direction and also components.
Given two or more forces acting on the same particle, adding the forces as vectors to get the net force.
Identifying Newton's first and second laws of motion.
Identifying inertial reference frames.
Sketching a free-body diagram for an object, showing the object as a particle and drawing the forces acting on it as vectors with their tails anchored on the particle.
Applying the relationship (Newton's second law) between the net force on an object, the mass of the object, and the acceleration produced by the net force.
Identifying that only external forces on an object can cause the object to accelerate.
Determining the magnitude and direction of the gravitational force acting on a body with a given mass, at a location with a given free-fall acceleration.
Identifying that the weight of a body is the magnitude of the net force required to prevent the body from falling freely, as measured from the reference frame of the ground.
Identifying that a scale gives an object's weight when the measurement is done in an inertial frame but not in an accelerating frame, where it gives an apparent weight.
Determining the magnitude and direction of the normal force on an object when the object is pressed or

pulled onto a surface.
Identifying that the force parallel to the surface is a frictional force that appears when the object slides or attempts to slide along the surface.
Identifying that a tension force is said to pull at both ends of a cord (or a cord-like object) when the cord is taut.
Identifying Newton's third law of motion and third-law force pairs.
For an object that moves vertically or on a horizontal or inclined plane, applying Newton's second law to a free-body diagram of the object.
For an arrangement where a system of several objects moves rigidly together, drawing a free-body diagram and apply Newton's second law for the individual objects and also for the system taken as a composite object.

<u>A student will demonstrate an understanding of force and motion by</u>

Distinguishing between friction in a static situation and in a kinetic situation.
Determining direction and magnitude of a frictional force.
For objects on horizontal, vertical, or inclined planes in situations involving friction, drawing free-body diagrams and applying Newton's second law.
Applying the relationship between the drag force on an object moving through air and the speed of the object.
Determining the terminal speed of an object falling through air.
Sketching the path taken in uniform circular motion and explain the velocity, acceleration, and force vectors (magnitudes and directions) during the motion.
Identifying that unless there is a radially inward net force (a centripetal force), an object cannot move in circular motion.
For a particle in uniform circular motion, applying the relationship between the radius of the path, the particle's speed and mass, and the net force acting on the particle.

<u>A student will demonstrate an understanding of kinetic energy and work by</u>

Applying the relationship between a particle's kinetic energy, mass, and speed.
Identifying that kinetic energy is a scalar quantity.
Applying the relationship between a force (magnitude and direction) and the work done on a particle by the force when the particle undergoes a displacement.
Calculating work by taking a dot product of the force vector and the displacement vector, in either magnitude-angle or unit-vector notation.
If multiple forces act on a particle, calculating the net work done by them.
Applying the work–kinetic energy theorem to relate the work done by a force (or the net work done by multiple forces) and the resulting change in kinetic energy.
Calculating the work done by the gravitational force when an object is lifted or lowered.
Applying the work–kinetic energy theorem to situations where an object is lifted or lowered.
Calculating the work done by the gravitational force when an object is lifted or lowered.
Applying the work–kinetic energy theorem to situations where an object is lifted or lowered.
Given a variable force as a function of position, calculating the work done by it on an object by integrating the function from the initial to the final position of the object, in one or more dimensions.
Given a graph of force versus position, calculating the work done by graphically integrating from the

initial position to the final position of the object.
Converting a graph of acceleration versus position to a graph of force versus position.
Applying the work–kinetic energy theorem to situations where an object is moved by a variable force.
Given a variable force as a function of position, calculating the work done by it on an object by integrating the function from the initial to the final position of the object, in one or more dimensions.
Given a graph of force versus position, calculating the work done by graphically integrating from the initial position to the final position of the object.
Converting a graph of acceleration versus position to a graph of force versus position.
Applying the work–kinetic energy theorem to situations where an object is moved by a variable force.

<u>A student will demonstrate an understanding of potential energy and conservation of energy by</u>

Distinguishing a conservative force from a nonconservative force.
For a particle moving between two points, identifying that the work done by a conservative force does not depend on which path the particle takes.
Calculating the gravitational potential energy of a particle (or, more properly, a particle–Earth system).
Calculating the elastic potential energy of a block–spring system.
After first clearly defining which objects form a system, identifying that the mechanical energy of the system is the sum of the kinetic energies and potential energies of those objects.
For an isolated system in which only conservative forces act, applying the conservation of mechanical energy to relate the initial potential and kinetic energies to the potential and kinetic energies at a later instant.
After first clearly defining which objects form a system, identifying that the mechanical energy of the system is the sum of the kinetic energies and potential energies of those objects.
For an isolated system in which only conservative forces act, applying the conservation of mechanical energy to relate the initial potential and kinetic energies to the potential and kinetic energies at a later instant.
When work is done on a system by an external force with no friction involved, determining the changes in kinetic energy and potential energy.
When work is done on a system by an external force with friction involved, relating that work to the changes in kinetic energy, potential energy, and thermal energy.
For an isolated system (no net external force), applying the conservation of energy to relate the initial total energy (energies of all kinds) to the total energy at a later instant.
For a non-isolated system, relating the work done on the system by a net external force to the changes in the various types of energies within the system.
Applying the relationship between average power, the associated energy transfer, and the time interval in which that transfer is made.
Given an energy transfer as a function of time (either as an equation or a graph), determining the instantaneous power (the transfer at any given instant).

<u>A student will demonstrate an understanding of potential energy and conservation of energy by</u>

Given the positions of several particles along an axis or a plane, determining the location of their center of mass.
Locating the center of mass of an extended, symmetric object by using the symmetry.
For a two-dimensional or three-dimensional extended object with a uniform distribution of mass,

determining the center of mass by (a) mentally dividing the object into simple geometric figures, each of which can be replaced by a particle at its center and (b) finding the center of mass of those particles.
Applying Newton's second law to a system of particles by relating the net force (of the forces acting on the particles) to the acceleration of the system's center of mass.
Applying the constant-acceleration equations to the motion of the individual particles in a system and to the motion of the system's center of mass.
Given the mass and velocity of the particles in a system, calculating the velocity of the system's center of mass.
Given the mass and acceleration of the particles in a system, calculating the acceleration of the system's center of mass.
Given the position of a system's center of mass as a function of time, determining the velocity of the center of mass.
Given the velocity of a system's center of mass as a function of time, determining the acceleration of the center of mass.
Calculating the change in the velocity of a com by integrating the com's acceleration function with respect to time.
Calculating a com's displacement by integrating the com's velocity function with respect to time.
When the particles in a two-particle system move without the system's com moving, relating the displacements of the particles and the velocities of the particles.
Identifying that momentum is a vector quantity and thus has both magnitude and direction and also components.
Calculating the (linear) momentum of a particle as the product of the particle's mass and velocity.
Calculating the change in momentum (magnitude and direction) when a particle changes its speed and direction of travel.
Applying the relationship between a particle's momentum and the (net) force acting on the particle.
Calculating the momentum of a system of particles as the product of the system's total mass and its center-of-mass velocity.
Applying the relationship between a system's center-of-mass momentum and the net force acting on the system.
Identifying that momentum is a vector quantity and thus has both magnitude and direction and also components.
Calculating the (linear) momentum of a particle as the product of the particle's mass and velocity.
Calculating the change in momentum (magnitude and direction) when a particle changes its speed and direction of travel.
Applying the relationship between a particle's momentum and the (net) force acting on the particle.
Calculating the momentum of a system of particles as the product of the system's total mass and its center-of-mass velocity.
Applying the relationship between a system's center-of-mass momentum and the net force acting on the system.
Identifying that impulse is a vector quantity and thus has both magnitude and direction and also components.
Applying the relationship between impulse and momentum change.
Applying the relationship between impulse, average force, and the time interval taken by the impulse.
Applying the constant-acceleration equations to relate impulse to average force.
Given force as a function of time, calculating the impulse (and thus also the momentum change) by integrating the function.

Given a graph of force versus time, calculating the impulse (and thus also the momentum change) by graphical integration.
In a continuous series of collisions by projectiles, calculating the average force on the target by relating it to the rate at which mass collides and to the velocity change experienced by each projectile.
For an isolated system of particles, applying the conservation of linear momenta to relate the initial momenta of the particles to their momenta at a later instant.
Identifying that the conservation of linear momentum can be done along an individual axis by using components along that axis, provided that there is no net external force component along that axis.
Distinguishing between elastic collisions, inelastic collisions, and completely inelastic collisions.
Identifying a one-dimensional collision as one where the objects move along a single axis, both before and after the collision.
Applying the conservation of momentum for an isolated one-dimensional collision to relate the initial momenta of the objects to their momenta after the collision.
Identifying that in an isolated system, the momentum and velocity of the center of mass are not changed even if the objects collide.
Distinguishing between elastic collisions, inelastic collisions, and completely inelastic collisions.
For isolated elastic collisions in one dimension, applying the conservation laws for both the total energy and the net momentum of the colliding bodies to relate the initial values to the values after the collision.
For a projectile hitting a stationary target, identifying the resulting motion for the three general cases: equal masses, target more massive than projectile, projectile more massive than target.
For an isolated system in which a two-dimensional collision occurs, applying the conservation of momentum along each axis of a coordinate system to relate the momentum components along an axis before the collision to the momentum components along the same axis after the collision.
For an isolated system in which a two-dimensional elastic collision occurs, (a) applying the conservation of momentum along each axis of a coordinate system to relate the momentum components along an axis before the collision to the momentum components along the same axis after the collision and (b) applying the conservation of total kinetic energy to relate the kinetic energies before and after the collision.
Applying the first rocket equation to relate the rate at which the rocket loses mass, the speed of the exhaust products relative to the rocket, the mass of the rocket, and the acceleration of the rocket.
Applying the second rocket equation to relate the change in the rocket's speed to the relative speed of the exhaust products and the initial and final mass of the rocket.
For a moving system undergoing a change in mass at a given rate, relating that rate to the change in momentum.

<u>A student will demonstrate an understanding of rotational variables by</u>

Identifying that if all parts of a body rotate around a fixed axis locked together, the body is a rigid body.
Identifying that the angular position of a rotating rigid body is the angle that an internal reference line makes with a fixed, external reference line.
Applying the relationship between angular displacement and the initial and final angular positions.
Applying the relationship between average angular velocity, angular displacement, and the time interval for that displacement.
Applying the relationship between average angular acceleration, change in angular velocity, and the time interval for that change.

Identifying that counterclockwise motion is in the positive direction and clockwise motion is in the negative direction.
Given angular position as a function of time, calculating the instantaneous angular velocity at any particular time and the average angular velocity between any two particular times.
Given a graph of angular position versus time, determining the instantaneous angular velocity at a particular time and the average angular velocity between any two particular times.
Identifying instantaneous angular speed as the magnitude of the instantaneous angular velocity.
Given angular velocity as a function of time, calculating the instantaneous angular acceleration at any particular time and the average angular acceleration between any two particular times.
Given a graph of angular velocity versus time, determining the instantaneous angular acceleration at any particular time and the average angular acceleration between any two particular times.
Calculating a body's change in angular velocity by integrating its angular acceleration function with respect to time.
Calculating a body's change in angular position by integrating its angular velocity function with respect to time.
For constant angular acceleration, applying the relationships between angular position, angular displacement, angular velocity, angular acceleration, and elapsed time.
For a rigid body rotating about a fixed axis, relating the angular variables of the body (angular position, angular velocity, and angular acceleration) and the linear variables of a particle on the body (position, velocity, and acceleration) at any given radius.
Distinguishing between tangential acceleration and radial acceleration, and drawing a vector for each in a sketch of a particle on a body rotating about an axis, for both an increase in angular speed and a decrease.
Finding the rotational inertia of a particle about a point.
Finding the total rotational inertia of many particles moving around the same fixed axis.
Calculating the rotational kinetic energy of a body in terms of its rotational inertia and its angular speed.
Determining the rotational inertia of a body if it is given in Table 10.5.1.
Calculating the rotational inertia of a body by integration over the mass elements of the body.
Applying the parallel-axis theorem for a rotation axis that is displaced from a parallel axis through the center of mass of a body.
Identifying that a torque on a body involves a force and a position vector, which extends from a rotation axis to the point where the force is applied.
Calculating the torque by using (a) the angle between the position vector and the force vector, (b) the line of action and the moment arm of the force, and (c) the force component perpendicular to the position vector.
Identifying that a rotation axis must always be specified to calculate a torque.
Identifying that a torque is assigned a positive or negative sign depending on the direction it tends to make the body rotate about a specified rotation axis: "Clocks are negative."
When more than one torque acts on a body about a rotation axis, calculating the net torque.
Applying Newton's second law for rotation to relate the net torque on a body to the body's rotational inertia and rotational acceleration, all calculated relative to a specified rotation axis.
Calculating the work done by a torque acting on a rotating body by integrating the torque with respect to the angle of rotation.
Applying the work–kinetic energy theorem to relate the work done by a torque to the resulting change in the rotational kinetic energy of the body.

Calculating the work done by a constant torque by relating the work to the angle through which the body rotates.
Calculating the power of a torque by finding the rate at which work is done.
Calculating the power of a torque at any given instant by relating it to the torque and the angular velocity at that instant.

<u>A student will demonstrate an understanding of rolling, torque and angular momentum by</u>

Identifying that smooth rolling can be considered as a combination of pure translation and pure rotation.
Applying the relationship between the center-of-mass speed and the angular speed of a body in smooth rolling.
Calculating the kinetic energy of a body in smooth rolling as the sum of the translational kinetic energy of the center of mass and the rotational kinetic energy around the center of mass.
Applying the relationship between the work done on a smoothly rolling object and the change in its kinetic energy.
For smooth rolling (and thus no sliding), conserving mechanical energy to relate initial energy values to the values at a later point.
Drawing a free-body diagram of an accelerating body that is smoothly rolling on a horizontal surface or up or down a ramp.
Applying the relationship between the center-of-mass acceleration and the angular acceleration.
For smooth rolling of an object up or down a ramp, applying the relationship between the object's acceleration, its rotational inertia, and the angle of the ramp.
Drawing a free-body diagram of a yo-yo moving up or down its string.
Identifying that a yo-yo is effectively an object that rolls smoothly up or down a ramp with an incline angle of 90°.
For a yo-yo moving up or down its string, applying the relationship between the yo-yo's acceleration and its rotational inertia.
Determining the tension in a yo-yo's string as the yo-yo moves up or down its string.
Identifying that torque is a vector quantity.
Identifying that the point about which a torque is calculated must always be specified.
Calculating the torque due to a force on a particle by taking the cross product of the particle's position vector and the force vector, in either unit-vector notation or magnitude-angle notation.
Using the right-hand rule for cross products to find the direction of a torque vector.
Identifying that angular momentum is a vector quantity.
Identifying that the fixed point about which an angular momentum is calculated must always be specified.
Calculating the angular momentum of a particle by taking the cross product of the particle's position vector and its momentum vector, in either unit-vector notation or magnitude-angle notation.
Using the right-hand rule for cross products to find the direction of an angular momentum vector.
Applying Newton's second law in angular form to relate the torque acting on a particle to the resulting rate of change of the particle's angular momentum, all relative to a specified point.
For a system of particles, applying Newton's second law in angular form to relate the net torque acting on the system to the rate of the resulting change in the system's angular momentum.
Applying the relationship between the angular momentum of a rigid body rotating around a fixed axis and the body's rotational inertia and angular speed around that axis.

If two rigid bodies rotate about the same axis, calculating their total angular momentum.
When no external net torque acts on a system along a specified axis, applying the conservation of angular momentum to relate the initial angular momentum value along that axis to the value at a later instant.
Identifying that the gravitational force acting on a spinning gyroscope causes the spin angular momentum vector (and thus the gyroscope) to rotate about the vertical axis in a motion called precession.
Calculating the precession rate of a gyroscope.
Identifying that a gyroscope's precession rate is independent of the gyroscope's mass.

<u>A student will demonstrate an understanding of equilibrium and elasticity by</u>

Distinguishing between equilibrium and static equilibrium.
Specifying the four conditions for static equilibrium.
Explaining center of gravity and how it relates to center of mass.
For a given distribution of particles, calculating the coordinates of the center of gravity and the center of mass.
Applying the force and torque conditions for static equilibrium.
Identifying that a wise choice about the placement of the origin (about which to calculate torques) can simplify the calculations by eliminating one or more unknown forces from the torque equation.
Explaining what an indeterminate situation is.
For tension and compression, applying the equation that relates stress to strain and Young's modulus.
Distinguishing between yield strength and ultimate strength.
For shearing, applying the equation that relates stress to strain and the shear modulus.
For hydraulic stress, applying the equation that relates fluid pressure to strain and the bulk modulus.

<u>A student will demonstrate an understanding of gravitation by</u>

Applying Newton's law of gravitation to relate the gravitational force between two particles to their masses and their separation.
Identifying that a uniform spherical shell of matter attracts a particle that is outside the shell as if all the shell's mass were concentrated as a particle at its center.
Drawing a free-body diagram to indicate the gravitational force on a particle due to another particle or a uniform, spherical distribution of matter.
If more than one gravitational force acts on a particle, drawing a free-body diagram showing those forces, with the tails of the force vectors anchored on the particle.
If more than one gravitational force acts on a particle, finding the net force by adding the individual forces as vectors.
Distinguishing between the free-fall acceleration and the gravitational acceleration.
Calculating the gravitational acceleration near but outside a uniform, spherical astronomical body.
Distinguishing between measured weight and the magnitude of the gravitational force.
Identifying that a uniform shell of matter exerts no net gravitational force on a particle located inside it.
Calculating the gravitational force that is exerted on a particle at a given radius inside a nonrotating uniform sphere of matter.
Calculating the gravitational potential energy of a system of particles (or uniform spheres that can be treated as particles).

Identifying that if a particle moves from an initial point to a final point while experiencing a gravitational force, the work done by that force (and thus the change in gravitational potential energy) is independent of which path is taken.
Using the gravitational force on a particle near an astronomical body (or some second body that is fixed in place), calculate the work done by the force when the body moves.
Applying the conservation of mechanical energy (including gravitational potential energy) to a particle moving relative to an astronomical body (or some second body that is fixed in place).
Explaining the energy requirements for a particle to escape from an astronomical body (usually assumed to be a uniform sphere).
Calculating the escape speed of a particle in leaving an astronomical body.
Identifying Kepler's three laws.
Identifying which of Kepler's laws is equivalent to the law of conservation of angular momentum.
On a sketch of an elliptical orbit, identifying the semimajor axis, the eccentricity, the perihelion, the aphelion, and the focal points.
For an elliptical orbit, applying the relationships between the semimajor axis, the eccentricity, the perihelion, and the aphelion.
For an orbiting natural or artificial satellite, applying Kepler's relationship between the orbital period and radius and the mass of the astronomical body being orbited.
For a satellite in a circular orbit around an astronomical body, calculating the gravitational potential energy, the kinetic energy, and the total energy.
For a satellite in an elliptical orbit, calculating the total energy.
Explaining Einstein's principle of equivalence.
Identifying Einstein's model for gravitation as being due to the curvature of spacetime.

<u>A student will demonstrate an understanding of fluids, density and pressure by</u>

Distinguishing fluids from solids.
When mass is uniformly distributed, relating density to mass and volume.
Applying the relationship between hydrostatic pressure, force, and the surface area over which that force acts.
Applying the relationship between the hydrostatic pressure, fluid density, and the height above or below a reference level.
Distinguishing between total pressure (absolute pressure) and gauge pressure.
Describing how a barometer can measure atmospheric pressure.
Describing how an open-tube manometer can measure the gauge pressure of a gas.
Identifying Pascal's principle.
For a hydraulic lift, applying the relationship between the input area and displacement and the output area and displacement.
Describing Archimedes' principle.
Applying the relationship between the buoyant force on a body and the mass of the fluid displaced by the body.
For a floating body, relating the buoyant force to the gravitational force.
For a floating body, relating the gravitational force to the mass of the fluid displaced by the body.
Distinguishing between apparent weight and actual weight.
Calculating the apparent weight of a body that is fully or partially submerged.
Describing steady flow, incompressible flow, non-viscous flow, and irrotational flow.

Explaining the term streamline.
Applying the equation of continuity to relate the cross-sectional area and flow speed at one point in a tube to those quantities at a different point.
Identifying and calculating volume flow rate.
Identifying and calculating mass flow rate.
Calculating the kinetic energy density in terms of a fluid's density and flow speed.
Identifying the fluid pressure as being a type of energy density.
Calculating the gravitational potential energy density.
Applying Bernoulli's equation to relate the total energy density at one point on a streamline to the value at another point.
Identifying that Bernoulli's equation is a statement of the conservation of energy.

<u>A student will demonstrate an understanding of oscillations by</u>

Distinguishing simple harmonic motion from other types of periodic motion.
For a simple harmonic oscillator, applying the relationship between position x and time t to calculate either if given a value for the other.
Relating period T, frequency f, and angular frequency ω.
Identifying (displacement) amplitude x_m, phase constant (or phase angle) φ, and phase ωt + φ.
Sketching a graph of the oscillator's position x versus time t, identifying amplitude x_m and period T.
From a graph of position versus time, velocity versus time, or acceleration versus time, determining the amplitude of the plot and the value of the phase constant φ.
On a graph of position x versus time t, describing the effects of changing period T, frequency f, amplitude x_m, or phase constant φ.
Identifying the phase constant φ that corresponds to the starting time (t = 0) being set when a particle in SHM is at an extreme point or passing through the center point.
Given an oscillator's position x(t) as a function of time, find its velocity v(t) as a function of time, identify the velocity amplitude v_m in the result, and calculate the velocity at any given time.
Sketching a graph of an oscillator's velocity v versus time t, identifying the velocity amplitude v_m.
Applying the relationship between velocity amplitude v_m, angular frequency ω, and (displacement) amplitude x_m.
Given an oscillator's velocity v(t) as a function of time, calculating its acceleration a(t) as a function of time, identifying the acceleration amplitude am in the result, and calculating the acceleration at any given time.
Sketching a graph of an oscillator's acceleration a versus time t, identifying the acceleration amplitude am.
Identifying that for a simple harmonic oscillator the acceleration a at any instant is always given by the product of a negative constant and the displacement x just then.
For any given instant in an oscillation, applying the relationship between acceleration a, angular frequency ω, and displacement x.
Given data about the position x and velocity v at one instant, determining the phase ωt + φ and phase constant φ.
For a spring–block oscillator, applying the relationships between spring constant k and mass m and either period T or angular frequency ω.
Applying Hooke's law to relate the force F on a simple harmonic oscillator at any instant to the displacement x of the oscillator at that instant.

For a spring–block oscillator, calculating the kinetic energy and elastic potential energy at any given time.
Applying the conservation of energy to relate the total energy of a spring–block oscillator at one instant to the total energy at another instant.
Sketching a graph of the kinetic energy, potential energy, and total energy of a spring–block oscillator, first as a function of time and then as a function of the oscillator's position.
For a spring–block oscillator, determining the block's position when the total energy is entirely kinetic energy and when it is entirely potential energy.
Describing the motion of an angular simple harmonic oscillator.
For an angular simple harmonic oscillator, apply the relationship between the torque τ and the angular displacement θ (from equilibrium).
For an angular simple harmonic oscillator, apply the relationship between the period T (or frequency f), the rotational inertia I, and the torsion constant κ.
For an angular simple harmonic oscillator at any instant, apply the relationship between the angular acceleration α, the angular frequency ω, and the angular displacement θ.
Describing the motion of an oscillating simple pendulum.
Drawing a free-body diagram of a pendulum bob with the pendulum at angle θ to the vertical.
For small-angle oscillations of a simple pendulum, relating the period T (or frequency f) to the pendulum's length L.
Distinguishing between a simple pendulum and a physical pendulum.
For small-angle oscillations of a physical pendulum, relating the period T (or frequency f) to the distance h between the pivot and the center of mass.
For an angular oscillating system, determining the angular frequency ω from either an equation relating torque τ and angular displacement θ or an equation relating angular acceleration α and angular displacement θ.
Distinguishing between a pendulum's angular frequency ω (having to do with the rate at which cycles are completed) and its $d\theta/dt$ (the rate at which its angle with the vertical changes).
Given data about the angular position θ and rate of change $d\theta/dt$ at one instant, determining the phase constant φ and amplitude θ_m.
Describing how the free-fall acceleration can be measured with a simple pendulum.
For a given physical pendulum, determining the location of the center of oscillation and identifying the meaning of that phrase in terms of a simple pendulum.
Describing how simple harmonic motion is related to uniform circular motion.
Describing the motion of a damped simple harmonic oscillator and sketch a graph of the oscillator's position as a function of time.
For any particular time, calculating the position of a damped simple harmonic oscillator.
Determining the amplitude of a damped simple harmonic oscillator at any given time.
Calculating the angular frequency of a damped simple harmonic oscillator in terms of the spring constant, the damping constant, and the mass, and approximating the angular frequency when the damping constant is small.
Applying the equation giving the (approximate) total energy of a damped simple harmonic oscillator as a function of time.

<u>A student will demonstrate an understanding of waves by</u>

Identifying the four main types of waves.
Distinguishing between transverse waves and longitudinal waves.
Given a displacement function for a transverse wave, determining amplitude y_m, angular wave number k, angular frequency ω, phase constant φ, and direction of travel, and calculating the phase $kx \pm \omega t + \varphi$ and the displacement at any given time and position.
Given a displacement function for a transverse wave, calculating the time between two given displacements.
Sketching a graph of a transverse wave as a function of position, identifying amplitude y_m, wavelength λ, where the slope is greatest, where it is zero, and where the string elements have positive velocity, negative velocity, and zero velocity.
Given a graph of displacement versus time for a transverse wave, determining amplitude y_m and period T.
Describing the effect on a transverse wave of changing phase constant φ.
Applying the relation between the wave speed v, the distance traveled by the wave, and the time required for that travel.
Applying the relationships between wave speed v, angular frequency ω, angular wave number k, wavelength λ, period T, and frequency f.
Describing the motion of a string element as a transverse wave moves through its location, and identify when its transverse speed is zero and when it is maximum.
Calculating the transverse velocity u(t) of a string element as a transverse wave moves through its location.
Calculating the transverse acceleration a(t) of a string element as a transverse wave moves through its location.
Given a graph of displacement, transverse velocity, or transverse acceleration, determining the phase constant φ.
Calculating the linear density μ of a uniform string in terms of the total mass and total length.
Applying the relationship between wave speed v, tension τ, and linear density μ.
Calculating the average rate at which energy is transported by a transverse wave.
For the equation giving a string-element displacement as a function of position x and time t, applying the relationship between the second derivative with respect to x and the second derivative with respect to t.
Applying the principle of superposition to show that two overlapping waves add algebraically to give a resultant (or net) wave.
For two transverse waves with the same amplitude and wavelength and that travel together, finding the displacement equation for the resultant wave and calculating the amplitude in terms of the individual wave amplitude and the phase difference.
Describing how the phase difference between two transverse waves (with the same amplitude and wavelength) can result in fully constructive interference, fully destructive interference, and intermediate interference.
With the phase difference between two interfering waves expressed in terms of wavelengths, quickly determining the type of interference the waves have.
Using sketches, explaining how a phasor can represent the oscillations of a string element as a wave travels through its location.

Sketching a phasor diagram for two overlapping waves traveling together on a string, indicating their amplitudes and phase difference on the sketch.
By using phasors, finding the resultant wave of two transverse waves traveling together along a string, calculating the amplitude and phase and writing out the displacement equation, and then displaying all three phasors in a phasor diagram that shows the amplitudes, the leading or lagging, and the relative phases.
For two overlapping waves (same amplitude and wavelength) that are traveling in opposite directions, sketching snapshots of the resultant wave, indicating nodes and antinodes.
For two overlapping waves (same amplitude and wavelength) that are traveling in opposite directions, finding the displacement equation for the resultant wave and calculating the amplitude in terms of the individual wave amplitude.
Describing the SHM of a string element at an antinode of a standing wave.
For a string element at an antinode of a standing wave, writing equations for the displacement, transverse velocity, and transverse acceleration as functions of time.
Distinguishing between “hard” and “soft” reflections of string waves at a boundary.
Describing resonance on a string tied taut between two supports, and sketching the first several standing wave patterns, indicating nodes and antinodes.
In terms of string length, determining the wavelengths required for the first several harmonics on a string under tension.
For any given harmonic, applying the relationship between frequency, wave speed, and string length.

<u>A student will demonstrate an understanding of sound waves by</u>

Distinguishing between a longitudinal wave and a transverse wave.
Explaining wavefronts and rays.
Applying the relationship between the speed of sound through a material, the material’s bulk modulus, and the material’s density.
Applying the relationship between the speed of sound, the distance traveled by a sound wave, and the time required to travel that distance.
For any particular time and position, calculating the displacement s(x, t) of an element of air as a sound wave travels through its location.
Given a displacement function s(x, t) for a sound wave, calculating the time between two given displacements.
Applying the relationships between wave speed v, angular frequency ω, angular wave number k, wavelength λ, period T, and frequency f.
Sketching a graph of the displacement s(x) of an element of air as a function of position, and identifying the amplitude sm and wavelength λ.
For any particular time and position, calculating the pressure variation Δp (variation from atmospheric pressure) of an element of air as a sound wave travels through its location.
Sketching a graph of the pressure variation Δp(x) of an element as a function of position, and identifying the amplitude Δpm and wavelength λ.
Applying the relationship between pressure-variation amplitude Δpm and displacement amplitude sm.
Given a graph of position s versus time for a sound wave, determining the amplitude sm and the period T.
Given a graph of pressure variation Δp versus time for a sound wave, determining the amplitude Δpm and the period T.

If two waves with the same wavelength begin in phase but reach a common point by traveling along different paths, calculating their phase difference φ at that point by relating the path length difference ΔL to the wavelength λ.
Given the phase difference between two sound waves with the same amplitude, wavelength, and travel direction, determining the type of interference between the waves (fully destructive interference, fully constructive interference, or indeterminate interference).
Converting a phase difference between radians, degrees, and number of wavelengths.
Calculating the sound intensity I at a surface as the ratio of the power P to the surface area A.
Applying the relationship between the sound intensity I and the displacement amplitude sm of the sound Identifying wave.
Identifying an isotropic point source of sound.
For an isotropic point source, applying the relationship involving the emitting power Ps, the distance r to a detector, and the sound intensity I at the detector.
Applying the relationship between the sound level β, the sound intensity I, and the standard reference intensity I_0.
Evaluating a logarithm function (log) and an antilogarithm function ($\log^{-1}$).
Relating the change in a sound level to the change in sound intensity.
Using standing wave patterns for string waves, sketching the standing wave patterns for the first several acoustical harmonics of a pipe with only one open end and with two open ends.
For a standing wave of sound, relating the distance between nodes and the wavelength.
Identifying which type of pipe has even harmonics.
For any given harmonic and for a pipe with only one open end or with two open ends, applying the relationships between the pipe length L, the speed of sound v, the wavelength λ, the harmonic frequency f, and the harmonic number n.
Explaining how beats are produced.
Adding the displacement equations for two sound waves of the same amplitude and slightly different angular frequencies to find the displacement equation of the resultant wave and identify the time-varying amplitude.
Applying the relationship between the beat frequency and the frequencies of two sound waves that have the same amplitude when the frequencies (or, equivalently, the angular frequencies) differ by a small amount.
Identifying that the Doppler effect is the shift in the detected frequency from the frequency emitted by a sound source due to the relative motion between the source and the detector.
Identifying that in calculating the Doppler shift in sound, the speeds are measured relative to the medium (such as air or water), which may be moving.
Calculating the shift in sound frequency for (a) a source moving either directly toward or away from a stationary detector, (b) a detector moving either directly toward or away from a stationary source, and (c) both source and detector moving either directly toward each other or directly away from each other.
Identifying that for relative motion between a sound source and a sound detector, motion toward tends to shift the frequency up and motion away tends to shift it down.
Sketching the bunching of wavefronts for a sound source traveling at the speed of sound or faster.
Calculating the Mach number for a sound source exceeding the speed of sound.
For a sound source exceeding the speed of sound, applying the relationship between the Mach cone angle, the speed of sound, and the speed of the source.

****Students – please refer to the Instructor's Course Information sheet for specific***

information on assessments and due dates.

Part III: Grading and Assessment

EVALUATION OF REQUIRED COURSE MEASURES/ARTIFACTS*

Students' performance will be assessed and the weight associated with the various measures/artifacts are listed below.

EVALUATION*

Lecture	75%
Lab	25%
Total	100%

****Students, for the specific number and type of evaluations, please refer to the Instructor's Course Information Sheet.***

GRADING SYSTEM:

Please note the College adheres to a 10-point grading scale A = 100 – 90, B = 89- 80, C = 79 – 70, D = 69 – 60, F = 59 and below.

Grades earned in courses impact academic progression and financial aid status. Before withdrawing from a course, be sure to talk with your instructor and financial aid counselor about the implications of that course of action. Ds, Fs, Ws, WFs and Is also negatively impact academic progression and financial aid status.

The Add/Drop Period is the first 5 days of the semester for **full term** classes. Add/Drop periods are shorter for accelerated format courses. Please refer to the academic calendar for deadlines for add/drop. You must attend at least one meeting of all of your classes during that period. If you do not, you will be dropped from the course(s) and your Financial Aid will be reduced accordingly.

Part IV: Attendance

Horry-Georgetown Technical College maintains a general attendance policy requiring students to be present for a minimum of 80 percent (80%) of their classes in order to receive credit for any course. Due to the varied nature of courses taught at the college, some faculty may require up to 90 percent (90%) attendance. Pursuant to 34 Code of Federal Regulations 228.22 - Return to Title IV Funds, once a student has missed over 20% of the course or has missed two (2) consecutive weeks, the faculty is obligated to withdraw the student and a student may not be permitted to reenroll. **Instructors define absentee limits for their class at the beginning of each term; please refer to the**

Instructor Course Information Sheet.

For online and hybrid courses, check your Instructor's Course Information Sheet for any required on-site meeting times. Please note, instructors may require tests to be taken at approved testing sites, and if you use a testing center other than those provided by HGTC, the center may charge a fee for its services.

Science Department Attendance Policies

For a 15-week course (fall and spring) or a 10-week course (summer), the allowed number of absences for a MW or TR class is as follows: 4 absences are allowed for lecture and 2 are allowed for lab, regardless of reason. For a lecture class that meets once a week, the allowed number of absences is 2.

For a 7-week fast-paced course (fall and spring) or a 5-week fast-paced course (summer), the allowed number of absences is as follows: 1 absence is allowed for lecture and 1 for lab, regardless of reason.

When a student surpasses the allowed number of absences, the student will be dropped automatically from the course with a W or a WF. Remember, an absence is an absence, no matter if it is excused or not!

Online/Hybrid Attendance:

Students enrolled in distance learning courses (hybrid and online) are required to maintain contact with the instructor on a regular basis to be counted as "in attendance" for the course. All distance learning students must participate weekly in an Attendance activity in order to demonstrate course participation. Students showing no activity in the course for two weeks (these weeks do not need to be consecutive) will be withdrawn due to lack of attendance.

Lab Attendance for Hybrid Courses:

Students in hybrid classes in which labs meet weekly, are allowed two (2) lab absences. Students in hybrid labs that only meet 5 or 6 times during the semester, must attend all lab sessions for its entirety. When a student surpasses the allowed number of absences, the student will be dropped automatically from the course with a W or a WF.

Part V: Student Resources

THE STUDENT SUCCESS AND TUTORING CENTER (SSTC):

The SSTC offers to all students the following **free** resources:

1. **Academic tutors** for most subject areas, **Writing Center support**, and **college success skills**.
2. Online **tutoring** and academic support resources.
3. Professional and interpersonal communication **coaching** in the EPIC Labs.

Visit the Student Success & Tutoring Center website for more information. To schedule tutoring, contact the SSTC at sstc@hgtc.edu or self-schedule in the Penji iOS/Android app or at www.penjiapp.com. Email sstc@hgtc.edu or call SSTC Conway, 349-7872; SSTC Grand Strand, 477-2113; and SSTC Georgetown, 520-1455, or go to the Online Resource Center to access on-demand resources.

STUDENT INFORMATION CENTER: TECH Central

TECH Central offers to all students the following free resources:

1. **Getting around HGTC**: General information and guidance for enrollment, financial aid, registration, and payment plan support!
2. Use the Online Resource Center (ORC) including Office 365 support, password resets, and username information.
3. **In-person workshops, online tutorials and more services** are available in Desire2Learn, Student Portal, Degree Works, and Office 365.
4. **Chat with our staff on TECH Talk**, our live chat service. TECH Talk can be accessed on the student portal and on TECH Central's website, or by texting questions to (843) 375-8552.

Visit the Tech Central website for more information. Live Chat and Center locations are posted on the website. Or please call (843) 349 – TECH (8324), Option #1.

HGTC LIBRARY:

Each campus location has a library where HGTC students, faculty, and staff may check out materials with their HGTC ID. All three HGTC campus libraries are equipped with computers to support academic research and related schoolwork; printing is available as well. Visit the Library website for more information or call (843) 349-5268.

STUDENT TESTING:

Testing in an **online/hybrid** course and in **make-up exam** situations may be accomplished in a variety of ways:

- Test administered within D2L
- Test administered in writing on paper
- Test administered through Publisher Platforms (which may have a fee associated with the usage)

Furthermore, tests may have time limits and/or require a proctor.

Proctoring can be accomplished either face-to-face at an approved site or online through our online proctoring service. To find out more about proctoring services, please visit the Online Testing section of the HGTC's Testing Center webpage.

The **Instructor Information Sheet** will have more details on test requirements for your course.

DISABILITY SERVICES:

HGTC is committed to providing an accessible environment for students with disabilities. Inquiries may be directed to HGTC's Accessibility and Disability Service webpage. The Accessibility and Disability staff will review documentation of the student's disability and, in a confidential setting with the student, develop an educational accommodation plan.

Note: It is the student's responsibility to self-identify as needing accommodations and to provide acceptable documentation. After a student has self-identified and submitted documentation of a disability, accommodations may be determined, accepted, and provided.

STATEMENT OF EQUAL OPPORTUNITY/NON-DISCRIMINATION STATEMENT:

Horry-Georgetown Technical College prohibits discrimination and harassment, including sexual harassment and abuse, on the basis of race, color, sex, national or ethnic origin, age, religion, disability, marital or family status, veteran status, political ideas, sexual orientation, gender identity, or pregnancy, childbirth, or related medical conditions, including, but not limited to, lactation in educational programs and/or activities.

TITLE IX REQUIREMENTS:

All students (as well as other persons) at Horry-Georgetown Technical College are protected by Title IX—regardless of their sex, sexual orientation, gender identity, part- or full-time status, disability, race, or national origin—in all aspects of educational programs and activities. Any student, or other member of the college community, who believes that he/she is or has been a victim of sexual harassment or sexual violence may file a report with the college's Chief Student Services Officer, campus law enforcement, or with the college's Title IX Coordinator or designee.

> *Faculty and Staff are required to report incidents to the Title IX Coordinators when involving students. The only HGTC employees exempt from mandatory reporting are licensed mental health professionals (only as part of their job description such as counseling services).

INQUIRIES REGARDING THE NON-DISCRIMINATION/TITLE IX POLICIES:

Student and prospective student inquiries concerning Section 504, Title II, Title VII, and Title IX and their application to the College or any student decision may be directed to the Vice President for Student Affairs.

> **Dr. Melissa Batten, VP Student Affairs**
> *Title IX, Section 504, and Title II Coordinator*
> Building 1100, Room 107A, Conway Campus
> PO Box 261966, Conway, SC 29528-6066

843-349-5228
Melissa.Batten@hgtc.edu

Employee and applicant inquiries concerning Section 504, Title II, and Title IX and their application to the College may be directed to the Vice President for Human Resources.

Jacquelyne Snyder, VP Human Resources
Affirmative Action/Equal Opportunity Officer and Title IX Coordinator
Building 200, Room 205B, Conway Campus
PO Box 261966, Conway, SC 29528-6066
843-349-5212
Jacquelyne.Snyder@hgtc.edu