



INSTRUCTIONAL PACKAGE

PHY 118

Medical Imaging Science

Spring 2019-Summer 2019

INSTRUCTIONAL PACKAGE

PART I: COURSE INFORMATION

Effective Term: 2018-2019

COURSE PREFIX: PHY 118

COURSE TITLE: Medical Imaging Science

CONTACT HOURS: 3

CREDIT HOURS: 3

RATIONALE FOR THE COURSE:

Completion of PHY 118 prepares students for the diagnostic medical sonography and X-ray technology degree programs and for other related allied health fields.

COURSE DESCRIPTION:

This course is the study of the fundamental physics associated with the field of medical imaging sciences. The areas of study include concepts of radiation production as it relates to x rays and nuclear medicine studies and acoustical properties related to sonographic exams.

PREREQUISITES/CO-REQUISITES:

Credit level MAT 102 Minimum Grade of C or Credit level MAT 120 Minimum Grade of C or Credit level MAT 110 Minimum Grade of C or Credit level MAT 102 Minimum Grade of TC or Credit level MAT 120 Minimum Grade of TC or Credit level MAT 110 Minimum Grade of TC or Credit level MAT 101 Minimum Grade of C or Credit level MAT 101 Minimum Grade of TC or COMPASS Algebra 46 or COMPANION Elementary Algebra 075 or ACCUPLACER Elementary Algebra 075 or New ACCUPLACER Adv Algebra 230 or SAT Mathematics 460 or New SAT Mathematics 500 or ACT Math 19 or (Multiple Measures Math 1)

REQUIRED MATERIALS:

Please visit the Bookstore online site for most current textbook information. Use the direct link below to find textbooks.

[BOOKSTORE](#).

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

ADDITIONAL REQUIREMENTS:

A scientific calculator will be needed for in-class use and for tests.

TECHNICAL REQUIREMENTS:

Access to Desire2Learn (D2L), HGTC's student portal for course materials.
WaveNet and D2L email access.

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

Lecture Student Learning Outcomes and Assessments*:

The Nature of Science

Acknowledge contributions to science by various cultures.
Recount how mathematics contributes to success in science.
List the steps in one scientific method, and cite other methods that advance science.
Describe how honest inquiry affects the formulation of facts, laws, and theories.
Distinguish between natural and supernatural phenomena.
Discuss some similarities and differences among science, art, and religion.
Relate technology to the furthering of science, and vice versa.
Compare the fields of physics, chemistry, Earth science, and astronomy.
Relate learning science to an increased appreciation of nature.

Patterns of Motion and Equilibrium

Establish Aristotle’s influence on classifying motion.
Establish Galileo’s influence in understanding motion.
Describe and distinguish between mass and weight.
Distinguish between Force and net Force, and give examples.
Describe the rule $\Sigma F=0$, and give examples.
Define support force, and explain its relationship to weight.
Describe friction and its direction when an object slides.
Distinguish between different kinds of speed and velocity.
Define acceleration, and distinguish it from velocity and speed.

Newton’s Laws of Motion

State Newton’s first law of motion, and relate it to inertia.
Relate acceleration, $\Delta v/\Delta t$, to its cause, F/m .
Describe how forces always occur in pairs.
Define Newton’s third law of motion by giving examples.
Summarize and contrast Newton’s three laws of motion.

Momentum and Energy

Describe the relationship between impulse and momentum.
Describe the role of force and time when momentum changes.
Relate the conditions under which momentum is and is not conserved.

Describe how the work done on an object relates to its change in energy.
Specify the relationship between work and kinetic energy.
Relate conservation of energy to physics and science in general.
Relate the concept of energy conservation to machines.
Describe efficiency in terms of energy input and output.
Identify and describe the two ultimate sources of energy on Earth.

Thermal Energy and Thermodynamics

Distinguish between thermal energy and temperature.
Describe the meaning of the lowest possible temperature in nature.
Distinguish between heat and temperature.
Distinguish among the units calories, Calories, and joules
Describe the three laws of thermodynamics.
Describe the direction of flow of ordered energy to disordered energy in nature.
Relate the specific heat capacity of substances to thermal inertia.
Describe the role of thermal expansion in common structures.
Relate the open structure of ice to water's maximum density at 4°C.

Magnetism and Electromagnetic Induction

Establish the rule for the attraction and repulsion of magnetic poles.
Relate magnetic field strength to magnetic field patterns.
Describe magnetic field strength in terms of domain alignment.
Relate magnetic field strength to electric wire configurations.
Show how relative directions, fields, and motion affect force.
Describe how Faraday's law is central to the industrial age.
Describe how electromagnetic induction produces the ac of generators.
Describe how generators transfer rather than produce energy.
Describe how voltage and current can be boosted or lowered.
Describe how the nature of light is related to electromagnetic induction.

Waves and Sound

Distinguish among amplitude, wavelength, frequency, and period.
Describe how energy is carried in waves.
Distinguish between transverse and longitudinal waves.
Identify compressions and rarefactions in a sound wave.
Distinguish between the reflection and the refraction of waves
Distinguish between forced vibration and resonance.
Describe how interference is a property of all wave behavior.
Relate the compression and extension of waves due to motion to the Doppler effect.
Describe the production of bow waves and shock waves.
Distinguish noise from musical sounds.

Light

Describe the nature and range of electromagnetic waves.
Relate the transparency of materials to wave frequencies.
Describe the law of reflection.
Describe how refraction is caused by changes in wave speed.
Describe how color depends on the frequency of light.

Relate different speeds of light in a medium to dispersion.
Describe how polarization is related to wave orientation.

Atoms and the Periodic Table

Describe the origin of atoms and the empty nature of their internal structure.
Recognize the elements of the periodic table as the fundamental building blocks of matter.
Describe the structure of the atomic nucleus and how the atomic mass of an element is calculated.
Interpret how elements are organized in the periodic table.
Distinguish between models that describe physical attributes and models that describe the behavior of a system.
Describe how an atom reveals its identity by the light it emits.
Recount how the quantum nature of energy led to Bohr's planetary model of the atom.
Summarize how electrons, when confined to an atom, behave like self-reinforcing wavelike entities.
Show how electrons behave as though they are arranged in a series of shells surrounding the atomic nucleus.

The Atomic Nucleus and Radioactivity

Identify three forms of radioactivity and their effects on living tissue.
Describe how the strong nuclear force acts to hold nucleons together in the atomic nucleus.
Recognize how radioactive elements can be identified by the rate at which they decay and how this decay results in the formation of new elements.
Review how the age of ancient artifacts can be determined by measuring the amounts of remaining radioactivity they contain.
Describe the process by which large atomic nuclei can split in half, leading to the production of energy.
Show how the mass of a nucleon depends on the identity of the nucleus within which it is contained.
Describe the process by which small nuclei can join together, leading to the production of energy, such as occurs in the Sun.

Elements of Chemistry

Define chemistry as a central science that has had a great impact on society.
Introduce the molecule as a fundamental unit of matter.
Describe how materials can be identified by their physical and chemical properties.
Spell out the difficulty involved in distinguishing between physical and chemical properties.
Contrast compounds with the elements from which they are created.
List three guidelines used to name compounds.
Show how nanotechnology is a novel and promising application of chemistry.

How Atoms Bond and Molecules Attract

Identify paired and unpaired electrons in an electron-dot structure.
Use the periodic table to predict the type of ion an atom tends to form.
Describe how ions combine to form ionic compounds.
Relate the properties of a metal to how the atoms of that metal are chemically bonded.
Describe how atoms combine to form covalent compounds.
Differentiate among ionic, polar covalent, and nonpolar covalent chemical bonds.
Show how the shape of a molecule affects the molecule's polarity.
Recognize the important role that molecular interactions play in determining the physical properties of a material.

Mixtures

Recognize mixtures and show how they can be separated by physical means.

Classify the states of matter under the categories of pure and impure.

Describe the components of a solution, and calculate a solution's concentration.

Discuss how solutes dissolve in solvents and how solubility changes with temperature.

Describe the mechanism by which soaps and detergents clean and how this mechanism is aided by hard water.

Identify the industrial means by which water is purified.

Identify the four stages of wastewater treatment.

How Chemicals React

Identify whether a chemical equation is balanced or not balanced.

Calculate the mass of reactants needed to produce a given mass of products.

Describe the requirements that must be met in order for a chemical reaction to occur.

Discuss how a catalyst can speed up a chemical reaction, using the destruction of stratospheric ozone as an example.

Calculate the amount of energy released or absorbed by a chemical reaction, using the bond energies of reactants and products.

Recognize that all chemical reactions are driven by the tendency of energy to disperse.

Two classes of Chemical Reactions

Identify when a chemical behaves like an acid or a base.

Describe how the strength of an acid or base affects the number of ions in solution.

Calculate the pH of a solution given the hydronium ion concentration.

Discuss how the pH of rain and the oceans is affected by atmospheric carbon dioxide.

Identify when a chemical undergoes oxidation or reduction.

Recognize where oxidation and reduction occur in a device that generates electricity.

Provide examples of electrolysis as an application of oxidation–reduction reactions.

Compare and contrast the processes of corrosion and combustion.

****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.

DEPARTMENT OF NATURAL SCIENCES GRADING POLICY

Your grade for this course will be determined solely on the basis of the criteria outlined below. Students will not be allowed to substitute other activities (reports, homework, etc.) to count in place of any of the stated criteria (this means there will be NO extra credit offered). As the tests/exams given in this course are designed to measure the extent to which you have mastered course materials, students should not expect there to be any "curving" of grades.

EVALUATION*

Lecture	75%
Homework	<u>25%</u>
	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.

Withdrawal before the sixth day of the term is considered a “drop” and will not show on the official transcript. Withdrawal from the sixth day of the term through the two-thirds point of the term results in a grade of “W.” Students who withdraw after the two-thirds point will receive either a grade of a “W” (if passing the course at the time of withdrawal), or the course instructor can assign a grade of “WF” (if the student is not passing the course at the time of withdrawal). Students should discuss their withdrawal plans and the grade they will receive with their instructor prior to withdrawal.

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 ([ACADEMIC CALENDAR](#)). 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 eighty percent (80%) of his or her classes in order to be eligible to receive credit for any course. However, due to the varied nature of courses taught at the College, a more rigid attendance policy may be required by individual instructors. At a minimum, a student may be withdrawn from a course(s) after he or she has been absent in excess of ten percent (10%) of the total contact hours for a course. **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, if you use a testing center other than those provided by HGTC, the center may charge a fee for its services.

Lecture Attendance:

For a 15 week course (fall and spring), the allowed number of absences for a MW or TR class is as follows: 6 absences are allowed for lecture, regardless of reason. For a lecture class that meets once a week, the allowed number of absences is two (2). 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.

Part V: Student Resources

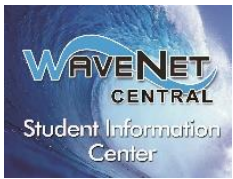


The Student Success and Tutoring Center (SSTC)

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

1. **Academic coaches** for most subject areas, **Writing Center Support**, and **college success skills**.
2. **On-line student success and academic support resources**.

Visit the SSTC website: [Student Success & Tutoring Center](#) and visit the student services tab in your WaveNet account to schedule appointments using TutorTrac. For more information, call: SSTC Conway, 349-7872; SSTC Grand Strand, 477-2113; and SSTC Georgetown, 520-1455. Room locations and Live Chat is available on the SSTC website.



Student Information Center: WaveNet Central (WNC)

WNC offers to all students the following **free** resources:

1. **Getting around HGTC:** General information and guidance for enrollment!
2. Use the [Online Resource Center \(ORC\)](#) for COMPASS support, technology education, and online tools.
3. **Drop-in technology support or scheduled training** in the Center or in class.
4. **In-person workshops, online tutorials and more services** are available.

Visit the WNC website: [Wavenet Central](#). Live Chat and Center locations are posted on the website. Or please call one of the following locations: WNC Conway, 349-5182; WNC Grand Strand, 477-2076; and WNC Georgetown, 520-1473.

Student Testing: (If course is offered in multiple format include this section, delete if only F2F sections are offered.)

Testing in an **online/hybrid** course may be accomplished in a variety of ways:

- Test administered within D2L
- Test administered in writing on paper
- Test administered through Publisher Platforms

Further more 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 RPNOW, 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 Beth Havens, Director of Student Development on the Conway Campus Jaime Davis, Counselor/Advisor on the Georgetown Campus or Kristin Griffin, Counselor on the Grand Strand Campus. These individuals 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, gender, national or ethnic origin, age, religion, disability, marital status, veteran status, sexual orientation, gender identity, or pregnancy in educational programs and/or activities.

Title IX Requirements

Horry Georgetown Technical College prohibits the offenses of domestic violence, dating violence, sexual assault, and stalking. Any student who believe he or she has experienced or witnessed discrimination including sexual harassment, domestic violence, dating violence, sexual assault or stalking is encouraged to report such incidents to one of the College's Title IX Coordinators.

*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 policies:	
Student and prospective student inquiries concerning Section 504, Title II, and Title IX and their application to the College or any student decision may be directed to the Associate Vice President for Student Affairs.	Employee and applicant inquiries concerning Section 504, Title II, and Title IX and their application to the College may be directed to the Associate Vice President for Human Resources.
Dr. Melissa Batten, AVP Student Affairs <i>Title IX Coordinator</i> Building 1100, Room 107A, Conway Campus PO Box 261966, Conway, SC 29528-6066 843-349-5228 Melissa.Batten@hgtc.edu	Jacquelyne Snyder, AVP Human Resources <i>Section 504, Title II, and Title IX Coordinator</i> Building 200, Room 212A, Conway Campus PO Box 261966, Conway, SC 29528-6066 843-349-5212 Jacquelyne.Snyder@hgtc.edu