

**Department of Medical Imaging Sciences**

**DXMS4160—Physics Concepts for Diagnostic Imaging**

**Course Rationale**

This entry level college physics course provides knowledge generally not obtained in many secondary school physics courses. The primary goal of this course is to provide the student with specific knowledge and the physics prerequisites necessary to enter a program in medical imaging. The information presented in this course, and the skills developed form part of the introductory training in radiography, nuclear medicine, magnetic resonance imaging, or sonography.

**Course Description**

The course explores the basic fundamentals of physics with emphasis on medical imaging. Along with basic concepts of mathematics, topics include hemodynamics, electricity, acoustics, optics, and radioactivity.

**Credits/Mode of Instruction** 3 credit equivalent / Web Based

**Time Management to Complete the Course**

The students should plan to spend approximately **8-10 hours** per week on course work. This includes time spent logging on to cover course content. It also includes time you will need to do the assignments, and time spent studying and taking quizzes and examinations. Please keep in mind that the 8-10 hour timeframe is an estimate; some weeks may require more or less time.

**Course Start Dates:**

**This course is designed to have a rolling enrollment. Once the on-line registration form is completed and payment has been received, the student will be notified via email immediately with a confirmation and instruction on how to access the course.**

**Registration Form:**

**Course registration is on-line at the link provided below.**

[https://apps.shp.rutgers.edu/projects/onlinepayment/MIS/MIS\\_physicsform.cfm](https://apps.shp.rutgers.edu/projects/onlinepayment/MIS/MIS_physicsform.cfm)

## ***General Requirements***

The expectation is that the student is either enrolled in a college-level allied health program or plans to enroll in such a program. Course content is delivered primarily via the Internet; therefore, the student is expected to be a self-directed learner capable of functioning effectively in a distance learning environment.

The student will be provided with learning objectives and significant concepts to be encountered in each week. With these as guidelines, the student will be required to read any relevant sections in the assigned textbook. Additional outside reading may be sought by any student who wishes to expand the coverage of the material. This can include traditional textbooks, journal articles, and internet resources

## ***Technical requirements***

The student should possess basic computer skills such as: Internet browsing and searching, e-mailing, word processing, and file transfer (uploading/downloading). The participant must also have remote (off-campus) access to Internet services: including at least Internet browsing capability and e-mail.

**The following programs are used extensively in the delivery of course content: Microsoft Word, PowerPoint, and Adobe Acrobat.**

## ***Moodle Course Management System Orientation***

Rutgers uses the **Moodle Course Management System** to deliver the on-line courses. **All first time students are encouraged to complete an on-line orientation before accessing course material.** The orientation will introduce you to the Moodle environment and guide you through some of its most commonly used features. The orientation may be accessed at: <http://moodle.rutgers.edu/course/view.php?id=9>  
Please note that a login is required to access Moodle trainings.

## **Instructor/Contact Information**

The facilitator/instructor for this course is Mr. Nathan Pinkney. He can be reached by e-mail at [pinknena@shp.rutgers.edu](mailto:pinknena@shp.rutgers.edu) or by telephone at (215) 872-0174.

It is recommended that you use the course email system to communicate with the instructor on any topic concerning this course.

***Class Meeting:*** The class is web-based and course material may be accessed at any time; however, students are required to log on for exams and discussions on specified dates and times.

***Office Hours:*** The primary means of communication/contact is via course e-mail. Students' queries sent via course e-mail will be answered within 72 hours of submission. Telephone conferences will be scheduled on an "as necessary" basis, and have to be requested via e-mail.

## **Course Goals and Objectives:**

### ***Goals***

The aim of the course is to provide the student with specific knowledge and the physics prerequisites necessary to enter a program in medical imaging. It is intended to prepare students to undertake other physics courses that are specific to their overall medical imaging program.

**General Objectives:** Students who successfully complete this course will be able to:

1. Define the various imaging modalities including radiography, nuclear medicine, magnetic resonance imaging, sonography, and endoscopy
2. Discuss the fundamentals of mathematics.
3. Define the various units of measurement.
4. Understand the concepts of work, energy, power, and motion.
5. Discuss the principles of elasticity.
6. Understand the hemodynamics related to medical imaging.
7. Discuss the concepts of sound wave production.
8. Define the concepts of electricity and magnetism.
9. Understand the general concepts of light and optics.
10. Understand general concepts of radioactivity.
11. Understand the concepts of medical imaging informatics

### **Course Units**

The course is comprised of 13 units plus a comprehensive final examination. Learning Resources for each unit consist of on-line PowerPoint and PDF presentations (with practice questions) along with reading assignments. Students are allotted **7 days** to cover the content and requirements for each unit. Specific dates and deadlines are contained in the course calendar. **Students may complete more than one unit per week but must complete at least one.** At the successful completion of this course, the student will receive a “Certificate of Completion” which will include their final grade. Completion of this course **DOES NOT** guaranteed admittance into any of the programs within Department of Medical Imaging Sciences.

### **WEEK/UNIT:**

1. **Topic: Course Introduction and Physics Overview**
2. **Topic: Units and Dimensions**
3. **Topic: Mathematics Fundamentals**
4. **Topic: Force, Motion, Work, Energy, Power**
5. **Topic: Elasticity**
6. **Topic: Hemodynamics**
7. **Topic: Waves and Sound**
8. **Topic: Electricity and Magnetism**
9. **Topic: Light**
10. **Topic: Geometric Optics**
11. **Topic: Radioactivity**
12. **Topic: Diagnostic Imaging Modalities Part I**
  - a) X-ray
  - b) Magnetic Resonance Imaging (MRI)
  - c) Nuclear Medicine
  - d) Positron Emission Tomography (PET)
  - e) Ultrasonography
13. **Topic: Diagnostic Imaging Modalities Part II**
  - a) Diagnostic Ultrasound (Sonography)
  - b) Video Endoscopy Systems
  - c) Medical Imaging Informatics
  - d) Digital Image Storage and PACS
14. **Topic: Comprehensive Final Examination**