SCED 521: Physics in Modern Medicine

Course Description of SCED 521:
Apply and use physics concepts and laws to understand modern medical techniques. Develop lessons to integrate physics into other courses.

Credits: 3 Semester Credits

Prerequisites: None

Course Overview and Objectives:
This course will discuss the physics principles that modern medical techniques utilize. For each topic addressed, we will investigate the history and development, the science and the application of the technique. Although we will discuss higher level physics topics, no background in physics will be required. Furthermore, you will design lessons to present some of the physics and medical content to students in classes that you teach.
The primary objectives of the course are the following:
Students will be able to:
- describe the physical concepts and laws that are used in modern medicine.
- apply physics, biology and chemistry concepts to modern medicine techniques.
- identify common misconceptions about the science content needed to understand modern medicine techniques.
- create connections between physics and medicine in courses that they are teaching.

Required Texts:

Optional Texts:

Technical Requirements:
Access to a computer with high-speed internet access.
Acrobat Reader
Word Processor (preferable Microsoft Word)

Evaluation
Grading Allotment:
- 30 points - Laboratory assignments and problem solving activities
- 30 points – Discussion Board
- 40 points - Lesson Plans
Final Grade assignment by points:
90 ≤ A ≤ 100
80 ≤ B < 90
70 ≤ C < 80
60 ≤ D < 70
0 ≤ F < 60

Course Schedule & Requirements:
This course will use the Blackboard on-line learning management system. Weekly participation in discussion boards will be required. Additionally, there will be assignments and problem solving to be done throughout the course. Finally, each student will be responsible for creating six lessons that incorporate physics in modern medicine. These lessons should be designed to fit into a class that you already teach. The purpose of this course is to increase your knowledge and understanding of physics concepts and pedagogy.

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Unit Topics</th>
<th>Reading (Kane)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Introduction</td>
<td>Ch. 1, p 1-10</td>
</tr>
<tr>
<td>Week 2-4</td>
<td>Fiber Optics</td>
<td>Ch. 2, p 11-54</td>
</tr>
<tr>
<td>Week 5-6</td>
<td>Lasers</td>
<td>Ch. 3, p 55-113</td>
</tr>
<tr>
<td>Week 7-9</td>
<td>Sound</td>
<td>Ch. 4, p 115-186</td>
</tr>
<tr>
<td>Week 10-11</td>
<td>X-Rays</td>
<td>Ch. 5, p 187-258</td>
</tr>
<tr>
<td>Week 12-13</td>
<td>Radioactivity</td>
<td>Ch. 6 &amp; 7, p 259 – 346</td>
</tr>
<tr>
<td>Week 14-15</td>
<td>Magnetic Resonance Imaging (MRI)</td>
<td>Ch. 8, p 347-404</td>
</tr>
</tbody>
</table>

Laboratory assignments and problem solving activities: Virtual laboratory activities designed for students to get experience with the physics concepts. Conceptual and mathematical problems to answer or solve about the topics presented. Some problems will come from the text, others will be supplemented from other sources. Addresses the learning goals of “students will be able to describe the physical concepts and laws that are used in modern medicine.” And “students will be able to apply physics, biology and chemistry concepts to modern medicine techniques.”

Discussion Board: A variety of discussions about experience with the medical procedures, misconceptions about the science content, lesson design, lesson evaluation, etc. Students will be required to post initial responses to each thread and at least two quality replies to other threads. Addresses the object of “students will be able to identify common misconceptions about the science content needed to understand modern medicine techniques.”

Lesson Plans: Design lessons (or extensions) that incorporate Physics in Modern Medicine. For each lesson, you are to include a description of the lesson, how it fits into your class’ scope and sequence, and the student materials for the lesson. Ideally the lessons will fit into what you
already teach, but you can create lessons for a class you might teach in the future. Addresses the learning goal “students will be able to create connections between physics and medicine in courses that they are teaching.”

Example: You may teach a lesson about photosynthesis and could also teach about the mechanism of absorption and how that plays a role with lasers in medical operations.

Example: Teaching about Oil extraction you might go into more depth about how they use, Fiber Optics, Sonar, or Radioactivity.

Example: Teaching about predator-prey relationships, discuss how bats or dolphins use echo-location and how their prey might adapt to become sonically invisible.

**Disability Support Services:**
Any student requesting disability accommodation for this class must inform the instructor giving appropriate notice. Students are encouraged to contact Disability Support Services at (970) 351-2289 to certify documentation of disability and to ensure appropriate accommodations are implemented in a timely manner.

**Honor Code:**
All members of the University of Northern Colorado community are entrusted with the responsibility to uphold and promote five fundamental values: Honesty, Trust, Respect, Fairness, and Responsibility. These core elements foster an atmosphere, inside and outside of the classroom, which serves as a foundation and guides the UNC community’s academic, professional, and personal growth. Endorsement of these core elements by students, faculty, staff, administration, and trustees strengthens the integrity and value of our academic climate.