**Marshall University - College of Science - Physics Department**

**PHY 350 Syllabus (4 Credit hours)**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Title/Number | Biomedical Physics Lecture and Lab / PHY 350 | | |
| Semester/Year | Spring Semester 2015 | | |
| Days/Time | MW 9:00 am – 10:50 am, F 9:00 am – 9:50 am | | |
| Location | SCI 281 | | |
| Instructor | Maria Babiuc Hamilton | | |
| Office Number | SCI 281 | | |
| Phone/Email | 304-696-2754/ babiuc@marshall.edu | | |
| Office Hours | MWF 11:00 am – 12:00 pm | | |
| University Policies | By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy by going to: [www.marshall.edu/academic-affairs](http://www.marshall.edu/academic-affairs) and clicking on “Marshall University Policies”.  Direct: [www.marshall.edu/academic-affairs/policies](http://www.marshall.edu/academic-affairs/policies)  Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment.  General Emergencies: [www.marshall.edu/emergency](http://www.marshall.edu/emergency)  MU Alert Sign Up: [www.marshall.edu/emergency/mualert](http://www.marshall.edu/emergency/mualert) | | |
| Instructor Policies | **Course corrections**: Information in this syllabus was, to the best knowledge of the instructor, considered correct and complete when distributed at the beginning of the term. The instructor, however, reserves the right, acting within policies and procedures of Marshall, to make changes in the course content and/or instructional techniques during the term with or without advance notice or obligation.  **Student Conduct**: Student rights and responsibilities are outlined in the Marshall catalog, page 34. Especially, the infractions and violations listed under "Conduct, Rights and Regulations" will be enforced in this class. Students who disrupt class may be removed from class (failing all of the activities for the day) on a daily basis, as warranted, by the instructor. Continuing behavior problems will result in an instructor drop of the offending student.  **Cell Phones** must remain unused and set to vibrate during regular class times. If an emergency call or message comes through, please leave the class before you answer it. If during an EXAM, ANY of these devices are “on” or “visible”, they belong to me and you get a zero (0) on that exam. | | |
| **Student Learning Outcomes** | | **How students will practice each outcome in this Course** | **How student achievement of each outcome will be assessed in this Course** |
| Students will engage actively with the subject matter and will achieve mastery of the course content, and in the same time enhancing their writing skills and strategies | | Student will actively participate in class and will fulfill the homework and writing assignments. | In class activity, homework, writing assignments, exams |
| Students will enhance their critical thinking skills through various forms of writing: low, medium and high stakes assignments. | | Students will write two research papers, draft will be peer-reviewed. | In class activity, homework, writing assignments, exams |
| Students will understand how the human body interacts with the physical world, by learning about locomotion, blood flow, heat transfer, diffusion by cell walls, bioelectricity of the brain and the heart, feedback and control in respiration, and physics of hearing and vision. | | Students will learn the course material, and will visit a local health center. | In class activity, homework, writing assignments, exams |
| Students will understand the applications of physical methods in medicine, will learn about cutting edge physical diagnostics and imaging methods and will use the modern medical technologies of imaging. | | Students will learn the course material, and will visit a local hospital. | In class activity, homework, writing assignments, exams |
| Students will understand how to design an experiment, to select the equipment, to overcome and find solutions to unexpected problems, to carefully collect data and to obtain and interpret scientifically viable results. | | Students will set-up and perform relatively complex experiments, and will learn how to discern important data from error and how to arrive to the correct conclusion, the same way real researchers do. | In class activity, homework, writing assignments, exams |

**Required Texts and Web Resources**

|  |  |
| --- | --- |
| Textbook | Intermediate Physics for Medicine and Biology, 4th Edition,  by R.K. Hobbie and B. J. Roth |
| Web Page | https://files.oakland.edu/users/roth/web/hobbie.htm |

**Course Description**

|  |
| --- |
| This interdisciplinary course introduces students to modern topics in bio and medical physics, at a level that is accessible to students who have taken introductory physics classes. The purpose of this course is to investigate how known physical principles shape and enable both the living systems as well as the medical instrumentation. The course is targeted towards students involved in health studies.  ***The enhancement of writing skills and strategies is one of the course objectives***.  The course has two parts. The first core topics covered are: the musculoskeletal and the circulatory system, exponential processes in physiology and biology, diffusion and drift in neutral membranes, electricity and magnetism in nerves and muscles, and feedback and control in respiration. The second core topics are: imaging techniques with sound and light, the biological effects of the interaction of photons and charged particles with matter, medical X rays, computed tomography techniques, radiation therapy, nuclear medicine and magnetic resonance imaging. |
| The labs are separated in two sets: (1) on biophysics and (2) on imaging techniques.   |  |  | | --- | --- | | Set 1: Biophysics | Set 2: Medical Physics | | The Human Arm Model | X-ray/CT Scan | | The Human Eye Model | MRI Spectroscopy | | Diffusion-Osmosis | The Infrared Camera | | The Cardiovascular System | ESR Spectroscopy | | Educative Movie: Human Body | Visit to Cabell Hospital | |

**Grading Policy**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Breakdown   |  |  | | --- | --- | | Examination | 30% | | Homework | 20% | | Labs | 10% | | Notebook | 10% | | Writing Assignments | 30% | | Grades   |  |  | | --- | --- | | A | 90% -100% | | B | 80% - 89.9% | | C | 70% - 79.9% | | D | 60% - 69.9% | | F | 59.9% and below | |

**Grading Specification**

|  |  |
| --- | --- |
| Examination | There will be 2 exams; the last one will not be comprehensive. Both exams are open book, from the chapters covered. Each exam will be 15% of the grade and contain a set of problems for 10% and a *medium stake written essay for 5%*. Students are not allowed to bring in any notes or cards, but a calculator will be permitted. If a student misses one exam, and documents within 3 days why the exam was missed, will be allowed to make up the exam. Otherwise, the missed exam will be graded **0**. Students can challenge a grade **2 days** after the exam has been returned. After that, the exam grade is fixed. |
| Homework | Homework problems and *low stake chapter summaries* will be assigned throughout the semester, and due one week after they are assigned. Late homework will be penalized **10%** if returned one week later, **20%** if returned 2 weeks later, and 30% if returned 3 weeks later. After that, there will be a flat penalty rate of **60%***.* |
| Laboratory | This is an open lab, so students can ask for access to the lab beyond the allocated time, to finish the experiment. Students will work in groups and for each experiment, time has to be allocated for:understanding the concepts and planning and setting up the experiment, taking and analyzing the data, and writing the lab report |
| Notebook | Students will be required to keep a record of the experimental setup, all parameters used on the equipment, and all data taken. Since this is the only source of original data, all notebooks should be neat, and contain enough information, that a similarly qualified student can reproduce the results from the notebook alone and arrive at conclusions similar to those at which you arrive. You should keep your notebook in the form of a journal, with an entry for each day you are in the lab, even if not much happened. You should write your notes assuming that someone is going to repeat your work with the same apparatus. Be sure to note everything that could have affected your results or caused problems. The notebooks will constitute a *low stake grade* and will be evaluated for effort and general appearance. |
| Writing Assignments | Students will prepare two research papers, one for each set of the lab experiments. The research papers will use your lab notebook as the primary source of raw data. Referenced articles will supply supporting information and theoretical models. The first research paper will be due at the midterm and the second one will be due at the end of the semester. *A week before the due date each student is required to bring a draft of the paper and peer-review it in class with the lab partners.* Failure to bring a draft for the peer-review will result in **15%** penalty from the essay grade. The research papers should be prepared on word processors and each should be about *3 pages long*, (no less than 700 words), with figures and tables. Those are *high stake writing assignments*, and will be graded upon the following criteria: (1) Content and clarity of presentation, (2) Data manipulation and graphs, (3) Analysis, conclusions, documentation.  ***Extra credit essay:*** You will have the opportunity to earn up to **10%** of the final grade by writing an essay on a subject covered in the course, which is of interest for you. The essay’s length should be 2 to 3 pages, (maximum 1000 words), written single spaced, with font size 12. Include a bibliography at the end. The Internet is a very valuable and up-to-date resource for information on biophysics and medical physics and you are encouraged to make extensive use of it. |