

Physics 185 – Mighty Impacts!

Instructor: Elizabeth Bell

Email: bellea@wlac.edu

Office: MSB 224

Phone: 310-287-4585

Course Description

Students study the physics of impact craters through hands-on experimentation in the lab. Impact height, angle, velocity, and various materials are analyzed using experimental methods and analysis. Students will also image the moon via telescope in an outdoor activity and hypothesize as to how particular craters may have been formed in the early years of the solar system. Students will be encouraged to engage in advanced experimental topics beyond the required analysis as they progress through the course. The class culminates in a presentation given to the STEM faculty and the college community. However, the symposium for this course will be scheduled during the second week of spring semester, on Friday, February 21, 2014 from 9:30 am to 12:00 noon.

Student Learning Outcomes

INSTITUTIONAL OUTCOMES (SLOs):

A. CRITICAL THINKING: Analyze problems by differentiating fact from opinion, using evidence and sound reasoning to specify multiple solutions and their consequences.

C. QUANTITATIVE REASONING: Identify, analyze, and solve problems that are quantitative in nature.

F. TECHNICAL COMPETENCY: Utilize the appropriate technology effectively for informational, academic, personal, and professional needs.

PHYSICS DIVISION PROGRAM OUTCOMES (SLOs):

1. Develop critical thinking skills and move toward autonomous learning.
2. Comprehend, describe, and apply the procedures of physics and understand their limitations.
3. Demonstrate competence in applying the methods of scientific inquiry.
4. Apply the basic physics principles to a wide/diverse range of problems.

Grading

- 20 points** → In-class activity / Impact Cratering experiment 1 (Results)
- 15 points** → Outside Activity / Astrophotography – Imaging the Moon
- 20 points** → In-class activity / Impact Cratering experiment 2 (Results)
- 15 points** → Presentation Run-Through / Special Topic on Impact Cratering
- 30 points** → Presentation Run-Through / Special Topic on Impact Cratering

A=90-100 pts., B=80-90 pts., C=70-80 pts., D=60-70 pts., F<60 pts.

Tentative Schedule

CLASS MEETING	TOPIC
1 Jan 6 Monday	<p style="text-align: center;">Theme for this directed study course: Impact Cratering on the Moon</p> <p style="text-align: center;">(Full class period – 9:35 am to 12:40 am)</p> <p>Introduction –</p> <ul style="list-style-type: none"> • What is impact Cratering? • What can we learn from it? • How can we use experimental observations to predict what caused various types of craters on the moon to form? <p>Introduction to the in-class experiment –</p> <ul style="list-style-type: none"> • The physics of impact cratering • Planning for the in-class experiment <p>Assignment – Read the experimental procedures. Plan the type of set-up and equipment to be used for the experiment. Choose partners. Look at pictures of craters on the moon and hypothesize as to what type of impact may have caused them.</p>
2 Jan 8 Wednesday	<p style="text-align: center;">(Full class period – 9:35 am to 12:40 am)</p> <p>Practice Run –</p> <p style="padding-left: 20px;">Set up your experiment and do some practice runs with your set-up, materials, and measuring devices. Choose a role for each member of your group (launcher, measurement, timer, reset of material, photographer, etc...)</p> <p>Experiment –</p> <p style="padding-left: 20px;">Run your prepared experiments. Make sure to take notes along the way (what works, what doesn't, capture photos, make all measurements, what you can improve on, etc...)</p>
3 Jan 8 Wednesday	<p style="text-align: center;">(Part of TBA time: evening – 1.5 hours)</p> <p>Moon Imaging –</p> <ul style="list-style-type: none"> • Meet on campus to capture images of moon craters using DSLR camera and CCD camera mounted on telescopes.

<p style="text-align: center;">4 Jan 13 Monday</p>	<p style="text-align: center;">(Full class period - 9:35 am to 12:40 am)</p> <p>Image Enhancement -</p> <ul style="list-style-type: none"> • Using Adobe Photoshop to enhance and modify interesting sections of your images. <p>Experiment part 2 planning -</p> <ul style="list-style-type: none"> • Based on your first experiment, and the images you collected, choose something else you may want to test (impact angle, ejecta patterns, high velocity impacts, etc...). <p>Present some results to the class.</p>
<p style="text-align: center;">5 Jan 15 Wednesday</p>	<p style="text-align: center;">(Full class period - 9:35 am to 12:40 am)</p> <p>Experiment part 2-</p> <p style="padding-left: 40px;">Run your prepared experiments. Make sure to take notes along the way (what works, what doesn't, capture photos, make all measurements, what you can improve on, etc...)</p> <p>**Experimental Report Summary Due (Part 1)**</p>
<p style="text-align: center;">6 Jan 20 Monday</p>	<p style="text-align: center;">(Part of TBA Time - 9:35 am to 11:40 am)</p> <ul style="list-style-type: none"> • About 2 hours for Presentation Run-Through • Q&A and office hours after class. <p>**Experimental Report Summary Due (Part 2)**</p>
<p style="text-align: center;">7 February 21 Friday</p>	<p style="text-align: center;">Symposium 9:35 am - 12:30 pm</p>