NATS 105 Course Outline **Fall 2016**
Physical Systems in Earth and Space Science **Lecture – ERF 1033; Lab – SELE 1284**

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Required Items: Text – Physics Made Simple, Christopher G. De Pree
Optional Text – Essentials of Geology, 4th Edition, Stephen Marshak
Participation - iClicker

Disclaimer: The terms of this syllabus are subject to change by announcements in class and on the Blackboard site.

Introduction:
NATS 105 is an exciting course with a laboratory component that provides a foundation in physics and earth and space science. It is the first course in a sequence of two courses, the second of which, NATS 106, focuses on chemical and biological systems. These two courses are focused for elementary education majors, although they do also fulfill a College of LAS General Education Natural World with Lab course requirement. The mathematical requirements are minimal and the emphasis is on developing a useful scientifically based understanding of the amazing world in which we live while simultaneously strengthening analytical and problem-solving skills.

Goals and Outcomes:
Recently, in 2011, the National Research Council (NRC) has released A Framework for K–12 Science Education: Practices, Crosscutting Concepts, and Core Ideas, which identifies key scientific ideas and practices all students should learn by the end of high school. The Framework recommends that science education be built around three major dimensions: scientific and engineering practices; crosscutting concepts; and disciplinary core ideas. This framework was designed to help realize a vision for education in the sciences and engineering in which students engage in science and engineering practices over time and apply crosscutting concepts to deepen their understanding of the core concepts in these fields. We find this framework, and its three dimensions, important not only for pre-college, but also for college science instruction. NATS 105 goals and outcomes are guided by this framework. Students who are enrolled in teacher education programs will find this particularly helpful.

In NATS105, we will explore the dimensions of the framework to varying degrees and engage in various activities that will help you understand scientific ideas and practices, see yourself as doing science, and appreciate the significance of understanding science for everyday life and participation in decision-making and public policy. After taking this course you should be able to apply basic physical principles to develop explanations for observations about everyday natural and human phenomena, make predictions about phenomena that are not directly observable and to assess scientific ideas encountered in the media. In addition you will develop your skills in taking and working with data, basic statistics and mathematics, and graphing.

The dimensions of the Framework particularly relevant for this course are listed below:

<table>
<tr>
<td>1. Scientific Practices
• Asking questions
• Developing and using models
• Planning and carrying out investigations
• Analyzing and interpreting data
• Using mathematics and computational thinking
• Constructing explanations
• Engaging in argument from evidence
• Obtaining, evaluating, and communicating information</td>
<td>2. Crosscutting Concepts
• Patterns
• Cause and effect: Mechanism and explanation
• Scale, proportion, and quantity
• Systems and system models
• Energy and matter: Flows, cycles, and conservation
• Structure and function
• Stability and change</td>
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<tr>
<td colspan="2">3. Disciplinary Core Ideas
Physical Sciences
PS 2: Motion and stability: Forces and interactions
PS 3: Energy
PS 4: Waves and their applications in technologies for information transfer
Earth and Space Sciences
ESS 1: Earth’s place in the universe
ESS 2: Earth’s systems
ESS 3: Earth and human activity</td>
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HOW TO SUCCEED IN OUR COURSE?

Be an active and courteous student in Lecture and Lab:
In Lecture and Lab, our goal is to create a friendly environment that maximizes class time for learning, investigating, and interacting. Students who have been most successful in our course have actively taken notes, utilized in-class time for discussion, and asked questions. As mature and responsible students, we expect you to take full advantage of these opportunities in a courteous and non-disruptive manner.

Familiarize yourself with our course Blackboard site:
The Blackboard site will list important course information including contact information, assignments, and lab material. It will also be the primary source of up-to-date information for what is happening in the course.

Utilize available resources including textbooks, websites, and your peers:
In addition to seeking assistance from instructors and teaching assistants, utilize available textbooks, websites, and your fellow peers. In order to best be prepared for class, we strongly suggest reading the assigned text.

HOW WILL YOU BE GRADED IN OUR COURSE?

Course Grades:
A single letter grade of A, B, C, D or F is assigned at the end of the semester according to the final score you have earned. The grade of incomplete (I) is given only in special cases according to very strict criteria. Please note: September 2nd is the last day to complete late registration and October 28th is the last day to withdraw from a course and receive a grade of W on academic record. Course grades will be determined based on your scored performance in the following areas according to the following percentage weight.

Labs: 20%	Participation: 10%
Pre-Lab Assignments: 5%	Presentation Project: 15%
Reviews Assignments: 20%	Final Exam: 15%
Pop Quizzes: 15%	

Your scores in each area, weighted as above, will determine your final grade on the following normal grading scale. A: 90-100, B: 80-89, C: 70-79, D: 60-69, F: below 60.

Laboratory:
The world around us is a huge laboratory, and gaining a deeper understanding of how it all works is only possible by studying it and making your own observations. Thus, we believe that your laboratory time is an essential part of scientific understanding. You are strongly encouraged to work with others, both in the lab and outside of the classroom – in many cases you will be assigned to work with lab partners. Help your fellow classmates, but understand that you are responsible for your own work and insuring that you understand the material at hand.

Attendance Policy – Your attendance and full participation in all labs is expected. If you arrive late to lab, up to 15 minutes, you will receive 10 % off of your lab grade. If you are 15-30 minutes late to lab, 25% will be deducted from your lab grade. If you are more than 30 minutes late to lab, you should email your TA to see if you are able to attend a different lab section.

Lab Policy – All labs will require you to submit an exercise of your work, which is due at the start of the lab period the following week. A lab turned in after the start of class is considered *late*. Each day the lab is late will result in 20% off. Labs will not be accepted after graded labs have been handed back.

Make-Up Lab Policy - If you know that you will be missing a lab because of extenuating circumstances, please contact an instructor a week in advance of the missed lab to request a make-up lab. If there is no advance notice for a missed lab, no make-up lab option is available.

Review Assignments:
All assignments are online through our Blackboard site. They are always due by Sunday at midnight. For each assignment, you can pause at any time and save your answers. Our goal for you is to master the material, so after submitting your first attempt, you can re-attempt the entire assignment up to 2 additional times. Your overall grade for the assignment will be an average score of the submitted assignments. You are encouraged to work with others on assignments and help your fellow classmates, but in the end you are responsible for your own work and for insuring you understand the material at hand.

Pre-Lab Assignments:
All labs will have a short ~5 question pre-lab assignment that will be due at midnight the day prior to your lab time. For example, if you have lab on Tuesday, your pre-lab assignment will be due Monday at midnight. Similar to your regular assignments, you will have an opportunity to re-attempt the entire pre-lab assignment up to 2 additional times. Your overall grade for the assignment will be an average score of the submitted assignments. You are encouraged to work with others on assignments and help your fellow classmates, but in the end you are responsible for your own work and for insuring you understand the material at hand.

Late Assignments on BB:
By implementing our assignments through Blackboard, we try to provide many opportunities for you to improve your understanding. However, Blackboard does not allow us to easily alter due dates for late work – so we will *not be able to allow for late work to be submitted*. If there are significant extenuating circumstances, you may email us so we can consider appropriate accommodations.

Pop Quizzes:
There will be several pop quizzes (~10 questions) given throughout the semester during the lecture period, in lieu of a larger midterm exam. Our overall goal is to have small checks on your comprehension of course material and reduce the stress of midterm exam period. Make-ups for pop quizzes will not be available. However, at the end of the semester, your lowest pop quiz grade will be dropped.

In-Class Participation:
We will be utilizing the iClicker (http://www.iclicker.com/) class participation remote system. Every student must have their own individual remote. Your same remote can be used for all "iClicker" classes at UIC, even if different courses are taken in the same semester. You can purchase this remote at the UIC bookstore, or online.

Partner Presentation Project:
Towards the middle of the semester, you will be assigned a partner presentation project. You and your partner will be responsible for a short presentation on a scientific topic of your choice. You are encouraged to demonstrate a scientific principal using a PhET simulation or by using the PASCO Spark device.

Final Exam:
The final exam will be based on questions taken from the labs, pop quizzes, iClicker questions, and assignments. The only emergencies that will allow a make-up final are a medical emergency with documentation or a family death with an obituary.

Dropped Scores:
We understand that sometimes things come up (jury duty, illness, etc.), so at the end of the semester before calculating your final grade, we will drop your lowest lab, review assignment, prelab assignment, pop quiz, and 3 lowest iClicker scores.

OTHER ITEMS:

Academic Integrity Policy:
As an academic community, UIC is committed to providing an environment in which research, learning, and scholarship can flourish and in which all endeavors are guided by academic and professional integrity. All members of the campus community-students, staff, faculty, and administrators-share the responsibility of insuring that these standards are upheld so that such an environment exists. Instances of academic misconduct by students will be handled pursuant to the Student Disciplinary Policy: http://www.uic.edu/depts/dos/studentconduct.html

Religious Holidays:
Students who wish to observe their religious holidays shall notify us by the 10th day of the semester of the date(s) when you will be absent. We will make every reasonable effort to honor the request and not penalize the student for missing the class. If you feel unsatisfied with our accommodations, you may request remedy through the campus grievance procedure.
http://oae.uic.edu/docs/ReligiousHolidaysFY20152017.pdf

Disability Accommodation:
UIC is committed to maintaining a barrier-free environment so that students with disabilities can fully access programs, courses, services, and activities at UIC. Students with disabilities who require accommodations for access to and/or participation in this course are welcome, but must be registers with the Disability Resource Center (DRC). You may contact DRC at 312-413-2183 (v) or 773-649-4535 (VP/Relay) and consult the following: http://www.uic.edu/depts/oaa/disability_resources/faq/accommodations.html

UIC Resources:
If you find yourself having difficulty with the course material or any other difficulties in your student life, don't hesitate to ask for help! Come to us, or if it is about an issue beyond this class, please contact your college advisors or get help from any number of other support services on campus. You can get a referral to the right place, or help on the spot, from concerned advisor in the Undergraduate Success Center (USC) at usc@uic.edu.

Course Schedule

	Instructor		Material Covered	Lab	Before Class Readings
Week 1: August 22 – 28					
Mon. Lecture	Hofman/Sit		Welcome to NATS 105	Intro to Pasco	
Wed. Lecture	Hofman	How objects move?	Facts, Laws, Theories		
Fri. Lecture	Hofman		Position, Velocity, and Acceleration		Physics Chapter 3
Week 2: August 29 - September 4					
Mon. Lecture	Hofman		Position, Velocity, and Acceleration	Velocity	
Wed. Lecture	Hofman		Forces		Physics Chapter 4
Fri. Lecture	Hofman		Potential and Kinetic Energy		Physics Chapter 5
Week 3: September 5 – 11					
Mon. Lecture			No School	Acceleration	
Wed. Lecture	Sit	What is in space?	The Big Bang		http://map.gsfc.nasa.gov/universe/
Fri. Lecture	Sit		Galaxies, Solar Systems, Stars, and Planets		https://www.cfa.harvard.edu/seuforum/howfar/howfar.html
Week 4: September 12 – 18					
Mon. Lecture	Hofman		Orbital Motion	Planetary Motion	Physics Chapter 6
Wed. Lecture	Hofman		Orbital Motion		
Fri. Lecture	Sit		Our Solar System		https://solarsystem.nasa.gov/planets/
Week 5: September 19 – 25					
Mon. Lecture	Sit		Our Solar System	Intro to Presentations EVL Tour	
Wed. Lecture	Sit		Age of the Earth		Geology Chapter 10.7-10.8, http://pubs.usgs.gov/gip/geotime/age.html
Fri. Lecture	Hofman / Sit		Controversies in Our Solar System		
Week 6: September 26 – October 2					
Mon. Lecture	Sit	What shapes the Earth?	Intro Earth	Age of the Earth	Geology Chapter 1.5-1.7, 2.1-2.2
Wed. Lecture	Sit		Plate Motion		http://pubs.usgs.gov/gip/dynamic/dynamic.html; https://www.learner.org/interactives/dynamicearth/index.html
Fri. Lecture	Sit		Plate Boundaries		
Week 7: October 3 – 9					
Mon. Lecture	Sit		Plate Boundaries	Plate Tectonics	
Wed. Lecture	Sit		Plate Boundaries		
Fri. Lecture	Sit		Plate Tectonics and People		http://pubs.usgs.gov/gip/dynamic/tectonics.html

Week 8: October 10 – 16					
Mon. Lecture	Sit		Earth's Interior - Melt Production	Plate Motion	
Wed. Lecture	Hofman	How do humans rely on energy?	Energy Transformations Through Time		
Fri. Lecture	Hofman		Energy Transformations Through Time		
Week 9: October 17 – 23					
Mon. Lecture	Sit		Energy Resources – Coal, Oil	Energy Lab	http://www.fe.doe.gov/education/energylessons/coal/gen_howformed.html; https://www.worldenergy.org/data/resources/; http://energy.gov/science-innovation/energy-sources/renewable-energy
Wed. Lecture	Hofman		Energy Resources – Nuclear		
Fri. Lecture	Hofman / Sit		Energy Resources – Natural Gas, Wind, and Solar		
Week 10: October 24 – 30					
Mon. Lecture	Hofman		Energy Footprint and Electricity Introduction	Circuit Boards	Physics Chapter 12
Wed. Lecture	Hofman		Electricity and Magnetism		Physics Chapter 13
Fri. Lecture	Hofman		Electric Circuits		Physics Chapter 14
Week 11: October 31 – November 6					
Mon. Lecture	Hofman		Electric Grids	Practice Presentations	
Wed. Lecture	Hofman	What influences climate?	Introduction to Weather, Climate, and Climate Change		
Fri. Lecture	Hofman		Weather and Seasons		http://spaceplace.nasa.gov/seasons/en/
Week 12: November 7 – 13					
Mon. Lecture	Sit		Evidence for Climate Change	Factors Influencing Climate	http://climate.nasa.gov/evidence/
Wed. Lecture	Sit		Evidence for Climate Change		
Fri. Lecture	Sit		Effects of Climate Change		http://climate.nasa.gov/effects/
Week 13: November 14 – 20					
Mon. Lecture	Hofman		Sustainable Future	In-Class Presentations	
Wed. Lecture	Hofman	Why are waves everywhere?	Introduction to Waves		Physics Chapter 9
Fri. Lecture	Hofman		Sound as Waves		
Week 14: November 21 – 27					
Mon. Lecture	Sit		Light as Waves - Reflection and Refraction	No Lab	Physics Chapter 10
Wed. Lecture	Sit		Light as Waves - Light and Color		Physics Chapter 11
Fri. Lecture	Thanksgiving				
Week 15: November 28 – December 4					
Mon. Lecture	Sit		Light as Waves - Dispersion and Rainbows	Study for Final Exam	
Wed. Lecture	Hofman		Information Transfer through Waves		
Fri. Lecture	Hofman/Sit		Final Items and Wrap-up		
Week 16: December 5 – 11					
Final Exams					