

Fall 2013 NSC 107 Natural Science Lecture Syllabus

John Jay College, CUNY

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Lecture Hall L2.85

Office Hours: M/W 1 – 2:30pm or by

Course Description:

For thousands of years, people have studied the world around us. This inherent curiosity motivates the scientific process. However, it is a collection of careful and replicable methods that drive that process forward. Science is often portrayed in public and even in the classroom as a collection of known facts. But, more accurately, science is a process by which we study things, and the knowledge gained through that process. Understanding the basic components of this process is critical to understanding scientific findings.

This course is a broad history of some of the most important scientific discoveries that have had a profound impact on our understanding of the natural world. This spectrum of understanding ranges from how we have come to understand the age of our universe to how we have come to understand the molecular basis of all living things. Students will examine the scientific processes and evidence behind phenomena and will be challenged to think critically about important discoveries in science.

Understanding science is a critical part of modern life because more than any generation before us we are asked to make decision based on scientific research. Students are introduced to three big theories in science and the evidence that supports these theories: The Theory of the Big Bang, The Theory of Plate Tectonics, and The Theory of Evolution. Within each of these big concepts lies a solid body of scientific reasoning based on modern understandings of physics, geology, chemistry, and biology.

Learning Outcomes

At the completion of this course, students will:

1. Identify and apply the fundamental concepts and methods of a life or physical science.

- Students will identify logical and illogical statements, discuss “fact” and reasoning, explain the basic steps of problem solving, and solve logic puzzles.
- Interact with other students by posting their conceptual understandings and discussions about ideas on BB Discussion Board.
- Recognize science as a creative process by reading and discussing the historical perspective of scientific discovery and participate in laboratory exercises that emphasize problem solving.
- Describe basic concepts in the physical and/or biological sciences toward interpreting the nature of scientific discoveries including the evidence for: the Big Bang Theory, the Theory of Plate Tectonics, and the Theory of Evolution
- Correctly use basic terminology in chemistry, biology and geology. Students actively test their own knowledge and understanding by journal writing or by responding to clicker questions during lecture.

2. Apply the scientific method to explore natural phenomena, including hypothesis development, observation, experimentation, measurement, data analysis, and data presentation.

- Students will differentiate between data analysis and interpretation by actively participating in two class projects which require students to collect, analyze and interpret both self-collected data and professionally collected data.
- Will investigate the basic morphology of organisms and make comparisons between organisms.
- Visit the Museum of Natural History “The Hall of Human Origins” to explore the scientific evidence behind evolution, create a BB thread of your visit and participate in an all class discussion about the evidence.

3. Use the tools of a scientific discipline to carry out collaborative laboratory investigations.

- Students will practice the skills of collaborative learning in a laboratory environment by working in groups to fulfill laboratory exercises. They will do this by allocating specific responsibility to each lab member, discussing their procedure, and finalizing their results. Ultimately, students are responsible for completing their own lab report. Students will assess

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themselves on how responsible they are for their own work as well as how well the whole group works together. (See Rubric)

- Students will practice the skills of collaborative learning in a laboratory environment by working in groups to fulfill laboratory exercises. They will do this by allocating specific responsibility to each lab member, discussing their procedure, and finalizing their results. Ultimately, students are responsible for completing their own lab report. Students will assess themselves on how responsible they are for their own work as well as how well the whole group works together. (See Rubric)
- Appreciate the character of observation and measuring instruments and the relationships between the instruments and what is to be studied.
- Quantify uncertainty and error in measurements by calculating percent error.
- Demonstrate safe lab practice during lab by following lab safety rules and responding appropriately on quizzes.
- Outline the basic modes of measurement by participating in laboratory exercises that require instrumentation.
- Identify basic laboratory equipment and practice methods of experimentation & investigation.

4. Gather, analyze, and interpret data and present it in an effective written laboratory or fieldwork report.

- Students will practically apply observation and/or measurement in a larger scientific context and thereby assess the reasonableness of the data they collect.

5. Identify and apply research ethics and unbiased assessment in gathering and reporting scientific data.

- Students will discriminate between scientific and non-scientific resources by describing the basic components of a scientific investigation, and contrast this with non-scientific statements.
- Judge the merit of scientific vs. pseudo-scientific conclusions.

Pre-requisites: MAT 104 or MAT 105 or the equivalent.

Course website & Readings: Important course announcements, course readings, homework assignments, and other resources will be posted to the course Blackboard website and Visionlearning website. Students must complete a free registration for the Visionlearning site and regularly check the email address they use to register. Readings: B/W – Available in the course textbook and website, W – Available on the course website only, H - Handout

Course parameters: This course consists of a lecture component and a laboratory component, completion of both is mandatory. There are two (2) lecture exams consisting of ~50 - 60 questions and in-class activities, quizzes, and homework. All students must take the exams during the indicated periods. If you have a documented emergency, please see the instructor to discuss options. *Both* exams count; *no* grade is dropped. The laboratory portion, worth 35% of the final grade, will be derived from the scores of two (2) exams, quizzes, laboratory work, and a paper.

Readings: Visionlearning.com *Natural Science/ Process of Science* Revised 5th Ed. by Carpi, A. & Egger, A., Kendall Hunt, Inc., Iowa (2010) For sale in the John Jay bookstore, also you may use the Website

Course Web Site: <http://www.visionlearning.com/myclassroom> and Blackboard

Course Requirements: Access to Blackboard and handouts using PDF format (Adobe Reader: <http://get.adobe.com/reader/>).
Turning Technologies Response Card may be purchased or rented from the JJ B&N bookstore; you must have and use your valid John Jay email address.

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Summary of Course Requirements:

Students are responsible for bringing the Response Cards (Turning Technologies) to every class and for accessing Blackboard to check for new announcements. Students must learn how to use the Discussion Board section on BB. See help options under Blackboard 9.1

Assignments: Will be given through the Blackboard page "Assignments" and will be added throughout the course. Please have an active John Jay email account to receive emails.

Cell phones and similar devices must be turned off in class. No electronic devices of any type (phones, computers, calculators, iPods, iPads etc.) are allowed in course exams. Students found using phones or other electronic devices during an exam will not be given credit for that exam. Students must take exams during the scheduled times. Students with a documented conflict should speak with the professor.

All students using electronic devices during lecture must seek approval by the instructor.

Attendance

An important part of the course grade is earned through in-class participation and laboratory work; therefore, it is essential for students to attend lecture and lab if they wish to be successful. No make-ups will be given for missed in-class activities and laboratory work unless there is a documented medical excuse. If you miss an exam (or foresee that you will miss an exam) for any reason, you **MUST** contact the instructor *as soon as possible*.

Grade of INC (Incomplete)

An Incomplete Grade may be given only to those students who would pass the course if they were to satisfactorily complete course requirements. It is within the discretion of the faculty member as to whether or not to give the grade of Incomplete.

Accommodations for Students with Disabilities: Students with hearing, visual, or mobility impairments; learning disabilities and attention deficit disorders; chronic illnesses and psychological impairments may be entitled to special accommodation under the Americans with Disabilities Act (ADA). In order to receive accommodation, students must register with the Office of Accessibility Services (O.A.S., Room 1233-N, 212-237-8031, <http://www.jjay.cuny.edu/2023.php>), which will define, for both students and faculty, the appropriate accommodations. Faculty are not allowed to work directly with students to attempt to accommodate disabilities, and accommodations cannot be applied retroactively (after-the-fact).

Statement of the College Policy on Plagiarism: Plagiarism is the presentation of someone else's ideas, words, or artistic, scientific, or technical work as one's own creation. Using the ideas or work of another is permissible only when the original author is identified. Paraphrasing and summarizing, as well as direct quotations, require citations to the original source. Plagiarism may be intentional or unintentional. Lack of dishonest intent does not necessarily absolve a student of responsibility for plagiarism. It is the student's responsibility to recognize the difference between statements that are common knowledge (which do not require documentations) and restatements of the ideas of others. Paraphrase, summary, and direct quotation are acceptable forms of restatement, as long as the source is cited. Students who are unsure how and when to provide documentation are advised to consult with their instructors. The library has free guides designed to help students with problems

Summary of Course Requirements:

Students are responsible for bringing the Response Cards (Turning Technologies) to every class and for accessing Blackboard once per day to check for new announcements. Students must learn how to use the Discussion Board section on BB. See help options under Blackboard 9.1

Students must take exams during the scheduled times. Students with a documented conflict should speak with the professor.

This course conforms to the College policy on plagiarism and grading.

Grading Scale:

Exam 1	20%
Exam 2	20%
On-line & in-class Assignments	7.5%
Quizzes	10%
BB Discussions & Participation	7.5%
Laboratory Grade	35%

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Readings: B/W – Available in the course textbook and website, W – Available on the course website only, H - Handout

Date	Lecture Topic and Assignments	Required Reading
Week 1	<ul style="list-style-type: none"> • Course Introduction and Overview • Problem Solving, Logic & Science • Solve Sudoku puzzle finish for HW • Introduce yourself on Blackboard Discussion Section • Discussion Section on BB: What is Science? How does it bring meaning to your life? 	<p>The Scientific Method-B/W Research Methods: The Practice of Science - W</p>
Week 2	<ul style="list-style-type: none"> •The Nature of Science 	The Nature of Science-W Energy
Week 2	<ul style="list-style-type: none"> • Age/Origins of the Universe • Discussion Section on BB: Describe scientific controversy 	Light I-B/W Controversy in Science-W
Week 3	<ul style="list-style-type: none"> • Birth of the Universe • The Early Universe • BB Discussion: What is the Doppler shift? How does it help us to understand stars and galaxies? 	Matter-B/W Atomic Theory I & II-B-W
Week 4	<ul style="list-style-type: none"> • Development of the Universe • NOVA: <i>Back to the Beginning</i> 	Nuclear Chemistry-B/W The Periodic Table-B/W
Week 5	<ul style="list-style-type: none"> • Formation/change of the Earth • Quiz 1 • A Dynamic Earth • In-class 1 paragraph writing assignment: Fossils/Mt. Everest 	Earth Structure-B/W Data: Uncertainty & Error-W
Week 6	<ul style="list-style-type: none"> • NOVA: <i>Earth is Born or A Pale Blue Dot: The Earth</i> • Analyzing & Interpreting Data: In class activity on student-collected data analysis and interpretation. 	Plate Tectonics I & II-B/W Data: Analysis & Interpretation-W
Week 7	EXAM I	STUDY!
Week 7	<ul style="list-style-type: none"> • The Theory of Plate Tectonics • In-class GeoMapApp/Smithsonian volcano and earthquake data mapping 	Organic Chemistry-B/W Nucleic Acids DNA I & II- B/W
Week 8	<ul style="list-style-type: none"> • Evidence of the Origins of Life • In-class writing assignment: What is life? 	Earth's Atmosphere-B/W The Carbon Cycle -W
Week 9	<ul style="list-style-type: none"> • Origins of Life • Miller/Urey experiment • NOVA: <i>How Life Began</i> 	Theories, Hypotheses, Laws Adaptation-W
Week 10	<ul style="list-style-type: none"> • Early Development of Life • Diversity of Life • The Fossil Record: A History of Life <p>Quiz 2</p>	Darwin I-B/W Darwin II-B/W
Week 11	<ul style="list-style-type: none"> • Phylogeny & Organism Change • Life's Diversity 	Genetics I-B/W

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Week 12	Visit the Museum of Natural History	AMNH: <i>Hall of Human Origins</i> <i>Paper and lab presentation</i>
Week 12	<ul style="list-style-type: none"> • BBC: <i>Life – Challenges of Life</i> 	
Week 13	<ul style="list-style-type: none"> • Human Origins • Evidence for Change in Humans 	The Cell: Prokaryotes/Eukaryotes
Week 14	<ul style="list-style-type: none"> • Science in the Modern Era • Wrap up and Review 	Understanding Scientific Journals-B/W The Scientific Literature-W Extra Credit due: Bill Bryson: <i>A Short History of Nearly Everything</i> ; Moon Phases
Final Exam	Lecture hall. Check the registrar's website for the exam schedule	Do not ask to reschedule No make ups will be given

Grades for Completed Courses

Grades for courses that have been completed through the final examination are as follows.

Grade	Numerical Value	Percentage Equivalent
A	4.0	93.0-100.0
A-	3.7	90.0- 92.9
B+	3.3	87.1- 89.9
B	3.0	83.0- 87.0
B-	2.7	80.0- 82.9
C+	2.3	77.1- 79.9
C	2.0	73.0- 77.0
C-	1.7	70.0- 72.9
D+	1.3	67.1- 69.9
D	1.0	63.0- 67.0
D-	0.7	60.0- 62.9
F	0.0	Below 60.0

Origins**Monday/Wednesday Sections** (NSC 107 run as Origins)

Recitation	Lab	Lab #	Experiment	Manual Page
-	8/28 (W)	-	<ul style="list-style-type: none"> • Safety Rules, Perils of Plagiarism, Emergency Contact • Discussion of Report Topics and Requirements • Observations • Units of Measure, Unit Conversion, Significant Figures, and Problem Solving 	3-7
9/9 (M)	9/11 (W)	1A	<ul style="list-style-type: none"> • Units of Measure – Weight, Volume and Length 	12
9/16 (M)	9/18 (W)	1B	<ul style="list-style-type: none"> • Metric System and Density 	15
9/23 (M)	9/25 (W)	2	<ul style="list-style-type: none"> • The Periodic Table and Model Building 	17
9/30 (M)	10/2 (W)	3	<ul style="list-style-type: none"> • Measuring the Wavelength of Light 	18
10/7 (M)	10/9 (W)	5	<ul style="list-style-type: none"> • Conservation of Mass and Energy 	25
10/15 (T)	10/16 (W)	4	<ul style="list-style-type: none"> • Resolution of Matter into Pure Substances 	22
10/21 (M)	10/23 (W)	-	<ul style="list-style-type: none"> • Review • Final Practical Exam #1 	-
10/28 (M)	10/30 (W)	-	<ul style="list-style-type: none"> • Visit the Museum of Natural History (10/28) • Plate Tectonics lab introduction (10/30) 	28
11/4 (M)	11/6 (W)	6	<ul style="list-style-type: none"> • Plate Tectonics (Meet in ITSS Computer Lab) 	28
11/11 (M)	11/13 (W)	10	<ul style="list-style-type: none"> • DNA and Phylogenetics 	38
11/18 (M)	11/20 (W)	7	<ul style="list-style-type: none"> • The Cell 	31
11/25 (M)	-	-	<ul style="list-style-type: none"> • Natural History Museum- Hall of Human Origins Presentations 	-
12/2 (M)	12/4 (W)	9	<ul style="list-style-type: none"> • Comparative Anatomy of Primates 	36
12/9 (M)	12/11 (W)	-	<ul style="list-style-type: none"> • Review • Final Lab Exam #2 	-

Origins**Tuesday/Thursday Sections** (NSC 107 run as Origins)

Recitation	Lab	Lab #	Experiment	Manual Page
8/29 (Th)	T 9/3		<ul style="list-style-type: none"> • Safety Rules, Perils of Plagiarism, Emergency Contact • Discussion of Report Topics and Requirements • Observations • Units of Measure, Unit Conversion, Significant Figures, and Problem Solving 	3-7
9/10 (T)	9/12 (Th)	1A	<ul style="list-style-type: none"> • Units of Measure – Weight, Volume and Length 	12
9/17 (T)	9/19 (Th)	1B	<ul style="list-style-type: none"> • Metric System and Density 	15
9/24 (T)	9/26 (Th)	2	<ul style="list-style-type: none"> • The Periodic Table and Model Building 	17
10/1 (T)	10/3 (Th)	3	<ul style="list-style-type: none"> • Measuring the Wavelength of Light 	18
10/8 (T)	10/10 (Th)	5	<ul style="list-style-type: none"> • Conservation of Mass and Energy 	25
-	10/17 (Th)	4	<ul style="list-style-type: none"> • Resolution of Matter into Pure Substances 	22
10/22 (T)	10/24 (Th)	-	<ul style="list-style-type: none"> • Review • Final Practical Exam #1 	-
10/29 (T)	10/31 (Th)	-	<ul style="list-style-type: none"> • Visit the Museum of Natural History (10/29) • Plate Tectonics lab introduction (10/31) 	28
11/5 (T)	11/7 (Th)	6	<ul style="list-style-type: none"> • Plate Tectonics (Meet in ITSS Computer Lab) 	28
11/12 (T)	11/14 (Th)	10	<ul style="list-style-type: none"> • DNA and Phylogenetics 	38
11/19 (T)	11/21 (Th)	7	<ul style="list-style-type: none"> • The Cell 	31
11/26 (T)	-	-	<ul style="list-style-type: none"> • Natural History Museum- Hall of Human Origins Presentations 	-
12/3 (T)	12/5 (Th)	9	<ul style="list-style-type: none"> • Comparative Anatomy of Primates 	36
12/10 (T)	12/12 (Th)	-	<ul style="list-style-type: none"> • Review • Final Lab Exam #2 	-

Origins**Monday Sections** (NSC 107 run as Origins)

Recitation and Lab	Lab #	Experiment	Manual Page
9/9 (M)	1A	<ul style="list-style-type: none"> • Safety Rules, Perils of Plagiarism, Emergency Contact • Discussion of Report Topics and Requirements • Observations • Units of Measure, Unit Conversion, Significant Figures, and Problem Solving • Units of Measure – Weight, Volume and Length 	3-7, 12
9/16 (M)	1B	<ul style="list-style-type: none"> • Metric System and Density 	15
9/23 (M)	2	<ul style="list-style-type: none"> • The Periodic Table and Model Building 	17
9/30 (M)	3	<ul style="list-style-type: none"> • Measuring the Wavelength of Light 	18
10/7 (M)	5	<ul style="list-style-type: none"> • Conservation of Mass and Energy 	25
10/15 (T)	4	<ul style="list-style-type: none"> • Review/ Recitation • Resolution of Matter into Pure Substances 	22
10/21 (M)	-	<ul style="list-style-type: none"> • Review • Lab Practical Exam #1 	-
10/28 (M)	-	<ul style="list-style-type: none"> • Visit the Museum of Natural History 	-
11/4 (M)	6	<ul style="list-style-type: none"> • Plate Tectonics (Meet in ITSS Computer Lab) 	28
11/11 (M)	10	<ul style="list-style-type: none"> • DNA and Phylogenetics 	38
11/18 (M)	7	<ul style="list-style-type: none"> • The Cell 	31
11/25 (M)	-	<ul style="list-style-type: none"> • Natural History Museum- Hall of Human Origins Presentations 	-
12/2 (M)	9	<ul style="list-style-type: none"> • Review/ Recitation • Comparative Anatomy of Primates 	36
12/9 (M)	-	<ul style="list-style-type: none"> • Review • Final Lab Exam #2 	-

Origins**Saturday Sections** (NSC 107 run as Origins)

Recitation and Lab	Lab #	Experiment	Manual Page
8/31 (S)	1A	<ul style="list-style-type: none"> • Safety Rules, Perils of Plagiarism, Emergency Contact • Discussion of Report Topics and Requirements • Observations • Units of Measure, Unit Conversion, Significant Figures, and Problem Solving • Units of Measure – Weight, Volume and Length 	3-7, 12
9/7 (S)	1B	<ul style="list-style-type: none"> • Metric System and Density 	15
9/21 (S)	2	<ul style="list-style-type: none"> • The Periodic Table and Model Building 	17
9/28 (S)	3	<ul style="list-style-type: none"> • Measuring the Wavelength of Light 	18
10/5 (S)	5	<ul style="list-style-type: none"> • Conservation of Mass and Energy 	25
10/12 (S)	4	<ul style="list-style-type: none"> • Review/ Recitation • Resolution of Matter into Pure Substances 	22
10/19 (S)	-	<ul style="list-style-type: none"> • Review • Lab Practical Exam #1 	-
10/26 (S)	-	<ul style="list-style-type: none"> • Visit the Museum of Natural History 	-
11/2 (S)	6	<ul style="list-style-type: none"> • Plate Tectonics (Meet in ITSS Computer Lab) 	28
11/9 (S)	10	<ul style="list-style-type: none"> • DNA and Phylogenetics 	38
11/16 (S)	7	<ul style="list-style-type: none"> • The Cell 	31
11/23 (S)	-	<ul style="list-style-type: none"> • Natural History Museum- Hall of Human Origins Presentations 	-
12/7 (S)	9	<ul style="list-style-type: none"> • Review • Comparative Anatomy of Primates 	36
12/14 (S)	-	<ul style="list-style-type: none"> • Review • Final Lab Exam #2 	-