

**School for New Learning  
DePaul University**

**SW220 COSMIC HISTORY: FROM BIG BANG TO MANY UNIVERSES  
WINTER 2009**

**Faculty:** Donald Opitz  
**Office:** 348 O'Malley Place, Loop Campus  
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**Location:** O'Hare Campus, TBA, Tuesdays, 6:30-9:30 pm

**Credits:** 2 per competence (up to 4 credits)

**Course Description**

This course invites students to enter into some of the universe's most mysterious spaces, especially black holes, red shifts, and higher dimensions. Scientific studies of the cosmos have reached a remarkable level of consensus, but mysteries continue to boggle astrophysicists' minds. Einstein's Theory of General Relativity, Hubble's expanding universe (with its implication of a Big Bang), and subsequent ideas about dark energy, dark matter, black holes, and other features of cosmology are now supported by a growing body of evidence from studies of background radiation, red shifts, and other astrophysical data. But puzzles remain that compel the boldest of thinkers to reconsider the physics of both the cosmic and the subatomic. This course invites students to engage in critical analyses of twentieth-century developments in the science of cosmic history, its creative process, and its movement toward connecting diverse aspects of the universe within unified theories.

**Prerequisites (and a Note on Mathematics)**

This course is intended as an introduction to cosmology as a science, historical inquiry, and creative process for liberal arts students. No prerequisites are required. Students can expect to encounter mathematical symbolism, but mathematical skill is not required; nor is it intended as a learning outcome. In this course students will be encouraged to develop their *appreciation* and literacy of mathematics (algebra and geometry) as a language and tool of science, as opposed to developing technical, quantitative skills.

**About the Instructor**

Donald Opitz is an Assistant Professor at the School for New Learning (SNL). He received his Ph.D. in the history of science from the University of Minnesota and B.S. in physics and mathematics from DePaul University. He has published journal articles and book chapters on the history of popular science, the physical and biological sciences, science and gender, and science and religion. He is currently writing a book on Victorian country-house science. He also writes on topics in teaching and learning in higher education.

## **Learning Experience**

Class meetings and homework assignments will engage students in learning through a variety of means. In-class activities include lectures and seminar-like discussions on assigned readings, interactive small-group and computerized activities, and student presentations. Written assignments consist of field note-taking, short-essay take-home exams, and optional contributions to discussion threads in the course's Blackboard site (<http://oll.depaul.edu/>).

## **Course Materials**

The following text is required (available at DePaul's bookstore): Joel R. Primack and Nancy Ellen Abrams, *The View from the Center of the Universe: Discovering our Extraordinary Place in the Cosmos*. New York: Riverhead Books, 2006. ISBN 1-59448-255-7. Companion Website: <http://theviewfromcenteroftheuniverse.com>

Additional required readings are available from eReserves at <http://eres.lib.depaul.edu>. Students can expect to read, on average, 50 pages per week.

## **Competences and Outcomes**

Students who satisfactorily complete this course will have demonstrated up to two of the following competences and associated criteria:

S2B: Can describe, differentiate, and explain form, function, and variation within physical systems.

1. Describes the structure and organization of a physical system (for example, galaxy, star, atom) in terms of its constituent parts.
2. Analyses the functions of the physical system's constituent parts.
3. Articulates at least one theory from a physical science that explains the interrelation between form and function of the phenomenon's parts.
4. Discusses how this physical system varies: internally, in comparison to related systems, or through time.

S4: Can describe and explain connections among diverse aspects of nature.

1. Describes one or more natural systems.
2. Explains how parts of the system are interconnected.
3. Demonstrates how such connections are found elsewhere in nature.

H1F: Can describe and explain the roles of individuals, groups, societies, or states in history.

1. Demonstrate an understanding of connections among selected events (involving scientific and religious perspectives) over time.
2. Use an informed historical approach to interpret events or roles of individuals, groups or states.

A-5: Can define and analyze a creative process.

1. Can define the concept of creativity.
2. Can identify, analyze, and describe the components of a creative process in one or more fields of human endeavor.
3. Can explain how engaging in a creative process affects one's perception of the world.

In addition to developing these competences, students who satisfactorily complete this course will have developed the core competences emphasized across the SNL curriculum: skills in communication, inquiry, experiential learning, and decision-making.

### **Evidences and Criteria for Assessment**

Students demonstrate competence through 5 types of evidence: class participation, an astronomical/meteorological observation report, two take-home short-essay examinations, a short reflection essay about a site visit, and a final project. Students' participation and written evidences must demonstrate development toward achieving the outcomes of their competences. Specific assessment criteria for each type of evidence are specified as follows (points are given per competence):

In-class participation. (200 points/competence: 20 points/session.) Students' participation will be assessed based on how well contributions demonstrate development of competences, the breadth and depth of reflection on readings and relevant outside experiences, and the frequency of contributions. Exemplary participation does not directly translate to being very vocal in class. Students who are shy may not always speak up in group settings but may be as engaged as their more outgoing classmates. A range of opportunities to participate in class in a variety of ways will exist, including seminar-like class discussions, question/comment periods during and after slideshows and lectures, small-group and paired activities, weekly "in the news" analyses, Blackboard discussion threads, and individual consultations with the instructor. These varied opportunities are intended to foster equitable opportunities to demonstrate one's participation. Students' in-class participation will be assessed on a weekly basis. ***No participation credit can be given for an unexcused absence*** (see policies on Attendance and Late Work).

Visit to the Adler Planetarium. (200 points/competence.) To provide an opportunity for experiential learning addressing students' enrolled competencies at a scientific institution devoted to astronomical education and research, students are required to visit the Adler Planetarium during the course. Students are asked to write a short reflection essay (at least 500 words in length) discussing their learning experience during the visits and to discuss highlights of their visits during class. Essays should address how the Adler's learning resources promoted students' development in their enrolled competencies.

Two Take-Home Short-Essay Examinations. (300 points/competence.) To encourage mastery of content and development of their enrolled competences and writing skills, students will complete two take-home short-essay examinations during the course. Students will be asked to select questions from among sets that correspond to their enrolled competences. The mid-term examination consists of 2 questions/competence (200 points), and the final examination consists of 1 question/competence (100 points).

Final projects. (300 points/competence.) To encourage students' development of their enrolled competences and core competences in communication, inquiry, experiential learning and decision-making, a final project and presentation will be required. Further information will be provided on a separate handout.

### **Policy on Late Work**

Any missed assignment or work submitted late will merit no credit unless an arrangement was negotiated with the instructor prior to the due date. (Documented emergencies are exceptions.) All negotiated late submissions are subject to a grade reduction of 5% for each business day for which the submission is late.

### **Policy on Attendance**

DePaul University anticipates that all students will attend all class meetings of this course. Attendance is essential to success in this class. Should extenuating circumstances necessitate an absence, when possible students must inform the instructor in advance. Work missed due to absences is subject to the Policy on Late Work. Students missing more than 2 class meetings may be asked to withdraw from the course or receive a failing grade.

### **Academic Integrity Policy**

Violations of academic integrity include but are not limited to the following categories: cheating, plagiarism, fabrication, falsification or sabotage of research data, destruction or misuse of the University's academic resources, alteration or falsification of academic records, and academic misconduct. Conduct that is punishable under the Policy may, at the instructor's discretion, result in sanctions that include a grade of F for the assignment or the entire course and do not preclude SNL or the University from taking further action, including dismissal and/or criminal or civil prosecution. See <http://studentaffairs.depaul.edu/handbook/index.html>.

### **Plagiarism**

Plagiarism is a major violation of academic integrity involving the presentation of the work of another as one's own. Plagiarism includes but is not limited to the following:

- The direct copying of any source, such as written and verbal material, computer files, audio disks, video programs or musical scores, whether published or unpublished, in whole or part, without proper acknowledgment that it is someone else's.
- Copying of any source in whole or part with only minor changes in wording or syntax, even with acknowledgment.
- Submitting as one's own work a report, examination paper, computer file, lab report or other assignment that has been prepared by someone else. This includes research papers purchased from any other person or agency.
- The paraphrasing of another's work or ideas without proper acknowledgment.

### **Grading**

The total points possible for each competence are:

200	Reflection essay on Adler Planetarium visit
200	Class participation
300	Final projects
300	Two take-home short-essay exams
<b>1000</b>	<b>Total</b>

To assign grades, the following grading scale and University grading standards will be used. (Partial percentage points will be rounded up to the nearest whole percentage point.)

<b>A</b>	93-100%	<b>C</b>	73-76%
<b>A-</b>	90-93%	<b>C-</b>	70-72%
<b>B+</b>	87-89%	<b>D+</b>	67-69%
<b>B</b>	83-86%	<b>D</b>	65-66%
<b>B-</b>	80-82%	<b>F</b>	0-64%
<b>C+</b>	77-79%		

- A** Accomplished the stated objectives of the course in an EXCELLENT manner
- B** Accomplished the stated objectives of the course in a VERY GOOD manner
- C** Accomplished the stated objectives of the course in a SATISFACTORY manner
- D** Accomplished the stated objectives of the course in a POOR manner
- F** Did NOT accomplish the stated objectives of the course
- IN** Temporary grade indicating that the student has a satisfactory record in work completed, but for unusual or unforeseeable circumstances not encountered by other students in the class and acceptable to the instructor is prevented from completing the course requirements by the end of the term. The student must request this grade from the instructor by submitting the form, "Contract for the Issuance of an Incomplete (IN) Grade," available on the SNL Web site. At the end of the second quarter (excluding summer) following the term in which the incomplete grade was assigned, a remaining IN grade will automatically convert to an F grade. Ordinarily no incomplete grade may be completed after the grace period has expired. Instructors may not change IN grades after the end of the grace period without the SNL Exceptions Committee's permission.
- PA** Passing achievement in a pass/fail course. (Grades A through D.) **Students who take this course pass/fail must request this option from the instructor. Students who request pass/fail grading cannot revert to A-F grading.**
- W** Automatically recorded when the student's withdrawal is processed after the deadline to withdraw without penalty, but within the stipulated period.
- WA** Administrative withdrawal, assigned by someone other than the student, whether within or outside the stipulated period of withdrawals.
- WN** Administrative withdrawal for no-shows, to indicate a student who was admitted, registered for one term of classes, but never actually came to DePaul.
- FX** Student stopped attending course. This is an apparent withdrawal. The grade can be changed to a W, WA or WN. If not administratively removed, it is scored in the grade point average the same as an F. Students should contact their college office to initiate the request to amend an FX grade. An FX grade may not be changed if it has remained on the student's record beyond 12 months except in extraordinary circumstances.

### **Workload Expectations**

For satisfactory completion of this course, students in this class are expected to spend at least 2 hours involved in outside class preparation for every hour spent in class. For a three-hour class period, that translates to 6 hours of outside work each week.

### **Resources for Student Writers**

A writing guide and resources tailored for SNL students is available at the Website, <http://www.snل.depaul.edu/writing>. DePaul Writing Centers offer further resources and

consulting both on-site and online. Visit the Loop Writing Center in 1620 Lewis, call 312-362-6726, email [wcenter@depaul.edu](mailto:wcenter@depaul.edu), or visit the Website at <http://condor.depaul.edu/~writing/>.

### **Disability Accommodations**

Reasonable accommodations will be provided for students with disabilities on an individualized and flexible basis. The Office of Students with Disabilities (OSD) determines appropriate accommodations through consultation with the student. For certain learning disabilities and/or attention deficit disorders, the Productive Learning Strategies Program (PLuS) determines the appropriate accommodations. See the instructor for more information or call OSD at 773-325-7290 (phone) or 773-325-7296 (TTY); or call PLuS at 773-325-1677.

### **Chronic Illness Initiative**

The Chronic Illness Initiative (CII) provides access to higher education for students disabled by a chronic illness. Students who struggle with illnesses that unpredictably increase and decrease in severity such as chronic fatigue syndrome, rheumatoid arthritis, lupus or illnesses requiring frequent hospitalizations such as cancer or heart disease, may have found it difficult, if not impossible, to meet the requirements of a conventional college program. At the School for New Learning, staff and faculty are compassionate and committed to helping CII students achieve their educational goals. For more information, contact CII at [CII@depaul.edu](mailto:CII@depaul.edu).

### **Adult & Suburban Student Services**

The mission of the Office of Adult & Suburban Student Services is to provide an area where adult students can address their unique and special needs. This office serves as the liaison between adult students and academic and administrative units of the University, helping them to easily navigate DePaul's system. On-site staff members are available at the Adult Student Center, 11017 DePaul Center, Loop Campus; phone: 312-362-6216.

### **DePaul Code of Student Responsibility**

The Code outlines the minimum acceptable level of conduct expected of every student of DePaul University, including respectful classroom behavior. DePaul condemns any form of harassment, discrimination, and/or assault behavior and any such conduct is subject to University disciplinary sanctions. See <http://studentaffairs.depaul.edu/handbook/index.html> for the complete Code.

### **Complaints Regarding Grades, Teaching, or Advising**

Students with complaints about grades, teaching, or advising should first try to resolve the problem with the faculty or staff member involved. If no satisfactory resolution can be reached, students may then discuss the matter with the Associate Dean of SNL, 200 Lewis Center, 312-362-8001.

## Class Schedule

Students are expected to complete reading and written assignments prior to the beginning of the class that meets on the date indicated. All students are expected to read all assigned readings. For each assignment, however, students should complete the options corresponding to their enrolled competences. Each week students should complete a journal entry, prepare for class discussions, and find and report on recent news concerning an issue involving science and religion that relates to class topics or final projects. *This schedule may change with advance notice.*

Date	Topic	Reading Assignment Due	Written Assignment Due
WEEKLY		News story (student choice)	Question on Blackboard
1/6	Introduction to the course		
1/13	Origins of Cosmology	Primack & Abrams, Chaps. 1-2 Hawking, Chap. 1 (eReserves)	Question on Blackboard
1/20	From Antiquity to the Scientific Revolution	Primack & Abrams, Chaps. 2-3	Question on Blackboard
1/27	Relativity	Stix, "Patent Clerk's Legacy" (eReserves)	Question on Blackboard
2/3	Cosmic Stuff	Primack & Abrams, Chap. 4	Question on Blackboard Planetarium visit essay
2/10	Cosmic Time	Primack & Abrams, Chap. 5	Question on Blackboard Take-home examination I
2/17	Cosmic Size	Primack & Abrams, Chap. 6	Question on Blackboard
2/24	Cosmic Inflation	Primack & Abrams, Chap. 7 Hu & White, "Cosmic Symphony" (eReserves)	Question on Blackboard Observation Reports
3/3	The Meaning of it All	Primack & Abrams, Chaps. 9-10 Thuan, "Cosmic Design" (eReserves)	Question on Blackboard
3/10	Class Presentations		Final project PowerPoints
3/17	FINALS WEEK		Take-home examination II: Submit on Blackboard

**Reminder:** Should extenuating circumstances necessitate an absence, when possible students must inform the instructor in advance. Work missed due to absences is subject to the Policy on Late Work, in this syllabus.