

G104: EVOLUTION OF THE EARTH

GENERAL INFORMATION AND SYLLABUS

INSTRUCTORS & CONTACT INFORMATION:

Professor Simon Brassell (office: GY 125).

Associate Instructors: Katarina Topalov (labs), Penny Meighen (labs), and Rituparna Bose (on-line assignments and exams).

All correspondence related to the class should be directed to: geol104@indiana.edu

Office hours with instructors are by arrangement. Please request a meeting by sending an email message and providing a number of possible times.

COURSE INFORMATION:

Explore the course home page <http://www.indiana.edu/~geol104/home.html> and its links.

Course assignments and reminders related to lectures are posted on Oncourse – section 11361.

Lab resources, assignments, and reminders are posted on each Oncourse lab section.

COURSE SYNOPSIS AND OBJECTIVES:

Evolution of the Earth is an introductory science course focused on the 5-billion years of Earth history. It employs a deductive approach to build understanding the significance of rocks and fossils and reconstructing the origins of mountains, continents, and ocean basins. The course focuses on how the characteristics of rocks and fossils provide clues to the reconstruction of the Earth's history and the processes that have shaped its change over geological time. It considers major events in Earth's history and aspects of its evolution that are relevant to contemporary environmental concerns through integrated perspectives. The primary course objectives are to develop an understanding of how and why the Earth changes over time, and the ability to interpret the history of its evolution from preserved rock records.

SCHEDULE OF TOPICS:

Explore the course webpage <http://www.indiana.edu/~geol104/home.html> and its links.

The sequence of topics is outlined on an accompanying page, but their timing is subject to change.

RECOMMENDED TEXT:

Steven M. Stanley: *Earth System History* (2nd or 3rd ed.), which has a website with resources (visit link from pictures of text covers on the class homepage).

The text is critical for those who learn best by reading a written discourse of topics, rather than from visual information provided by class presentations (made available on Oncourse).

LECTURES:

Timing: Tuesdays and Thursdays from 10:10 – 11:00 a.m. in GY 126

Review Sessions scheduled for February 11, March 25, and April 29

Focus: Examine evidence of Earth's history provided by rock and fossil records; explore critical concepts and principles that control geological processes; explain phenomena that shaped changes in Earth's environment over time; emphasize the evolutionary nature of physical, chemical and biological components within the Earth system.

Activities: In-class question/answer sessions discussing critical learning points by deduction; elucidation and interpretation of rock and fossil evidence for Earth's history aided by *Powerpoint* presentations containing images and movies; reinforcement and assessment of key learning points by addressing reflective questions.

Tasks: Prior to lectures read and review resource materials available for download (as pdf files) from *Resources* within Oncourse; print and review question sheets; come to class prepared to discuss and complete in-class questions; participate actively in discussions; take notes and ask questions if you don't understand concepts or materials.

Reflect: Be active in your learning; reflect on your understanding of class materials; review materials to assess your comprehension; use time effectively to learn concepts not just memorize facts; seek assistance during office hours to resolve unanswered questions.

WRITTEN EXAMS:

- Timing: In class: February 16, March 30; Final Exam is Tuesday, May 4, 12:30 – 2:30 p.m.
- Format: Combination of multiple choice and short answer questions. Partial credit is available for partially correct answers to some of the multiple-choice questions. Short answer questions require annotation of figures and diagrams and explanation of concepts or considered in the lectures. Bonus points are integrated into these exams. Sample questions will be distributed and discussed in class during the first review session.
- Topics: Exam 1: rocks and fossils; Exam 2: fossils, sedimentary environments and time; Final Exam: Earth dynamics and integrated Earth history.

LAB CLASSES:

- Timing: Wednesdays, and Thursdays from 12:20 – 2:15 p.m. and 2:30 – 4:25 p.m. in GY 210, also Thursdays from 4:40 – 6:35 p.m. in GY 210
Lab classes begin in week 2 on Wednesday, January 20 or Thursday, January 21.
- Activities: Study geological materials to build practical skills in rock and fossil identification; interpret geological sequences to discern temporal relationships; systematically assess the spatial relationships of rocks to develop abilities in problem solving.
A field trip will be held during the semester to examine some local geology and rock relationships in outcrop. (Details will be provided prior to spring break)
Collaboration in pairs or small groups during the lab class is encouraged, but the answers submitted must be written in your own words.
- Tasks: Preparation through review of information on lab objectives (downloadable pdf file); active involvement and engagement in each lab exercise, ensuring that aims are understood and assignment completed; pose questions if unsure about the lab principles, the tasks to be performed, or the scope of answers expected; complete lab work by determining answers to specific questions.
- Submission: Submit lab report answers via Oncourse within one week (i.e. prior to the next lab class). Answers should reflect your own individual work in your own choice of words. Participation in the lab, verified by attendance sheets, is required for credit.

ON-LINE QUIZZES:

- Timing: Two quizzes (Feb. 25 - Mar. 2 and Apr. 15 - 20). Each is timed (30 min.) and can be taken on-line anytime during the week via Oncourse.
- Format: Combination of multiple choice (choose 1 from 5) and short answer questions. The latter involve answering questions based on interpretation or assessment of images or data sets related to topics covered in the lectures and/or labs.
- Submission: Answers to all quizzes should represent your own individual effort. No collaboration is permitted for the assignments.

LECTURE RESPONSES, REFLECTIVE QUESTIONS:

- Timing: Timing of these assignments has yet to be determined because it depends on the timing of topics. However, all assignments will be announced in advance and posted on Oncourse. Completion of questions is administered through Oncourse.
- Tasks: Response to a series of questions directly based on specific lecture topics and the questions considered during in-class discussions.
- Submission: Answers to all questions should reflect your own work in your own choice of words.

ASSIGNMENTS & GRADING:

- Exams: Two mid-term exams are 8% each; comprehensive final exam is 16%. (32% total)
- Quizzes: Each of the two on-line quizzes represents 5%. (10% total)
- Labs: Each of the twelve lab class reports can earn 4%. (48% total)
- Responses: Each of the five lecture response assignments is worth 2% (10% total)
- Comment: All assigned work should be completed individually, except where group work is expressly permitted. No credit (i.e. 0 points) will be given where there is conclusive evidence of impermissible collusion in the answers submitted for any assignments.

Date	Critical Question	Lecture/Lab/Quiz Topic	Resources	Readings
Jan. 12	Why study the history of the Earth?	Introduction	Intro.pdf	1; 4
Jan. 14	What features describe today's world?	Planet Earth Today	Earth.pdf	2, 35-46 (36-47)
Jan. 19	How and why do rocks differ?	Mineral and Rock Types	Minerals.pdf	2, 25-35 (27-36)
Jan. 20, 21	<i>What constitutes a rock?</i>	Minerals	MineralsLab.pdf	5, 100-123 (106-126)
Jan. 21	What records are preserved in rocks?	Rocks as Historical Records	Rocks.pdf	2, 35-46 (36-47)
Jan. 26	What can be learnt from rock outcrops?	Rocks in Context	RockRec.pdf	1, 5-9 (6-9)
Jan. 27, 28	<i>How can rocks best be distinguished?</i>	Rocks	RocksLab.pdf	5
Jan. 28	How are rocks formed?	Rock Formation	RockContext.pdf	3; 7
Feb. 2	What processes control rock types?	Sedimentary Environments	SedEnvA.pdf	7
Feb. 3, 4	<i>How does water influence rock formation?</i>	Sedimentary Rocks	SedRocksLab.pdf	7; 11-19 (parts)
Feb. 4	What do we know about past life?	Evolution of Life	SedEnvB.pdf	7
Feb. 9	What can be learnt from fossils?	Fossils	Fossils.pdf	7; 11-19 (parts)
Feb. 10, 11	<i>What remnants of life survive in rocks?</i>	Fossils	SedEnvLab.pdf	7
Feb. 11	What will be examined in the test?	Review #1	Review1.pdf	7; 11-19 (parts)
Feb. 16	What will be examined in the test?	Exam #1: Minerals and Rocks	Review1.pdf	7; 11-19 (parts)
Feb. 17, 18	<i>How do rocks reflect environments?</i>	Sedimentary Environments	FossilsLab.pdf	5
Feb. 18	How can the age of a rock be determined?	Age Dating	Strat.pdf	6, 125-142 (129-145)
Feb. 23	Why do rocks differ in age?	Stratigraphic Principles	Strat.pdf	6, 142-149 (145-151)
Feb. 24, 25	<i>How and why are rocks layered?</i>	Stratigraphy	StratLab.pdf	6, 142-149 (145-151)
Feb. 25	How was the Earth different in the past?	Ancient Environments	AncEnv.pdf	10; 12, 269-276 (278-286)
Feb. 25 - Mar. 2	How was the Earth formed?	Quiz #1: Rocks and Fossils	AncEnv.pdf	10; 12, 269-276 (278-286)
Mar. 2	How was the Earth formed?	Earth's Origin	EarlyEarth.pdf	11, 239-252 (247-255)
Mar. 3, 4	<i>What can be learnt from layered rocks?</i>	Stratigraphic Sections	StratSectLab.pdf	11, 239-252 (247-255)
Mar. 4	What was the Earth like when newly formed?	Early Earth	Prebiotic.pdf	11, 256-261 (255-271)
Mar. 9	Is the Earth a typical planet?	Earth Characteristics	EarthChar.pdf	10, 219-232 (231-238)
Mar. 10, 11	<i>How is the Earth's surface described?</i>	Topographic Maps	Field Trip.pdf	10, 219-232 (231-238)
Mar. 11	What systems control the Earth's evolution?	Evolution of the Earth System	Proterozoic.pdf	10, 219-232 (231-238)
Mar. 13-21	Spring Break	Geological Structures	StructGeolA.pdf	9, 202-208 (205-207)
Mar. 23	How and why are some rocks deformed?	Field Trip	TopoMapLab.pdf	9, 202-208 (205-207)
Mar. 24, 25	<i>What rocks and stratigraphic features occur locally?</i>	Field Trip	TopoMapLab.pdf	9, 202-208 (205-207)
Mar. 25	What will be examined in the test?	Review #2	Review2.pdf	9, 202-208 (205-207)
Mar. 30	What will be examined in the test?	Exam #2: Fossils, Sedimentary Environments and Time Structures	Review2.pdf	9, 202-208 (205-207)
Mar. 31/Apr. 1	<i>How are geological structures visualized?</i>	Structures	GeolStructMapLab.pdf	9, 196-213 (200-218)
Apr. 1	How is evidence of rock relationships presented?	Geological Maps	StructGeolB.pdf	9, 196-213 (200-218)
Apr. 6	How are mountains formed?	Earthquakes and Volcanoes	Tectonics.pdf	9, 196-213 (200-218)
Apr. 7, 8	<i>How is a Geological Map Compiled?</i>	<i>Simulated Geological Mapping</i>	GeoLabMaps.pdf	8, 175-193 (177-185)
Apr. 8	Why do Atlantic coastlines match?	Continental Margins	GeoLabMaps.pdf	8, 175-193 (177-185)
Apr. 13	Why study geology at sea?	Marine Geology	TectonicsA.pdf	8, 175-193 (177-185)
Apr. 14, 15	<i>How is Earth history reflected in geological maps?</i>	<i>Simulated Earth History</i>	GeoHistoryLab.pdf	8, 175-193 (177-185)
Apr. 15	How and why do continents move?	Plate Tectonics	TectonicsB.pdf	18-1; 19, 440-443
Apr. 15-20	How and why do continents move?	Quiz #2: The Changing Earth	TectonicsB.pdf	1, 14-18 (15-18); 8
Apr. 20	How has Earth evolved over geological time?	Earth Evolution	EvolChanges.pdf	1, 14-18 (15-18); 8
Apr. 21, 22	No Lab Classes	No Lab Classes	EvolChanges.pdf	12-19 (parts)
Apr. 21, 22	What controls development of life on Earth?	Evolutionary Processes	EvolChanges.pdf	7
Apr. 22	What events are critical in Earth history?	Reflections on Earth History	EvolChanges.pdf	12-2; 17-1
Apr. 27	What events are critical in Earth history?	Reflections on Earth History	EvolChanges.pdf	12-2; 17-1
Apr. 29	What knowledge does the final exam assess?	Final Review	FinalRev.pdf	12-2; 17-1
May. 4	What knowledge does the final exam assess?	Final Exam (12:30-2:30 p.m.): Dynamic Earth and Integrated Earth History	FinalRev.pdf	12-2; 17-1

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LOGISTICS OF LAB CLASSES AND ONLINE SUBMISSIONS OF ASSIGNMENTS

The following points summarize important aspects of the management of the lab classes and other online assignments. The submission process for all of the labs and on-line assignments utilizes the Oncourse tool "Original Test and Survey." All resources are uploaded to the Resources link in Oncourse for the lecture section 11361 or the appropriate lab section.

LAB CLASSES:

- 1 Please print (from Oncourse) and read the lab activities, instructions, and questions prior to the lab class. Bring your copy of the instructions to complete during the lab.
- 2 Sign the sheet to confirm your attendance at each lab. (see #6 below)
- 3 You are encouraged to explore and consider the materials during class discussions and in the lab classes with classmates.
- 4 Please ask questions during class about the materials and objectives of the lab. Your AI is there to assist you. She is also available for consultation by appointment at other times to help with the assignment providing you have made the most of opportunities presented during the formal lab class time.
- 5 Submit your answers to the lab questions via Oncourse prior to the next lab class. Note, however, that your answers for all assignments should represent your own individual effort, written in your own words.
- 6 No credit for submission of answers in Oncourse is available for any student who did **NOT** attend and participate fully in the appropriate lab class.
- 7 It may be possible to attend an alternate lab class in extenuating circumstances (e.g. illness, bereavements), or when conflicts arise (e.g. interviews). Permission for such arrangements must be made *in advance* by a formal email request to geol104@indiana.edu. If approved permission to attend an alternate lab class is for one occasion only; no permanent switching of labs is possible, nor will such permissions to take an alternate lab be given multiple times during a semester.

ON-LINE QUIZZES:

These assignments should represent your own individual effort. Like the in-class written examinations you should not consult with other students while completing these assignments.

ON-LINE REFLECTIVE QUESTIONS:

You are encouraged to discuss these questions during and outside of class with fellow students, but the answers you submit for the assignments must be written in your own choice of words.

GENERAL PRINCIPLES FOR ON-LINE ASSIGNMENTS

- 1 There is an expectation and requirement that answers to all on-line assignments reflect your own efforts. Thus, all your answers to all on-line assignments (lab classes, on-line quizzes and reflective questions) *must be written in your own choice of words*.
- 2 It is a student's responsibility to ensure that his/her assignments are submitted on time via Oncourse. If you are ever concerned whether an assignment has been successfully submitted via Oncourse please send an email message to ask for confirmation. Normally, if you can still access the questions your submission was not successful. All opportunities to resubmit on-line assignments will depend on your timely notification (via email to geol104@indiana.edu) that you encountered problems.