Geology of State and National Parks Revealed
GEOL-G138

Tue - Thu 9:30 – 10:45 AM GY 522

Instructor: Prof. Julie Fosdick
Office Hours: Wed 1:00 PM – 3:00 PM or by appointment
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Syllabus

Course Goals

This course introduces students to the fundamental principles of geology including the composition and structure of the Earth, volcanism and magmatism, weathering and erosion, Earth history, and the origin of natural resources. Additionally, emphasis is placed on the protection and degradation of these natural environments and resources within the parks. Students who participate fully in this course will be able to explain the general geological processes that influence the Earth's diverse landforms and geology as exemplified by national and state parklands.

Specifically, by the end of the course students will be able to:

- Identify and describe the major chemical and physical properties of the Earth.
- Sketch and describe the processes and rock types in the Rock Cycle.
- Given geologic cross-sections and radiometric age data, interpret sequence and timing of geologic events (deposition, faulting, erosion).
- Describe the tectonic plate boundaries and diagnostic geologic features.
- Summarize the evidence that led to the development of Plate Tectonics Theory.
- Sketch the three primary fault types and the associated landforms in terms of tectonic setting.
- Explain how magma chemistry influences eruption behavior of volcanoes.
- Compare and contrast how landforms are controlled by differential weathering of rocks.
- Sketch and describe the physical features of drainage basins and river systems.
- Construct topographic contours from elevation data and interpret topographic and geologic maps.
- Perform basic calculations of geologic processes such as rates of river incision and plate motion.
- Evaluate best land use practices to minimize effects of environmental degradation such as groundwater contamination.
- Predict potential natural hazards and resources in terms of physical variables such as rock type, climate, and tectonic setting.
- Be able to use available technological tools and resources for learning about National Parks.
- Design a visual presentation on the geologic history of national or state parklands.

Course Requirements

Class Attendance & Participation

Class attendance is mandatory! There will be in-class activities, quizzes, and participation credit that require you to be present in class and ensure the course is dynamic and fun. Make-up work is permitted only with Instructor's approval (for absences arranged with in advance, medical emergencies, or other University approved situations). If there is an absolutely unavoidable circumstance, it is your responsibility to contact the Instructor as soon as possible.

Canvas

Course materials, announcements, and grades will be made available to students using the online portal *Canvas* (https://canvas.iu.edu), so be sure to register and stay connected through this resource.

Required reading

There is one required textbook for the class which is available at the IU Bookstore and online. For some topics, the reading assignment will be a handout prepared by the Instructor and available on Canvas. Students are responsible for keeping up with all reading assignments, which will be covered on quizzes and midterm exams. Readings should be completed prior to the class listed in the schedule.

Lillie, R.J., 2005 Parks and Plates: The Geology of Our National Parks, Monuments, and Seashores

Weekly TLC (Tuesday Learning Challenge)

A short quiz will be given at the beginning of class on Tuesdays to assess general understanding of topics and reading assignments covered during the previous week. Quiz questions will consist of three multiple choice/matching/fill-in-the-blank questions. We will review answers together in class. ***Missed TLCs cannot be made up outside of class without Instructor's approval… but good news - your lowest score will be dropped!***

Midterms

Two midterm exams will test students on material covered in lecture and reading assignments. All exams will be held in the regular classroom and are closed-book/notes. Exam questions will be mostly short answer and multiple choice/fill-in-the-blank. Exam material will cover (1) factual knowledge and scientific vocabulary, (2) conceptual understanding of basic rock properties, geologic relationships, or principles, and (3) solving problems such as interpreting relative timing of events, recognizing environmental changes, etc. ***Make-up exams are permitted only with Instructor's approval (for absences arranged with Instructor in advance, medical emergencies, or other University approved situations)***.

Geology field trip

Observation "in the field" and hands-on study of rocks and landforms are integral components of geology. We will take a required one-day class field trip to *Turkey Run State Park* to expand on class topics of sedimentary geology, climate, and paleogeography.

Schedule: The scheduled field trips are either **Saturday, Sept. 26** or **Saturday, Oct. 10.** Students are required to sign for the field trip by Sep. 3rd on a first-come, first served basis.

*****This field trip is a required part of the class*****

In the case of missed fieldtrips due to medical emergencies or other University approved absences, the Instructor will consider an alternative make-up assignment.

Guidebook Final Report

The goal of the Final Report is to prepare a "Geologic Field Guidebook" to a National or State park of your choosing that you could use "in the field" to explain the geology of that area. Each student will write an individual report. Reports must be 10-12 pages in length (including figures), double spaced, 12 pt. font (Times New Roman), and properly referenced. Students are required to select

their parks by **October 15th** via an online sign-up sheet in *Canvas*. The class is encouraged to select a diverse range of parklands… so sign up early if you have a favorite park!

Final Reports must be turned in by 5:00 pm on **December 3rd**; reports submitted thereafter will receive 2% grade reduction for each late day.

Additionally, working in groups of three to five classmates with similar Parkland topics, students will prepare a group classroom presentation to be given at the end of the semester. PowerPoint presentations will be limited to 10 minutes per group and all group members are required to participate. Group presentations constitute 10% of the Final Report grade.

Course Grades

Midterms (30%)
TLCs (20%)
Final term paper (20%)
Classroom & take-home assignments (10%)
Class participation (10%)
Field trip (10%)

Grading scale: A = >89.5%, B = 79.5-89.4%, C = 69.5%- 79.4%; D = 59.5%-69.4%; E = <59.5%.

Other Class Policies

Policy on in-class use of mobile devices

The use of cell phones in class is prohibited. Phones and mobile devices should be on silent during lecture. Students are allowed to take lecture notes on personal laptops, but the privilege may be revoked if excessive computer distractions or lack of class engagement become a problem.

Reasonable Accommodation

It is the policy of Indiana University to provide reasonable accommodations or academic adjustments as needed. These accommodations and adjustments will be made in a timely manner and on an individualized and flexible basis. Please review the University's ADA Policy and/or speak with the Instructor to make the necessary arrangements.

Academic Integrity

As a student at IU, you are expected to adhere to the standards and policies detailed in the *Code of Student Rights, Responsibilities, and Conduct* (http://www.iu.edu/~code/). When you submit an assignment with your name on it, you are signifying that the work contained therein is all yours, unless otherwise cited or referenced. All suspected violations of the *Code* will be handled according to University policies.

******Course syllabus subject to changes with advanced notice by the Instructor******

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Class Schedule (Fall 2015)

Day	Date	Class	Lecture topic	Assigned Reading
Part I: Earth Systems and Our Parks				
Tue	8/25	1	Course overview	
Thu	8/27	2	Plate tectonics	*Parks & Plates* Ch. 1 pp. 1-21
Tue	9/1	3	Geologic time	*Parks & Plates* Ch. 2 pp. 22-27
Thu	9/3	4	Earth materials: rocks and minerals	*Parks & Plates* Ch. 2 pp. 27-34
			******Sign up for geology field trip by Thursday 9/3******	
Tue	9/8	5	Igneous processes	*Parks & Plates* Ch. 2 pp. 34-42
Thu	9/10	6	Sedimentary processes	*Earth (handout)* pp. 232-252
Tue	9/15	7	Past climate and environments	*Earth (handout)* pp. 314-318
Thu	9/17	8	Metamorphic processes	*Earth (handout)* pp. 269-285
Tue	9/22	9	Geology of the Illinois Basin & Turkey Run State Park	*Earth* pp. 253-264; *Parks & Plates* pp. 215-227
Thu	9/24	*10*	**MIDTERM 1**	Review all readings and lectures
			Turkey Run State Park Field Trip A: <u>Saturday, September 26th</u>	
Part II: Divergent Plate Boundaries				
Tue	9/29	11	Continental rifting - Tetons	*Parks & Plates* Ch. 3 pp. 42-45, 54-60
Thu	10/1	12	Continental rifting - Death Valley	*Parks & Plates* Ch. 3 pp. 60-68
Tue	10/6	13	Formation of oceanic crust	*Parks & Plates* Ch. 3 pp. 69-71
Thu	10/8	14	Plate tectonics revisited: birth of a new paradigm	*Earth (handout)* pp. 41-53
			Turkey Run State Park Field Trip B: <u>Saturday, October 10th</u>	
Tue	10/13	15	Passive continental margins: Biscayne	*Parks & Plates* Ch. 4 pp. 72-79
Thu	10/15	16	Ancient passive continental margin: Grand Canyon	*Parks & Plates* Ch. 4 pp. 80-88
			******Selecting of topic for Final Report due 10/15******	
Part III: Convergent & Transform Plate Boundaries				
Tue	10/20	17	Cascadia subduction zone: Cascade Volcanoes	*Parks & Plates* Ch. 5 pp. 91-118
Thu	10/22	18	Southern Alaska subduction zone: Mt. St. Elias	*Parks & Plates* Ch. 5 pp. 119-128
Tue	10/27	19	The North American Cordillera	*Earth (handout)* pp. 185-189; 459-470; 480-481
Thu	10/29	20	Collisional mountain belts: Appalachians	*Parks & Plates* Ch. 6 pp. 129-148
Tue	11/3	21	Transform plate boundaries: San Andreas Fault	*Parks & Plates* Ch. 7 pp. 149-166
Thu	11/5	22	**MIDTERM 2**	Review all readings and lectures
Part IV: Hot spot volcanism				
Tue	11/10	23	Oceanic hot spot volcanism: Hawaii	*Parks & Plates* Ch. 8 pp. 167-192
Thu	11/12	24	Continental hot spot volcanism: Yellowstone	*Parks & Plates* Ch. 9 pp. 193-208
Tue	11/24	-	*Thanksgiving holiday - no class*	
Thu	11/26	-	*Thanksgiving holiday - no class*	
Part V: Building the North American Craton				
Tue	12/1	25	The North American Craton	*Parks & Plates* Ch. 10 pp. 209-238
Thu	12/3	26	Accreted Terranes	*Parks & Plates* Ch. 11 pp. 239-254
			******Guidebooks Due 12/3******	
Tue	12/8	27	**Final group presentations**	
Thu	12/10	28	**Final group presentations**	