

## **Geos 101 – The Dynamic Earth**

**Lectures:** Mon., Wed., Fri. – 10:30 AM – 11:30 AM – NSCI 201B

**Labs:** Tues., 9:45 AM – 12:45 PM, 6:00 – 9:00 PM, 2:00 – 5:00 PM (Honors);  
Wed., 11:45 – 2:45 PM, 6:00 – 9:00 PM; Thurs., 9:45 AM – 12:45 PM, 5:20 –  
8:20 PM – NSCI 230

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**Office Hours:** Monday & Friday 9:00-10:30 a.m., or by appointment

### **Required text:**

Smith, G. A. and Pun, A., 2006. **How Does Earth Work?** Pearson Prentice Hall, New Jersey, 639 p.

### **Other required materials:**

Geos 101: The Dynamic Earth Laboratory Manual

### **Introduction:**

The Earth is a dynamic planet that is constantly changing. Physical geology is concerned with understanding the processes that operate at or beneath the surface of the Earth, and the materials on which those processes operate. An understanding of these processes and materials is essential for finding and utilizing Earth's resources, for occupying our planet in an environmentally responsible manner, and for responding to natural changes at the Earth's surface. The goals of this course are to understand and identify common minerals and rocks, to understand the structure and composition of the Earth, to understand basic processes on and within the Earth and how these relate to resources (including water!), and to view the Earth as a dynamic system.

### **Attendance:**

A university classroom is an adult environment and, therefore, attendance at lectures is entirely up to you. However, it is unlikely that you will perform well in this class without attending lectures. It is strongly recommended that you attend all labs and class sessions.

### **Grades:**

Your final grade for this course will be determined as follows:

- Mid-term examination #1 – 15%
- Mid-term examination #2 – 15%
- Laboratory exercises – 40%
- Final examination – 30%

The two mid-term examinations will encompass the first and second thirds of the course respectively. The final examination will be cumulative, encompassing material from the entire semester, although the emphasis will rest heavily on the final third.

**The final examination will be given only on the day and time scheduled by the university.**

### **Labs:**

A fundamental goal of this class is to give you the tools to interpret the geologic features that you encounter on a daily basis. Reading topographic maps, interpreting aerial photos, and identifying rocks and minerals are practical skills that will be of use to you whether you decide to become a geologist or not. It is in the lab that you will have the opportunity to apply your geological knowledge and practice these new skills.

A pre-lab is found at the start of each lab exercise in your lab manual. Your lab manual will be handed out to you at the start of your first lab. The pre-lab is designed to introduce some basic concepts and to get you thinking about the material that will be covered in the next week's lab. Pre-labs are to be handed in to your TA at the start of your lab period the next week.

Completion of lab assignments is essential for understanding course material. The labs are designed so that you can complete them within the three hour lab period. However, labs will require that you commit yourself for most, or all, of the 3 hours. Do not schedule other activities during any portion of the lab period. If you have a conflict, you can make it up by attending another lab section. Please notify your TA the week before if this will be necessary.

You will be allowed to drop one lab mark from your final grade if, and only if, you have completed all of the laboratory assignments for the semester.

### **Field Trips:**

The first two labs of the semester are local field trips. These trips will give you a chance to examine rocks and minerals in their natural environment and will provide you with an appreciation for the types of rocks and geologic structures in and around Fairbanks. Be sure to wear appropriate clothing – e.g. sturdy shoes or boots, a warm jacket and raincoat (just in case!). The field trips will “go” regardless of weather. Attendance on the field trips is mandatory and a “missed” field trip lab cannot be made up in later weeks.

### **Questions:**

There is no such thing as a foolish question. If you don't understand what I'm saying, please stop me and ask for clarification. Chances are someone else in class isn't understanding either! If you're not comfortable asking questions in class, please ask after the lecture or send an e-mail or drop by my office so we can clear up any confusion. That's what I'm here for!

**Tentative Lecture Schedule:**

| <b>Date</b>             | <b>Lecture/Lab Topic</b>                                     | <b>Reading</b>                 |
|-------------------------|--|--------------------------------|
| September 2 (F)         | Introduction   | Chpt. 1 – p. 2-15              |
| <b>September 5 (M)</b>  | <b>Labor Day – no classes</b>                                |                                |
| September 7 (W)         | An overview of planet Earth                                  | Chpt. 9                        |
| September 9 (F)         | Mineralogy: the basics                                       | Chpt. 2 – p. 29-36             |
|                         | <b>Lab #1 – <i>The 3 major rock types</i> – Field Trip</b>   | Chpt. 3                        |
| September 12 (M)        | Mineralogy: structures                                       | Chpt. 2 – p. 36-44             |
| September 14 (W)        | Mineralogy: identification                                   | Chpt. 2 – p. 24-29             |
| September 16 (F)        | Magma and intrusive rocks                                    | Chpt. 4 – p. 82-93             |
|                         | <b>Lab #2 – <i>Folds and faults</i> – Field Trip</b>         |                                |
| September 19 (M)        | Volcanoes, lava and extrusive rocks                          | Chpt. 4 – p. 73-82; 93-100     |
| September 21 (W)        | Igneous rocks  | Chpt. 4 – p. 66-73             |
| September 23 (F)        | Weathering   | Chpt. 5 – p. 102-111           |
|                         | <b>Lab #3 – <i>Mineral properties and identification</i></b> |                                |
| September 26 (M)        | From sediment to sedimentary rocks                           | Chpt. 5 – p. 111-120           |
| September 28 (W)        | Sedimentary environments                                     | Chpt. 5 – p. 120-131           |
| <b>September 30 (F)</b> | <b>Mid-term Exam #1</b>                                      |                                |
|                         | <b>Lab #4 – <i>Igneous rocks and processes</i></b>           |                                |
| October 3 (M)           | Soils and paleosols  | Chpt. 14                       |
| October 5 (W)           | Metamorphic processes  | Chpt. 6 – p. 134-152; 158-165  |
| October 7 (F)           | Foliation: telling metamorphic rocks apart                   | Chpt. 6 – p. 152-157           |
|                         | <b>Lab #5 – <i>Sedimentary rocks and services</i></b>        |                                |
| October 10 (M)          | Geologic time and relative sequence of events                | Chpt. 7 – p. 166-179           |
| October 12 (W)          | Radiometric dating and absolute ages                         | Chpt. 7 – p. 180-195           |
| October 14 (F)          | Folds and ductile deformation                                | Chpt. 11 – p. 270-274; 280-290 |
|                         | <b>Lab#6 – <i>Metamorphic rocks and processes</i></b>        |                                |

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| October 17 (M)         | Maps   |                        |
| October 19 (W)         | Geologic maps and structures                                 | Chpt. 11 – p. 275      |
| October 21 (F)         | Faults, fractures and brittle deformation                    | Chpt. 11 – p. 274-279  |
|                        | <b>Lab #7</b> – <i>Understanding topographic maps</i>        |                        |
| October 24 (M)         | Earthquakes: distribution and magnitude of hazard            | Chpt. 11 – p. 291-305  |
| October 26 (W)         | Seismology and structure of Earth's interior                 | Chpt. 8                |
| October 28 (F)         | Earth's magnetic field                                       | Chpt. 10               |
|                        | <b>Lab #8</b> – <i>Geologic maps and geologic structures</i> |                        |
| October 31 (M)         | Paleomagnetism and continental drift                         | Chpt. 12 – p. 308-310. |
| November 2 (W)         | Tectonics: plates and plate boundaries                       | Chpt. 12 – p. 311-341  |
| November 4 (F)         | Tectonics: crustal dynamics                                  | Chpt. 12 – p. 342-348  |
|                        | <b>Lab #9</b> – <i>Earthquakes and seismic waves</i>         |                        |
| November 7 (M)         | Tectonics: building mountains                                | Chpt. 13               |
| <b>November 9 (W)</b>  | <b>Mid-term Exam #2</b>                                      |                        |
| November 11 (F)        | Mass wasting   | Chpt. 15               |
|                        | <b>Lab #10</b> – <i>Earth magnetism and faults in Alaska</i> |                        |
| November 14 (M)        | Rivers and deltas I  | Chpt. 16               |
| November 16 (W)        | Rivers and deltas II   | Chpt. 16               |
| November 18 (F)        | Groundwater: fundamentals                                    | Chpt. 17 – p. 482-504  |
|                        | <b>Lab #11</b> – <i>Air photos and remote sensing</i>        |                        |
| November 21 (M)        | Groundwater: chemistry and karst                             | Chpt. 17 – p. 504-515  |
| November 23 (W)        | Wind and deserts   | Chpt. 20               |
| <b>November 25 (F)</b> | <b>Thanksgiving – no classes</b>                             |                        |
|                        | <b>Thanksgiving – no labs this week</b>                      |                        |
| November 28 (M)        | Oceans and ocean processes                                   | Chpt. 19               |
| November 30 (W)        | Glaciers   | Chpt. 18 – p. 516-528  |

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| December 2 (F)         | Glaciers: erosion and deposition              | Chpt. 18 – p. 528-548                       |
|                        | <b>Lab #12</b> – <i>Groundwater hydrology</i> |   |
| December 5 (M)         | Ice Ages and Permafrost                       | Chpt. 18 – p. 548-563                       |
| December 7 (W)         | Global change                                 |   |
| December 9 (F)         | Global change – a geological perspective      |   |
|                        | <b>Lab #13</b> – <i>Glacial geology</i>       |   |
| December 12 (M)        | Mineral and energy resources in Alaska        |   |
| <b>December 14 (W)</b> | <b>Final Exam</b>                             | <b>10:15 a.m. - 12:15 p.m. in NSCI 201B</b> |