

**GEO. 420K - INTRODUCTION TO FIELD AND STRATIGRAPHIC METHODS**  
**MONDAY/WEDNESDAY SECTIONS, SPRING 2015**

**LECTURE:** Monday and Wednesday, 2:00 - 3:00 p.m.; JGB 2.218

**LAB:** Friday 2:00 - 5:00 p.m. in EPS 2.104 (#26835), EPS 2.136 (#26840), EPS 4.104 (#26845), JGB 2.308 (#26850)

**INSTRUCTORS:** Dr. Mark Helper, JGB 4.112  
helper@jsg.utexas.edu  
Phone: Office - 512- 471-1009  
Mobile - 512-924-2526

Dr. Timothy (Tip) Meckel  
tip.meckel@beg.utexas.edu  
Phone: Office - 512-471-4306

**TEACHING ASSISTANTS:**

EPS 2.104	Alissa Kotowski	kotowski@utmail.utexas.edu
EPS 2.136	Tomas Capaldi	tcapaldi@utmail.utexas.edu
EPS 4.104	Daniel Arnost	danielarnost@utexas.edu
JGB 2.308	Sarah George	sgeorge@wellesley.edu

**OFFICE HOURS:** Dr. Helper: T.B.A.  
Dr. Meckel: T.B.A.

**GRADING:**

Field Projects .....	55%	There will be no makeup exams or projects.
Labs .....	15%	
Lab Exam(s).....	15%	
Class Exam(s) .....	15%	

**PREREQUISITES:** A grade of C or better in Geo. 416K, 426P, and 416M (Geo. 426P may be taken concurrently with 420K) for B.S. Geology, or C or better in Geo. 416M and Geo. 416K for G.E.H., Geophysics, Hydrogeology and B.A. Geology. If you do not have these prerequisites and have not already done so, see one of us immediately.

**OTHER ITEMS:** By registering for Geo. 420K, students agree to be available for field trips on at least **6 (six)** weekends. See the attached schedule for the dates trips are planned. In addition some Friday labs will be conducted off campus, but during normally scheduled lab hours.

**Announcements, information pertinent to field trips, labs, etc. will be posted on the 420K Canvas site. Check it often for information about materials for upcoming labs and field trips.**

Academic dishonesty will not be tolerated. Anyone in violation of University policy (see Student Handbook) will receive a failing grade and is subject to additional punitive measures, which may include expulsion from the University.

**REQUIRED TEXT:** Coe, A. L., Geological Field Techniques. Wiley-Blackwell, 323 pp.  
Lisle, R.J., Brabham, P.J. and Barnes, J.W., Basic Geologic Mapping, 5<sup>th</sup> edition, Wiley-Blackwell, 216 pp.

**WEB SITE:** UT Canvas site for Geo420K

**REQUIRED ITEMS:** See Attached list. These items are available in a supply packet at the University Coop.

**GEO. 420K - INTRODUCTION TO FIELD AND STRATIGRAPHIC METHODS**  
**TUESDAY/THURSDAY SECTIONS, SPRING 2015**

**LECTURE:** Tuesday and Thursday, 2:00 - 3:00 p.m.; JGB 2.218

**LAB:** Friday 2:00 - 5:00 p.m. in JGB 3.116 (#26855), JGB 3.120 (#26860), JGB 3.204 (#26865), JGB 3.222 (#26870)

**INSTRUCTORS:** Dr. Brian Horton, JGB 5.220A                      Dr. Randall Marrett, JGB 4.126  
horton@mail.utexas.edu                                      marrett@mail.utexas.edu  
Phone: Office - 471-1869                                      Phone: Office - 471-2113

**TEACHING ASSISTANTS:**

JGB 3.116	Peter Laciano	peter.laciano@utexas.edu
JGB 3.120	Thomas Hundley	halhundley@utmail.utexas.edu
JGB 3.204	Margret Odum	modlum@utmail.utexas.edu
JGB 3.222	David Brown	davidmbrown@utexas.edu

**OFFICE HOURS:** Horton: T.B.A.  
Marrett: T.B.A.

**GRADING:** Field Projects ..... 55%                      There will be no makeup  
Labs ..... 15%    exams or projects.  
Lab Exam(s) ..... 15%  
Class Exam(s) ..... 15%

**PREREQUISITES:** A grade of C or better in Geo. 416K, 426P, and 416M (Geo. 426P may be taken concurrently with 420K) for B.S. Geology, or C or better in Geo. 416M and Geo. 416K for G.E.H., Geophysics, Hydrogeology and B.A. Geology. If you do not have these prerequisites and have not already done so, see one of us immediately.

**OTHER ITEMS:** By registering for Geo. 420K, students agree to be available for field trips on at least **6 (six)** weekends. See the attached schedule for the dates trips are planned. In addition some Friday labs will be conducted off campus, but during normally scheduled lab hours.

**Announcements, information pertinent to field trips, labs, etc. will be posted on the 420K Canvas site. Check it often for information about materials for upcoming labs and field trips.**

Academic dishonesty will not be tolerated. Anyone in violation of University policy (see Student Handbook) will receive a failing grade and is subject to additional punitive measures, which may include expulsion from the University.

**REQUIRED TEXT:** Coe, A. L., Geological Field Techniques. Wiley-Blackwell, 323 pp.  
Lisle, R.J., Brabham, P.J. and Barnes, J.W., Basic Geologic Mapping, 5<sup>th</sup> edition, Wiley-Blackwell, 216 pp.

**WEB SITE:** UT Canvas site for Geo420K

**REQUIRED ITEMS:** See Attached list. These items are available in a supply packet at the University Coop.

**GEO. 420K – FIELD TRIP DATES**  
***Monday/Wednesday Sections, SPRING 2015***

By registering for GEO 420K, you agree to be available for field trips on at least 6 weekends. The field trip weekends this semester are:

- Trip 1: January 31 or February 1 – Dr. Helper
- Trip 2: February 14 AND 15– Drs. Helper & Marrett
- Trip 3: February 28 or March 1 – Dr. Helper
- Trip 4: April 4 or 5 – Dr. Meckel
- Trip 5: April 18 or 19 – Dr. Meckel
- Trip 6: May 2 or 3 – Dr. Meckel

These dates are provided to you now so that you can plan your Spring semester weekend activities accordingly. Unlike other courses, the field trips are not supplementary to the classroom work; *they are 55% of your grade*. **Your attendance and participation in all field exercises are required for a passing grade, without exceptions.** Specific information for each trip, *including which days you are expected to attend*, will be posted on the “Trips” pages of the class Canvas site and can be found in the Lab/Lecture Manual.

A list of materials needed for the field exercises is attached



**GEO. 420K – FIELD TRIP DATES**  
***Tuesday/Thursday Sections, SPRING 2015***

By registering for GEO 420K, you agree to be available for field trips on at least 6 weekends. The field trip weekends this semester are:

- Trip 1: February 7 or 8 – Dr. Marrett
- Trip 2: February 21 AND 22– Drs. Marrett & Helper
- Trip 3: March 7 or 8 – Dr. Marrett
- Trip 4: March 28 or 29 – Dr. Horton
- Trip 5: April 11 or 12 – Dr. Horton
- Trip 6: April 25 or 26 – Dr. Horton

These dates are provided to you now so that you can plan your Spring semester weekend activities accordingly. Unlike other courses, the field trips are not supplementary to the classroom work; *they are 55% of your grade*. **Your attendance and participation in all field exercises are required for a passing grade, without exceptions.** Specific information for each trip, *including which days you are expected to attend*, will be posted on the “Trips” pages of the class Canvas site and can be found in the Lab/Lecture Manual.

A list of materials needed for the field exercises is attached.

LECTURE AND LAB SCHEDULE - GEO. 420K, MW Sections, 2015

<u>Date</u>	<u>Lecture</u>	<u>Lab</u>
1/21	Overview and Introduction The Geologic Compass – Strike/Dip, Bearing/Plunge (M. H.)	1. Compass/Pace and Compass Map*
1/26	Metamorphic Rocks: Textures and Fabrics in Tectonites (M. H.)	2. Describing Metamorphic Rocks
1/28	Field Trip 1 Preparation – Precambrian Geology of the Llano Uplift <b>Field Trip 1: Precambrian Geology, Llano Co. (1/31 or 2/1)</b>	
2/2	Base Maps, Grids and Location Methods (M. H.)	3. Topographic Maps & GPS
2/4	The Global Positioning System (M. H.)	
2/9	Geologic Map Patterns; Strike Lines (M. H.)	4. Geologic Maps I
2/11	Field Trip 1 Debrief; Trip 2 Prep. (M. H.) <b>Field Trip 2: Mapping Project 1 (2/14 AND 2/15)</b>	
2/16	Dip Calculation and Unit Thicknesses from Maps (M. H.)	5. Geologic Maps II
2/18	Introduction to Faulting (R. M.)	
2/23	Introduction to Folding (R. M.)	6. Geologic Maps III/ Folds and Faults
2/25	Field Trip 2 Debrief; Trip 3 Preparation <b>Field Trip 3: Mapping Project 2 (2/28 or 3/1)</b>	
3/2	Cross Section Construction (R. M.)	7. Cross Sections
3/4	Down Plunge Viewing/Geologic Maps as Cross Sections (R. M.)	
3/9	Digital Mapping Tools and Techniques (M. H.)	8. No Lab
3/11	Field Trip 3 Debrief (M. H.)	
3/14 - 3/21 SPRING BREAK		
3/23	Sedimentary Rock Description: Essential Elements	9. Rock and Rock Unit Descriptions
3/25	Vertical Successions in Clastic Strata	
3/30	Basic Stratigraphy and Approaches to Subsurface Mapping	10. Net Sand Isopach Mapping
4/1	Texas GOM history and Tertiary Regional Context & Trip 4 Prep. <b>Field Trip 4: Tertiary Clastics (4/4 or 4/5)</b>	
4/6	Scales of Cyclicity and Correlation of Sedimentary Rocks	11. Cyclicity/ Fisher Plots
4/8	Measuring and Logging Carbonate Strata	
4/13	Trip 4 Debrief & Cretaceous Stratigraphy of Central Texas	12. Unconformities, Correlation & Facies
4/15	Trip 5 prep. & Biostrat., Sed. Structures, Trace Fossils, Fauna <b>Field Trip 5: Cretaceous Carbonate Section Correlation (4/18 or 4/19)</b>	
4/20	Field Trip 5 Debrief	13. Pilot Knob Exercise 1*
4/22	Chronostratigraphy and Age Dating of Sedimentary Rocks	
4/27	Basin Classification; Sediment Provenance, Paleocurrents; Late Paleozoic Ouachita Orogen and Associated Basin Fill	14. Pilot Knob Exercise 2*
4/29	Trip 6 Prep. & Lithostratigraphy, Chronostratigraphy, and Tools for Correlation <b>Field Trip 6: Measuring Features in Sedimentary Rocks (5/2 or 5/3)</b>	
5/4	Trip 6 Debrief	15. Lab Final
5/6	Course Evaluation and Review	
5/14 or 5/16; 2-5 PM or 9-12 noon	<b>Final Exam</b>	

\* Lab conducted outdoors, prepare accordingly.

LECTURE AND LAB SCHEDULE - GEO. 420K, TTH Sections, 2015

<u>Date</u>	<u>Lecture</u>	<u>Lab</u>
1/20	Overview and Introduction (R. M.)	1. Compass/Pace and Compass Map*
1/22	The Geologic Compass – Strike/Dip, Bearing/Plunge (R. M.)	
1/27	Base Maps, Grids and Location Methods (M. H.)	2. Topographic Maps & GPS
1/29	The Global Positioning System (M. H.)	
2/3	Metamorphic Rocks: Textures and Fabrics in Tectonites (M. H.)	3. Describing Metamorphic Rocks
2/5	Field Trip 1 Preparation – Precambrian Geology of the Llano Uplift <b>Weekend Trip 1: Precambrian Geology, Llano Co. (2/7 or 2/8)</b>	
2/10	Interpreting Geologic Map Patterns; Strike Lines (R. M.)	4. Geologic Maps I
2/12	Field Trip 1 Debrief; Map Interpretation, Continued (R. M.)	
2/17	Dip Calculation and Unit Thicknesses from Maps (R. M.)	5. Geologic Maps II
2/19	Trip 2 Prep. (R. M.) <b>Weekend Trip 2: Mapping Project 1 (2/21 AND 2/22),</b>	
2/24	Introduction to Faulting (R. M.)	6. Geologic Maps III/ Folds and Faults
2/26	Introduction to Folding (R. M.)	
3/3	Field Trip 2 Debrief; Cross Section Construction (R. M.)	7. Cross Sections
3/5	Down Plunge Viewing/Geologic Maps as Cross Sections, Trip 3 Prep. <b>Weekend Trip 3: Mapping Project 2 (3/7 or 3/8)</b>	
3/10	Digital Mapping Tools and Techniques (M. H.)	8. No Lab
3/12	Field Trip 3 Debrief (R. M.)	
3/14 - 3/21 SPRING BREAK		
3/24	Sedimentary Rock Description: Essential Elements	9. Rock and Rock Unit Descriptions
3/26	Vertical Successions in Clastic Strata; Trip 4 Prep. <b>Weekend Trip 4: Tertiary Clastics (3/28 or 3/29)</b>	
3/31	Basic Stratigraphy and Approaches to Subsurface Mapping	10. Net Sand Isopach Mapping
4/2	Texas GOM history and Tertiary Regional Context	
4/7	Trip 4 Debrief; Scales of Cyclicity and Correlation of Sed. Rocks	11. Cyclicity/ Fisher Plots
4/9	Measuring and Logging Carbonate Strata; Trip 5 prep. <b>Weekend Trip 5: Cretaceous Carbonate Section Correlation (4/11 or 4/12)</b>	
4/14	Cretaceous Stratigraphy of Central Texas	12. Unconformities, Correlation & Facies
4/16	Biostratigraphy; Sedimentary Structures, Trace Fossils, Fauna	
4/21	Field Trip 5 Debrief	13. Pilot Knob Exercise 1*
4/23	Chronostratigraphy and Age Dating of Sedimentary Rocks <b>Weekend Trip 6: Measuring Features in Sedimentary Rocks (4/25 or 4/26)</b>	
4/28	Basin Classification; Sediment Provenance, Paleocurrents;	14. Pilot Knob Exercise 2*
4/30	Late Paleozoic Ouachita Orogen and Associated Basin Fill Lithostratigraphy, Chronostratigraphy, and Tools for Correlation	
5/5	Trip 6 Debrief	15. Lab Final
5/7	Course Evaluation and Review	
5/14 or 5/16; 2-5 PM or 9-12 noon	<b>Final Exam</b>	

\* Lab conducted outdoors, prepare accordingly.

**GEO 420K - EQUIPMENT LIST**

- Most items are available in a single course packet for sale at the UT Co-Op

**REQUIRED MATERIALS**

Field notebook with waterproof paper (e.g. surveyor's field book)  
Geologic hammer  
Hand lens - 10X Mag. or better  
Small squirt bottle for acid (acid will be provided)  
Six-inch ruler with mm and inch scale (best if with a protractor)  
Protractor, smaller is better  
Mechanical Pencil: Pentel 0.5 mm or equivalent with F or 2H hardness lead  
Colored pencil set - 6 colors minimum; hard lead, shouldn't smudge  
2 technical (drafting) pens (#0 and #00)  
Proper field clothes, particularly hat and shoes/boots  
Clipboard with cover (standard 8 1/2 x 11" size, without a large metal clip)  
Erasers/liquid paper  
Canteen (1 or 2 one-quart canteens)  
Watch  
Knapsack or carrying bag  
Grain size scale card – available in the JSG undergraduate office

**DESIRABLE MATERIALS:**

Rainwear  
Aspirin, chap stick, bandaids, sunscreen or tanning lotion, insect repellent, etc.  
Toilet paper

**PROHIBITED ITEMS:**

Firearms  
Alcoholic beverages in University vehicles  
Controlled substances and narcotics



## Course Objectives

Why a class in geological field methods? Geology is first and foremost a field science. Field geology and field geologists provide literally the ground truth for geologic concepts and theories of how the earth works. *The degree to which we, as geologists, are successful observers and interpreters of rocks in the field depends in large measure on what we are prepared to see and record.* The old adage “I wouldn’t have believed it if I hadn’t seen it” is, in the case of field geology, more truthfully “I wouldn’t have seen it if I hadn’t believed it”. We explore. We discover. Unfortunately, without sufficient experience and preparation we also frequently ignore what we don’t recognize or understand. Developing what anthropologists have called “professional vision” – the ability to quickly recognize and sort the significant from insignificant – is one of the most important skills a field geologist possesses. You will begin honing that skill in this class.

*Successful field work also depends greatly on how well we can formulate and test ideas while in the field.* Without proper preparation, including a strong grounding in field methods, we are little better than rock hounds out for a day of casual collecting. Field geology is not merely collecting data and samples; it is about making sense of the geology around you, about making geologic interpretations. Landscapes are histories, with time marked by boundaries in the rocks, soil and sediment. A geologic map or a measured section is the articulation of that history, with each line marking a before and after, a hiatus that might last a second or a billion years. Through our maps and graphical logs, we represent time as space. *The ability to create, read and interpret such product is best developed from training and practice in a field setting.* It all begins by making and recording observations. An accurate record in the form of a map, measured section, photograph, sketch, a carefully documented sample, field notes, etc. provides a permanent, solid basis upon which to develop testable ideas and interpretations – the plot of the story. Without such evidence, interpretations are fanciful fables; there is no scientific basis to objectively evaluate them.

*Field proficiency has long been a distinguishing characteristic of our science.* As a geoscientist, you are expected to be a proficient scientific observer and recorder. Your unique skills and training in this area separate you from lawyers, engineers, chemists and other professionals with whom you might one day work. Geology is rooted in the scientific method, so the process of formulating hypotheses and testing those hypotheses through careful data collection are fundamental skills to a geologist.

As suggested by the course name, this class contains two main components. This semester our principal objectives are to: 1) learn and apply geologic field methods to *describe, measure, map, sample and report on* rocks in the field and in the laboratory; 2) acquire an understanding of the elements of stratigraphy (e.g. what is a Formation? what are lithostratigraphic, biostratigraphic and chronostratigraphic units? what is a type section? how are rock units correlated?) and the field methods upon which they are based. Like all sciences, geology has its own vocabulary. There is no better way to learn a language than to be immersed in it, and field experiences, however brief, provide that immersion.

Some of you may find this an uncomfortable experience. Unlike most subjects, field work can not be mastered by studying hard, nor is there a set formula for successfully interpreting the rocks you will study. You will learn largely by doing and making mistakes. Get comfortable with this idea now and you’ll be less anxious in the long run.

Finally, it is often said “The best geologist is the one who has seen the most rocks” and there is much truth to it. Six weekend field trips and a semester of labs will provide an introduction, the beginnings of a

*GEO420K Intro. To Field and Stratigraphic Methods – Lab & Lecture Manual*

mental catalog of rocks and field relationships that can provide a framework to build upon in future classes, later field work and a future career in the geosciences.