

Academic Year	2017/2018	Semester	1
Course Coordinator	Kerry Sieh & Kyle Bradley		
Course Code	ES3005		
Course Title	Advanced Field Course in Geology		
Pre-requisites	ES2002 Earth Materials ES2004 Layers and Landforms ES2101 Introduction to Geological Field Mapping ES3002 Structural Geology and Tectonics <i>Or by instructor permission</i>		
No of AUs	5		
Contact Hours	1 hour x 13 weeks = 13 hours (Semester 1) 38 hour x 5 weeks = 190 hours (Special Term 1)		
Proposal Date	28 March 2019		

Course Aims

This course will provide you with the essential skills required by all Geoscience based careers, and therefore benefit whichever career path you choose. The course aims to provide you with the knowledge to describe and map geological and geomorphic features in the field, reconstruct detailed histories of geological events from multiple lines of evidence, and link the observable rock record with active Earth processes. This course will challenge you to develop practical field skills in order to document and understand a wide variety of tectonic settings, time periods, and geological processes.

Intended Learning Outcomes (ILO)

By the end of this course, you (as a student) will be able to:

1. Describe, map, and report on igneous, sedimentary, and metamorphic rocks, active fault scarps, Quaternary deposits and geomorphic features, and volcanic deposits.
2. Document detailed and informative observations, as well as your evolving ideas in a field notebook.
3. Map complex geology and morphology on topographic basemaps.
4. Make appropriate structural and stratigraphic measurements.
5. Collect and annotate effective field photographs.
6. Communicate your observations and scientific conclusions drawn from how geological processes shaped the area you are studying.
7. Articulate the main geological concepts present in the area you are studying, and suggest areas for further research.

Course Content

Upon arrival in the field, students will participate in basic orientation exercises including detailed safety briefings. The main field course will take place in three different areas of eastern California.

Mapping days

On each mapping day, students will participate in a morning briefing, head into the field area to participate in mapping projects, and work on report writing or map production in the evening. Students will participate in camp maintenance and food preparation on a rotating group basis.

Area 1 - Cerro Gordo, CA

Students will map bedrock geology of a fold-and-thrust belt. They will identify rock types and their field relationships, construct cross sections at multiple scales, and create a geological map. Students will observe faults, folds, pervasive deformation structures, sedimentary sequences, and complex igneous units.

Area 2 - Panum Crater, CA

Students will map a young rhyolitic eruptive center. They will identify different eruptive units, observe and interpret ductile and brittle rock fabrics, and construct a conceptual model of the evolution of Panum Crater during its life cycle.

Area 3 - Lundy Canyon, CA

Students will map surficial sediments and geomorphic features related to multiple cycles of glaciation, Pleistocene lake level fluctuations, delta formation, and range-front normal faulting. They will create a detailed geomorphic-geological map and investigate the relationships between peak glaciation, lake level high stand, and long-term uplift of the Sierra Nevada mountains.

Rest days

Approximately one day per week, students will participate in a short morning field exercise and then travel into a nearby town to wash clothes, rest, and participate in voluntary short field excursions in the region. After spending the night in proper accommodations, they will return to the field and participate in afternoon field work.

Final field tour

The last days of the field camp will be used for regional field excursions, which will challenge the students to integrate their field experiences into an overarching picture of the geological evolution of the East Sierra Nevada region.

Camp participation

The essential skills of independent field work include the ability to cook, clean, perform tasks that benefit the camp as needed, and maintain good working relationships with other camp members. Students will participate in food preparation, cooking, and dish washing on a rotating group basis.

Assessment (includes both continuous and summative assessment)

Component	Course LO Tested	Related Programme LO or Graduate Attributes	Weighting	Team/ Individual	Assessment Rubrics
1. Continuous assessment in the field	1, 2, 3, 4, 5, 6	Knowledge; Intellectual flexibility and critical thinking; Passion and communication; Formulating questions; Research; Problem solving; interdisciplinary; Lifelong learning.	20%	Individual	Appendix 1
2. Field notebook, photographs, maps and cross sections	1, 2, 3, 4, 5, 6, 7	Knowledge; Intellectual flexibility and critical thinking; Problem solving; Interdisciplinary.	40%	Individual	Appendix 2
3. Project reports	6, 7	Knowledge; Intellectual flexibility and critical thinking; Passion and communication; Formulating questions; Research; Problem solving; interdisciplinary; Values; Collaboration and leadership.	40%	Individual	Appendix 3
4. Total	100%				

Formative feedback

Students will present their field notebooks, maps, and annotated photographs to instructors on a periodic basis in order to get feedback. Grades will be assessed on neatness of presentation, application of appropriate scientific documentation methods, correctness, and relevance to geological problems previously highlighted by the instructors.

Learning and Teaching approach

Approach	How does this approach support students in achieving the learning outcomes?
Independent learning	This is an upper level class and therefore students are required to show initiative in their learning process. This supports aspects of all the learning

	outcomes.
Active learning	Students will be in the field where they will be exposed to learning in different environments. This supports aspects of all learning outcomes

Reading and References

This course has no textbook. We will provide reference material related to the study areas in the field, and instructors will give periodic evening lectures as well as technical instruction on the outcrop.

Course Policies and Student Responsibilities

Students are expected to complete all assigned readings and activities, and take all scheduled assignments by due dates. Students are expected to take responsibility to follow up with course notes, assignments and course related announcements they have missed.

Students are expected be aware that they are representing ASE and NTU whilst on placement, and behave in a way which represents the school and department favourably.

Academic Integrity

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the [academic integrity website](#) for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Course Instructors

Instructor	Office Location	Phone	Email
Kerry Sieh	N2-01a-10b	65138093	D-EOS@ntu.edu.sg
Kyle Bradley	N2-01a-14	65922494	kbradley@ntu.edu.sg

Planned Weekly Schedule

Please see Course Content for information.

Appendix 1. Assessment Criteria for Continuous Assessment

Grade / Numerical Score	Criteria
A+ (Exceptional) A (Excellent)	<ul style="list-style-type: none"> - Student shows complete understanding of technical skills of field work, such as compass measurements, rock identification, sample collection, and map production. - Student answers questions correctly and completely. - Student exhibits a high level of thoughtfulness about field safety and preparation, for themselves and for their mapping partners. - Student is able to outline uncertainties in their understanding and propose ideas for overcoming them.
A- (Very good) B+ (Good)	<ul style="list-style-type: none"> - Student shows mastery of most field skills. - Student answers questions with little prompting from the instructor. - Student exhibits a moderate level of thoughtfulness about field safety and preparation, for themselves and their mapping partners. - Student recognizes that uncertainties in their understanding exist, but does not have clear plans to overcome them.
B (Average) B- (Satisfactory) C+ (Marginally satisfactory)	<ul style="list-style-type: none"> - Student shows mastery of some field skills, but struggles to perform others. - Student can answer questions from the instructor only with significant prompting. - Student does not show thoughtfulness about field safety and relies on their field partners for safety. - Student does not recognize uncertainties in their understanding.
C (Bordering unsatisfactory) C- (Unsatisfactory)	<ul style="list-style-type: none"> - Student fails to show mastery of most field skills. - Student cannot correctly answer most questions from the instructor, even with significant prompting. - Student creates safety concerns for themselves or others through carelessness. - Student exhibits significant misunderstandings of their field projects but recognizes that they might be wrong.
D (Deeply unsatisfactory) F (0-44)	<ul style="list-style-type: none"> - Student has not mastered most field skills. - Student cannot answer questions from the instructor. - Student creates safety concerns for themselves or others through recklessness. - Student exhibits significant misunderstandings of their field projects and does not recognize that they might be wrong.

Appendix 2. Assessment Criteria for Field notebook, photographs, maps and cross sections

Grade / Numerical Score	Criteria
A+ (Exceptional) A (Excellent)	<ul style="list-style-type: none"> - Notebook shows clear and original insight into the research process - All entries are similarly formatted and provide all pertinent information. - Student shows diligence in competing entries consistently throughout the research process. - Any problems during the research are clearly outlined, with potential resolutions stated, and reasoning behind the chosen resolution. - Maps and cross sections are all completed to a high standard, and show understanding and insight into the field study area.

	<ul style="list-style-type: none"> - Field photographs are appropriate, scaled, legible, relevant to main concepts, and informatively captioned. Annotations on photographs aid communication of main points.
B- (Very good) B+ (Good)	<ul style="list-style-type: none"> - Log book shows clear outline of the research process - Most entries are similarly formatted and provide most of the pertinent information. - Student shows diligence in competing entries consistently throughout the research process. - Any problems during the research are clearly outlined. - Maps and cross sections are all completed to a high standard - Field photographs are appropriate, scaled, and legible, but may not be relevant to the main concepts. Captions are informative but can be improved.
B (Average) B- (Satisfactory) C+ (Marginally satisfactory)	<ul style="list-style-type: none"> - Log book shows some outline of the research process - Some disparity in how entries are formatted. Some pertinent information missing. - Entries appear to be sporadic throughout the research process. - Any problems during the research are referenced but not clearly outlined. - Maps and cross sections are mostly completed. - Field photographs are appropriate, and scaled, but are illegible. Captions provide some relevant information but do not significantly improve knowledge of the study area.
C (Bordering unsatisfactory) C- (Unsatisfactory)	<ul style="list-style-type: none"> - Log book shows limited outline of the research process - No continuity in how entries are formatted. Some pertinent information missing. - Entries appear to be sporadic throughout the research process. - Any problems during the research are not clearly outlined. - Maps and cross sections are mostly completed, but with many mistakes. - Field photographs are relevant, but are illegible, lack a scale, and have uninformative or incorrect captions.
D (Deeply unsatisfactory) F (0-44)	<ul style="list-style-type: none"> - Log book shows no outline of the research process - No continuity in how entries are formatted. Pertinent information clearly missing. - Entries are sporadic or missing. - No further assessment or thoughts. - Maps and cross sections are incomplete or are mostly incorrect. - Field photographs are absent or irrelevant to the study area. <p>Or</p> <ul style="list-style-type: none"> - Failure to submit Research Log

Appendix 3: Assessment Criteria for Project Reports

Grade / Numerical Score	Criteria
A+ (Exceptional) A (Excellent)	<ul style="list-style-type: none"> - Clear description, interpretation and explanation of research process and findings - Clarity and distinct originality of thought, with clear link to major topics from research materials, as well as important linked topics. - Correct use of referencing throughout. - Use of stylish scientific language, with no grammatical or spelling errors. - Ability to introduce, review and engage critically with secondary readings (where relevant) - Shows clear understanding of key concepts and theories, and interpretation of wider context issues. - Formatted in the correct scientific specification. - Shows evidence of strong mapping group dynamics, collaboration, and idea sharing

A- (Very good) B+ (Good)	<ul style="list-style-type: none"> - Clear description and explanation of research process and findings - Clarity of thought, with clear link to major topics from research materials - Correct use of referencing throughout. - Use of scientific language, with few grammatical and no spelling errors. - Shows an understanding of secondary readings/research - Shows an understanding of the key concepts and theories. - Formatted to the correct scientific specification. - Shows significant evidence of effective group collaboration
B (Average) B- (Satisfactory) C+ (Marginally satisfactory)	<ul style="list-style-type: none"> - Some description and explanation of research process and findings - Some discernable links to the major topics from research materials - Correct use of referencing throughout most of the paper. - Fair use of scientific language, with some grammatical and spelling errors. - Shows a fair understanding of secondary readings/research - Shows some understanding of the key concepts and theories. - Formatted to the correct scientific specification. - Shows some evidence of group collaboration
C (Bordering unsatisfactory) C- (Unsatisfactory)	<ul style="list-style-type: none"> - Some description of research process and findings - Limited link to major topics from research materials - Correct use of referencing throughout some of the paper. - Some use of scientific language, with grammatical and spelling errors. - Identifies secondary readings/research - Identifies key concepts and theories. - Some attempt to format to the correct scientific specification. - Little evidence of effective group dynamics or collaboration
D (Deeply unsatisfactory) F (0-44)	<ul style="list-style-type: none"> - Unclear or no description of research process and findings - Failure to link to major topics from research materials - Incorrect use of referencing throughout most of the paper. - No scientific language, with grammatical and spelling errors. - No secondary readings/research referenced. - No identification or misinterpretation of key concepts and theories. - Incorrect formatting. - No evidence of group collaboration or idea sharing <p>Or</p> <ul style="list-style-type: none"> - Failure to submit project report