CH EN 6171 Field Study (Credit or Non-Credit)

Overview
The Department of Chemical Engineering and the Energy & Geoscience Institute (EGI) at the University are offering an eleven-day field program exposing engineers and geoscientists to the principal aspects of petroleum field operating systems and petroleum geology. This is a required course for an MS degree in Petroleum Engineering (credit based) at the University of Utah. Information about this program and admission requirements are described in http://www.che.utah.edu/pe.

This course is also available to qualified and mature individuals who are interested in taking this as an accredited field course at another academic institution or as a non-credit continuing education experience.

Petroleum geologic principles are best illustrated in the field; by surface exposures—outcrops. The same can be said for petroleum engineering activities such as pipeline facilities, drilling operations and refining operations. Each student will be required to spend two weeks in the summer in the Central Rocky Mountains and Colorado Plateau region on a field study. Specific localities will include the Uinta Basin, Central Utah Thrust Belt, San Rafael Swell, Colorado Plateau, Uinta Uplift, Green River Basin, and Utah-Wyoming Thrust Belt. From a geologic perspective, this field program will encompass studying geologic cores, outcrops, and landforms and developing predictive geologic models. Concurrently, students will visit E&P (exploration and production) and gathering field operations, as well as mid- and downstream facilities including refineries and power generation plants.

2014 Meeting Times
Daily from May 5 – 16 (half-day), 2014, inclusive including Saturday, May 10. Specific field activities are not allocated on Sunday May 11, 2014.

Instructors
The three course instructors are:

Tom Anderson
Senior Advisor to the Director and Research Scientist, EGI
Energy & Geoscience Institute - University of Utah
E-Mail: tanderson@egi.utah.edu
Office Phone: 801-585-9178
Mobile Phone: 307-277-8031

Bill Keach
Research Scientist - EGI; Visiting Associate Professor, Brigham Young University
Energy & Geoscience Institute - University of Utah
E-Mail: bkeach@egi.utah.edu
Mobile Phone: 801-857-7728

Alan Walker
Catalogue Course Description
CH EN 6171 Field Study (3 credits)

Prerequisites
N/A Instructor Permission Required

Course Description
Petroleum geologic principles are best illustrated in the field; by surface exposures—outcrops. The same can be said for petroleum engineering activities such as pipeline facilities, drilling operations and refining operations. Each student will be required to spend two weeks in the summer in the Central Rocky Mountains and Colorado Plateau region on a field study. Specific localities will include the Uinta Basin, Central Utah Thrust Belt, San Rafael Swell, Colorado Plateau, Uinta Uplift, Green River Basin, and Utah-Wyoming Thrust Belt. From a geologic perspective, this field program will encompass studying geologic cores, outcrops, and landforms and developing predictive geologic models. Concurrently, students will visit E&P (exploration and production) and gathering field operations, as well as mid- and downstream facilities including refineries and power generation plants. The data and insight from the culminating field site in the Green River Basin of Wyoming will be integrated into the project for CH EN 6156 Simulation, which will immediately follow the field study. Completion of CH6171 is strongly recommended prior to taking CH EN 6156 (Simulation)

Attendees are requested to register by April 4, 2014. Any registration after that could be subject to additional fees because of the restricted accommodations in these areas.

Registration Questions
Please contact:
Email: petroleum.engineering@chemeng.utah.edu
Phone: (801)587-3610

Tentative Grading Scheme
The grading will be based on the following criteria.
- 25% Active and engaged participation in the field program
- 25% Assignments
- 25% Detailed journal submitted within three weeks of completion of the field study
- 25% Two, weekend exams
Topics
Students will be exposed to the following engineering operations and geologic features and topics and concepts.

1. Rock outcrops, comprising both clastic and carbonate exposures
2. Stratigraphy (reservoir, seal, source rocks)
3. Geologic structures (faults, folds, thrusts, unconformities, natural fractures)
4. Geologic history, tectonics, and landforms
5. Conventional and unconventional reservoirs
6. Drilling, logging, and well workover operations
7. Production gathering systems
8. Water management facilities and concepts, including reuse for secondary recovery
9. Hydraulic fracturing and completions
10. Gas processing and storage
11. Petroleum refining
12. Oil shale and coalbed methane

Texts
The following textbook will be provided.


Additional field guides will be provided by the instructors.

Expenditures

<table>
<thead>
<tr>
<th>Student status</th>
<th>Tuition cost</th>
<th>Course Fee</th>
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<tbody>
<tr>
<td>On campus registrants</td>
<td>$2,000.00**</td>
<td>$3,000.00</td>
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<tr>
<td>Distance education</td>
<td>$2,000.00</td>
<td>$3,000.00</td>
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The course fee includes lodging, transportation, meals, and safety gear.

**Approximate- exact cost will depend on established University tuition.

Questions about travel accommodations
Please contact:

Peggy Nish
Email: pnish@egi.utah.edu
Phone: (801)581-5126

Alan Walker
Email: awalker@egi.utah.edu
Phone: (801)585-9690
## Tentative General Schedule (for Summer 2014, subject to change)

The following tentative schedule is planned.

<table>
<thead>
<tr>
<th>Day</th>
<th>Date</th>
<th>Itinerary</th>
<th>Locations and Topics (subject to adjustment)</th>
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</thead>
</table>
| 1   | May 05 | Salt Lake City to Green River, Utah | - Utah Hingeline, Wasatch Fault, Intermountain Seismic Belt  
- Eocene to Cretaceous stratigraphy; Green River Formation.  
- Oil rail trans-loading facilities: Savage in Price  
- Coalbed Methane Operations – Drunkard’s Wash: ConocoPhillips  
- Castle Valley amine plant, CO₂ extraction: XTO  
- Buckhorn Draw: Mesozoic stratigraphy, petroglyphs  
- San Rafael Swell Laramide structure; Sinbad Limestone |
| 2   | May 06 | Green River via Moab to Bluff | - Dalton Wells Dinosaur Quarry, lower Cretaceous dinosaurs  
- Arches National Park, development of arches, joints and fractures  
- Drilling operations in Cane Creek Shale: Fidelity  
- Dead Horse Point |
| 3   | May 07 | Bluff “loop” (raft trip) | - Anticline structures  
- Paradox Basin reservoir facies: Pennsylvanian algal buildups  
- Honaker Trail section raft trip “Icehouse Stratigraphy” |
| 4   | May 08 | Bluff to Richfield | - Aneth Oil Field, EOR, Montezuma Creek: Resolute Energy  
- Salt Valley Anticline; Paradox Basin salt tectonics  
- Dakota and Morrison channels  
- Salina Canyon angular unconformity  
- Covenant Oil Field: Wolverine Oil |
| 5   | May 09 | Richfield to Salt Lake City | - Nebo Thrust Fault  
- Faulted alluvial fans: Wasatch Fault  
- Power’s Natural gas-fired power generation plant at Current Creek in Mona: Rocky Mountain Power.  
- Utah Core Research Center |
| 6   | May 10 | Salt Lake City | - Refinery operations in Salt Lake City: Tesoro  
- Antelope Island – Precambrian rocks and Lake Bonneville geology |
| 7   | May 12 | Salt Lake City to Vernal via Parley’s-Heber-Duchesne | - Produced water management, GOSP at Myton: Newfield  
- Uinta Basin oil & gas production: Crescent Point Energy  
- Drilling rig, possible hydraulic fracturing operations  
- Oil Shale Operations – RedLeaf  
- Oil Sand Operations – US Oil Sands |
| 8   | May 13 | Vernal to Rock Springs | - UBATC oil and gas field equipment laboratory  
- Oil & Gas Service, logging tools, stimulation equipment: Halliburton  
- Uinta Mountains; Precambrian to Cretaceous stratigraphy on flank  
- Clay Basin natural gas storage; Frontier formation production: Questar |
<table>
<thead>
<tr>
<th>Date</th>
<th>May 14</th>
<th>Rock Springs to Kemmerer</th>
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<tr>
<td></td>
<td></td>
<td>• Rock Springs Uplift and Laramide structures</td>
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<td>• Almond-Erickson tight gas sands</td>
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<td>• Green River “oil shale”</td>
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<td>• Pinedale Anticline operations and geology (QEP, Shell)</td>
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<td>• Moxa Arch oilfields; Big Piney-LaBarge (Chevron, EOG, Exxon)</td>
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<td>• Sevier thrust faults; outcrops</td>
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<td>• Birch Creek Unit oilfield; 3D seismic</td>
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<td>• Setup for modeling and simulation course</td>
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<td>10</td>
<td>May 15</td>
<td>Kemmerer area plants</td>
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<td>• Shute Creek processing plant (CO₂, H₂S, Helium, CH₄): ExxonMobil</td>
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<td>• Opal hub, pipeline operations: Williams</td>
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<td>11</td>
<td>May 16</td>
<td>Kemmerer to Salt Lake City</td>
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<td></td>
<td>• Fossil Butte National Monument, Green River shale and fish fossils</td>
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<td>• Cretaceous clastic wedge sedimentation</td>
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<td>• Utah-Wyoming Thrust Belt play and discoveries (Pineview, etc.)</td>
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<td>• Echo Canyon conglomerate</td>
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