Syllabus CH EN 6163 – Petroleum Geoscience

Credit Hours: .................................................................................................................. 3.0
Semester: .......................................................................................................................... Fall
Date/Time: ........................................ Tuesdays and Thursdays, 9:10 to 10:30 a.m.
Instructor: ................................................................................................................ Rasoul Sorkhabi, Ph.D.
Title: .................. Research Professor, Energy & Geoscience Institute, University of Utah
Telephone: ..................................................................................................................801-587-9070
E-Mail: .............................................................................................................rsorkhabi@egi.utah.edu

Course Rationale and Learning Outcomes
The formation, distribution and preservation or destruction of oil and natural gas resources are governed by geologic histories of basins and the sedimentary, geochemical and tectonic processes operating in them. Oil industry is an expensive and risky enterprise. Petroleum geoscience is a crucial tool for finding and developing hydrocarbon resources and for reducing the business risks. Petroleum geoscience, in its varied aspects, is thus a key component to the modern methods of exploration, development and production in the petroleum industry. This Petroleum Geoscience course aims to provide students with a knowledge-base (1) to understand the fundamental terms, principles, and tools of petroleum geoscience in order to communicate with other professional and comprehend petroleum geoscience reports and discussions, (2) to understand how various disciplines and methods of geoscience are integrated to characterize and evaluate hydrocarbon basins and prospects, and (3) to better benefit from other courses offered in this M.S. Petroleum Engineering Program.

Reading Materials for the Course

Course Materials and Main Textbooks:
Each week of the course will focus on a certain topic and will consist of two lectures. Lectures will be recorded and uploaded online by the University; lecture materials will be uploaded to the Canvas site by the Instructor at the end of each week. Class participation and reviewing the lectures and PowerPoint files are necessary for success in the course.
The following textbooks will be used for the course, but none replaces the Instructor's lectures and PowerPoint files (these should be considered as most necessary for the course).

[A basic textbook on petroleum geology; will be throughout the course]

[An advanced textbook on petroleum geology with emphasis on some new topics and developments; will be throughout the course]

[This is a pictorial, basic book on geology. It is most relevant for Module I of the course. Read it with fun; it will help better understand Module I and geology in general.]

Why Geology Matters, Doug Macdoughall (University of California Press, 2011)
[Like the previous book, this is most relevant for Module I of the course: It will enrich your knowledge of geology.]

This book is a must read for online/long-distance students in lieu of their class attendance. After reading the book, the student should write 20 interesting points (about a paragraph each with page number) that he/she learned from the book. The report will contribute toward the long-distance students’ attendance.

All students may read the book and write a report to gain 4 extra points as needed for their grades. The report would consist of 20 interesting points, facts and concepts (about a paragraph each point with page number) that the student learned from the book.

Field Trip:
One-day field trip in Salt Lake City to look at some geological outcrops. (Saturday, Date TBD) [Attendance and report will carry 4 points]. Long-distance students need to visit a natural history museum (or an oil field, geology) and write a brief report.

Other Useful Textbooks:
Basic Petroleum Geology, 3rd edition, Peter Link (OGCl Publications, 2009)


The Petroleum Systems: From Source to Trap, edited by Leslie Magoon and Wallace Dow (AAPG Memoir 60, 1994)

Articles:
Certain articles pertaining to the course will be introduced by the Instructor during the classes.

Evaluation and Grade Criteria
Class participation.............................................................................................................................................20 points
(Including field trip and report, 4 points)
3 Tests (10 points each).................................................................................................................................. 30 points
Exercises (4 x 5 points each)..........................................................................................................................20 points
Research Paper (a basin or field report)........................................................................................................... 30 points
(14-16 pages + presentation 5 points)

Student should submit a brief description (title, study area and key references) of their research papers (by email to the Instructor) in Week 8.

Grading

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Class Work and Course Description

MODULE I. GEO-KNOWLEDGE
Week 1: Geoscience and Petroleum Industry: Foundations
Reading materials: Selley (Chapter 1); Bjorlykke (Chapter 1); Lambert (Chapter 1 & 12)
Week 2: Earth Materials: Minerals and Rocks  
(Lecture presentation is the main reading material); Lambert (Chapters 3, 4 & 5)

Week 3: Sedimentology and Depositional Environments  
Reading materials: Bjorlykke (Chapters 3 & 2); Lambert (Chapters 6, 7, 8 & 9)

Week 4: Geologic Time and Stratigraphy  
Reading materials: Bjorlykke (Chapters 7); Lambert (Chapters 10 & 11)

Week 5: Geologic Structures in Petroleum Basins  
(Lecture presentation is the main reading material); Lambert (Chapter 5)

Week 6: Plate Tectonics and Basin Types  
Reading materials: Selley (Chapter 8); Bjorlykke (Chapters 8 & 12); Lambert (Ch. 2)

**MODULE II. THE PETROLEUM SYSTEM**

Week 7: Petroleum Geochemistry and Source Rocks  
Reading materials: Selley (Chapters 2 and 5); Bjorlykke (Chapters 14, 15 and 9)  
**Test 1 (for Module I of the course)**

Week 8: Petroleum Reservoirs  
Reading materials: Selley (Chapters 6); Bjorlykke (Chapters 4, 5)

Week 9: Petroleum Seals and Traps  
Reading materials: Selley (Chapter 7); Bjorlykke (Chapters 20 and 11)

Week 10. Prospect Evaluation and Global Petroleum Resources  
Reading materials: Selley (Chapter 10)

Week 11: Unconventional Petroleum Resources  
Reading materials: Selley (Chapter 9); Bjorlykke (Chapters 21)

**MODULE III. EXPLORATION TOOLS**

Week 12: Geophysical Surveys  
Reading materials: Selley (Chapter 3:3, 3:4and 3:6); Bjorlykke (Chapter 17 and 19)  
**Test 2 (for Module II of the course)**

Week 13: Seismic Interpretation and Sequence Stratigraphy  
Reading materials: Relevant chapters from Week 12

Week 14: Well Logs and Subsurface Environments  
Reading materials on well logs: Selley (Chapter 3:2); Bjorlykke (Chapter 16)
Reading materials on subsurface environments: Selley (Chapter 4); Bjorlykke (Chapter 10)

Week 15: Geologic Maps & Geology of North America
(Lecture presentation is the main reading material)

Week 16: Final Exam, Students’ Papers & Presentations (at EGI)
   Including Test 3 (for Module III of the course)