

GEO391: Petroleum Basin Evaluation (3 credit hours)

Course for Spring 2011

Instructor: Dr. Chris Zahm, Bureau of Economic Geology, Jackson School of Geosciences

Course Description: This applied course is designed to introduce graduate and upper-level undergraduate students to the concepts of petroleum basin evaluation for hydrocarbon exploration. The course will broadly introduce students to the petroleum geosciences within the context of critical analysis of uncertainty, risk and economics. This course will use real technology on real datasets and provide relevant experience for students looking for a career in petroleum geosciences.

Active participation will be a requirement of each class period (Monday, 9-12) as students will be introduced to concepts in the first part of the lecture and will work exercises designed to solidify the conceptual aspects in the second portion of the class (essentially a laboratory portion). This course will have applications of 2D and 3D seismic interpretation, well logging and geochemistry incorporated into basin scale stratigraphy, structure and tectonics. As a final project, students will work in teams to complete a technical assessment of the prospectivity within a basin by defining key plays, petroleum systems, leads and prospects (including economics) and risks. Each group will make recommendations on the future exploration activity based on prevailing technical and economic conditions.

Expected Interest: The Jackson School of Geosciences is considered by most private and nationalized energy companies to be one of the premiere applied petroleum geology institutions in the world, yet no class is offered in the current JSG curriculum that teaches students to critically consider integrated geologic systems within an economic framework. This class is designed to teach scientific problem-solving with economic rigor. Student enrollment will be limited to 15 maximum, 5 minimum. The ideal candidate is a second-year Master of Science student with industry internship experience. However, the experience of this course is beneficial to upper-level undergraduates and graduate students that have an interest in petroleum basin evaluation.

Course Plan: This course will be taught on a timeline that parallels the AAPG Imperial Barrel Award (IBA) Competition. A dataset provided by the AAPG IBA committee will be the source for most of the classroom and homework exercises which will be a combination of individual and team assignments. The course has an aggressive timetable in first eight-weeks of the semester, meeting once a week for a 3 hour each period, but that time commitment will expand as the competition deadline approaches. Significant reading and homework assignments related to the dataset will be assigned to ensure that the class has developed the skills necessary to assess the geologic and economic factors related to petroleum exploration.

One team of five students will be selected by fellow students and the faculty advisor to travel to Houston to present the analysis of the dataset at a Regional AAPG IBA competition. If the UT team advances to the finals, the same students will have the opportunity to travel compete at the International level against eleven other US and global universities selected to the finals. Last year's competition was won by IFP, but over 57 universities participated. More expected to compete this year.

Each student will write a ten-page (size 12 font, 1.5 line spaced, figures not included), report discussing their analysis of the basin, highlighting critical data and evaluation methods used to formulate their analyses, and summarizing their final conclusions. This report will be due on the last day of classes for the semester. In addition, a 24-hour take home final exam will be given the last class day.

Week	Topic
Jan. 17	Reading: Magoon and Dow, 1994; 2000; Zahm, 2011
Jan. 24	Reading: Magoon and Dow, 1994; 2000; Zahm, 2011 Homework Assignment 1 (See Blackboard Site) - Due in class Jan 31 (including in class presentation).
Jan. 28	Imperial Barrel Dataset Arrives
Jan. 31	Reading: Demaison and Moore, 1980; Peter Rose, Chapter 1-5 Homework Assignment 2 (See Blackboard Site) - Due in class Feb. 7
Feb. 4	BP Mentor, John O'Leary to Visit at 1 pm until ?
Feb. 7	Reading: TBA – Select papers from Imperial Barrel area Homework Assignment 3 (See Blackboard Site) – Due in class on Feb. 14
Feb. 14	Reading: TBA – Select papers from Imperial Barrel area In Class Demonstration: *3D interpretation of horizons and faults in seismic *Well log manipulation in Petra *Demonstration of Crystal Ball Homework Assignment 4 (See Blackboard Site) – Due in Class on Feb. 28
Feb. 21	Assignment: *Finalize interpretation of horizons and faults. *Finalize net pay, porosity and water saturation on well logs *Finalize slides of Petroleum System within IBA area *Initial assessment of prospect volumes. *Determine financial structure, well costs, etc.
Feb. 28	Class Assessment and Update I Strategic planning and assignment of responsibilities I
Mar. 7	In class presentations – Class Only Class Assessment and Update II Strategic planning and assignment of responsibilities II Determination of IBA Team
Mar. 14-19	Spring Break
March 22	In class presentations – Mentors, Faculty and Reviewers
March 24-25	Regional IBA Competition in Houston, TX
April 12	Global IBA Competition in Houston, TX
April 19	Term Paper Topic Selection
May 2	Term Paper Due
May 6	Take Home Final Exam (24 hour)

Logistics

- Classes taught in the BEG Auditorium (BEG 1.132) on the PRC campus. This course has datasets and seismic that are easily facilitated within the BEG classroom.
- Class meets once a week for 3 hours;
- Enrollment limited to 15 students;
- From this class, a group of 5 students will be selected to compete in the AAPG Imperial Barrel regional competition. These students will be required to prepare a concise written and oral summary of the petroleum potential of a basin assigned by the AAPG committee.
- Final Exam (take home)

Grading

10% Homework Assignments

50% In-Class Presentation (weeks of March 7 & 21)

25% Final Exam

15% Term Paper (IBA Team exempt)

Course References

Allen, P.A., and J.R. Allen, 2005, *Basin Analysis: Principles and Applications*, 2nd ed., Blackwell Publishing.

Beaumont, E.A., and N.H Foster, 1999, *Exploring for Oil and Gas Traps*, AAPG Treatise of Petroleum Geology.

Magoon, L.B. and W.G. Dow, 1994, The Petroleum System: AAPG Memoir 60, p. 3-24.

Morton-Thompson, D., and A.M. Woods, 1992, *Development Geology Reference Manual*, AAPG Methods in Exploration Series, No. 10

Newendorp, P.D., 1975, *Decision Analysis for Petroleum Exploration*, Petroleum Publishing Co., Tulsa, OK, 677 pp.

North, F.K., 1985, *Petroleum Geology*, Chapman & Hill Publishers, 631 pp.

Rose, P.R., 2001, *Risk Analysis and Management of Petroleum Exploration Ventures*, AAPG Methods in Exploration Series No. 12

Snedden, J.W., J.F. Sarg, and X. Ying, Handout, Exploration Play Analysis from a Sequence Stratigraphic Perspective, AAPG.