

# FINA 7372 , PETR 6310

## Upstream Economics

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Using a combination of lectures, case studies and participation in a realistic economic simulation of exploration and production activities, used for training by oil and gas companies, students will gain an understanding of the economics of the upstream oil and gas industry, decision making under uncertainty and economic modeling.

### Instructor

The instructor is D. H. Bellman. Prior to working with the Global Energy Management Institute, Professor Bellman spent thirty-five years at Exxon. He gained experience in a wide variety of functions, including manufacturing operations, marketing, business analysis and strategic planning. As a Business Development Manager he was involved in creating new joint ventures, acquisitions, and investments in petrochemical complexes in East Asia, West Europe, Australia, Latin America, and the Arabian Gulf, as well as in the US. He earned a bachelor's degree in mechanical engineering at Duke University, and a master's degree in business administration at Stanford University.

### Required Texts

1. "Journey To Sakhalin (A), (B), (C)," case study (Harvard Business School, 2007)  
Obtain a copy online from Harvard Business Publishing Web Site
2. "Ambitious Oil Company (A) case study (J. Tomlinson, 2008) available via Blackboard.
3. "New Rigor at Maradarko Exploration." Obtain a copy online from [bauerenergycases.com](http://bauerenergycases.com).

### Recommended Text

1. Oil & Gas Production in Nontechnical Language, Martin Raymond and William Leffler (PennWell Publishing, 2006)

### Reference Books

1. *Project Economics and Decision Analysis, Volumes 1 and 2, 2<sup>nd</sup> ed.*, M. A. Mian, (PennWell Publishing, 2011)
2. *International Exploration Economics, Risk, and Contract Analysis*, Daniel Johnston (PennWell Publishing, 2003).
3. *Deepwater Exploration and Production – a Nontechnical Guide, 2<sup>nd</sup> ed.*, W L Leffler, et al, (PennWell Publishing, 2011).

## Course Outline

### Objectives

- Understanding of the physical systems affecting the exploitation of hydrocarbon accumulations
- Understanding the economic structure and issues associated with key upstream processes.
- Ability to construct and use financial models and performance measures for the upstream business
- Appreciation of the key management decisions and the considerations that go into them in the highly uncertain exploration and production businesses

### Requirements

1. Participation on a student team in a competitive simulated oil and gas exploration and production venture, concluding with an assessment of the team's results and lessons learned
2. Two brief recommendation memos relating to case studies discussed in class
3. Two financial analysis homework problems
4. A final examination

### Class Schedule and Topics

#### Session 1 8/25/14

- Course introduction and administration
- Overview of the exploration and production value chain

Read: Chapter 1 in "Oil and Gas Production"

Bloomberg, "Shale Gas Reserves Have Potential To Reignite US Economy"

Wallace-Wells, in the New York Times, January 14, 2011, "The Will To Drill"

#### Session 2 9/8/14

- Petroleum reserves (Guest lecturer)
- Introduction to Journey to Sakhalin Case (Issues involved in dealing with sovereign governments to gain access to petroleum resources, using Royal Dutch/Shell's experience with the Sakhalin 2 venture)

Read: Chapters 2 and 3 in "Oil and Gas Production"

Pages 7 to 22 in "Guidelines for Application of the PRMS"

Simmons, "Calculating Oil and Gas Reserves"

Session 3 9/15/14

- Financial modeling of the upstream business
- Petroleum fiscal systems
- Introduction to Ambitious Oil Company (A) Case (Issues relating to matching exploration and production investment strategy with organizational objectives and capabilities)

Session 4 9/22/14

- Journey to Sakhalin case discussion
- Homework discussion
- Natural gas and natural gas liquids

Preparation: Financial analysis homework #1

Sakhalin (A) one page recommendation memo (one per team)

Read and prepare to discuss: Journey to Sakhalin (A) case

Read: Chazan in the Financial Times, July 8, 2013, "Kashagan – a study in a struggle for oil"

IEA, "Golden Rules for a Golden Age of Gas"

Session 5 9/29/14

- Ambitious Oil Company (A) case discussion
- Homework discussion
- Risk and uncertainty
- Introduction to Maradarko case

Preparation: Ambitious Oil Company (A) recommendation memo (one per team)

Financial analysis homework #2

Session 6 10/6/14

- The value of information (Guest lecturer)

Read: Value of information documents to be provided on Blackboard

Session 7 10/13/14

- Maradarko case discussion
- Introduction to OilSim

Read and prepare to discuss: Maradarko case

Session 8 10/20/14

- Identifying possible petroleum basins to explore
- OilSim challenge 1: Nominate blocks to be included in the licensing round, using geographic maps, and magnetic and gravimetric survey data.
- OilSim challenge 2: Identify the most promising of the blocks offered for lease and prepare bids, using common risk segment maps and 2D seismic surveys

Read: Chapter 4 in "Oil and Gas Production"

Pages 23 to 33 in "Guidelines for Application of the PRMS"

Session 9 10/27/14

- Discovery and appraisal of petroleum reserves
- OilSim challenge 2 continued: Submit bids and learn results
- OilSim challenge 3: Negotiate farm-ins and farm-outs with other teams, after obtaining and assessing 3D seismic surveys, then plan wildcat and appraisal drilling, including choice of rigs and service providers to contract.

Read: Chapters 5 and 6 in "Oil and Gas Production"  
Pages 35, 36, 78 and 79 in "Guidelines for Application of the PRMS"

Prepare: OilSim bids  
Farm-in, farm-out strategy and plans

Session 10 11/3/14

- Review results of the exploration phase
- Reservoir depletion
- OilSim challenge 4: Prepare a depletion plan for every reservoir to be developed and determine the initial expected detailed production profile for each.

Read: Chapters 7 and 8 in "Oil and Gas Production"  
Executive Summary in "Economic Analysis of Future Oil and Gas Development"

Scan: Example exploration plan

Session 11 11/10/14

- Complete Challenge 4, if necessary
- Field processing and transportation
- OilSim challenge 5: Plan the facilities to produce the oil and gas that has been found in the block.

Read: Chapter 9 in "Oil and Gas Production"  
Shell, "Oil and Gas Offshore Production"

Session 12 11/17/14

- Project management
- Financial models
- OilSim challenge 6: Plan the construction of needed facilities, including cost and time estimates .

Read: Santiago & Magallon, "Critical Path Method"  
NetMBA.com, "PERT"

Session 13 11/24/14

- OilSim challenge 6 continued: Execute the construction plan
- OilSim challenge 7: Adapt/react to events occurring during the production life of the venture.

Read: Chapter 10 in "Oil and Gas Production"  
Campbell for Reuters, June 14, 2010, "Deepwater Spills and Short Attention Spans"

Preparation: Facility construction plan

Session 14 12/1/14

- Review and discuss results of OilSim venture and lessons learned
- Exam review

Preparation: Individual reappraisals of the OilSim ventures to be submitted before class.

Final Exam