

PET 412E PETROLEUM AND NATURAL GAS ECONOMICS

Course Title		Petroleum and Natural Gas Economics				
		Course Implementation, Hours/Week				
Code	Semester	Local Credits	ECTS Credits	Theoretical	Tutorial	Laboratory
PET 412E	7	3	5	3	0	0
Department		Petroleum and Natural Gas Engineering				
Course Type		Compulsory		Course Language		English
Course Prerequisites		EKO 201E MIN DD				
Course Category By Content, %		Math & Basic Sciences	Engineering Topics; Check if Contains Significant Design (√)			Other
		-	100			-

Course Description	Overview of petroleum and natural gas economics and basic concepts. Methods of profitability measures. Definition of risk and uncertainty. Decision analysis, decision tree analysis, evaluation of expected monetary value. Basic principles of probability: probability distributions, binomial, multinomial and hypergeometric distributions. Risk analysis methods in oil and gas exploration: risking petroleum exploration, judging probability of discovery, resource distribution, multiwell drilling programs. Valuation in discovered fields. Appraisal of risky investments under uncertainty.		
Course Objectives	<ol style="list-style-type: none"> 1. Develop students' ability to apply engineering economics to evaluate engineering projects 2. Develop students' ability to apply decision analysis concepts to decision making problems in the oil, gas and geothermal engineering 3. Develop students' ability to incorporate risk and uncertainty into economic analysis and decision making 		
Course Learning Outcomes	<p>Students who pass the course will be able to:</p> <ol style="list-style-type: none"> 1. Estimate the reserves and performance of a petroleum asset with or without uncertainty 2. Apply the principles of engineering economics and time value of money to engineering projects 3. Design a cash-flow model for a petroleum asset using related prices and costs 4. Incorporate government related laws such as taxes and royalty into the economic study 5. Evaluate and compare different investment alternatives based on their economic indicators to recommend a decision 6. Appraise a recommended decision using decision-analysis methods 7. Characterize probability distributions from available data to quantify uncertainty and probabilities of interest 8. Interpret case studies, statistics, and data related to petroleum economics and decision analysis from published reports/literature 		
Textbook	<ol style="list-style-type: none"> 1. Newendorp, P., Schuyler J. (2000) <i>Decision Analysis for Petroleum Exploration</i>, Planning Press. 2. McCray, A. (1975) <i>Petroleum Evaluation and Economic Decisions</i>, Prentice-Hall, Inc. 		
Other References	<ol style="list-style-type: none"> 1. Thompson, R., Wright, J. (1985). <i>Oil Property Evaluation</i>. Thompson-Wright Associates. 2. Ikoku, C.U. (1985) <i>Economic Analysis and Investment Decisions</i>, John Wiley and Sons, Inc. 3. Blank, L., Tarquin, A. (2011) <i>Engineering Economy</i>, McGraw-Hill. 		
Homework & Projects	Throughout the semester the students will be given homework assignments which include problems and steps to evaluate alternatives related to oil, gas or geothermal industry considering risk and uncertainty.		
Laboratory work	-		
Computer Use	Students will be using the computer for their homework assignments.		
Other Activities	-		
Assessment Criteria	Activities	Quantity	Effects on Grading, %
	Midterms	2	40
	Quizzes	-	-
	Homework	5	25
	Projects	-	-
	Term Paper/Projects	-	-
	Laboratory Work	-	-
	Other Activities	-	-
Final Exam	1	35	

Weeks	Course Plan	Course Outcomes
1	Introduction, reserves estimation	8, 1
2	Decline curve analysis	1
3	Time value of money, and the concepts of economic equivalence and interest	2
4	Interest relations, nominal/effective interest, escalated/constant currency analysis	2
5	Elements of cash-flow for petroleum properties: income and expenditures	3
6	Taxes, and tax allowances: depreciation, depletion	4
7	Defining a project and its alternatives, mutually exclusive/non-mutually exclusive alternatives, evaluation of alternatives (profitability measures): NPV, ROR	5
8	Cost-only alternatives: Capitalized cost, equivalent uniform cash-flow, incremental ROR	5
9	Other useful economic indicators and graphical methods	5
10	Introduction to decision analysis, decision hierarchy and influence diagrams, sensitivity and break-even, tornado and spider diagrams	6
11	Basic principles of probability and statistics, probability distributions, Monte Carlo simulation	6, 7
12	Discrete probability distributions, binomial, multinomial, hypergeometric distributions and Bayes' theorem	7
13	Expected value concept, determining probability of success, decision trees	6
14	Decision quality analysis, value of information	6

Related Performance Indicators
<p>1b. Apply engineering methods to reservoir, drilling and production engineering problems</p> <p>2c. Conduct economic analysis in Petroleum, Natural Gas, and Geothermal Engineering design.</p> <p>6b. Acquire, analyze, and interpret data.</p> <p>7a. Acquire new information relevant to tasks without guidance.</p>

Relationship of Course Learning Outcomes to the Performance Indicators				
Course Learning Outcome	Performance Indicator			
	(1b)	(2c)	(6b)	(7a)
1	x			
2		x		
3		x		
4		x		
5		x		
6		x		
7			x	
8				x