MECHANICAL ENGINEERING PROGRAM

ABET COURSE SYLLABUS

ME435: Drilling Engineering (4) Elective

Course Description: (2013-15 Catalog) Theory and practice of oil well planning, drilling, well logging, and completion applied to the development of new oil and gas production from onshore and offshore fields. 4 Lectures

Prerequisite Courses: ME 329, ME 347

Prerequisites by Topic: ME 329, Intermediate Design
ME 347, Fluid Mechanics II.

Textbook: **(and/or other required material)** Applied Drilling Engineering, by Adam T. Bourgoyne, Jr., et al.; Society of Petroleum Engineering, Richardson, Texas, 1986.

References: Offshore Handbook, Gulf Publishing Company, Houston, Texas.
A Primer of Oilwell Drilling, by Ron Baker, Petroleum Extension Service, Austin, Texas, 1979.
A Primer of Offshore Operations, by Ron Baker, Third Edition, Petroleum Extension Service, Austin, Texas, 1998.
Petroleum Engineering-Drilling and Well Completions, by Carl Gatlin; Prentice-Hall, Englewood Cliffs, N.J., 1960.

Course Coordinator/Instructor: M. Medizade, Professor of ME

Course Learning Outcomes:

1. Describe specifications for equipment and structures for the drilling of oil wells onshore and offshore.
2. Describe well programs for the drilling, logging, testing, and completion of oil wells.
3. Drilling fluid, cement, and drilling hydraulics calculations.
4. Design of surface, intermediate, and production casings.
5. Assist in the supervision of routine drilling operations and special operations of coring, logging, casing installation, and cementing.
6. Design for best drilling practice.

Relationship of Course to MECHANICAL ENGINEERING Program Outcomes:												
a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*	*l*	*m*
H	**M**	**H**	**L**	**H**	**L**	**M**	**L**	**M**	**L**	**M**	**H**	**H**

Topics Covered: (recommended number of hours each)

1. Introduction: Concepts of petroleum geology and basic rock properties, petroleum exploration methods, general leasing practices.
2. Rotary Drilling: Introduction and basic operations, rig components and their design.
3. Drilling Fluids: Testing of drilling fluids, functions of the drilling fluid, composition and nature of common drilling muds, drilling mud calculations, field maintenance of mud systems, air, natural gas, and aerated mud as drilling fluids.
4. Rotary Drilling Hydraulics: Newtonian fluid flow calculations, plastic fluid flow calculations, pressure drop across bit nozzles, pressure drop calculations for a typical system, hydraulics and rate of penetration, pressure surges caused by pipe movement, air, gas, and aerated mud drilling.
5. Cements and Cementing: Composition of portland cement, cement testing, standardization of drilling concepts, cement additives, and cement placement techniques.
6. Coring and Core Analysis: General coring methods and equipment, routine core analysis and practical uses of core analysis data.
7. Well Logging: Driller's logs, sample logs, mud logging, electric logging, porosity logs and gamma ray logs.
8. Casing Design: Manufacture of casing, standardization of casing, API casing performance properties, casing design criteria, and special design considerations.
9. Formation Damage: Causes, prevention of formation damage and quantitative analysis of formation damage.
10. Offshore Drilling/Production Platforms: Platform history, water depth, environmental factors, basic steel structures, platform characteristics, construction considerations, comparative costs and different types of platforms.
11. Directional Drilling and Deviation Control: Definition and reasons for directional drilling, wall trajectory, directional drilling measurements and deviation control.

Laboratory Projects: None

Class/Lab Schedule: Four 50-minute lectures per week.

Contribution of Course to Meeting the Professional Component:

(a)College-level mathematics and basic sciences:	0 credits
(b) Engineering Topics:	4 credits
Design	Yes, 1 unit
(c)General Education:	0 credits
(d) Other:	0 credits

Prepared by:	**Date:**
M. Medizade	6/10/2014