UNIVERSITY OF MISKOLC
FACULTY OF **EARTH SCIENCE AND ENGINEERING**
1735

DRILLING ENGINEERING II.

MSc in Petroleum Engineering **MFKOT730033**

COURSE DESCRIPTION

University of Miskolc
Faculty of Earth Science and Engineering
Petroleum and Natural Gas Institute
September 2022

Course Data Sheet

Course Title: Drilling Engineering II. **Instructor:** Dr. Gabriella FEDERER-KOVACS associate professor	**Code:** MFKOT730033 **Responsible department/institute:** DPE/IPNG (OMTSZ/KFGI)
	Course Element: Compulsory
Position in curriculum* (which semester): 3 (2)	**Pre-requisites (if any):** Drilling engineering I. (MFKOT720022)
No. of contact hours per week (lecture + seminar): 2+2	**Type of Assessment (examination / practical mark / other):** examination
Credits: 5	**Course:** full time

Course Description:

1. Pressure basics
2. Formation integrity tests
3. Kick tolerance & calculation.
4. Well structure.
5. Fracture gradient. Casing shoe setting depth determination.
6. Vertical and directional drilling & MWD,LWD
7. Casing design, graphical method
8. Test 1
9. Primary cementing design, selection of cement and additives.
10. Two stage cementing operation.
11. Liner cementing, squeeze cement operation.
12. Cement slurry lab test, cementing calculations, effective mud removal.
13. Hole problems
14. Test 2

Competencies to evolve:Knowledge:

T1: Knows the economic processes related to the hydrocarbon industry.

T2: Familiar with the equipment, methods and facilities necessary for drilling the oil, gas and water wells.

T3: Familiar with the methods used to avoid and eliminate the typical disturbances when establishing oil, gasand water wells.

T11: Familiar with the methods and software of computer design and analysis in the hydrocarbon industry.

Ability:

K1: Able to interpret the economic processes related to the hydrocarbon industry and give adequate answers to them.

K2: Able to manage teams to operate the equipment needed for the drilling of oil, gas and water wells and to design drilling of wells.

K3: Able to avoid disturbances that are typically encountered when establishing oil, gas and water wells.

K11: Capable to perform computer design and evaluations for hydrocarbon industry.

Attitude:

A1 Enforce sustainability and energy efficiency requirements.

A2 Strive professionally at a high level, independently or in a workgroup to plan and carry out tasks.

A3 Strives to carry out work using a complex approach based on a systematic and process-oriented mindset.

A4 Seeks to achieve research, development and innovation goals during work.

Autonomy and responsibility:

F1: Independently capable of manage a hydrocarbon industrial complex design work and the task of performing and participating in Project manager tasks.

F2: Independently capable to design construction (drilling) and to manage drilling fluids, producing wells, to optimize the cost of deep drilling; to troubleshoot of breakdowns during drilling.

F7 Takes responsibility for professional decisions, for carrying out workflows or managing them.

Assessment and grading:

Students will be assessed with using the following elements.

Attendance:	5 %
Homework	10 %
Short quizzes	10 %
Midterm exam	40 %
Final exam	35 %
Total	100%

Grading scale:

% value	Grade
90 -100%	5 (excellent)
80 – 89%	4 (good)
70 - 79%	3 (satisfactory)
60 - 69%	2 (pass)
0 - 59%	1 (failed)

Compulsory or recommended literature resources:

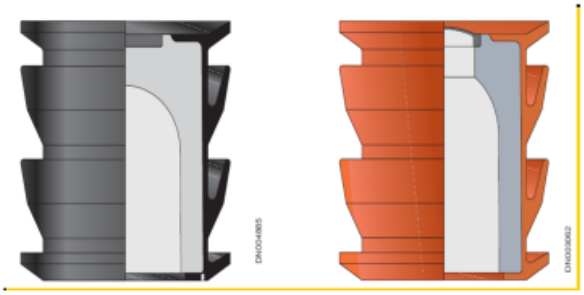
- H. Rabia: Oilwell Drilling Engineering. Principles and Practice. Graham Tratman Ltd. London 1995. 322 p.
- Howard B. Bradley: Petroleum Engineering Handbook, Third Printing, Society of Petroleum Engineers, Richardson, TX, U.S.A. 1992.
- Drilling Data Handbook, Edition Technip, Paris ISBN 2-2108-0756-4, 1999. 542 p.
- Erik B. Nelson: Well Cementing. Schlumberger Educational Services. Second Edition, Houston Texas, 2006.
- Arthur Lubinski (Edited by Stefan Miska): Development of Petroleum Engineering I-II. Gulf Publishing Company, Houston, 1987.

Course Schedule based on the 2022/23 school year

Date	Topic
09.07.	Pressure basics
09.14.	Formation integrity tests
09.21.	Educational break
09.28.	Kick tolerance & calculation. Well structure.
10.05.	Fracture gradient. Casing shoe setting depth determination.
10.12.	Vertical and directional drilling & MWD,LWD
10.19.	Casing design, graphical method
10.26.	Test 1
11.02.	Educational break.
11.09.	Primary cementing design, selection of cement and additives Two stage cementing operation.
11.16.	Liner cementing, squeeze cement operation.
11.23.	Cement slurry lab test, cementing calculations, effective mud removal.
11.30.	Hole problems
12.07.	Test 2

Test Example

4) What tool can you see in the image? _____/1 pont



☐ top and bottom cementing plug ☐ guide shoe ☐ float collar ☐ float shoe

5) Pair the cementing methods with their type. _____/2 pont

☐ Primary ☐ Secondary

[1] remedial, squeeze, bailer cementing [2] single stage, inner string, multiple stage, liner cementing

6) Why is it important to chose the correct casing shoe depth in case of Surface Casing? (two answers) _____/2 pont

☐ formation can easily fracture at these shallow depth ☐ need to protect shallow water zones

☐ shallow gas kick can easily lead to blowout ☐ the collapse pressure at this depth is very high

7) Where do you collect the information for casing seat selections? (two answers) _____/2 pont

☐ can not be told ☐ cement bond logs ☐ gamma ray logs ☐ data from offset wells

☐ seismic and geology

8) Which data do you need for shoe pressure calculation? (three answers) _____/3 pont

☐ Shoe TVD ☐ SIDPP ☐ MD ☐ TVD ☐ Shoe MD ☐ mud weight ☐ SICP

10) What are the most important data to determine the depth of the casing shoe? (three answers) _____/3 pont

☐ formation gradient ☐ open hole volume ☐ mud weight ☐ casing size ☐ gas gradient

11) Please explain what loads are casings required to design for? _____/4 pont

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12) Are the following statements true or false? _____/2 pont

In case of a collapse design casing is supposed to be cemented in place. ☐ Igaz ☐ Hamis

Collapse pressure is designed for an empty casing where the internal pressure of the casing is zero. ☐ Igaz ☐ Hamis

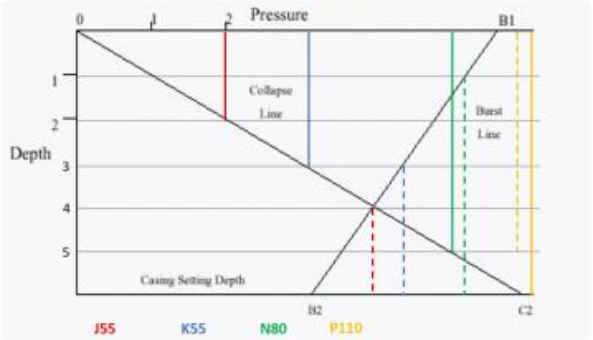
13) What are the main functions of the Intermediate Casing? (two answers) _____/2 pont

☐ it is seated above the overpressured zone ☐ isolates shallow ground water

☐ this is the first casing that is equipped with a BOP ☐ this is the last casing string in a well

☐ very good cement bond is highly important

17) Based on the attached image which is the correct casing design for the combined collapse+burst design? _____/5 pont



- [ ] 0-2/J55, 2-3/K55, 3-5-N80, 5-6/P110
- [ ] 0-1/P110, 1-3/N80, 3-4/K55, 4-6/J55
- [ ] 0-1/P110, 1-5/N80, 5-6/P110
- [ ] 0-1/N80, 1-3/K55, 3-5/N80, 5-6/P110

18) Arrange the Leak-off test procedure in order. _____/7 pont

- [ ] Line up on high pressure low volume pump
- [ ] Plot the Volume vs. Pressure
- [ ] Pull bit inside shoe
- [ ] Pump down drillpipe or annulus
- [ ] Circulate mud until uniform
- [ ] Close the BOP
- [ ] Drill out shoe and 3-5 m (10 - 15 ft) of new hole

Examination review questions

1. Pressure basics (hydrostatic, formation, fracture)
2. Formation integrity tests (LT,LOT,FT)
3. Kick tolerance & calculation.
4. Well structure. Casings and functions
5. Fracture gradient. Casing shoe setting depth determination.
6. Vertical and directional drilling & MWD,LWD
7. Casing design, graphical method
8. Primary cementing design, selection of cement and additives.
9. Two stage cementing operation.
10. Liner cementing, squeeze cement operation.
11. Cement slurry lab test, cementing calculations, effective mud removal.
12. Hole problems