UNIVERSITY OF MISKOLC

FACULTY OF
EARTH AND ENVIRONMENTAL
SCIENCES AND ENGINEERING

WELL COMPLETION DESIGN

MSc in Petroleum Engineering **MFKOT720014**

COURSE DESCRIPTION

University of Miskolc
Faculty of Earth Science and Engineering
Petroleum and Natural Gas Institute
2024

Course Data Sheet

<table>
<tr><td>Course Title: Well Completion Design
Instructor: Dr. Imre FEDERER, honor associate professor</td><td>Code: MFKOT720014
Responsible department/institute:
DPE/IPNG (OMTSZ/KFGI)
Course Element: Compulsory</td></tr>
<tr><td>Position in curriculum*
(which semester):
4 (3)</td><td>Pre-requisites (if any): Drilling Engineering I. (MFKOT720022)</td></tr>
<tr><td>No. of contact hours per week
(lecture + seminar): 2+1</td><td>Type of Assessment (examination / practical mark / other): examination</td></tr>
<tr><td>Credits: 3</td><td>Course: full time</td></tr>
<tr><td colspan="2">Course Description:
1. Tubing string design.
2. Recommended torque for threaded coupling.
3. Tubing elongation, tubing movements.
4. Introduction of packer types.
5. Calculation of packer forces.
6. Connection between tubing and packer.
7. Well completion tools selection.
8. Perforating techniques, control the formation damage.
9. Well completion fluids.
10. Gravel pack techniques.
11. Formation stimulation: hydraulic fracturing
12. Formation stimulation: matrix acidizing,
13. Coiled tubing operations, wireline operations, nitrogen operations,
14. Well completion quality control.
Competencies to evolve:
Knowledge:
Knows the economic processes related to the hydrocarbon industry. Knows the equipment and methods required for the drilling and completion of oil, natural gas and water wells and has the necessary knowledge to plan drillings. Knows the malfunctions that typically occur during the construction of oil, natural gas, and water wells and how to resolve them. Knows the methods and tools of computerized design and analysis in the hydrocarbon industry.
Ability:
Able to interpret the economic processes related to the hydrocarbon industry and to give adequate answers to them. Able to manage groups operating the equipment required for the drilling and completion of oil, natural gas and water wells and to plan the drilling. Able to avoid and eliminate malfunctions that typically occur during the construction of oil, natural gas, and water wells. Capable of hydrocarbon industrial computer design and analysis.
Attitude:
Autonomy and responsibility: Able to independently manage hydrocarbon industrial complex planning works and perform project management tasks, or participate in them. Capable, as an efficient part of a group, of planning the drilling and completion of fluid producing wells and conducting deep drilling; to optimize the costs of deep drilling; to prevent malfunctions occurring during deep drilling. Takes responsibility for his/her professional decisions and the work processes carried out by him/her or under his/her control.</td></tr>
<tr><td>Assessment and grading:</td><td>Grading scale:
% value Grade</td></tr>
</table>

Students will be assessed with using the following elements.		90 -100%	5(excellet)
		80 – 89%	4 (good)
Attendance:	5 %	70 - 79%	3(satisfactory)
Homework	10 %	60 - 69%	2 (pass)
Midterm exam	40 %	0 - 59%	1 (failed)
Final exam	45 %		
Total	100%		

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, Edítion 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 for 2023/24 school year

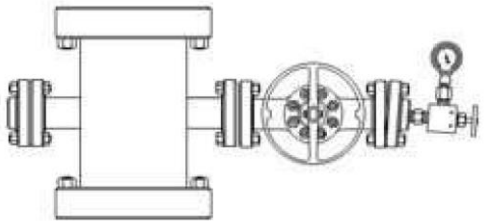
Date	Topic
14.febr	Tubing string design. Recommended torque for threaded coupling.
21.febr	Tubing elongation, tubing movements.
28.febr	Introduction of packer types. Calculation of packer forces.
06.márc	Connection between tubing and packer. Well completion tools selection
13.márc	Perforating techniques, control the formation damage.
20.márc	Well completion fluids.
27.márc	Gravel pack techniques.
10. ápr	Formation stimulation: hydraulic fracturing, matrix acidizing,
24.ápr	Coiled tubing operations, wireline operations, nitrogen operations, Well completion quality control
8.máj	Test writing.

Examination review questions

1. The side outlet spool (figure below), is required to monitor the riser pressure in a well test stack up.

The riser has been pressure tested and the well test is ongoing, but the instrument flange has been made up incorrectly.

What action should be taken?



A. Close in the well, close the manual side outlet valve and rectify the incorrectly made up flange

B. Continue to flow the well, close the manual side outlet valve and rectify the incorrectly made up flange

C. Continue to flow the well and monitor the incorrectly made up flange for leaks

D. Close in the well, depressurise the riser, close the side outlet valve and rectify the incorrectly made up flange.

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2. The flange has been made up incorrectly within the riser section and the full bore intervention drift will not pass the flange.

The drift has been pulled to surface and the riser bled down.

What should be done to fix the problem?

A. Loosen all the nuts and realign the flange before retightening

B. Break out the flange, replace the ring joint, realign and retorque

C. Tighten the left side nuts to realign the flange

D. Loosen the right side nuts to realign the flange

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3. What is the function of the swab valve?

A. It is hydraulically operated and part of the automatic security system that is activated by an individual closing signal.

B. It is normally manual and used to pump in or circulate fluid out of the well.

C. It shuts in conjunction with the maintenance of valves higher up and in emergency situations.

D. It is used in conjunction with well intervention and is manually operated.

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4. The tubing hanger (figure WEQ04) has a wireline lock profile machined into the body.

When using this profile with a wireline plug to isolate the well to allow removal of the Christmas Tree,

How should the plug be dressed to ensure it can be tested from above and hold well pressure from below?

A. The profile cannot be used for this application

B. With the chevron packings all facing down

C. With the chevron packings all facing up

D. With a bonded single elastomer

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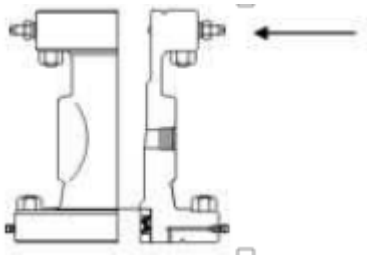
5. It has been reported that the tubing hanger tie down bolt (figure below) has well fluid leaking from the bolt threads.

The well head pressure is 173 bar and the 'A' annulus pressure is 10 bar.

What action should be taken?



A. The leak can be easily repaired by removing the bolt and changing the packing gland

B. The leak can only be repaired by killing the well and changing out the leaking tie down bolt

C. As the leak is being driven by the 'A' annulus pressure and annulus fluid, bleed down the annulus pressure and monitor the well, before repairing the leak

D. As the leak is being driven by the well pressure and well fluid, plug the well, bleed down the tubing and annulus pressures and monitor the well before repairing the leak

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6. If the tubing movement calculations are incorrect and the tubing hanger is over stressed in tension, what part of the tubing hanger is likely to fail first?

A. The tubing hanger seal assembly

B. The casing head spool

C. The tubing hanger to tubing connection

D. The tubing hanger landing ring

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7. The Surface Controlled Sub Surface Safety Valve (SCSSSV) in the well you are about to work on is identified as non-equalising and has been closed and de-pressured above.

Identify the correct action to re-open the valve without damaging it.

A. Open with equal pressure above and below flapper.

B. Open with differential above flapper.

C. Open with wireline.

D. Open with differential below flapper.

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8. How are sub-surface controlled down hole safety valves closed?

A. A decrease in tubing pressure.

B. An increase in tubing temperature.

C. A decrease in tubing temperature.

D. An increase in tubing pressure.

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9. Which of the following down hole safety valves are sub-surface controlled?

(TWO ANSWERS)

A. Tubing retrievable valves.

B. Ambient pressure valves.

C. Automatic valve.

D. Differential pressure valves.

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10. How does a surface controlled wireline retrievable down hole safety valve make hydraulic communication with the control line?

A. Through the opening of a sliding sleeve.

B. Between two packing seal stacks, once the lock mandrel is set.

C. Through a hydraulic stab.
