GAS PROCESSING

MSc in Petroleum Engineering **MFKOT7703**

COURSE DESCRIPTION

University of Miskolc
Faculty of Earth Science and Engineering
Petroleum and Natural Gas Institute
September 2020

Course Data Sheet

<table>
<tr><td>Course Title: Compulsory elective I.
Gas Processing
Instructor: Dr. Zoltán TURZÓ, associate professor
László KIS, assistant lecturer</td><td>Code: MFKOT77003
Responsible department/institute:
DPE/IPNG (OMTSZ/KFGI)
Course Element: Compulsory Elective</td></tr>
<tr><td>Position in curriculum*
(which semester): 1
(4)</td><td>Pre-requisites (if any): -</td></tr>
<tr><td>No. of contact hours per week (lecture + seminar): 2+0</td><td>Type of Assessment (examination / practical mark / other): practical mark</td></tr>
<tr><td>Credits: 2</td><td>Course: full time</td></tr>
<tr><td colspan="2">Course Description:
1. Gas laws
2. Equation of states and their usage.
3. Physical properties of hydrocarbon systems.
4. Vapor-liquid equilibrium calculations 1.
5. Vapor-liquid equilibrium calculations 2.
6. Gas hydrates and their formation.
7. Basics of separation,
8. Basics of separator types, separator design 1.
9. Basics of separator types, separator design 2.
10. Absorption gas drier and treating system.
11. Adsorption technology.
12. Cold separation.
13. Cold separation technology
14. Computer modelling of gas treating technologies.

Competencies to evolve:
Knowledge: T1, T4, T5, T11
Ability: K1, K4, K5, K9, K10, K11
Attitude:
Autonomy and responsibility: F1, F3, F6, F7</td></tr>
<tr><td>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%</td><td>Grading scale:
% value — Grade
90 -100% — 5 (excellent)
80 – 89% — 4 (good)
70 - 79% — 3 (satisfactory)
60 - 69% — 2 (pass)
0 - 59% — 1 (failed)</td></tr>
</table>

Compulsory or recommended literature resources:

- J. M. Campbell (2014): Gas Conditioning and Processing, Vol. 1.: The Basic Principles, 9th edition, ISBN 978-0-9703449-2-2
- J. M. Campbell (2014): Gas Conditioning and Processing, Vol. 2.: The Equipment Modules, ISBN 978-0-9703449-5-3
- R. N. Maddox, D. J. Morgan (2006): Gas Conditioning and Processing, Vol. 4.: Gas Treating and Sulphur Recovery, ISBN 978-0-9703449-3-7
- F. S. Manning, R. E. Thompson (1991): Oilfield Processing of Petroleum, Volume 1.: Natural Gas, ISBN 978-0-87814-343-6
- A. Bahadori: Natural Gas Processing: Technology and Engineering Design, Gulf Professional Publishing, 2014. ISBN 9780124202047

Course Schedule for 2020/21 school year

Date	Topic
2020.09.07.	Gas laws
2020.09.14.	Equation of states and their usage.
2020.09.21.	Physical properties of hydrocarbon systems.
2020.09.28.	Vapor-liquid equilibrium calculations 1.
2020.10.05.	Vapor-liquid equilibrium calculations 2.
2020.10.12.	Gas hydrates and their formation. Basics of separation,
2020.10.19.	Test writing.
2020.10.26.	Basics of separator types, separator design 1.
2020.11.02.	Basics of separator types, separator design 2.
2020.11.09.	Absorption gas drier and treating system.
2020.11.16.	Adsorption technology.
2020.11.23.	Cold separation.
2020.11.30.	Cold separation technology Computer modelling of gas treating technologies.
2020.12.07.	Test writing.

Test Example

Gas Processing Test

1. List the known basic hydrocarbon groups (4) with their formula and at least one member. (20p)
2. List the most common impurities in the produced hydrocarbons (4). Mention at least one associated problem for every impurity. (13p)
3. Why is the treating of the produced natural gas essential? (8p)
4. What is the Wobbe number? Write down its formula. (7p)
5. Find the higher heating value for the following gas mixture. (10p)

Composition	mol%	MW [kg/kmol]	HHV [MJ/m3]
C1	77.5	16	37.7
C2	7.5	30	66.0
C3	10.0	44	94.4
N2	2.0	28	0.0
CO2	3.0	44	0.0
Total	100		

6. How the required water-content of a natural gas mixture is defined (2)? (3p)
7. What is the gas sweetening procedure? (3p)
8. List different methods for dehydration. (7p)
9. Estimate the water content of the natural gas containing 10% H_2S and 30% CO_2 at 30°C and 15000 kPa. Find the equivalent H_2S concentration. Correct the water content with the obtained factor. (10p)
10. Water is separated in an inlet scrubber upstream of a compressor at 3 MPa and 45°C. The gas is then compressed to 20 MPa and cooled to 60 °C before entering the dehydrator. Is the gas saturated when entering the dehydrator? If not, find the temperature when it is saturated. (8p+10p)

Examination review questions

1. Gas laws
2. Equation of states and their usage.
3. Physical properties of hydrocarbon systems.
4. Vapor-liquid equilibrium calculations 1.
5. Vapor-liquid equilibrium calculations 2.
6. Gas hydrates and their formation. Basics of separation,
7. Basics of separator types, separator design 1.
8. Basics of separator types, separator design 2.
9. Absorption gas drier and treating system.
10. Adsorption technology.
11. Cold separation.
12. Cold separation technology Computer modelling of gas treating technologies.