



Faculty of Engineering
Department of Petroleum Engineering

Module Guide 2014/15

Reservoir fluids

Module Code	
Module Level	2
Module Credit	
Semester	1
Module Lecturer	Dr Pavel Spirov
Other Module Team Members	TBC
Pre-requisites	None
Co-requisites	None
Student class contact time	30 hours
Student lab contact time	45 hours
Timetable details	TBC

1. Module Description

After completion of this course, students will know basement of reservoir engineering. They will gain essential knowledge which each oil/gas engineer should know.

2. Learning Outcomes

By successful completion of this module students will be able to:

Learning Outcome	Learning Activity	Explanation
In this course will be studied basics of reservoir engineering. .	1. Lectures	Lectures will be divided into several modules
	2. Calculations and assignments.	There will be practical calculations and drawings in order to get deeper knowledge of petroleum industry.
	3. Lab work together with petrophysics course. Sometimes will be necessary to do labs for reservoir fluids and sometimes for petrophysics.	For better understanding the laboratories will be carried out together with reservoir fluids course

3. Assessment Details

Assessment Tasks	weighting for components (%)	Hand-in date (university week)	Rationale for the task
1. Midterm exam	30	TBC	To demonstrate knowledge and understanding of the module content
2. Lab work (Assignment & presentation)	20	TBC	To demonstrate the application of knowledge and understanding of the module content to a particular aspect of the subject
3. Final exam	50	Check University Exam timetable	To demonstrate knowledge and understanding of the module content

4. Teaching and Learning Details

The “reservoir fluids ” is a theory, lab based, practical assessments and pc demonstration module and will be delivered by a combination of lectures, discussion, experiments and software demonstration to show reservoir fluid properties. This course is essential for further development of oil and gas engineers.

5. Outline Syllabus

Week No.	Date	Content	Staff
1		<p>Module 1:</p> <p>introduction to oil and gas, introduction to reservoir, formation of reservoirs, geochemistry, crude oil origin, source rocks, reservoir rocks, kerogen types, oil window, elemental composition of crude oil and gas, basic analytical methods, migration of hydrocarbons, requirement for formation of oil and gas fields, overview of oil and gas reserves</p>	Dr. Pavel Spirov
2		<p>Module 2:</p> <p>Exploration of oil and gas field, anatomy of oil and gas fields, contour maps</p>	Dr. Pavel Spirov
3		<p>Module 3</p> <p>Reservoir types, trap types, reserves</p>	Dr. Pavel Spirov
4		<p>Assessment 1</p>	
5-6		<p>Module 4:</p> <p>– PVT properties of oil, binary diagrams, classification of oil and gas reservoirs, oil reservoirs such as: Undersaturated oil reservoir, Saturated oil reservoir, Gas-cap reservoir.</p> <p>There will be also explained : black oil, ordinary, low shrinkage oil, near critical oil, low volatile oil.....),</p> <p>In gas reservoirs will be : Retrograde gas-condensate, Near-critical gas-condensate, Wet</p>	Dr. Pavel Spirov

		gas, Dry gas)	
6-7		<p>Module 5 –</p> <p>Reservoir fluid properties –</p> <ul style="list-style-type: none"> - Natural gases - Crude oil systems - Reservoir water systems <p>Gases = Ideal gases, Real gases EFFECT OF NONHYDROCARBON COMPONENTS ON THE Z-FACTOR, COMPRESSIBILITY OF NATURAL GASES, Z – compressibility factor, Gas formation volume factor, Gas formation volume factor,</p> <p>Exercise on $PV = RT$</p> <p>Exercise on gas compressibility factor - z</p>	Dr. Pavel Spirov
7-8		<p>Module 6</p> <p>Properties of crude oil systems</p> <p>Fluid gravity</p> <p>Specific gravity of the solution gas</p> <p>Gas solubility</p> <p>Bubble-point pressure</p> <p>Oil formation volume factor</p> <p>Isothermal compressibility coefficient of undersaturated crude oils</p> <p>Oil density</p> <p>Total formation volume factor</p> <p>Crude oil viscosity</p> <p>Surface tension</p> <p>Crude oil gravity - Exercise</p>	Dr. Pavel Spirov
		Assessment 2	
9		<p>Module 7 – development and production</p> <p>Stages of development</p> <p>Primary, Secondary, Tertiary recovery</p>	Dr. Pavel Spirov

		Natural drive mechanisms - Water drive (artesian and ellision) , Solution gas drive, Gas cap drive, Gravitational	
10		Module 8 – volumetric, calculation of reserves Calculation of volumes Calculating Gross Reservoir Volume (GRV)	Dr. Pavel Spirov
11		Module 9 – Reservoir fluid flow , one phase flow Types of fluids in the reservoir Flow regimes Reservoir geometry Number of flowing fluids in the reservoir	Dr. Pavel Spirov
12		Assessment 3	
13		Module 10 – multiple phase flow Frontal displacement Buckley-Leverett theory Calculation of the speed of a Section Sw	Dr. Pavel Spirov
14		Module 11 – Recovery Recovery factor, Analysis of efficiencies, Areal sweep efficiency, Displacement efficiency	Dr. Pavel Spirov
15		Module 12 – EOR Various EOR such as chemical, biological, CO2, thermal methods	Dr. Pavel Spirov
16		Assessment 4	
17		Overview of the course	
18		Final Exam	

Practical:

Week	Action
2	Distillation, basic understanding of distillation
3	Drawing of contour maps
4	Understanding of chromatograms
6	Viscosity and density, Exercise: crude oil gravity
9	PVT diagrams
8	Calculation of reserves
9	Formation volume factor calculation
10	Introduction to Petrel

6. Reading and Learning Support List

Offshore book

- Offshore center Denmark

Basics of Reservoir Engineering

- Cosse

Reservoir engineering handbook

- Tarek Ahmed

7. Plagiarism and Collusion

All students are strongly advised to be familiar with Student Codes of Conduct on this matter and be aware of the Soran University and KRG Ministry of Higher Education and Scientific Research procedures as outlined in the: “Teaching Quality Assurance”, etc.

Good luck with your studies