

# Course TECHNOLOGY OF PROCESSING HEAVY OILS, BITUMEN AND RESIDUE

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## Basic Information

**This is a course, which contributes to MSc award in Petroleum Chemistry and Refining**

<b>Course period</b>	From February 1st till May 31st, 4 semester (15 weeks)
<b>Study credits</b>	6 ECTS credits
<b>Duration</b>	216 hours
<b>Language of instruction</b>	English
<b>Academic requirements</b>	<ul style="list-style-type: none"><li>– BSc degree in Petroleum Engineering, Engineering, Chemistry, Environmental Sciences or equivalent (transcript of records),</li><li>– good command of English (certificate or other official document)</li></ul>

## Course Description

«Technology of processing heavy oils, bitumen and residue» is an extensive course where overview of the current methods of recovery for heavy oil and tar sand bitumen technology by nonthermal and thermal methods will be presented. The course is designed to be suitable for undergraduate students, graduate students, and professionals who are working with heavy oil and tar sand bitumen. «Technology of processing heavy oils, bitumen and residue» requires basic chemistry, general engineering and modeling (such as [Deep Oil Refining Processes](#) and [System modeling of chemical-technological processes](#)) knowledge.

Heavy and conventional oil properties and its difference are reviewed. Besides, the course acquires students with current heavy crudes production and transportation methods and its severe environmental impact. There is considerable focus on natural bitumen and extra-heavy oil extraction technologies. Bitumen and heavy oil upgrading technologies are also discussed.

## Special Features of the Course

1. Scientific, social and practical aspects of oil recovery industry are tightly integrated in the teaching on the course.

In addition to conventional lectures the course offers a range of other learning opportunities in which students actively participate. Moreover, students will be involved in online mini-games and tests.

2. Provides broad technical information on methods enhanced oil recovery, enabling a rapid immersion in the exploration industry.

Detailed course material with a glossary of the main technical terms used in the oil recovery industry. New trends in methods of extraction and heavy crudes reservoir characteristics in worldwide scale. Up to date processes schemes including modified thermal methods.

3. Meetings with Rosneft employees

In exam week Rosneft employees will be invited to evaluate student's knowledge. It is a great opportunity to ask professional questions and receive some advices from specialists.

## Course Aims

- .To explain primary (natural) recovery methods.
- .To develop understanding related to the recognition and interpretation of advanced recovery methods.
- To acquaint with schematic diagrams of steam-based and in situ combustion processes.
- To introduce special bitumen and heavy oils processing technologies.

## Course Objectives

- To explain the different quarrying bitumen extraction methods.
- To classify bitumen and extra heavy oil extraction methods.
- To provide students with the explanation of basic bitumen's and heavy oil's extraction schematic diagrams.
- To familiarize students with different natural bitumen and heavy oil refining technologies.

## Learning Outcomes of the Course

By the end of the course, students will be able to:

- to demonstrate how natural bitumen could be extracted by nonthermal ("Cold") methods,
- to analyze the difference between thermal bitumen and heavy oil extraction methods,
- to identify major processes' features: temperature, pressure, different kind of equipment, products output and etc,
- to interpret schematic diagrams and compare them,

## Course Outline

Week	Lectures	Practice session / Assignments	Hours <sup>1</sup>
1-4	Quarrying bitumen extraction methods	<ul style="list-style-type: none"> <li>- Rocks hydraulic transportation scheme</li> <li>- Schematic diagram of modern bitumen extraction technologies from Oil Sands</li> <li>- Home assignment No 1</li> <li>- Test No 1</li> </ul>	2 4 2
5-7	Extraction method of bitumen and extra heavy oil with sand	<ul style="list-style-type: none"> <li>- SAGD technology</li> <li>- Thermal and nonthermal extraction methods</li> <li>- Home assignment No 2</li> <li>- Test No 2</li> </ul>	2 2 2
8-11	Conventional bitumen and heavy oil refining processes	<ul style="list-style-type: none"> <li>- Conventional natural bitumen and heavy oil refining technology</li> <li>- Schematic diagrams of hydrocracking, coking, thermal cracking and visbreaking, deasphaltization and gasification</li> <li>- Home assignment No 3</li> <li>- Test No 3</li> </ul>	2 4 2
12-14	Special bitumen and heavy oils processing technologies	<ul style="list-style-type: none"> <li>- Thorough examination of hydro&amp;thermal cracking and deasphaltization schematic diagrams</li> <li>- Home assignment No 4</li> <li>- Test No 4</li> <li>- Final test</li> </ul>	4 2
15	Final exam		2



## Lecturer and Contact Information

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## Assessment

- Grade policy for both home assignments and the final exam is:
- A (excellent work) 91–100 points
- B (above average work) 81–90 points
- C (average work) 71–80 points
- D (below average work) 50–70 points
- F (failed work) < 50 points
- To pass the exam students have to do all course's assignments. The final exam consists of two parts: presentation on a set topic and writing exam.
- Students should be able to:
  - perform the presentation and describe a topic they have (50 points maximum),
  - write an answer on 2 questions, demonstrate processes' schematic diagrams and explain them (50 points maximum).

## Attendance Policy

Students are expected to attend and participate in classes and should notify trainers of excused absences in advance, where possible. Students who have an excused absence are expected to make arrangements with instructors for alternative assignment.

Every topic has a home assignment work that should be done. The final mark will be made by the same grade policy as for a final exam.

## Web page of the course

The webpage of the course [Technology of processing heavy oils, bitumen and residue](#) is available through E-learning SibFU web site: [www.e.sfu-kras.ru](http://www.e.sfu-kras.ru). You must be logged in to access this course. Course materials and required reading materials are available at the course web-page.

## Core reading

The main book for this course is [Enhanced recovery methods for heavy oil and tar sands](#) Speight, James G. It contains all information that is required for study in a more extensive

manner. It will help students to reach a deeper understanding of natural bitumen and heavy oil exploration methods.

A book [Handbook of Petroleum Processing](#) Steven A. Treese, Peter R. et al is also recommended for studying the basic petroleum chemistry and exploration technique that will be used during the course.

Some of the course topics include modeling simulation. Although this simulation is very common, a book [Structure and Modeling of Complex Petroleum Mixtures](#) by Chunming Xu and Quan Shi can provide students with additional information.