| 1. GENERAL INFORMATION | | | | |
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| 1.1. Course teacher | Associate Professor Tomislav Kurevija, PhD | | 1.6. Year of the study | I. |
| 1.2. Name of the course | Secondary methods in reservoir engineering | | 1.7. ECTS credits | 6,5 |
| 1.3. Associate teachers | Teaching Assistant Marija Macenić, PhD; Teaching Assistant Lucija Jukić, MSc | | 1.8. Type of instruction (number of hours L + E + S + e-learning) | 30L+15E+10S+5e-learning |
| 1.4. Study programme (undergraduate, graduate, integrated) | graduate | | 1.9. Expected enrolment in the course | 30 |
| 1.5. Status of the course | ☒ mandatory | ☐ elective | 1.10. Level of application of e-learning (level 1, 2, 3), percentage of online instruction (max. 20%) | level 2, 8,3% online |
| **2. COUSE DESCRIPTION** | | | | |
| 2.1. Course objectives | Introducing students to impact and processes regarding secondary recovery methods of waterflooding in order to enhance oil recovery. | | | |
| 2.2. Enrolment requirements and/or entry competences required for the course | - | | | |
| 2.3. Learning outcomes at the level of the programme to which the course contributes | Independently solve complex engineering problems in petroleum engineering and geoenergy engineering;<br>Plan hydrocarbon and geothermal reservoir management;<br>Predict reservoir behaviour and the behaviour of hydrocarbon and geothermal water production system;<br>Optimize hydrocarbon and geothermal water production;<br>Compare specific procedures and processes in petroleum engineering and geoenergy engineering;<br>Appraise process and facility's efficiency in petroleum engineering and geoenergy engineering. | | | |
| 2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes) | Elaborate the mechanism of waterflooding in the case of immiscible conditions;<br>Elaborate the impact of specific parameters on starting the implementation of secondary recovery methods;<br>State the advantages and limitations of using the material balance equations in waterflood analysis;<br>Analyse the optimal production and injection wells pattern;<br>Use analytical methods to describe waterflooding;<br>Evaluate effects of waterflooding by using technoeconomical analysis. | | | |
| 2.5. Course content (syllabus) | Reservoir pressure maintenance – overview of fundamental methods and links to primary oil recovery; Advantages and limitations of using the material balance equations (MBE) in waterflood analysis, part I; Advantages and limitations of using the material balance equations in waterflood analysis, part II; Impact of reservoir and technoeconomical parameters on the | | | |

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| | decision regarding the starting point of waterflooding, part I; Impact of reservoir and technoeconomical parameters on the decision regarding the starting point of waterflooding, part II; Displaced oil and displacing fluid mobility ratio and gravitational segregation; Microscopic and macroscopic sweep efficiency; Impact of production and injection wells pattern on waterflooding efficiency, part I; Impact of production and injection wells pattern on waterflooding efficiency, part II; Caudle-Whitt method for waterflood analysis, part I; Caudle-Whitt method for waterflood analysis, part II; Stiles method for waterflood analysis, part I; Stiles method for waterflood analysis, part II; Dykstra Parsons method for waterflood analysis; Craig-Geffen-Morse method for waterflood analysis.<br>Recovery prediction during reservoir pressure maintenance by using MBE – water injection; Recovery prediction during reservoir pressure maintenance by using MBE – natural gas injection and gas cap control; Caudle-Whitt method for waterflood calculation; Stiles method for waterflood calculation; Dykstra Parsons method for waterflood calculation; Craig-Geffen-Morse method for waterflood calculation. |

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| 2.6. Format of instruction: | ☒ lectures<br>☒ seminars and workshops<br>☒ exercises<br>☐ online in entirety<br>☒ partial e-learning<br>☐ field work | ☒ independent assignments<br>☒ multimedia and the internet<br>☐ laboratory<br>☒ work with mentor<br>☐ (other) | 2.7. Comments:<br>- |
| 2.8. Student responsibilities | Active participation in lecture, preparation and presentation of the seminar paper, taking the oral exams. | | |

| 2.9. Monitoring student work | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Class attendance | YES | | Research | YES | | Oral exam | YES |
| | Experimental work | | NO | Report | | NO | | |
| | Essay | | NO | Seminar paper | YES | | | |
| | Preliminary exam | YES | | Practical work | | NO | | |
| | Project | | NO | Written exam | | NO | ECTS credits (total) | 6,5 |

| 2.10. Required literature (available in the library and/or via other media) | **Title** | **Number of copies in the library** | **Availability via other media** |
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| | Ahmed, T. (2001.): *Reservoir Engineering Handbook*, Gulf Professional Publishing. | NO | YES |
| | Smith, J., Cobb, W. (1997.): *Waterflooding*. | NO | YES |
| | Willhite, P. (1986.): *Waterflooding*, SPE. | YES | YES |
| 2.11. Optional literature | | | |
| 2.12. Other (as the proposer wishes to add) | | | |

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