1. GENERAL INFORMATION				
1.1. Course teacher	Assistant Professor Sonja Koščak Kolin, PhD		1.6. Year of the study	II.
1.2. Name of the course	Well Production System Modelling		1.7. ECTS credits	4
1.3. Associate teachers	-		1.8. Type of instruction (number of hours L + E + S + e-learning)	30L+20E+0S+10e-learning
1.4. Study programme (undergraduate, graduate, integrated)	graduate		1.9. Expected enrolment in the course	15
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, 16,67% on line
2. COUSE DESCRIPTION				
2.1. Course objectives	The main goal of the course is to train students to apply the standard software packages for integrated modelling of well production systems, which are used in petroleum and geoenergy industrial sectors. The purpose of modelling is also to digitally connect the production system of oil, gas and geothermal wells with the surface equipment, as well as with their reservoir models, which include economic analysis of the entire system.			
2.2. Enrolment requirements and/or entry competences required for the course	Passed exams from *Oil and Gas Production Engineering* and from *Well Test Analysis*, from the 1st year of study.			
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; Plan hydrocarbon and geothermal reservoir management; Predict reservoir behaviour and the behaviour of hydrocarbon and geothermal water production system; Optimize hydrocarbon and geothermal water production; Appraise projects in petroleum engineering and geoenergy engineering.			
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	Create production models for oil, gas and geothermal wells in programme Prosper; Digitally connect a surface pipeline system with well production model in programme Gap; Design production models of the artificially lifted wells in programme Prosper; Design production models of the stimulated wells (FW-fractured wells, HW-horizontal wells, MFHW-multy fractured HW); Design sensitivity analysis for future production forecasting in programme Prosper; Apply temperature model for geothermal wells in programme Prosper; Understand digital data connections and economic analysis of production and reservoir model in computer programme Resolve.			
2.5. Course content (syllabus)	Introduction to the IPM suite for production engineering of oil, gas and geothermal water (Prosper, Gap and Resolve programme); Characteristics of production models of natural flow and injection vertical wells in programme Prosper; Introduction to the programme Gap for surface system optimisation; Digital connection of the computer program Gap with the well production model; Characteristics of			

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<table>
<tr><td></td><td colspan="9">production systems modelling of artificially lifted wells; Modelling of the well production system with gas lift and with submersible pumps in programme Prosper; Theoretical assumptions of production models of stimulated wells (FW-fractured, HW-horizontal, MFHW-multiple fractured HW); Production system modelling of fractured oil and gas wells; Production system modelling of horizontal oil and gas wells; Production system modelling of multiple fractured horizontal oil and gas wells; Possibilities of the production forecasting by sensitivity analysis of the well production model; Characteristics of production models of the stimulated wells in unconventional oil and gas reservoirs; Temperature model designs for geothermal wells; Digital connection of the production model with the reservoir in the computer programme Resolve (intelligent systems); Economic analysis of production and reservoir models in the Resolve programme.</td></tr>
<tr><td>2.6. Format of instruction:</td><td colspan="4">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☐ field work</td><td colspan="3">☒ independent assignments
☒ multimedia and the internet
☐ laboratory
☐ work with mentor
☒ work in software</td><td colspan="2">2.7. Comments:
-</td></tr>
<tr><td>2.8. Student responsibilities</td><td colspan="9">Regularly attend classes (lectures, exercises and e-learning), create a project assignment in software, pass a colloquium.</td></tr>
<tr><td rowspan="6">2.9. Monitoring student work</td><td>Class attendance</td><td>YES</td><td></td><td>Research</td><td></td><td>NO</td><td>Oral exam</td><td>YES</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>NO</td><td>Report</td><td></td><td>NO</td><td>E-learning exam</td><td>YES</td><td></td></tr>
<tr><td>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td></td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td></td><td>NO</td><td></td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td colspan="2">4</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">2.10. Required literature (available in the library and/or via other media)</td><td colspan="6">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="6">Petroleum Experts (2020.): IPM – Integrated Production Modelling Online Manuals for Prosper & Gap (educational licence #4186). E-edition, 2273 str. & 1359 str. – selected chapters</td><td>YES</td><td>YES</td></tr>
<tr><td colspan="6">Jansen, J. D. (2017.): Nodal Analysis of Oil and Gas Production Systems, Society of Petroleum Engineers, 368 str. - selected chapters</td><td>NO</td><td>YES</td></tr>
<tr><td rowspan="4">2.11. Optional literature</td><td colspan="9">Mohaghegh, S.D. (2017): Data-Driven Reservoir Modeling, SPE, 166 str. – selected chapters</td></tr>
<tr><td colspan="9">Poston, S.W. et al. (2019.): Analysis of Oil and Gas Production Performance, SPE, 175 str. – selected chapters</td></tr>
<tr><td colspan="9">Ahmed, T. (2010.): Reservoir Engineering Handbook, Elsevier, 4th ed, 1463 str. – selected chapters</td></tr>
<tr><td colspan="9">Economides, M.J., Nolte, G.N. (2000.): Reservoir Stimulation, John Wiley & Sons, 3rd edition, 20 Chapters. – selected chapters</td></tr>
<tr><td>2.12. Other (as the proposer wishes to add)</td><td colspan="9">-</td></tr>
</table>

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