# Digitalization in the Energy Industry (ONLINE)

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| **ECTS Credits** | 4,0 |
| **Teaching hours** | 50 |
| **Workplace learning hours** | 50 |
| **Total hours of student learning** | 144 |

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| **Pre-requisites** | The course is opened for Russian and foreign Bachelor, Master and PhD students with specialized background in Computer (Digital) Engineering or equivalent skills and knowledge. |
| **Alignment to graduate profiles** | This course contributes to achievement of the graduate outcomes of the following qualifications:<br>• Bachelor in Computer Engineering (Digitalization / Mechanical)<br>• Graduate Diploma in Computer Engineering (Digitalization / Mechanical)<br>• Diploma in Computer Engineering (Digitalization / Mechanical) |
| **Core transferable skills** | This course contributes towards the development of the following core transferable skills categories: Self/Others - Learning to Learn, Specialist skills, Literacy, Numeracy, Digital Literacy. Energy School Digitalization in the Energy Industry will provide an immersion into the world of Digital technologies in electrical engineering and power engineering. The course includes different topics on Digitalization in Energy Industry, its tendencies and problems, new elaborations and projects. Part of the course will include information on Digital Transformation in Oil&Gas Complex and in Nuclear Industry. |
| **Course aim** | The relevance and novelty of the program is associated with the great demand in the international environment for specialists with skills in working with the digital environment in all energy sectors. At present, digital energy is the basis for solving key problems for the fuel and energy complex.<br>The goals of mastering the program are to acquire a set of theoretical knowledge, as well as skills and practical skills necessary to solve the main tasks caused by the onset of the fourth industrial revolution and the transition to cloud technologies and digital platforms. |
| **Indicative content** | Content may include but is not limited to:<br>• Digital technologies in the Energy Industry.<br>• CFD for Turbomachinery. Introduction.<br>• Application of digitalization in nuclear industry.<br>• Introduction to machine learning. Application in oil and gas industry.<br>• Guest Speakers Day.<br>• Application of machine learning techniques to geophysical well' log data.<br>• Digital technologies in Renewable Engineering.<br>• Introduction to MATLAB/Simulink.<br>• MATLAB/Simulink Support Package for Microcontrollers. Project development.<br>• Code generation in MATLAB/Simulink.<br>• External connection of Microcontroller with Simulink.<br>• Simulation of thermal schemes of TPP for the application in information systems. |

**LEARNING OUTCOMES**

| **On successful completion of this course students will be able to:** | |
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| **1** | Identify promising areas of digital research in different areas of energy. |
| **2** | Explain the basics of modelling digital processes using various computer programs and codes. |
| **3** | Own various software. |
| **4** | Provide cybersecurity at work. |
| **5** | Work with scientific and educational literature in your specialty. |
| **6** | Know fundamentals of mathematical modelling in energy processes. |
| **7** | Know theory of digital processes in energy |
| **8** | Know technologies, schemes and tasks of digitalization of the nuclear, thermal power, electric power and oil and gas complex. |
| **9** | Analyze the best Russian and foreign experience in solving the assigned tasks. |

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| **10** | Work with large databases (Big Data). |
| **11** | Own skills in software for the automation of research and engineering calculations. |

**ASSESSMENTS**

| **Basis of assessment** | Achievement based assessment | | |
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| **Methods of assessment** | **Learning Outcomes** | **Pass criteria (Minimum)** | **% Weightings** |
| Summative review | 1, 4 | 40% | 40% |
| Portfolio – summative of practices | 2, 3, 5 | 40% | 60% |

**REQUIREMENTS FOR SUCCESSFUL COURSE COMPLETION**

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| **Requirements** | • Mark of 40% or more in every summative assessment<br>• Gain a course result of C (50%) or higher |

**RESULTS**

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| **Assessment results** | • Results for assessments are given in percentage marks |
| **Course results** | • Individual assessments may cover one or more of the learning outcomes.<br>• Each summative assessment is assigned a percentage weighting.<br>• The overall percentage mark for the course is calculated by adding the weighted results for all summative assessments.<br>• To derive the course result the overall percentage mark is converted into a grade using Course Result Key AC-NMIT-06 |

**LEARNING AND TEACHING**

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| **Learning and teaching approaches** | Lectures, group discussions, tutorials, learner managed activities, laboratories, presentations, research, projects and case studies. |
| **Learning and teaching resources** | Textbooks, journals and Library Learning Centre resources; use of Internet; computer laboratory and specialist software. |
| **Learner managed activities** | • Completion of course work, set assignments/projects<br>• Reading of course materials<br>• Study group work<br>• Preparation for classes<br>• Homework<br>• Research - (e.g. exploration, location and selection of relevant information, review/ evaluation/analysis of information, recording information)<br>• Discussions with colleagues/subject matter experts<br>• Review application of information to course work<br>• Practicing relevant practical and technical skills/methods/techniques<br>• Self-evaluation of course work<br>• Gathering relevant contextual information/ issues/ideas to build knowledge of the subject |