**COURSE DESCRIPTION**
**THE HIGHER VOCATIONAL STATE SCHOOL IN WLOCLAWEK**
**Course: Computer simulation technologies**

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| **Field of study:** | Information Technology | **Course code:** |
| **Unit supervising the course:** | Information Technology Unit | |
| **Course orientation:** | practical profile | |
| **Language of instruction:** | English | |
| **Course type:** | general | |
| **Course status:** | obligatory | |
| **Level: 1st degree** | **Year: I** | **Semester: I** |

**The number of teaching hours on the full-time programme:**

| **Total** | **lecture** | **classes** | **laboratory** | **projects** | **tutorials** | **seminars** | **practicum** |
|---|---|---|---|---|---|---|---|
| 25 | 10 | | 15 | | | | |

**The number of teaching hours on the part-time programme:**

| **Total** | **lecture** | **classes** | **laboratory** | **projects** | **tutorials** | **seminars** | **practicum** |
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| **Learning outcomes:** | **Knowledge:** Students gain knowledge of computer simulation techniques for physical, technical and real-world phenomena with the use of most common programming and simulation tools. |
| | **Skills:** Students are able to design and create practical implementations of physical, real-world and technical phenomena using C++ programming language and a basic set of visualization libraries. |
| | **Social competence:** Students gain social competence in cooperative team work and are aware of the significance of meeting the pre-determined work schedule. |
| **Full description of the course:** | **Lecture**<br>- Basic numerical techniques of modeling and simulation<br>- Differential and difference calculus<br>- Discrete integral calculus |

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<tr><td></td><td colspan="5">- Physical and synthetic models<br>- Basics of vector and matrix calculus<br>- Newton's laws of motion<br>- Physical model of material points system dynamics<br>- Object-oriented modeling techniques<br>- Neural networks modeling introduction<br>- Modeling of a single neuron<br>- Modeling of a MADALINE neural network<br>- Modeling of a Hopfield’s neural network<br>Laboratory<br>- Material points system dynamics model, object-oriented implementation<br>- MADALINE neural network implementation for character recognition<br>- Hopfield’s neural network for image compression</td></tr>
<tr><td>Methods:</td><td colspan="5">- lecture with multimedia presentation<br>- laboratories – projects’ design and implementation of simulations regarding selected physical, technical and real-world phenomena with the use of C++ programming language and 2D visualization C++ libraries.</td></tr>
<tr><td rowspan="6">The student’s workload/ ECTS credits:</td><td rowspan="3">Forms of activities</td><td colspan="4">Average number of hours to complete activities</td></tr>
<tr><td colspan="2">Full-time</td><td colspan="2">Part-time</td></tr>
<tr><td>Lecture</td><td>Classes</td><td>Lecture</td><td>Classes</td></tr>
<tr><td>Contact hours with academic instructor</td><td>10</td><td>15</td><td></td><td></td></tr>
<tr><td>Hours without academic instructor</td><td></td><td></td><td></td><td></td></tr>
<tr><td>1. Preparation for the classes, including reading assignments</td><td>15</td><td>30</td><td></td><td></td></tr>
<tr><td>2. processing the quantitative data /preparation for the exam, evaluation tests, etc.</td><td>20</td><td>50</td><td></td><td></td></tr>
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<tr><td rowspan="4"></td><td>3. Preparation of a report, presentation, discussion</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Total</td><td>45</td><td>95</td><td></td><td></td></tr>
<tr><td>Total number of ECTS for the conducted form of classes</td><td>2</td><td>4</td><td></td><td></td></tr>
<tr><td>Total number of ECTS points for the entire course</td><td colspan="2">6</td><td colspan="2"></td></tr>
<tr><td rowspan="3">The type and mode of obtaining the credit and marking criteria or requirements:</td><td colspan="5">The type:<br>- lecture examination<br>- laboratory project assignments</td></tr>
<tr><td colspan="5">The mode:<br>- lecture examination takes the form of an open questionnaire consisting of three open questions regarding the presented lecture material<br>- laboratories consist of two obligatory out three practical tasks, where two assignments of the highest difficulty level are mutually optional</td></tr>
<tr><td colspan="5">Basic assessment criteria:<br>- final lecture grade is the one obtained for the lecture exam<br>- final laboratory grade is the arithmetic mean of the partial grades obtained from each of the obligatory laboratory tasks.</td></tr>
<tr><td>Literature:</td><td colspan="5">Prescribed reading:<br>- A. Hartmann, A Practical Guide To Computer Simulation, World Scientific Publishing, 2009<br>- J. Tyszer, Object-Oriented Computer Simulation of Discrete-Event Systems, Springer, 1999<br>- Lecture notes and demonstration materials<br>Recommended reading:<br>- D. Maki, M. Thompson, Mathematical modeling and computer simulation, Cengage Learning, 2005</td></tr>
<tr><td colspan="6">Course instructor: Kamil Stokfiszewski, Ph.D.</td></tr>
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