Informatics Engineering (Master’s degree) - autumn

<table>
<thead>
<tr>
<th>Course title</th>
<th>ECTS</th>
<th>Degree</th>
<th>Course code</th>
<th>Prerequisites</th>
<th>Subject area</th>
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</thead>
<tbody>
<tr>
<td>Application Parallelization Methods and Technologies</td>
<td>6</td>
<td>Master</td>
<td>P170M104</td>
<td>Algorithm and programming knowledge bases</td>
<td>Informatics engineering</td>
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<tr>
<td>Data Mining Methods and Technologies</td>
<td>6</td>
<td>Master</td>
<td>P175M101</td>
<td>Basics of Informatics Engineering</td>
<td>Informatics engineering</td>
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<tr>
<td>Intelligent Decision Methods and Technologies</td>
<td>6</td>
<td>Master</td>
<td>P176M010</td>
<td>Bachelor's Education of Informatics Engineering</td>
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<tr>
<td>Engineering of Control Systems</td>
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Subject area: **Informatics Engineering**

**Status**
- Course code: P170M104
- Course title: Application Parallelization Methods and Technologies

**Semester**
- Autumn: ECTS credits 6, Languages Lithuanian, English, Duration 1 semester

**Study hours**
- Lectures – 16 h
- Laboratory work – 32 h
- Self-study – 32 h

**Assessment**
- 10-point scale
- Algorithm and programming knowledge bases

**Prerequisites**
- Defence of laboratory work – 30 %
- Paper – 20 %
- Exam – 50 %

**Subject content**
- Students are introduced to a multi-procedural systems architecture and pseudo-parallel systems, principles of operation procedures of each system. Analyzing methods of realization multiprocessor systems, clusters and GRID networks operating bases. Available in parallel algorithms, methodologies, consistent action in the separation of the parallel methods. Students are introduced to the practical use of parallel systems and their effectiveness. Described the concept of threads and synchronization techniques and program implementation in different programming languages.

**Learning Outcomes**
- Based on the system architecture to identify the possibility of pseudo-parallel or parallel actions
- Analyze and develop of parallel based algorithms and information systems by evaluate the need of parallelism in a given situation
- Have knowledge on singleprocessor and multiprocessor system architecture, clusters and GRID network principles, data and functional parallelism, master-slave and agent models, thread usage for parallelization realization in information system, synchronization methods and its feasibilities in different programming languages
- Have cognitive skills to analyze usage of various computer and network systems for parallel execution, to analyze and develop parallel based algorithms, to evaluate the need for parallelism in a given situation, to design and develop parallel and concurrent programming packages
- Have ability to optimize available resources and its management in time by using parallel execution, problem dividing in to elementary tasks and usage of self-operating items as well as taking into account the need of parallel action monitoring and management to achieve one goal by many separate executors

**Literature**
1. Lygiagretieji algoritmai ir tinklinės technologijos : vadovėlis aukščiųjų mokyklų studentams, studijuojantiems informatiką ir matematiką / Raimondas Čiegis ; Vilniaus Gedimino technikos universitetas.
3. Development, analysis and applications of the technology for parallelization of numerical algorithms for solution of PDE and systems of PDE’s : summary of doctoral dissertation : technological science

**Additional literature**

* It's a Master study subject.
Subject area: **Informatics Engineering**

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<td>Self-study – 96 h</td>
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**Subject content**

Students are introduced to data mining process, specifics and importance of its parts. Students get to know different methods, technologies and tools for data classification, association estimation, prediction and other data analysis areas. Obtained knowledge is used to solve different problems and tasks. Abilities to prepare analysis data, choose of needed tools and methods are improved.

**Learning Outcomes**

- Is able to assimilate ideas and principles of data mining, become acquainted with main methods and algorithms of data mining, and learn how to apply them in practical activities using modern data mining software.

**Literature**


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**Subject area: Informatics Engineering**

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**Subject content**

Introducing to the general principles of creative thinking, the concepts of artificial intelligence and intelligence simulation capabilities. Analyze methods of heuristic search solutions and re-election. Discuss the management models of complex semiotic systems and its properties. Introducing to the concepts of Fuzzy sets and no clear definition of knowledge in the decision-making systems. Provide basics of knowledge engineering. Analyze software agents, its properties and features.

**Learning Outcomes**

- Acquired knowledge about: General principles of creative thinking, the concept of artificial intelligence and intelligence simulation capabilities; Methods of heuristic solutions search and re-election; Management models of semiotic complex systems; Concepts of Fuzzy sets, basics of knowledge engineering and usage of software agents.
- Acquired cognitive skills: Understand the general principles of creative thinking, the concepts of artificial intelligence and capabilities of intelligence simulation; Analyze management models of complex semiotic systems and assess its potential; Understand concepts of Fuzzy sets and knowledge engineering. Evaluate properties and characteristics of Software agents.
- Acquired practical skills: Understand the general principles of creative thinking, the concepts of artificial intelligence and capabilities of intelligence simulation; Apply methods of heuristic decision search and re-election; Identify case of management of semiotic complex system and apply the necessary management model; Apply Fuzzy sets and tools of knowledge engineering; Understand the capabilities of software agent application.
- Acquired competencies: Usage of Intelligence principles in creation of various systems; Usage of heuristic solutions search and re-election techniques in design of intelligent systems; Organization of management in complex systems; Usage Fuzzy sets, knowledge engineering and software agents in information processing. General principles of creative thinking, concepts of artificial intelligence; terminology and potential of intelligent simulation; Methods of heuristic solutions search and re-election; Models of semiotic complex systems management; Concepts of Fuzzy sets, basics of knowledge engineering and usage of software agents.

**Literature**

10. Norgėla, Stanislovas. Logika ir dirbtinis intelektas : vadovėlis aukštųjų mokyklų studentams

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<td>Students are introduced to control theory, process and object models and control systems architecture. They acquire the skills to plan, design and operation control system, process control models to choose hardware and software tools. Students learn how to control the logical and mathematical model of the application of control systems. Also, they are introduced to control accuracy and stability, structure optimization.</td>
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<td><strong>Learning Outcomes</strong></td>
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<td>• Is able to apply the basic theory of control to systems design and development and to model control of the processes to obtain the basic properties of system model</td>
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<td>• Is able to arrange self-study process and decision making to design different type of control systems and to present the results in public</td>
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<tr>
<td>1. Richard C. Dorf, R.Bishop, Modern control systems</td>
</tr>
<tr>
<td>2. A. Ivanauskas, Automatinio valdymo teoriniais pagrindais, Kaunas, Technologija, 2005</td>
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<td>3. V. T. Januševičius, Automatinis valdymas, Kaunas, Technologija, 2003</td>
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