1. Course title: EXPERT SYSTEMS

2. Course code


4. Level of studies: MSc programme

5. Mode of studies: intramural studies

6. Field of study: AUTOMATICS AND ROBOTICS (FACULTY SYMBOL)AEII

7. Profile of studies: academic

8. Programme:

9. Semester: 1

10. Faculty teaching the course: Institute of Automatic Control, Rau1


12. Course classification: compulsory course

13. Course status: compulsory

14. Language of instruction: English

15. Prerequisite qualifications: It is assumed that student is familiar with a basic logic, probability and statistics, programming methods and control theory.

16. Course objectives: Expert systems are decision support systems that are a part of artificial intelligence. The aim of the course is to give students basic knowledge concerning expert systems and knowledge engineering.

17. Description of learning outcomes:

<table>
<thead>
<tr>
<th>Nr</th>
<th>Learning outcomes description</th>
<th>Method of assessment</th>
<th>Teaching methods</th>
<th>Learning outcomes reference code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The student knows the concept of expert systems and their functional and informatics structure.</td>
<td>SP</td>
<td>WT</td>
<td>K_W17, K_K02</td>
</tr>
<tr>
<td>2</td>
<td>The student knows the methods of knowledge acquisition and representation.</td>
<td>SP</td>
<td>WT</td>
<td>K_W03</td>
</tr>
<tr>
<td>3</td>
<td>The student knows exact and uncertain methods of forward and backward inference.</td>
<td>SP</td>
<td>WT</td>
<td>K_W14</td>
</tr>
<tr>
<td>4</td>
<td>The student can acquire and code knowledge in a knowledge base and use shell expert systems.</td>
<td>SP</td>
<td>WT, WM, P</td>
<td>K_U01, K_K03</td>
</tr>
<tr>
<td>5</td>
<td>The student can design inference systems for shell based expert systems.</td>
<td>OP</td>
<td>P</td>
<td>K_U09, K_U18</td>
</tr>
<tr>
<td>6</td>
<td>The student is able to present and defend the proposed solution to a given problem in the field of expert systems.</td>
<td>OP</td>
<td>P</td>
<td>K_U04</td>
</tr>
</tbody>
</table>

18. Teaching modes and hours

Lecture: 15 / BA/MA Seminar: 0 / Class: 0 / Project: 15 / Laboratory: 0

19. Syllabus description:

Lecture:
The course on Expert Systems concerns the following topics: artificial intelligence – history, definition, foundations, basic ideas and state of the art; knowledge representation and methods of knowledge acquisition; expert system definition, functional and informatics structure of expert system; areas of expert system application; knowledge bases and their structure; inference systems, user’s interface; facts and rules; Horn’s clauses; problems with rule based knowledge representation; exact and uncertain, forward
and backward chaining inference; modus ponens rule and closed world assumption; algebra of certainty factors; inference with certainty factors; fuzzy rules and fuzzy inference; software realisation of inference systems; knowledge acquisition in examples: system modeling, identification methods, design of single- and multi-channel control systems, optimal and adaptive control, programming methods, numerical integration, optimization methods, multiprocessor systems, agent systems, combinatorial problems, signal sampling and reconstruction, digital filter design.

**Project:**
Project is conducted in parallel with lectures. The students build shell-based expert system focusing on knowledge acquisition, rule-based knowledge representation and inference system.

**20. Examination:** no

**21. Primary sources:**

**22. Secondary sources:**

**23. Total workload required to achieve learning outcomes**

<table>
<thead>
<tr>
<th>Lp.</th>
<th>Teaching mode</th>
<th>Contact hours / Student workload hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lecture</td>
<td>15/15</td>
</tr>
<tr>
<td>2</td>
<td>Classes</td>
<td>0/0</td>
</tr>
<tr>
<td>3</td>
<td>Laboratory</td>
<td>0/0</td>
</tr>
<tr>
<td>4</td>
<td>Project</td>
<td>15/15</td>
</tr>
<tr>
<td>5</td>
<td>BA/ MA Seminar</td>
<td>0/0</td>
</tr>
<tr>
<td>6</td>
<td>Other</td>
<td>5/5</td>
</tr>
<tr>
<td></td>
<td>Total number of hours</td>
<td>35/35</td>
</tr>
</tbody>
</table>

**24. Total hours:** 70

**25. Number of ECTS credits:** 3

**26. Number of ECTS credits allocated for contact hours:** 1

**27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects):** 2

**28. Comments:**

Approved:

(date, Instructor’s signature)  (date, the Director of the Faculty Unit signature)