S Y L L A B U S   OF THE SUBJECT

Subject: Chemistry of Explosives
Code of the subject: 
Basic Organizational Unit: (managing the direction of studies): Institute of Chemistry
Direction of the studies: chemistry
Specialization: explosives and pyrotechnics
Category of the studies: third degree studies
Form of the studies: full time studies
Official language: English
Validity of the syllabus for recruitment in the academic year: 2010/2011

1. REALIZATION OF THE SUBJECT

Lecturer’s name: prof. Stanisław Cudziło; Dr Mateusz Szala
Basic organizational unit of the lecturer’s employment: Institute of Chemistry, Department of New Technologies and Chemistry

2. TIME ACCOUNT

<table>
<thead>
<tr>
<th>semester</th>
<th>Form of teaching, lecture’s number / qualification (X - examination, + - credit, # - project)</th>
<th>ECTS points</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>total</td>
<td>lectures</td>
</tr>
<tr>
<td>II</td>
<td>60</td>
<td>16x</td>
</tr>
<tr>
<td>total</td>
<td>60</td>
<td>16</td>
</tr>
</tbody>
</table>

3. INTRODUCTORY SUBJECTS AND PRELIMINARY REQUIREMENTS

- Organic Chemistry............................. Prerequisites: structure, functional groups, reaction mechanisms
- General and Inorganic Chemistry. Prerequisites: atomic structure and bonding..............................
- Physical Chemistry............................. Prerequisites: reaction kinetics and thermodynamics...........

4. AIMS OF THE SUBJECT:

After successful completion of this course, students should be able to:
- understand the mechanism of explosion by chemical explosives,
- know and understand the methods and mechanism of nitration,
- know the structure, compositions and properties of current and novel energetic compounds and materials,
- prepare and test of explosive compounds at a laboratory scale.
5. TEACHING METHODS

- lecturing based on modern technical means enabling efficient transfer of information
- thermochemical calculations of explosive parameters
- experiments on synthesis and testing of explosive compounds and mixtures
- permanent checking and estimation of the students’ knowledge in the form of discussion, seminars, homework assignments etc
- self-study

6. SUBJECT CONTENTS

<table>
<thead>
<tr>
<th>No</th>
<th>Subject matter</th>
<th>Number of lecture hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The nature of explosions: physical, nuclear and chemical explosions. Types of explosive transformations: burning, deflagration, detonation. Thermochemistry of explosives: oxygen balance, decomposition reactions, heat and temperature of explosion, explosive power.</td>
<td>2 lect.</td>
</tr>
<tr>
<td>2</td>
<td>Basic properties and test methods for explosives sensitivity, stability and performance of explosives.</td>
<td>2 lect.</td>
</tr>
<tr>
<td>3</td>
<td>Classification and general characterization of explosives: the history, present and future development of explosives.</td>
<td>2 lect.</td>
</tr>
<tr>
<td>4</td>
<td>Nitration – reagents, methods and mechanisms: aromatic and aliphatic C-nitration, N-nitration, O-nitration, technological aspects of nitration process.</td>
<td>2 lect.</td>
</tr>
<tr>
<td>5</td>
<td>Manufacture, properties and application of the commoner explosives: TNT, TATB, HNS, DADNE, NTO, NG, NC, PETN, RDX, HMX, HNIW, ADN; primary explosives: LA, LS, MF.</td>
<td>2 lect.</td>
</tr>
<tr>
<td>6</td>
<td>Introduction to propellants and pyrotechnics: composition, manufacture and properties of gun and rocket propellants, heat, smoke, light, gas, noise generating pyrotechnics.</td>
<td>2 lect.</td>
</tr>
<tr>
<td>7</td>
<td>Advanced energetic materials: new energetic CHNO compounds, coordination energetic compounds, all-nitrogen materials, thermobaric explosives, advanced propellants, nanomixtures and nanocomposites, reactive materials.</td>
<td>2 lect.</td>
</tr>
<tr>
<td>8</td>
<td>Commercial explosive compositions: dynamites, ANFO, ammonium nitrate slurries and emulsions, heavy ANFO, unconventional and home made explosives.</td>
<td>2 lect.</td>
</tr>
<tr>
<td>9</td>
<td>Final exam</td>
<td>Total</td>
</tr>
</tbody>
</table>

Seminar’s subject matter:
7. BIBLIOGRAPHY

Obligatory:

Complementary:

8. REQUIREMENTS FOR THE SUBJECT'S ACCEPTANCE

The subject is accepted based on the positive result of examination procedure, which includes:
- Homework problems that will be assigned with due dates throughout the course and some homework assignments will be collected (announced and unannounced) for grading.
- The participation in lectures, labs, and seminars
- Final exam covering the theory and practice of energetic materials that has been presented during lectures, labs and seminars.

The subject's author

Manager of the unit responsible for the subject

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   title, scientific degree, first name, SURNAME, signature    title, scientific degree, first name, SURNAME, signature