### 1. Annotation

The course covers the subject of carbon nanomaterials (fullerenes, nanodimond, nanotubes, and graphene). The history of carbon compounds since antiquity till our days starting from charcoal to carbon nanotubes and graphene will be reviewed. The students will have opportunity to synthesize carbon nanotubes (by aerosol and CVD methods) and graphene, to observe the materials in transmission (TEM) and scanning (SEM) electron microscopes as well as by atomic force (AFM) microscope and to study optical and electrical properties of the produced carbon nanomaterials. A few lectures are presented by various specialists on the topic of their research.

Totally 32 hours of lectures, 12 hours of exercises and 4 hours of discussion work. During the courses each student is supposed to give a short presentation (15 min) on a selected topic, to write an essay on other selected topic and to prepare an exercise report.

### 2. Structure and Content

**Course Academic Level**

Master-level course suitable for PhD students

**Number of ECTS credits**

6
5. Basic Information

**Attendance Requirements**
Mandatory

**Maximum Number of Students**

| Overall: | 20 |
| Per Group (for seminars and labs): | |

**Course Stream**
Science, Technology and Engineering (STE)

**Course Delivery Frequency**
Every year

**Students of Which Programs do You Recommend to Consider this Course as an Elective?**

<table>
<thead>
<tr>
<th>Masters Programs</th>
<th>PhD Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced Manufacturing and Materials Science</td>
<td>Materials Science and Engineering Physics</td>
</tr>
<tr>
<td>Materials Science</td>
<td>Physics</td>
</tr>
<tr>
<td>Photonics and Quantum Materials</td>
<td></td>
</tr>
</tbody>
</table>

**Course Tags**
Physics
Engineering

6. Textbooks and Internet Resources

7. Facilities

**Labs for Education**
Laboratory of Nanomaterials (TPOC3: 133)
SMA

8. Learning Outcomes
The students will be able
- to describe the electronic structure of various carbon nanomaterials;
- to produce carbon nanotubes and graphene by substrate CVD method;
- to interpret optical absorbance and spectra of carbon nanomaterials;
- to describe the mechanisms of the carbon nanotube formation;
- to enhance presentation and scientific writing skills, group/team work skills.

The learning outcomes will be achieved during the contact teaching: by listening the lectures, participating in the group discussions, by doing exercises and writing the exercise reports. The learning outcomes will be solidified and widened during writing essays. These together with student answers at the exam will help me to properly assess the students taking into the weight of the learning assignments.