



Study Plan M.Sc. Biomaterials

Faculty of Materials Engineering

Study plan for reference only; may be subject to change

The main aim of the course is to develop knowledge in biomaterials including biomaterials design, characterization, fabrication and application in different fields of medicine.

The students will learn about metals, ceramics, polymers, and composites used in medicine, and a role of materials science in their design and optimization. The course will provide an insight into modern methods of shaping material properties, design, and manufacturing, in the aspect of their interaction with the living cells, and replacement or regeneration of tissues and organs. Graduates will gain understanding of the concepts of implant devices, drug delivery systems or scaffolds. Additionally, they will learn about the impact of the living organism on the biomaterial and implant behavior, degradation of various biomaterials, basic of cells and tissue biology, biocompatibility, biophysical, biochemical and biomechanical requirements for biomaterials and medical devices.

Semester 1

| Course | Hours per week | | | | Total | ECTS |
|---|----------------|----------|-----|---------|-------|------|
| | Lecture | Exercise | Lab | Project | | |
| Social courses | 4 | | | | 60 | 5 |
| Phase Transformations (E) | 2 | | | | 30 | 3 |
| Defects of Crystalline Structure (E) | 2 | 1 | | | 45 | 4 |
| Advanced Methods of Electron Microscopy | 1 | | | | 15 | 2 |
| Thermodynamics of Alloys (E) | 2 | | | | 30 | 3 |
| Design of Experiments and Statistical Data Analysis | 1 | | | | 15 | 2 |
| Biomaterials | 2 | | | | 30 | 3 |
| Research Project <i>Materials Science</i> | | | | 10 | | 8 |
| Total | | | | | | 30 |

Semester 2

| Course | Hours per week | | | | Total | ECTS |
|--|----------------|----------|-----|---------|-------|------|
| | Lecture | Exercise | Lab | Project | | |
| Advanced Technologies in Surface Engineering | 2 | | | | 30 | 3 |
| Bioengineering | 2 | | | | 30 | 3 |
| Microbiological Corrosion | 1 | | | | 15 | 2 |
| Materials Design | | 2 | | | 30 | 3 |
| Nanomaterials and Nanotechnology | 2 | | | | 30 | 3 |
| Methods of Biomaterials Characterization | | | 2 | | 30 | 3 |
| Research Project <i>Biomaterials</i> | | | | 10 | | 8 |
| Elective Courses | | | | | | 5 |
| Total | | | | | | 30 |

Elective Courses:

- Tissue Engineering, lecture, 30 h, 3 ECTS (Prof. Świąszkowski)
- Modern Materials in Pharmacy and Cosmetics, lecture + lab. 15 h, 2 ECTS (Dr. Kucharska)
- Advanced Polymer and Composite Biomaterials, lecture, 30 h, 3 ECTS (Prof. Boczkowska, Prof. Ryszkowska)
- Introduction to Single Molecule Biophysics and Nanotechnology, lecture + lab. 15 h, 2 ECTS (Prof. Szoszkiewicz)
- Quantification of the Structure of Engineering Materials (lecture, 30 h, 2 ECTS (Prof. Kurzydłowski)
- History of materials, lecture, 30 h, 3 ECTS (Dr Wróblewski, Dr Kostecki) HES

Semester 3

| Course | Hours per week | | | | Total | ECTS |
|--------------------|----------------|----------|-----|---------|-------|------|
| | Lecture | Exercise | Lab | Project | | |
| Diploma seminar | | | | 2 | 30 | 3 |
| Diploma Laboratory | | | 10 | | | 7 |
| Master Thesis | | | | | | 20 |
| Total | | | | | | 30 |