

MSE-471

**Biomaterials (pour MX)**

<b>Cursus</b>	<b>Sem.</b>	<b>Type</b>
Materials Science and Engineering	MA1, MA3	Opt.

Language of teaching	English
Credits	4
Session	Winter
Semester	Fall
Exam	Written
Workload	120h
Weeks	14
<b>Hours</b>	<b>4 weekly</b>
Courses	2 weekly
TP	2 weekly
<b>Number of positions</b>	

**Remark**

pas donné en 2019-20

**Summary**

The course introduces the main classes of biomaterials used in the biomedical field. The interactions with biological environment are discussed and challenges highlighted. State of the art examples per type of material are discussed. Students will generate a biomaterial and study cell compatibility.

**Content**

- Lecture 1. Intro to biomaterials
- Lecture 2. Surfaces
- Lecture 3. Naturally derived biomaterials
- Lecture 4. Manmade biomaterials
- Lecture 5. Polymers
- Lecture 6. Materials for tissue engineering
- Lecture 7. Materials for immune engineering
- Lecture 8. Materials for neuroprosthetics
- Lecture 9. Nanoparticles
- Lecture 10. Targeting and drug delivery
- Lecture 11. Programmable biomaterials
- Lecture 12. Translation to industry
- Lecture 13. Regulatory aspects and trials
- Lecture 14. Revision and conclusion

**Keywords**

Biomaterials, biocompatibility, biofunctionality, implants, nanotechnology, tissue engineering, drug-delivery, nanoparticles.

**Learning Prerequisites****Required courses**

Introduction to materials science

**Recommended courses**

Materials, metallurgy, polymer, ceramics.

**Learning Outcomes**

By the end of the course, the student must be able to:

- Estimate a biomaterial in function of the application
- Compare developments of new biomaterials
- Describe the interactions with biological environment
- Describe the translation of a biomaterial to commercial use
- Design nanoparticle for targeting/drug delivery
- Compare biocompatibility of various materials
- Describe requirements to limit toxicity

### Transversal skills

- Communicate effectively with professionals from other disciplines.
- Respect relevant legal guidelines and ethical codes for the profession.
- Collect data.
- Access and evaluate appropriate sources of information.

### Teaching methods

Ex cathedra and invited speakers

Practicum at DLL laboratories: developement and characterization of a soft biomaterial as scaffold for cell proliferation.

### Expected student activities

Attendance at lectures.

Presence at practicum (also at hours not in lab)

Participation at all experimental projects

### Assessment methods

Written exam

100% participation at DLL practicum

### Supervision

Office hours	Yes
Assistants	Yes
Forum	No

### Resources

#### Ressources en bibliothèque

- [Biological performance of materials : fundamentals of biocompatibility / Black](#)
- [Traité des matériaux 7 - Comportement des matériaux dans les milieux biologiques / Schmidt](#)
- [Biomaterials science : an introduction to materials in medicine / Ratner](#)
- [Bone Repair Biomaterials / Planell](#)
- [Human Anatomy & Physiology: Pearson New International Edition / Marieb](#)

#### Notes/Handbook

All necessary documentation will be made available in the Moodle of this course