**MSE-471 Biomaterials (pour MX)**

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<th>Cursus</th>
<th>Sem.</th>
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<td>Science et génie des matériaux</td>
<td>MA1, MA3</td>
<td>Opt.</td>
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**Language** | English  
**Credits**  | 4  
**Session** | Winter  
**Semester** | Fall  
**Exam** | Written  
**Workload** | 120h  
**Weeks** | 14  
**Hours** | 4 weekly  
**Lecture** | 2 weekly  
**Practical work** | 2 weekly  
**Number of positions** |  

**Remarque**  
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: development 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
Assistant 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

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