



Course Syllabus

Department/Faculty School of Engineering
Graduate Program Materials Engineering and Nanotechnology
Degree <input checked="" type="checkbox"/> Academic Master's <input checked="" type="checkbox"/> Doctorate (PhD) <input type="checkbox"/> Professional Master's
Course Name Biomaterials
Professor(s)
Office hours 48
Course Overview <p>Initially it is discussed the history, the concepts and the fundamental properties of biomaterials. The course also covers an overview of the development of biomaterials and their applications over the past few years. Moreover, the state of the art in the fields of medicine, dentistry and related are presented showing the advances made in the processing, characterization and properties of biomaterials (metals, polymers, ceramics and composites). The course deals with the interaction between biomaterials and tissues, and the methods of evaluation in vitro and in vivo tests. The purpose of discipline is to encourage and contribute to the formation of new professionals working in this dynamic and interdisciplinary area.</p>
Topics outline <ul style="list-style-type: none">• Introduction of the biomaterials area.• History of the development of biomaterials.• Fundamental concepts and properties of Biomaterials.• Basic classifications of biomaterials.• Ceramics - processing, properties and applications as biomaterials.• Polymers - processing, properties and applications as biomaterials.• Metals - processing, properties and applications as biomaterials.• Coating methods: CVD (chemical vapor deposition), Plasma deposition (plasma-spraying), Immersion in particulate solutions, Biomimetic method, Electrochemical deposition, Sol-gel deposition, Coating and conversion to hydroxyapatite (HA) by immersion in NH₄OH bases, NaOH, KOH, Pulsed laser deposition.• Characterization / evaluation of biomaterials.• In vitro and in vivo tests.• Detailed application examples.• Biomaterials, osteointegration and osteoperception.• Physiology of the inflammatory process.



Letter Grade Assignment

Grade A (Excellent) - Grade points between 9 and 10

Grade B (Good) - Grade points between 8 and 8.9

Grade C (Satisfactory) - Grade points between 7 and 7.9

Grade D (Unsatisfactory) - Grade points between 0 and 6.9

Texts, Materials, and supplies

Basic Bibliography

- RATNER, B. D., HOFFMAN, A. S., SCHOEN, F. J., LEMONS, J. E. **Biomaterials Science - An Introduction to Materials in Medicine**. 3rd Edition, Elsevier Inc, 2013.
- ORÉFICE, R.L.; PEREIRA, M.M.; MANSUR, H.S. **Biomateriais - Fundamentos & Aplicações**. Reimpressão, Guanabara Koogan, 2012.
- AGRAWAL, C. M. *et al.* **Introduction to Biomaterials**. Cambridge University Press; 1 edition, 2013.

Complementary Bibliography

- CHEN, Q.; THOUAS, G. **Biomaterials: A Basic Introduction**. CRC Press, 1st Edition, 2018.
- RUSO, J. M. ; MESSINA, P. V. **Biopolymers for Medical Applications**. CRC Press, 2016.
- HOLLINGER, JEFFREY O. **An Introduction to Biomaterials**. CRC Press, 2nd Edition, 2011
- HASIRCI, V., HASIRCI, N. **Fundamentals of Biomaterials.**, Springer, 2018
- RAVAGLIOLI, A.; KRAKEWSKI, A. **Bioceramics Materials - Properties - Applications**. Springer, 1992.