MFG 566 Computer-Aided Biomodeling and Fabrication
Fall 2021

Class Time and Location: Wednesdays 8:50-11:30 (FENS L030); Online

Instructor: Prof. Bahattin Koc **Office:** FENS 1023
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Objective of the course: ability to use advanced computer-aided design and fabrication technologies in development of biomedical related products such as customized medical devices, tools, implants, engineered tissues, organs and biological systems.
Outcomes: At the conclusion of this course, you will be able to:
- Understand and develop segmentation methods for medical images
- Model custom implants using medical images
- Analyze and optimize implants or medical devices based on biological and process requirements
- Develop and implement algorithms to model implants, medical devices, tissue scaffolds
- Decide on biomaterials for biomanufacturing
- Develop optimum plans for manufacturing of implants and medical devices and tissue engineering
- Develop bio manufacturing processes to produce custom implants, medical devices and tissue constructs.

Description:
This course will introduce advanced design and fabrication methodologies in development of customized medical devices and tools, implants, and engineered tissues, organs and biological systems. The topics covered include computer-aided design and representation of biological objects, computational geometry for medical imaging and processing, reverse engineering, computer-aided analysis and engineering, biomaterials, tissue engineering, solid freeform fabrication (rapid prototyping) and rapid tooling for biomedical engineering applications, bio-manufacturing and manufacturing processes for medical devices/tools. The course also includes several related hands-on laboratory projects.

Grade Distribution for the course is as follows:

	MFG 566
Assignments…….....	10%
Projects…….....	35%
Review Paper……..	15%
Final Exam	40%
Total…….....100 %	

References:

- Tissue Engineering by B. Palsson and S. N. Bhatia, Prentice Hall 2004
- Biomaterials, J.S. Temenoff and A. G. Mikos, Prentice Hall, 2008
- Advanced Manufacturing Technology for Medical Applications: Reverse Engineering, Software Conversion and Rapid Prototyping by Ian Gibson (Editor), Wiley, 2006.
- Computer Aided Manufacturing, by T.C. Chang, R.A. Wysk, and H.P. Wang 3rd Edition, Prentice Hall, 2006.
- Product Design: Techniques in Reverse Engineering and New Product Development by K. Otto and K. Wood, Prentice Hall, 2001.
- Principles of CAD/CAM/CAE, by K. Lee, Addison-Wesley, 1999.

Topics:

1. Introduction to biomedical and engineering
2. Computer-aided design and bio-modeling
3. Computational geometry for medical imaging and processing
4. Three-dimensional reconstruction
5. Biomimetic design
6. Reverse engineering
7. Computer-aided analysis and engineering
8. Materials in biomedical engineering and their properties
9. Traditional fabrication processes for biomedical engineering
10. Tissue engineering
11. Solid freeform fabrication (rapid manufacturing)
12. Rapid tooling
13. Advanced Processes (nanofabrication, MEMS).