[Medicinski fakultet u Rijeci]

Curriculum
2023/2024

[Za kolegij]

Additive Technology

Study program:	**Medical Studies in English (R)** (elective) [Sveučilišni integrirani prijediplomski i diplomski studij]
Department:	**[Centar za biomodeliranje i inovacije u medicini]**
Course coordinator:	**izv. prof. dr. sc. Maričić Sven**
Year of study:	**3**
ECTS:	**1.5**
Incentive ECTS:	**0 (0.00%)**
Foreign language:	**Possibility of teaching in a foreign language**

Course information:

Application of new technologies in biomedicine. Historical development of technology. Digital production of personalized medicine products. Development of additive technologies. Manufacturing applications. Input materials for high-precision technologies - photopolymers. The concept and application of various systems that are most commonly used today, such as stereolithography (SL/SLA), selective laser sintering (SLS), fused deposition modeling (FDM), 3D printing (eng. 3D printing - 3DP), lamination (eng. laminated object manufacturing - LOM), hybrid process - combination of SLA and 3DP (PolyJet).

List of assigned reading:

- Gibson I., Rosen D., Stucker B., Khorasani M.: Additive Manufacturing Technologies, 2021, ISBN: 978-3030561260
- Wimpenny D., I., Pandey P., M.: Advances in 3D Printing & Additive Manufacturing Technologies, 2016, ISBN: 978-9811008115
- Kalaskar D.,. M.: 3D printing in Medicine, 2017, ISBN: 978-0081007174
- Zhang L., G., Fisher J., P., Leong K.: 3D Bioprinting and Nanotechnology in Tissue Engineering and Regenerative Medicine, Elsevier 2015, ISBN: 978-0128005477

List of optional reading:

- Chua C., K., Yeong W., Y.: Bioprinting: Principles and Applications (Wspc Book Series in 3D Printing), World Scientific Publishing Company 2015, ISBN: 978-9814612104
- Atala A., Yoo J., J.: Essentials of 3D Biofabrication and Translation 1st Edition, Academic Press 2015, ISBN: 978-0128009727

Curriculum:

[Seminari] list (with titles and explanation):

Introduction to the course, an overview of the development of technology.

Overview of technologies used in biomedicine. Conventional and unconventional 3D technologies. Emphasis on additive technologies and their application. Overview of seminar topics.

3D printers – basic structure and working principles.

Basic structure. Standard methods and protocols of use. Various popular 3D printing approaches:

- stereolithography – SL/SLA
- selective laser sintering – SLS
- fused deposition modeling – FDM
- 3D printing – 3DP
- laminated object manufacturing – LOM
- combination of SLA i 3DP (PolyJet)

Application of additive technologies in the biomedical field.

Analysis of applied methods and examples of good practice. The use of high-precision prints in reconstructions. Basics of biomodelling. The use of photopolymers.

CAD/CAM environment, introduction.

Fundamentals of computer modeling in different systems. Examples of simple biomodeling and reconstruction of anatomical geometry. Data export preparation, 3D model generation.

CAD/CAM environment, continuation.

Using a program for the preparation of 3D printing. Basic print parameters. Quality control and analysis. Postprocessing of the model.

Development trends of additive technologies, emphasis on biocompatible materials

Trends in the development of biocompatible materials. Development and analysis of the application of biopolymers and metal alloys.

Trends in the development of additive technologies, application technology.

Overview of trends in the development of 3D printing: stereolithography, hybrid processes, deposition and sintering of materials.

Student obligations:

Regular attendance at classes, writing a seminar paper.

Exam (exam taking, description of the written/oral/practical part of the exam, point distribution, grading criteria):

Other notes (related to the course) important for students:

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COURSE HOURS 2023/2024

Additive Technology

[Seminari] (Place and time or group)
24.10.2023
Introduction to the course, an overview of the development of technology.: • [P04] (16:00 - 19:00) [1626]   ○ ATe
izv. prof. dr. sc. Maričić Sven [1626]
31.10.2023
3D printers – basic structure and working principles.: • [P03 - INFORMATIČKA UČIONICA] (11:00 - 14:00) [1626]   ○ ATe
izv. prof. dr. sc. Maričić Sven [1626]
06.11.2023
Application of additive technologies in the biomedical field.: • [P03 - INFORMATIČKA UČIONICA] (14:15 - 16:30) [1626]   ○ ATe
izv. prof. dr. sc. Maričić Sven [1626]
13.11.2023
CAD/CAM environment, introduction.: • [P03 - INFORMATIČKA UČIONICA] (11:00 - 14:00) [1626]   ○ ATe
izv. prof. dr. sc. Maričić Sven [1626]
20.11.2023
CAD/CAM environment, continuation.: • [ONLINE] (11:00 - 14:00) [1626]   ○ ATe
izv. prof. dr. sc. Maričić Sven [1626]
21.11.2023
Development trends of additive technologies, emphasis on biocompatible materials: • [P03 - INFORMATIČKA UČIONICA] (12:00 - 14:15) [1626]   ○ ATe
izv. prof. dr. sc. Maričić Sven [1626]
27.11.2023
Trends in the development of additive technologies, application technology.: • [P08] (14:00 - 16:15) [1626]   ○ ATe
izv. prof. dr. sc. Maričić Sven [1626]

List of lectures, seminars and practicals:

[SEMINARI] (TOPIC)	Number of hours	Location

Introduction to the course, an overview of the development of technology.	4	[P04]
3D printers – basic structure and working principles.	4	[P03 - INFORMATIČKA UČIONICA]
Application of additive technologies in the biomedical field.	3	[P03 - INFORMATIČKA UČIONICA]
CAD/CAM environment, introduction.	4	[P03 - INFORMATIČKA UČIONICA]
CAD/CAM environment, continuation.	4	[ONLINE]
Development trends of additive technologies, emphasis on biocompatible materials	3	[P03 - INFORMATIČKA UČIONICA]
Trends in the development of additive technologies, application technology.	3	[P08]

EXAM DATES (final exam):