

Medicinski fakultet u Rijeci

## IZVEDBENI NASTAVNI PLAN 2023/2024

Za kolegij

### **Additive Technology**

Studij:	<b>Medical Studies in English (R)</b> (izborni) Sveučilišni integrirani prijediplomski i diplomski studij
Katedra:	<b>Centar za biomodeliranje i inovacije u medicini</b>
Nositelj kolegija:	<b>izv. prof. dr. sc. Maričić Sven</b>
Godina studija:	<b>3</b>
ECTS:	<b>1.5</b>
Stimulativni ECTS:	<b>0 (0.00%)</b>
Strani jezik:	<b>Mogućnost izvođenja na stranom jeziku</b>

## **Podaci o kolegiju:**

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).

## **Popis obvezne ispitne literature:**

- 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

## **Popis dopunske literature:**

- 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

## **Nastavni plan:**

### **Seminari popis (s naslovima i pojašnjenjem):**

#### **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.

## **Obveze studenata:**

Regular attendance at classes, writing a seminar paper.

## **Ispit (način polaganja ispita, opis pisanog/usmenog/praktičnog dijela ispita, način bodovanja, kriterij ocjenjivanja):**

## **Ostale napomene (vezane uz kolegij) važne za studente:**

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## SATNICA IZVOĐENJA NASTAVE 2023/2024

Additive Technology

<b>Seminari</b> (mjesto i vrijeme / grupa)
<b>24.10.2023</b>
Introduction to the course, an overview of the development of technology.: <ul style="list-style-type: none"><li>• P04 (16:00 - 19:00) <sup>[1626]</sup><ul style="list-style-type: none"><li>◦ ATe</li></ul></li></ul>
izv. prof. dr. sc. Maričić Sven <sup>[1626]</sup>
<b>31.10.2023</b>
3D printers – basic structure and working principles.: <ul style="list-style-type: none"><li>• P03 - INFORMATIČKA UČIONICA (11:00 - 14:00) <sup>[1626]</sup><ul style="list-style-type: none"><li>◦ ATe</li></ul></li></ul>
izv. prof. dr. sc. Maričić Sven <sup>[1626]</sup>
<b>06.11.2023</b>
Application of additive technologies in the biomedical field.: <ul style="list-style-type: none"><li>• P03 - INFORMATIČKA UČIONICA (14:15 - 16:30) <sup>[1626]</sup><ul style="list-style-type: none"><li>◦ ATe</li></ul></li></ul>
izv. prof. dr. sc. Maričić Sven <sup>[1626]</sup>
<b>13.11.2023</b>
CAD/CAM environment, introduction.: <ul style="list-style-type: none"><li>• P03 - INFORMATIČKA UČIONICA (11:00 - 14:00) <sup>[1626]</sup><ul style="list-style-type: none"><li>◦ ATe</li></ul></li></ul>
izv. prof. dr. sc. Maričić Sven <sup>[1626]</sup>
<b>20.11.2023</b>
CAD/CAM environment, continuation.: <ul style="list-style-type: none"><li>• ONLINE (11:00 - 14:00) <sup>[1626]</sup><ul style="list-style-type: none"><li>◦ ATe</li></ul></li></ul>
izv. prof. dr. sc. Maričić Sven <sup>[1626]</sup>
<b>21.11.2023</b>
Development trends of additive technologies, emphasis on biocompatible materials: <ul style="list-style-type: none"><li>• P03 - INFORMATIČKA UČIONICA (12:00 - 14:15) <sup>[1626]</sup><ul style="list-style-type: none"><li>◦ ATe</li></ul></li></ul>
izv. prof. dr. sc. Maričić Sven <sup>[1626]</sup>
<b>27.11.2023</b>
Trends in the development of additive technologies, application technology.: <ul style="list-style-type: none"><li>• P08 (14:00 - 16:15) <sup>[1626]</sup><ul style="list-style-type: none"><li>◦ ATe</li></ul></li></ul>
izv. prof. dr. sc. Maričić Sven <sup>[1626]</sup>

### Popis predavanja, seminara i vježbi:

SEMINARI (TEMA)	Broj sati	Mjesto održavanja
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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

**ISPITNI TERMINI (završni ispit):**

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