

**Course title: Digital technologies and materials in removable prosthodontic appliances fabrication**

**Department: Department of removable prosthodontics**

**Address: Gundulićeva 5, Zagreb**

**Total ECTS points: 3**

**Course leader: assoc.prof. Samir Čimić**

**Course associates: /**

**Teaching plan**

	<b>No. classes</b>
<b>Lecture</b>	6
<b>Seminar</b>	4
<b>Practical</b>	3
<b>Total</b>	

1 class = 45 minutes

**Course description**

Computer aided design (CAD) and computer aided manufacturing (CAM) have become usual practice in removable prosthetic dentistry, while 3D printing becomes more available in production of removable prosthodontic appliances. As with the advancement of technology new materials came to expression, in literature can be found different kind of materials for fabrication of removable prosthodontic appliances. Students will be introduced to the digital technologies in the production of complete and partial removable dentures: fabrication of denture base using CAD-CAM and 3D printing technology, fabrication of partial denture metal framework using 3D printing, finishing 3D printed removable prosthodontic appliances, use of Arcus Digma II device. Especially will be emphasized advantages, disadvantages and differences between CAD-CAM/3D printing systems and conventional technologies and materials. Aim of seminars is to introduce students with different methods of investigation of the new technologies and materials. It will be discussed possibilities of research of digital technologies, and appropriate materials and their clinical application according to research results. Special emphasis will be put on the in vitro investigations of mechanical properties of newly developed materials for denture base production. During exercises students will be introduced to fabrication and preparation of samples for investigation of mechanical properties of 3D printed materials for denture base fabrication.

**Learning outcomes**

1. to describe different digital technologies during fabrication of removable prosthodontic appliances
2. to describe advantages and disadvantages of digital technologies with regard to conventional fabrication
3. to explain different methods of investigation of materials and technologies of digitally produced removable prosthodontic appliances

4. to argue the advantages and disadvantages of in vitro testing of mechanical properties of denture base materials

**Course content**

## Lecture

	<b>Lecture topics</b>	<b>Number of classes/hours</b>
1.	Fundamentals of digital technologies in fabrication of removable prosthodontic appliances	1
2.	Use of CAD-CAM in complete denture fabrication	1
3.	Use of 3D printing technology in complete and partial dentures fabrication	1
4.	Evaluation of different types of materials produced conventionally, using 3D printing and CAD-CAM system	1
5.	Investigations of removable prosthodontic appliances materials produced with digital technologies	1
6.	Investigation of jaw tracking devices use in fabrication of different types of prosthodontic appliances	1
7.	-	-
8.	-	-
9.	-	-
10.	-	-

1 sat = 45 minuta

## Seminar

	<b>Seminar topics</b>	<b>Number of classes/hours</b>
1.	Clinical use of CAD-CAM and 3D printed materials for denture base/framework fabrication considering scientific results	1
2.	Investigation possibilities for CAD-CAM and 3D printing materials in removable prosthodontic appliances fabrication	1
3.	In vitro investigations of digitally produced materials in removable prosthodontic appliances fabrication	1
4.	Studying of mechanical properties of materials used for denture base fabrication	1
5.	-	-
6.	-	-
7.	-	-
8.	-	-
9.	-	-
10.	-	-

1 sat = 45 minuta

## Vježbe

	<b>practicals topics</b>	<b>Number of classes/hours</b>
<b>1.</b>	STL file creation (used for production of CAD-CAM and 3D printed samples)	1
<b>2.</b>	Preparation of samples for investigation of mechanical properties of materials used for denture base fabrication	2
<b>3.</b>	-	-
<b>4.</b>	-	-
<b>5.</b>	-	-
<b>6.</b>	-	-
<b>7.</b>	-	-
<b>8.</b>	-	-
<b>9.</b>	-	-
<b>10.</b>	-	-

1 class = 45 minutes

**Literature:**

1. Baba NZ, Goodacre BJ, Goodacre CJ, Müller F, Wagner S. CAD/CAM Complete Denture Systems and Physical Properties: A Review of the Literature. *J Prosthodont.* 2021;30:113-24
2. Alharbi N, Wismeijer D, Osman RB. Additive Manufacturing Techniques in Prosthodontics: Where Do We Currently Stand? A Critical Review. *Int J Prosthodont.* 2017;30:474–84.
3. Revilla-León M, Özcan M. Additive Manufacturing Technologies Used for Processing Polymers: Current Status and Potential Application in Prosthetic Dentistry. *J Prosthodont.* 2019;28:146-58.
4. Dawood A, Marti Marti B, Sauret-Jackson V, Darwood A. 3D printing in dentistry. *Br Dent J.* 2015;219:521-9.
5. Pacquet W, Benoit A, Hatège-Kimana C, Wulfman C. Mechanical Properties of CAD/CAM Denture Base Resins. *Int J Prosthodont.* 2019;32:104-6.
6. Huettig F, Kustermann A, Kuscu E, Geis-Gerstorf J, Spintzyk S. Polishability and wear resistance of splint material for oral appliances produced with conventional, subtractive, and additive manufacturing. *J Mech Behav Biomed Mater.* 2017;75:175-9.
7. Ahmad I, Al-Harbi F. 3D Printing in Dentistry 2019/2020. Quintessence Publishing; 2019. ISBN: 978-1-78698-026-7

**CV (curriculum vitae) and bibliography of course leader**

Born in 1984 in Banja Luka. Graduated in 2008th (School of Dental Medicine Zagreb). Working at the Department of Removable Prosthodontics since 2009 as a research novice. Doctoral dissertation entitled " Clinical study of movements and positions of lower jaw with ultrasonic method" defended in 2014. Passed the specialist exam in dental prosthodontics in 2016. Became assistant professor at

Department of Removable Prosthodontics, School of Dental Medicine Zagreb in 2016, and associate professor in 2021. So far published about thirty scientific and professional papers, and is co-authored on two university textbooks. Actively participated in dozens of domestic and foreign professional and scientific conferences. Participates in the continuing education of dentists. Member of domestic and foreign professional associations and societies (Croatian Dental Chamber, Croatian Prosthodontic Society, Croatian Society for Minimal Interventional Dental Medicine, International association for dental research).

Bibliography of course leader:

<https://www.bib.irb.hr/pretraga?operators=and|C4%8CimiC4%87,%20Samir%20%2825993%29|text|profile>