

Course title: Finite element method in biomechanical analysis of the craniofacial system

Department: Department of Orthodontics

Adress Gundulićeva 5

Total ECTS points: 4

Course leader: Prof. dr. sc. Senka Meštrović

Course associates

Teaching plan

	No. classes
Lecture	6
Seminar	10
Practical	4
Total	20

1 class = 45 minutes

Course description

Anatomical, histological and mechanical characteristics of tooth, PDL and alveolar bone will be introduced as well as bone metabolism and remodeling as result of orthodontic and orthopedic force application. Force, stress and strain will be defined and methods for their measuring and calculation. Methods for biomechanical analysis of craniofacial system will be described with accent on finite element method. The possibilities of using the FEM in biomechanical researches of craniofacial system

Learning outcomes

1. plan the biomechanical research
2. describe the characteristics of stress and strain as result of different force application
3. explain the biomechanical characteristics of the tooth, PDL and alveolar bone during the application of orthodontic and orthopedic forces
4. define the proper method for FEM modeling

Course content

Lectures

	Lecture topics	Number of classes/hours
1.	Introduction to biomechanical analysis	2
2.	Mechanical properties of the PDL, tooth and bone	2
3.	Methodes for analysing orthodontic forces, strain and stres during orthodontic tooth movement	2
4.	-	-
5.	-	-
6.	-	-
7.	-	-
8.	-	-
9.	-	-
10.	-	-

1 class = 45 minutes

Seminars

	Seminar topics	Number of classes/hours
1.	Strain and stress analysis	2
2.	Mathematical model of stomatognathic system	2
3.	Biomechanical characteristics of the bone	2
4.	Orthodontic tooth movement	2
5.	Biomaterials	2
6.	-	-
7.	-	-
8.	-	-
9.	-	-
10.	-	-

1 class = 45 minutes

Practicals

	Practicals topics	Number of classes/hours
1.	Finite element method research – modeling, computer simulations and calculation	4
2.	-	-
3.	-	-
4.	-	-
5.	-	-

6.	-	-
7.	-	-
8.	-	-
9.	-	-
10.	-	-

1 class = 45 minutes

Literature

1. Fung Y.C. (1993). Mechanical properties of living tissues, New York, Springer
2. Graber TM. Vanarsdall RL. (1994). Orthodontics. Current Principles and Techniques, St. Louis: Mosby
3. Profit WR. Fields HW. (2007). Contemporary orthodontics, St. Louis: Mosby
4. Nikolić V. Hudec M. (1988). Principi i elementi biomehanike, Zagreb: Školska knjiga
5. Nikolai RJ. (1985). Bioengineering analysis of orthodontic mechanics, Philadelphia:, Lea Febiger

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

Senka Meštrović was born in 1967 in Zagreb. In 1990 she graduated at the University of Zagreb School of Dental Medicine. In 1992 she finished the postgraduate study program and defended her master thesis titled Orthodontic Disorders and Oral Health in Subjects with Down Syndrome and obtained the title of Master of Science. Since 1991, she has been employed as a research novice at the School of Dental Medicine, and on August 8th, 1993 she was elected an assistant at the Department of Orthodontics. In 1995 she finishes clinical training in orthodontics. During the academic year 1995/96 she spent a month on professional training at the University of Vienna Orthodontics Clinic as a CEEPUS scholarship holder. In 1999 she defended her dissertation entitled Finite element method analysis of stress and strain caused by the orthodontic forces. On 23rd December 1999 she was elected to the scientific-teaching title of assistant professor, on 15th July 2003 to the scientific-teaching title of associate professor. On January 20th, 2008 she was elected a full professor. 21st January 2014 she was elected to the scientific- teaching title of full tenured professor. From academic years 2007/02008 to 2011/2012 she was vicedean for education and students. She is head of Department of Orthodontics.

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