**Study program:** Integrated academic studies in dentistry

**Type and level of the study program:** Integrated academic studies

**Course title: Mathematical models in dental research (DIV-MATMD)**

**Teacher:** Ljubomir M. Petrović, Ljubiša D. Džambas, Saša N. Vukmirović

**Course status:** elective

**ECTS Credits: 3**

**Condition:** none

**Course aim**

To understand and apply mathematical modeling in dental research.

**Expected outcome of the course:**

After passing the exam student is expected know different approaches of mathematical data modeling and to express the factors influencing variability in dentistry by the parameters of mathematical models.

Upon the completion of the course, the student is expected to be able to apply the appropriate mathematical model in dental theory and practice and to calculate the unknown parameters of the model.

**Course description**

*Theoretical education*

1. Modeling in dentistry
2. Mathematical modeling methods in dentistry
3. The method of least squares
4. Systemic approach to dental researches and practice
5. Laplace and Fourier's transformation
6. Complete Laplace's transformation, the concept of subsystems and partial Laplace's transformation
7. Application of spine functions
8. Interpolation and approximation of functions
9. The principle of convolution
10. Heavisid's development and general theorem on partial fractions in solving mathematical models via Laplace's transformation
11. General compartment theory
12. The method successive derivative ratio spectra
13. The method of frequency response of linear dynamic systems
14. The method based on the concept of artificial neural networks
15. Method based on fuzzy logic of theory groups
16. The method based on fractal concept
17. The application of incomplete derivatives of linear differential equations, their sum and integrals

*Practical education: exercises, other forms of education, research related activities*

1. Systems theory in dentistry
2. Identification of systems
3. Frequency-response data model
4. Structural model
5. System time delay and shunt system
6. Application of system theory in biology, medicine and dentistry
7. Composite materials in dentistry and the application of mathematical models

**Literature**

*Compulsory*

1. Ritschel W. Kearns G, Handbook of Basic Pharmacokinetics, APhA Publications, 6th edition, 2004.

*Additional* -

| **Number of active classes** | | | | Other: |
|---|---|---|---|---|
| Lectures: 30 | Practice: 15 | Other types of teaching: | Research related activities: | |

**Teaching methods**

Lectures, interactive lectures, Internet use e-learning, practical classes workshops, learning based on computational problems, the analysis of cases from the practice, participation in research and development projects.

**Student activity assessment** (maximally 100 points)

| **Pre-exam activities** | **points** | **Final exam** | **points** |
|---|---|---|---|
| Lectures | 25* | Written | 50 |
| Practices | 25* | Oral | |
| Colloquium | | ..... | |
| Essay | | | |

*5 attendance + 20 activity