UNIVERSITY OF NOVI SAD
FACULTY OF MEDICINE

Study program: Integrated Academic Studies in Pharmacy

Course title: Mathematical Models in Pharmacy

Teacher: Mihalj M. Poša, Kosta J. Popović, Nataša P. Milošević

Course status: elective

ECTS Credits: 3

Condition: Biophysics; Mathematics

Course aim

To understand and apply mathematical modeling in the design of new drugs and determining dosage regimen for the implementation of rational pharmacotherapy.

Expected outcome of the course:

After passing the exam students are expected to know the different approaches to mathematical modeling of data and to present the factors that affect the variability of therapeutic response, as adequately as possible, by using mathematical models parameters. Upon completion of the course, the student is expected to be able to apply both in the pharmaceutical theory and in practice the appropriate mathematical model and calculate the unknown parameters of the model.

Course description

Theoretical education

1. Modeling in pharmacy
2. Mathematical modeling methods in pharmacy
3. The method of least squares
4. System approach in pharmaceutical research and practice
5. Laplace and Fourier transformation
6. Complete Laplace transformation, the concept of subsystems and partial Laplace transformation
7. Application of spline functions
8. Interpolation and approximation of functions
9. The principle of convolution
10. Heaviside's development and general theorem of partial fractions in solving mathematical models via Laplace transform
11. General compartment theory
12. The method of successive terminals
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 the fuzzy logic of the groups theory
16. The method based on the concept of fractal
17. The application of partial linear differential equations, their sum and integrals

Practical education

1. Wagner-Nelson and Lu-Rigelman's methods
2. System's theory in pharmacy
3. Identification of the system
4. Modeling the frequency response
5. Structural model
6. System with time delay and shunt
7. Application patterns of the theory in biology, medicine and pharmacy
8. Systemic setting of the biological usability and examples
9. Systemic determining of the amount and rate of drug metabolites formation
10. Systemic determining of drug dissolution in vivo
11. Systemic determination of absorption from coated granules
12. Systemic modeling and dissolving similarity testing of drug formulations in vitro

Literature

Compulsory

1. Jambhekar SS. Breen PJ. Basic Pharmacokinetics. London: Pharmaceutical Press, 2009.

2. Winter M. Basic clinical pharmacokinetics, 4th edition. London: Lippincott Williams & Wilkins, 2003.
3. Ritschel W, Kearns G. Handbook of Basic Pharmacokinetics, 6th edition. Washington: APhA Publications, 2004.
4. Bauer LA. Applied clinical pharmacokinetics, 3rd edition. New York: McGraw-Hill Education, 2014.

Number of active classes	**Theoretical classes:** 30	**Practical classes:** 15

Teaching methods

Lectures, Interactive Lectures, usage the Internet, 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	10	Written	30
Practices	20	Oral	
Colloquium		.....	
Essay	40		