

SYLLABUS

1. Course title:

FUNDAMENTALS OF MICROFLUIDICS

2. Code:

3. Cycle of study:

4. ECTS credits:

5. Type of course:

6. Prerequisites:

7. Class restrictions:

8. Duration / semester(s):

9. Weekly contact hours and student workload:

	Semester (1)	Semester (2)	(for two-semester courses)	Workload: (hours)
	<input style="width: 40px; height: 20px;" type="text" value="V"/>	<input style="width: 40px; height: 20px;" type="text"/>		
9.1. Lectures	<input style="width: 40px; height: 20px;" type="text" value="2"/>	<input style="width: 40px; height: 20px;" type="text"/>	Classes:	<input style="width: 40px; height: 20px;" type="text" value="33,75"/>
9.2. Seminars	<input style="width: 40px; height: 20px;" type="text" value="0"/>	<input style="width: 40px; height: 20px;" type="text"/>	Individual work:	<input style="width: 40px; height: 20px;" type="text" value="85,42"/>
9.3. Laboratory / Practice classes	<input style="width: 40px; height: 20px;" type="text" value="1"/>	<input style="width: 40px; height: 20px;" type="text"/>	In total:	<input style="width: 40px; height: 20px;" type="text" value="119,17"/>

10. Faculty:

11. Department/study program:

12. Lecturer:

13. Course aims:

Due to the rapid progress in science, the production of micro electromechanical systems, which find wide application in industry, has been made possible. Simultaneously with the development of these systems, microfluidics is being intensively developed as its basic part. The goal of this course is to get to know the phenomena that occur during fluid flow

in microchannels and the most modern devices that rely on microfluidics, without using complex analytical and numerical methods.

14. Learning outcomes:

Identifies the basic principles and laws of processes and phenomena in micro electromechanical systems. Evaluates measures and methods for enhancing fluid transfer within various microchannels. Ability to calculate basic processes and phenomena in microfluidic devices and systems.

15. Course content:

1. Introduction to microfluidics. Fluid flow in micro and nanodevices.
2. Basic equations of fluid flow. Basic differences in the approach of microscopic and macroscopic fluid modeling.
3. Electrohydrodynamics. Electroosmotic flow in channels and pipes.
4. Multichannel electroosmotic pump. Cascade electroosmotic pump.
5. Electrophoresis. Diffusion and transport of substances in channels of small cross-section.
6. Capillarity in microsystems. Capillary pump.
7. Knowledge test.
8. Microsensors. Microactuators. Micropumps. Microvalves and auxiliary components.
9. Microfilters. Microfluidic mixers. Microfluidic chip.
10. Fabrication of microfluidic chips. Microfluidic implants.
11. Microfluidic control. Numerical modeling of microfluidic processes.
12. Applications of microfluidic devices. Microfluidics in medicine and bioengineering.
13. Microfluidics in modern mechanical engineering.
14. Microfluidics in electrical engineering and process industry.
15. Knowledge test.

16. Learning methods:

The following methods will be used in the course of the course in order to effectively conduct classes and achieve the set objectives of the course and student competencies:

- lectures with the use of multimedia tools with active participation and discussions of students,
- preparation and presentation of problems during auditory exercises and individual and team/group laboratory exercises,
- presentation in a real environment.

17. Assessment methods:

The concept of knowledge assessment is based on continuous work with students throughout the semester. Knowledge assessment methods include: assessment of both individual and group activities during the semester, preparation of a seminar paper, and final knowledge assessment in written and/or oral form. This ensures equal treatment (written and/or oral knowledge assessment) for all students with different affinities.

Grade	described	by letter	points
5 (five)	Does not meet minimum criteria	F;FX	<54
6 (six)	meets the minimum criteria	E	54 -64
7 (seven)	Generally good, but with significant flaws	D	65-74
8 (eight)	Average, with noticeable errors	C	75-84
9 (nine)	Above average, with some errors	B	85-94
10 (ten)	Exceptional success without mistakes or with minor mistakes	A	95-100

18. Assessment components:

The exam grade is based on the total number of points that the student has earned by completing the pre-exam requirements and taking the exam and contains a maximum of 100 points, according to the following scale

Student obligations

Points

Lecture attendance 5

Test I 25

Test II 25

Total pre-exam requirements 55

Final exam 25 - 45

19. Mandatory reading list:

1. Tabeling P. (2005) Introduction to microfluidics, Oxford University Press, Oxford
2. Brus H. (2008) Theoretical Microfluidics, Oxford University Press Inc., New York
3. Dongqing L. (2008) Encyclopedia of Microfluidics and Nanofluidics, Springer

4. Nevena D. S. (2014) Osnove mikrofluidike i nanofluidike, Planeta Print

20. Additional reading list:

21. Web sources:

22. Applicable from the academic year:

2025/26

23. Adopted in the Faculty/Academy session: