Course: Integrated Chemical Systems		
Language: Croatian and English		
Lecturer: Dr Ivana Steinberg, Associate Professor		
TEACHING	**WEEKLY**	**SEMESTER**
Lectures	**2**	**30**
Laboratory	**-**	**-**
Seminar	**2**	**30**
		Overall: 60
		ECTS: 6

PURPOSE:

Adopting fundamental concepts of *nano* and *micro*-integrated chemical systems (ICS) and their function, form and application in the context of multidisciplinary fields of modern science and technology. Enabling students to understand and apply systematic approach in analysis and synthesis of ICSs, using previously adopted knowledge in related fields of chemistry and engineering. Becoming familiar with real examples of hight-tech integrated chemical systems including DNA chips, organic solar cells, microfluidic diagnostic chips.

THE CONTENTS OF THE COURSE:

Week	**Lectures and seminars**
1	Introduction to the course, concepts of Integrated Chemical Systems
2	Examples of ICSs: glucose biosensor, organic solar cells, organic light emitting diode, *Lab-on-a-chip* systems: chemical function, form, application
3	Integrated chemical *analytical* systems (ICAS): examples of chemical sensors and biosensors
4	Building blocks and ICS fabrication techniques I Functional materials – examples
5	Building blocks and ICS fabrication techniques II Self-assembly of molecules and materials
6	Building blocks and ICS fabrication techniques III Microsystem Technologies
7	Building blocks and ICS fabrication techniques IV

	Chemical methods of *nano*- and *micro*-functionalisation of ICSs
8	Introduction to microfluidics as *enabling* technology for ICAS
9	Miniaturisation of analytical systems: *Lab-on-a-chip*
10	Integrated chemical *analytical* systems (ICAS)
11	Integrated chemical *synthetic* systems (microreactors) Microfluidic chemical synthesis *(Plant-on-a-chip)*
12	Students' presentations
13	Students' presentations
14	Final revision and summary of the course
15	Final Exam

GENERAL AND SPECIFIC COMPETENCE:

General: individual and team based project research skills, written and oral presentation skills

Specific: understanding the role of chemistry in development and application of integrated micro- and nano chemical systems, synthesis of knowledge from different fields of chemistry and related areas, adopting systematic approach to solving problems in the field of applied chemistry

KNOWLEDGE TESTING AND EVALUATION:

Lectures and seminars are compulsory; regular homework assignments and problem solving exercise, written and oral presentations; compulsory reading for seminar discussions; presentation of final assignment, final written exam

MONITORING OF THE COURSE QUALITY AND SUCCESSFULNESS:

Student survey

LITERATURE:

1. Allen J. Bard, *Integrated Chemical Systems: A Chemical Approach to Nanotechnology*, John Wiley & Sons Ltd., New York, 1994.

2. G. A. Ozin, A. C. Arsenault, *Nanochemistry: A Chemical Approach to Nanomaterials,* RSC, Cambridge, 2005.

3. A. Rios, A. Escarpa, B. Simonet, *Miniaturization of Analytical Systems: Principles, Design and Applications*, Wiley, Chichester, 2009.

4. F. A. Gomez (Editor*), Biological Applications of Microfluidics*, John Wiley & Sons, New Jersey, 2008.