



## SCIENTIFIC AND METHODS MODULE

Module name	Sensors
Number	2012-MatCatNet01
Aims	<ol style="list-style-type: none"> <li>1. Link molecular sciences with material sciences</li> <li>2. Understand how materials with optimised properties are obtained from molecules or molecular precursors</li> <li>3. Understand the properties and applications of these materials</li> <li>4. Deepen the understanding of generation and handling of nanoparticles and functional materials</li> <li>5. Linking molecular sciences, as well as topics from solid-state chemistry and physics, homogeneous, heterogeneous and bio-catalysis.</li> </ol>
Basics	Basic understanding of electrochemistry
Contents	<ol style="list-style-type: none"> <li>1. Definitions; history; classification; operational aspects; methodology</li> <li>2. Electrode processes; electrode thermodynamics and kinetics; electrocatalysis; amperometric sensors; potentiometric sensors; three-phase electrodes as electrochemical sensors</li> <li>3. Modification of conductor and semiconductor surfaces with organic films: chemical and electrochemical way</li> <li>4. Preparation of nano-particles, their properties and application for detection of various substrates</li> <li>5. Obtaining ionic liquids; physical and catalytic properties</li> <li>6. Liquid-liquid interfaces in biological systems</li> </ol>
Type	Two-day block course
Date (month/year)	8 to 9 October 2012
Time	Day 1: 8:30 – 18:30, Day 2. 8:30 – 18:30
Work load	15 hours presence/ 45 hours self-study
Examination	written
Credit points	2
Responsible scientists	Valentin Mirceski (MK), Rubin Gulaboski (MK), Fetah Podvorica (KOS), Blaga Radovanovic (SER)
Guest lecturers	Catalin Popescu (RUM), Evamarie Hey-Hawkins (DE)
Recommendations for literature, e-learning	<ul style="list-style-type: none"> <li>• Joseph Wang, Analytical Electrochemistry 2d Ed., 2001, Wiley, VCH</li> <li>• Allen J. Bard, Larry R. Faulkner, Electrochemical methods. Fundamentals and Applications, John Wiley &amp; Sons, 2001</li> <li>• Valentin Mirceski, Šebojka Komorsky-Lovric, Milivoj Lovric, Square-Wave Voltammetry. Theory and Application, 2007 Springer-Verlag Berlin Heidelberg</li> <li>• W. Göpel, J. Hesse, J. N. Zemel (eds.), Sensors. A comprehensive survey, vol. 2, part 1, VCH, Weinheim 1991</li> <li>• J. Janata, Principles of Chemical Sensors, Plenum Press, New York, 1989</li> <li>• T. E. Edmonds, Chemical Sensors, Blakie and Son, Glasgow, 1988</li> <li>• A. H. Hall, Biosensors, Open Univ. Press, Buckingham, 1990</li> </ul>

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## SCHEDULE 2012

Time	Lecturer	Programme	Location
<b>Day 1</b>			
8:30-10:00	Evamarie Hey-Hawkins (Leipzig)	Coordination complexes as selective sensors for ions and molecules	Skopje, MK
10:00-10:30	<i>Coffee Break</i>		
10:30-12:00	Catalin Popescu (Cluj-Napoca)	Sensors I: basic aspects; electrochemical sensors	Skopje, MK
12:00-13:00	<i>Lunch</i>		
13:00-14:30	Blaga Radovanovic (Nis)	Chemical sensors as a tool for antioxidant capacity assessment	Skopje, MK
14:30-15:00	<i>Coffee Break</i>		
15:00-16:30	Fetah Podvorica (Prishtina)	The use of chemically and electrochemically grafted films on material surfaces as electrochemical sensors	Skopje, MK
16:30-17:00	<i>Coffee Break</i>		
17:00-18:30	Rubin Gulaboski (Stip)	The role of nanoparticles in electrochemistry	Skopje, MK
<b>Day 2</b>			
8:30-10:00	Fetah Podvorica (Prishtina)	Modification of different carbon surfaces with organic molecules	Skopje, MK
10:00-10:30	<i>Coffee Break</i>		
10:30-12:00	Catalin Popescu (Cluj-Napoca)	Sensors II: optical, mass, thermal and piezoelectric sensors	Skopje, MK
12:00-13:00	<i>Lunch</i>		
13:00-14:30	Valentin Mirceski (Skopje)	Three-phase electrodes as electrochemical sensors	Skopje, MK
14:30-15:00	<i>Coffee Break</i>		
15:00-16:30	Rubin Gulaboski (Stip)	Liquid-liquid interface as biochemical sensor for biorelevant ions	Skopje, MK
16:30-17:00	<i>Coffee Break</i>		
17:00-18:30	Valentin Mirceski (Skopje)	Electrocatalysis	Skopje, MK
19:00-...	<i>Get-together dinner</i>		

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