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|  **UNIVERSITY OF NIŠ** |
| **Course Unit Descriptor** | **Faculty**  | Faculty of Science and Mathematics |
| **GENERAL INFORMATION** |
| Study program  | **Applied chemistry** |
| Study Module (if applicable) | Applied chemistry |
| Course title | Materials chemistry and technology |
| Level of study | [ ] Bachelor [x]  Master’s [ ]  Doctoral |
| Type of course | [ ]  Obligatory [x]  Elective |
| Semester  |  [ ]  Autumn [x] Spring |
| Year of study  |  |
| Number of ECTS allocated | 5 |
| Name of lecturer/lecturers | Aleksandra R. Zarubica |
| Teaching mode |  [x] Lectures [ ] Group tutorials [ ]  Individual tutorials [x] Laboratory work [x]  Project work [ ]  Seminar [ ] Distance learning [ ]  Blended learning [ ]  Other |
| **PURPOSE AND OVERVIEW (max. 5 sentences)** |
| *Earning basic knowledge of designing and synthesis of modern materials, and chemical reactions that take place during synthesis. Adopting of knowledge, earning ability and experiences in physic-chemical characterization of high technology materials, and their application in selected processes in context of sustainable development (catalysis and/or adsorption). Application of appropriate mathematical and technical/software apparatus/application programs in calculation of some properties of materials, also estimation of their efficiency in test-reactions and real processes in industry and environment. Design of above mentioned modern materials should ensure finding useful materials, which give/provide proper yields/effects when they are used. Application of these materials as adsorbents or catalysts that would provide fulfil of fundamental postulates of sustainable development.**Student should be able to: develop detailed design of material synthesis of given chemical content; predict and describe all chemical and physico-chemical reactions/processes that occur during synthesis; indicate and compare analytical and physic-chemical methods for complete characterization of material; explain influence of all physicalo-chemical characteristics of materials on their efficiency during application; establish/correlate graphic relations and dependences, selected parameters (texture, structure, morphology) of materials and/or dependences with/in line (with) occurred effects in test-processes (adsorption and/or catalysis); independently conduct necessary data analysis (theoretical-mathematical or software approach) based on theoretical knowledge and practical application; establish optimisation of process parameters, adequately communicate and present fundamental and empirical data in oral/written form, independently or in cooperation with colleagues (team work if needed) professionally set and plan work in appropriate topic in materials chemistry and technology and coordinate them in line with sustainable development principles.* |
| **SYLLABUS (brief outline and summary of topics, max. 10 sentences)** |
| LecturesChemistry of ZrO2  - Synthesis and properties; Chemistry of ZrO2 – production and application; Chemistry of TiO2 – synthesis and properties; Chemistry of TiO2 – production and application; Zeolites – synthesis, properties and structure; Zeolites – application; Obtaining/production of films and coatings; Preparation/production of coatings by liquid phase methods; Deposition of films and coatings from gas phase; Chemical deposition from steam/gas phase; Growth and structure of films and coatings deposited from steam/gas phase; Extrusion of ceramic fibres, application of ceramic fibres; Carbon nano-tubes: synthesis, structure, growth; Carbon nano-tubes: properties and application.Practices Synthesis of MO2 (M=Zr, Ti, Sn) by sol-gel method; Synthesis of MO2 by inorganic compounds hydrolysis; Synthesis MO2 by hydrothermal method; Synthesis of nano-tubes; Application of nano-tubes; Physico-chemical characterization of ceramic materials; Textural characteristics of ceramic materials; Calculation of material specific surface area and porosity analysis; Structural characteristics of material; Morphological properties of ceramics materials (electronic microscopy); Scanning/transmission electronic microscope imaging (SEM/TEM) and images analysis; Examination of acid-base centres of ceramics materials; Synthesis of double layered mixed oxides/hydroxides and nonstoichiometric oxides; Application of double layered mixed oxides/hydroxides – adsorption and degradation of colours and pesticides; Visit/practices to/in porcelain and ceramics industry. |
| **LANGUAGE OF INSTRUCTION** |
| [x] Serbian (complete course) [ ]  English (complete course) [ ]  Other \_\_\_\_\_\_\_\_\_\_\_\_\_ (complete course)[ ] Serbian with English mentoring [ ] Serbian with other mentoring \_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| **ASSESSMENT METHODS AND CRITERIA** |
| **Pre exam duties** | **Points** | **Final exam** | **points** |
| **Activity during lectures** | **15** | **Written examination** | **40** |
| **Practical teaching** | **15** | **Oral examination** |  |
| **Teaching colloquia** | **30** | **OVERALL SUM** | **100** |
| **\*Final examination mark is formed in accordance with the Institutional documents** |