

Course title:
applications

Nanomaterials for optoelectronic and biological

Institute/Speciality:
Technological Processes

FACULTY OF CHEMICAL ENGINEERING AND TECHNOLOGY / Engineering of

Number of contact hours: 30 hours (lectures)

Course duration: 1 semester

ETCS credits: 2

Course description:

The course aims: expanding knowledge of students to comprehensive overview of synthesis and characterization of nanomaterials especially for optoelectronic and biological applications. Course modules will cover the fundamental scientific principles controlling assembly of nanostructured materials, novel synthesis methods and toxicity problem of nanomaterials. Expanding knowledge of students to understanding the design and properties of hierarchical nanostructures that are utilized in advanced applications, including photovoltaic applications, drug delivery, LEDs and others. The course will also provide the students with necessary background for understanding basic nanomaterials characterization techniques, including X-ray scattering diffraction, crystal structure analysis, microscopy techniques, dynamic light scattering and others.

Lectures content: Definition of nanotechnology and nanomaterials, classifications of nanomaterials, including quantum dots nanoparticles, hybrid organic-inorganic nanocomposites / Nanoparticles, shapes, dimensionality, surface modifications, methods of stabilization of nanomaterials, the process of self-organization / The main synthesis methods of nanomaterials: bottom-up and top-down approaches including sol-gel reactions, colloidal methods, solvothermal synthesis, microwave synthesis / The main analytical methods for characterization of nanomaterials including: microscopic techniques (SEM, TEM, AFM, HRTEM, EDX), diffractive techniques (XRD, and spectroscopy techniques (DLS, XPS, SIMS, NMR, UV-VIS, ICP-AES, FT-IR and ellipsometry) / Optoelectronics application of nanomaterials including photovoltaic cells, transistors, LEDs, sensors / Biology and medicine applications of nanomaterials: drug delivery, including cancer therapy, biosensors, bio-labeling / Toxicity of Nanomaterials.

Literature:

Nanomaterials" 2015, Taylor & Francis Group

[1] Vijaykumar B. Sutariya, Yashwant Pathak, „Biointeractions of

[2] Wei Chen, Shaowei Chen „Functional Nanometer-Sized Clusters of Transition Metals – synthesis, properties and applications"; 2013, Royal Society of Chemistry

Assessment method: Final test

Prerequisites: Student should have basic knowledge from physical, inorganic and organic chemistry, electrochemistry and biology

Primary target group: all specialties students (Chemical Engineering / Chemical Technology)

Lecturer: dr inż. Katarzyna Matras-Postołek

Contact person: dr inż. Katarzyna Matras-Postołek (katarzyna.matras-postolek@pk.edu.pl)

Deadline for application: 15th of January for students applying for spring semester

Remarks: The course is selectable