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|  | **Course Syllabus** |

**1.** **Course Title:**

Micro- and Nanosystems

**2. Academic Level:**

Master

**3. ECTS Credits:**

5 ECTS

**4. Semester:**

2, spring semester

**5. School/Department:**

Institute of Nanotechnologies, Electronics and Equipment Engineering / Department of Nanotechnology and Microsystems Technology

**6. Location:**

Taganrog Campus, 2 Shevchenko St., Taganrog

**7. Instructor:**

English

Prof. Evgeny Gusev, PhD, email: [eyugusev@sfedu.ru](mailto:eyugusev@sfedu.ru)

**8. Language of Instruction:**

**9. Course Description:**

The course is designed to study basics of designing technology for manufacturing products of micro- and nanosystems, as well as micromechanical and microelectromechanical structures, components and sensors.

**10. Course Aims:**

- to obtain theoretical and practical knowledge about designing technology for manufacturing products of micro- and nanosystems.

- to study micromechanical and microelectromechanical structures, components and sensors.

- to develop communicative competence in English.

English B1. Bachelor's degree in Engineering or Science, preferably in the field of microsystems design or nanofabrication. Knowledge: fundamentals/basics of higher mathematics (differential and integral calculus with several variables), chemistry and materials science, general and solid state physics (crystallography); digital and analogue circuit technology, layout design for electronic circuits; nanomaterials technology, integrated circuit, micro and nanofabrication, microsystem technologies.

Skills: analytical calculations, computer-aided design basics, algorithm and flowchart basics.

**11. Specific entry requirements (if any):**

**12. Course Content:**

Micro and nanosystems, MEMS, NEMS.

MEMS design.

Structures modelling.

Micro- and nanofabrication.

Process flows.

Case studies (inductor, capacitor, actuator, gas sensor, ultra sound sensor, accelerometer, and gyroscope).

**13. Intended Learning Outcomes:**

Knowledge: processing methods (machining) and their use in the technology of micro- and nanoelectromechanical systems, basic and specialized technological processes for the manufacture of micromechanical components, sensors and MEMS.

Abilities: to analyze, make a reasonable choice of technological methods of manufacture, technological routes for the manufacture of components, sensors and MEMS.

Skills: in assessing and calculating main parameters of structures and technological operations, working with technological documentation.

**14. Learning and Teaching Methods:**

**Passive:** lecture-visualization using presentation material, oral questioning.

**Active:** independent work with literature, scientific, educational and reference digital resources.

**Interactive:** lab sessions and project work. The course can be carried out partly or as a whole using electronic and distant educational system of University.

**15. Methods of Assessment/Final assessment information:**

Assignments: project assignments (60%), lab work (30 %), presentation (10%).

**16. Reading List:**

1. Senturia S.D. Microsystem Design, Springer US, 2005, 689 p., ISBN 0792372468, 9780792372462.

2. Franssila S. Introduction to Microfabrication, Wiley, 2010, 536 p., ISBN 9781119991892, 1119991897.

3. Micro and Nanosystems, ISSN 1876-4029, 1876-4037