

## International Master Programme “Light Guide Photonics”

**Partner University:** Aristotle University of Thessaloniki.

**Place of Study:** Saint Petersburg, Russian Federation.

**Outcome (diploma):** Master of Science (ITMO University), Master of Science (AUTH University).

**Duration:** 2 Years, 120 credits.

**Language of instruction:** English.

**Admission Requirements:** Bachelor's degree in the field of Photonics, Fiber and Integrated Optics/ Technology, Micro- and Nanomaterials or equivalent, with excellent/good grades; upper-intermediate level of English.

**Career Options:** The program is aimed at preparing elite personnel for research and modification of materials in the field of Light Guide Photonics and Nanomaterials:

Objective 1 - Preparing for innovative engineering activities aimed at the development and creation of new competitive optical systems and technologies.

Objective 2 - Acquire deep knowledge in the field of optotechnology. Continuous perfecting in area of fundamentals and applications of high-level professional knowledge.

Objective 3 - The ability to creatively conducting the complex experiments, to applying original techniques in ambiguity, to drawing adequate conclusions.

Objective 4 - Accumulated experience in designing highly demanded and promising optical systems and technologies.

Objective 5 - Leadership development, preparation for successful work in a rapidly changing environment.

### Program description:

We live in the information age and it is no secret that the modern technologies, based on advances in the scientific fields of photonics and electronics, are its groundwork. Photonics is in many respects similar to electronics and instead of electrons it uses quanta of the electromagnetic field - photons. Photonics covers a wide range of optical, electro-optical and optoelectronic devices and their various applications from transmitting information via optical fibers to creating new sensors that modulate light signals in accordance with the slightest changes in the environment.

The state-of-the-art devices and instruments should provide maximum information flexibility and tunability with purpose to meet rapidly changing requirements and to provide processing algorithms. That is why almost all modern controlling systems, communications, etc. are built on the basis of programmable digital devices and instruments based on microcontrollers, signal processors and programmable logic integrated circuits.

The symbiosis of photonics and electronics opens up new possibilities and allows increasing the capabilities of modern devices, as well as creating technologies for transmitting terabit information flows over long distances, and conducting precision measurements in the remote places of our planet, on the ocean floor, underground, under conditions of the high temperatures and radiation. Without these achievements, it is difficult for our contemporary to imagine actual life. Really, to develop and maintain the efficiency of existing systems, the profound knowledge and skills in the field of photonics and electronics are needed, that this Programme is being aimed at.

The proposed educational Programme is aimed at preparing the Masters of Science who would be able to be involved into research and design activities in the field of devices and systems development on the basis of fiber and integrated optics and programmable electronics.

### The students will learn:

- the physical principles of operation and development of the technologies for designing devices and systems on the basis of fiber/integrated optics and programmable electronics; development of principles of the fiber-optic sensors and information-measuring sensor systems creation;
- creation and research of new materials for photonics, optoelectronics and quantum electronics;
- flowcharting the computer models of optical radiation propagation processes in the waveguide systems

and elements of the light guide path of sensor devices and systems created on the basis of fiber/integrated optics and programmable electronics.

**The main branches of the design and production and technological activities:**

- development, design and operation of devices and systems created on the basis of fiber/integrated optics and programmable electronics;
- software development of fiber-optic sensor systems created on the basis of microelectronics;
- maintenance and operation of fiber-optic sensor systems;
- automation of the management of fiber-optic sensor devices and systems created on their basis;
- computer simulation of physical processes.

**Content of the Program**

Photonics	3 credits
Up-to-date production of the optical fibers	3 credits
Fiber and integrated optics	3 credits
Specific problems of electronics	5 credits
Information and measurement systems based on the fiber optics components	7 credits
Electronics based on the programmable logic integrated circuits	3 credits
CAD systems for electronic circuits	3 credits
Practical electronics	3 credits
Precision mechanics	3 credits
Communication networks and commutation systems	3 credits
Application of the neural networks	2 credits
Methods for statistical processing the experimental data	3 credits
Principles of the self-operated control theory	2 credits
Programmable electronics for the fiber optic devices	3 credits
Digital processing the signals	3 credits
Project management	2 credits
Nanotechnology of the photonic inscription of the Bragg gratings into photorefractive optical fibers	3 credits
Acousto-optic conversion devices and their application	3 credits
Raman and Mandelstam- Brillouin scattering Within optical fibers and its application	3 credits
Basics of the modern designing	3 credits
Up-to-date systems of packet switching	3 credits
Interim results	60 credits
Practical work	54 credits
Preparing and defending a final qualification thesis	6 credits