MSc Program in "Cutting-edge Technologies in Visual Sciences"

Study Guide

The Program aspires to become the only one in Greece and Europe that will meet a significant demand for specialized training in the field of Cutting-edge Technology in Visual Sciences. Through its collaboration with the Institute of Applied and Computational Mathematics and the Institute of Electronic Structure and Laser of the Foundation for Research and Technology - Hellas (FORTH), as well as with the University Ophthalmology Clinic of P.A.G.N.I., the program aims to train highly qualified professionals in cutting-edge technologies in an interdisciplinary field that includes medicine, optical physics, neurosciences, mathematics, optometry, materials science, pharmacology, chemistry and biotechnology. The aim of the program is to prepare graduates for careers in hospitals, medical centers, private companies engaged in the design, development or maintenance of vision science devices, as well as for research positions in universities and research centers. The curriculum of the program is structured so as to provide a solid foundation in the fundamentals of vision science and then delve into specialized topics, promoting interdisciplinary cooperation among the participating institutions. Students will prepare a Master's thesis to apply their knowledge and skills, contributing to the advancement of research in vision science.

Learning Outcomes/Qualifications acquired from successful attendance of the Program

The Program will train graduates in cutting-edge technologies of Visual Sciences through characteristic examples that illuminate the interdisciplinary character of this field. Graduates of the Program will acquire sufficient knowledge in a wide range of sciences (such as anatomy and physiology of vision, visual physics, physiological optics, mathematics, biology, chemistry) that will allow them to understand and deepen the new technologies of Vision regardless of the subject of their basic education.

Graduates will acquire theoretical knowledge and skills with emphasis on the interdisciplinary approach of cutting-edge technologies of Vision. An important contribution to this direction will be made by the interdisciplinary modules, each of which will concern a characteristic cutting-edge topic and will be organized by two or more of the collaborating departments/bodies.

In this way, graduates of the Program will be prepared for:

- Postgraduate studies at doctoral level.
- Successful career in research institutions and in the productive sector.
- Promotion of modern research in the rapidly evolving field of Technologies in Visual Sciences.
- Teaching in high-level seminars related to the subject of the Program.
- Staffing of Ophthalmology Clinics and Clinics in the Public and Private sector.
- Staffing of Laboratories and Companies active in the field of Vision Technology.
- Employment in similar positions that require a high level of knowledge and skills of the subject of the Program (research centers, biotechnology laboratories, digital medicine applications, ministries and other public health services, etc.).

Courses – Structure of the Program – ECTS

For the successful completion of the Program and the award of the MSc, students must accumulate at least one hundred and twenty (120) Credits (ECTS) from attending the compulsory courses of the table below, which presents the indicative distribution of the corresponding credits.

Indicative Programme of Study:

N/A	Lesson	ECTS	Semester of Studies
1	Eye and Vision I Eye and Vision I	7	1
2	Mathematics I Mathematics I	7	1
3	Waves and tissues Waves and tissues	7	1
4	Biology Biology	7	1
5	Mini Review Projects Study and Presentation of Review Publications	2	1
Total ECTS		30	
6	Eye and Vision II Eye and Vision II	6	2
7	Biostatistics Biostatistics	6	2
8	Principles of Imaging Imaging Principles	6	2
9	Mathematics II Mathematics II	6	2
10	Visual Optics Physiological Optics	6	2
Total ECTS		30	
11	Interdisciplinary Modules	30	3
12	Master’s Thesis	30	4

Analytically:

Course Outline

Course Title (English)	ECTS	Short outline
Eye and Vision I	7	Basic principles of anatomy and physiology of the eye and vision in order to familiarize students from heterogeneous cognitive fields.
Mathematics I	7	Functions and graphs. Linear Algebra and Analytical Geometry. Discrete time models and sequences. Limits and continuity of functions. Function derivative and applications. Function integration and applications
Waves and Tissues	7	Basic principles of wave physics, wave sources and detectors. Study of the interaction of waves with tissues. Examples of applications in the visual sciences
Biology	7	Principles of the biology of the cell, its basic functions. Biological principles of the functions of multicellular organisms. Inflammation and healing. Biology and physiology of nervous tissue.
Mini Review Projects	2	Students undertake to review the literature of a topic and present their findings in aggregate. The aim is to familiarize students with the process of literature review, evaluation of published research results and presentation to the public.
Eye and Vision II	6	Continuation of the homonymous course of the 1st semester. Basic issues of nosology, diagnostics and treatment of eye and vision problems are presented. The familiarization of audiences with heterogeneous fields of knowledge is also a key objective here.
Biostatistics	6	Principles of medical biostatistics aiming at understanding the processing and management of experimental data and learning the basic tools for use by students.
Principles of Imaging	6	Basic principles of physics and mathematics applied to the development and operation of imaging techniques and systems. Presentation of representative techniques and applications in Visual Sciences.
Mathematics II	6	Basic ordinary differential equations and elementary dynamical systems. Multivariable functions. Introduction to partial differential equations.
Visual Optics	6	Presentation of the eye as a visual system. Analysis of the visual properties of the anatomical structures of the eye and their function in the process of vision. Presentation of the process of converting visual information into a neural signal and its higher integration of vision.
Inderdisciplinary Modules	30	The Interdisciplinary Modules are equivalent to each other in terms of workload. Each student is asked to choose 4 modules in which a total of 30 ECTS are awarded. The Interdisciplinary Modules include, but are not limited to, the following:

Course Title (English)	ECTS	Short outline
		Section 1: Monitoring the signal in the optical pathway: from photons to vision Module that aims to understand and familiarize with the neurophysiology of vision and the technologies that support it. Collaborate Medical School UCY, FORTH. Section 2: Refractive errors: correction by interfering with the visual elements of the eye Module aimed at understanding and familiarizing with the use of physiological optics and related technologies for the therapeutic modification of the visual properties of the eye. Collaborating are the Medical School of UCY, FORTH, TEMI. Section 3: Slow release of drugs for ophthalmological use Module aimed at understanding and familiarization with Ophthalmic pharmacology and techniques that allow development of slow-release drugs. They collaborate Medical School of UCY, TEMI. 4th session: New technologies in ophthalmic oncology Module aimed at understanding and familiarizing with the applications of radiation physics in ophthalmic oncology. Collaborate Medical School UCY, FORTH. 5th session: New ophthalmic imaging technologies Module that aims to understand and familiarize with modern imaging technologies with application in ophthalmology and vision sciences. Collaborating are the Medical School of UCY, FORTH, TEMI.
Master's Thesis	30	Thesis prepared in the 4th semester under the supervision of a teacher. It aims to complete a small research project, collect data and present them comprehensively.

The language of the Program in both teaching and writing the postgraduate thesis is English.

A modification in the content and composition of the interdisciplinary units may be made following a decision of the PSC of the Program.

Attendance at the Program is full-time and is done by following the sequence of semesters. Modification of the program of courses, redistribution of courses between semesters, definition or modification of credits (ECTS) per course, addition of courses as well as replacement of a course with a postgraduate course of another Postgraduate Program, if it has relevant or complementary content with corresponding credits, may be brought about by decisions of the PSC.