MSc "Cutting-edge Technologies in Visual Sciences"

Structure - Study Guide of the Program

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 IPPP – ECTS

For the successful completion of the Program and the award of the MSc, the MF 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

Mobility

The Program supports the mobility of its students usually through the ERASMUS+ Program. The students are offered the opportunity to carry out their thesis (data collection, experiments, data analysis and writing) in laboratories and institutions abroad in collaboration with the visiting Professors and Researchers participating in the Program, thus giving the Program the desired international character while at the same time expanding the students' professional horizons.

All information regarding the mobility can be found on the website of the International Relations Department of the University of Crete at https://www.uoc.gr/intrel/en/

Educational Process

The educational process of the Program takes place with the physical presence of students. By decision of the Assembly of the Medical School following a reasoned recommendation of the Program's Assembly, courses may be offered with synchronous distance teaching at a rate not exceeding twenty-five percent (25%) of the credits of the Program.

Services provided to students

The University of Crete has the necessary structures and services to serve both undergraduate and postgraduate students:

The **UC Library** is one of the most well organized in Greece with two premises in Rethymno and Heraklion that adequately serve students and teaching – research staff in both humanities and sciences and medicine. The equipment of the library includes personal computers for access to electronic sources of information, printers, scanners and photocopiers that are available at least 12 hours on a daily basis.

The **Student Center** in Heraklion houses most of the cultural groups and has a theater stage for performances and events, a radio station, a recording studio, a photography darkroom, a student hangout and a restaurant

The **Counseling Center** offers undergraduate and postgraduate students psychological support in occasional difficulties related to developmental and personal and/or adjustment problems and support for students with special educational needs, disabilities and learning difficulties.

The **Student Ombudsman** mediates between students and professors or administrative services of the Institution and generally ensures the observance of legality in student matters, always within the framework of academic freedom and the proper functioning of the Institution.

The Employment and Career Structure (DASTA) supports students and graduates in finding work, ensures their proper information and develops partnerships with external bodies.

The **University Gym in Heraklion** operates daily and has a complete sports center with an indoor gym fully equipped with cardiorespiratory and muscular strengthening equipment, an indoor swimming pool of 25 meters, an indoor basketball court and many different sports teams in which students can participate.

The **Electronic Services** that students have access to through their institutional accounts include, among others, email, access to StudentsWeb and the e-learning system of the University of Crete e-learn, access to the wireless network, remote access service (VPN), access to Library services (prints / photocopies, institutional repository) etc.

Student Welfare

The University of Crete, through its Student Welfare Offices, supports and promotes action to support postgraduate students regarding benefits food, housing, health care, etc., taking into account the current State legislation and decisions of the administration of the University of Crete (see https://www.merimna.uoc.gr/index.php/el/).

After their enrollment in the IPSP, postgraduate students receive information about the following:

- Access their emails on https://mail.uoc.gr page.

Detailed instructions on the website: https://ict.uoc.gr/index.php/el/ypostiriksi/egxeiridia

- STUDENT PORTAL https://eduportal.cict.uoc.gr/

- ACADEMIC IDENTITY CARD/SPECIAL TICKET CARD (PASS) https://academicid.minedu.gov.gr/

- STUDENT WELFARE https://www.merimna.uoc.gr/index.php/el/

- LIBRARY https://www.lib.uoc.gr/

Access to Library services (prints / photocopies, institutional repository).

- WIRELESS NETWORK

- VIRTUAL PRIVATE NETWORK (VPN) SERVICE

- ONLINE COURSES

- DELOS365 https://delos365.grnet.gr/

- Office 365 for Windows

- OKEANOS https://okeanos.grnet.gr

- PROBLEM SOLVING

Useful information (e.g. transportation)

By plane, the city of Heraklion is connected by air with daily flights to and from Athens, Thessaloniki, Rhodes, Santorini and Larnaca.

For information and reservations, interested parties can contact the airlines Ryanair, Olympic Airlines, Aegean Airlines and Sky Express, and for more information at Heraklion Airport "Nikos Kazantzakis" at tel. 2810-223500, 2810-282828.

In addition, there are routes from/to European destinations via Athens or charter flights directly from Heraklion. Information: Heraklion Airport and tel. 2810-397800.

By ferry, the port of Heraklion is connected with daily ferries to and from Piraeus. Information and reservations: Minoan Lines, ANEK, GA Ferries.

There are also ferry routes to and from the Cyclades islands. Information: Hellenic Seaways, GA Ferries.

Finally, there are ferry routes from the port of Heraklion to the islands of Kasos-Karpathos-Rhodes. Information: LANE Sea Lines and www.greekferries.gr

For more information and any changes or cancellations of departure, please contact the Port Authority of Heraklion at 2810-244912.

By bus and boat, many cities in Greece are connected to Heraklion by bus and boat. Timetable information: KTEL HERAKLION-LASSITHI

From the city of Heraklion to the University Campus of Voutes

Search on the map of the University Campus of Voutes, points of interest and directions to the destination.

By bus, there is a connection with regular itineraries of the Heraklion Urban Bus Service from various districts of the city. Consult the accompanying files for bus schedules to and from the University Campuses or call 2810 283270.

By car, the Voutes Campus is located south west of the city center at a distance of 8.5 km. You can follow the direction to the National Road Heraklion-Mires and before the first kilometer is completed, turn right, at the traffic light after Estavromenos. Then there is signage up to the university.

By taxi, you can find information on the following websites
https://candiataxi.gr/
https://www.cretataxi.com/
By bus, there is a connection with regular itineraries of the Heraklion Urban Bus Service from various districts of the city. Consult the accompanying files for bus schedules to and from the University Campuses or call 2810 283270.