



HELLENIC REPUBLIC

**National and Kapodistrian
University of Athens**

EST. 1837

**POSTGRADUATE PROGRAMME
"QUANTITATIVE INVESTING"**

Study Guide 2022-23



**POSTGRADUATE PROGRAM
IN QUANTITATIVE INVESTING**

SPECIALIZATIONS

MATHEMATICAL FINANCE
& RISK ANALYSIS

REAL ESTATE INVESTING & VALUATION

January 2023

Contact information

Postal address:

PP Quantitative Investing, Department of Economics, National and Kapodistrian University of Athens, Euripidou 14, 105 59 Athens | 5th floor

PP Administration telephone numbers: 210 368 9813 | 210368 9452

Administration Email: mscmfrisk@econ.uoa.gr

PP website: <https://qi.econ.uoa.gr/>

Facebook: @MSc.in.Quantitative.Investing

Linkedin : @MSc in Quantitative Investing

Director: Associate Professor Vasilios Katsikis
e-mail: vaskatsikis@econ.uoa.gr

Committee: Professor Stelios Kotsios
e-mail: skotsios@econ.uoa.gr
Professor Ioannis Basiakos
e-mail: ybassiak@econ.uoa.gr
Professor Dimitrios Kainourgios
e-mail: dkenourg@econ.uoa.gr
Associate Professor Georgios Dotsis
e-mail: gdotsis@econ.uoa.gr

Release: October 2022

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Prologue

The Postgraduate Program (PP) "Quantitative Investing" of the Department of Economics of the National and Kapodistrian University of Athens was founded in 2018, as the Master's Degree Program "Mathematical Finance and Risk Analysis", aiming at the high-level training of scientists in special mathematical, statistical and computational techniques, used in finance and risk analysis, as well as deepening those financial insights necessary to understand the wider economic environment within which these practices operate.

In 2019, it was renamed PP "Quantitative Investing" with the addition of a second specialization in "Real Estate Investing and Estimation" which was created to fill the gap in the training of specialized scientists in the field of Real Estate.

In 2021, responding to the new scientific trends and modern international educational standards, it proceeded to update the curriculum of the "Mathematical Finance and Risk Analysis" specialization by amending the Study Regulations, while in 2022 the curriculum of the "Real Estate Investing and Estimation" specialization was revised into an intensive 12-month study program. Each specialization in the "Quantitative Investing" PP corresponds to an ambitious and well-designed curriculum aimed at the appropriate preparation of scientists interested in acquiring modern professional skills or oriented towards a research or academic career. In this way, the "Quantitative Investing" program is designed according to new scientific trends, modern international educational standards, as well as the demands of the labor market, contributing to the specialization of knowledge and the professional development of its graduates. Graduates of the program can solve complex problems in Finance, Risk Analysis and Real Estate Investing & Estimation, using the most modern quantitative tools and analysis techniques from Mathematics, Statistics, and Computer Science.

In this study guide, students will find useful information regarding all aspects of the "Quantitative Investing" program.

The Director of PP
Associate Professor V.N. Katsikis

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Object – Purpose of the PP - Learning outcomes

The Master's Program "Quantitative Investing" aims to train scientists in special mathematical, statistical and computational techniques, used in finance, risk analysis and real estate investing-estimation, as well as deepening that financial knowledge which are necessary for understanding the wider economic environment within which these practices operate.

The profile of the MSc is twofold: On the one hand, it aims to provide high quality education in direct connection with the labor market and, on the other hand, to prepare students for the continuation of their studies at doctoral level, if they wish.

The purpose of the program is to prepare students for high-level staffing in the private and/or public sector, international organizations and more generally in the training of qualified scientists capable of contributing to the multifaceted development of the Greek economy. Also, the level of knowledge provided gives the possibility to continue the studies at doctoral level. At the same time, the international promotion of the Department is sought, as well as its interconnection with the Greek, but also with the international economy at the national, regional and/or international level.

The main orientation of the MSc "Quantitative Investing" is that the Programs of Study per specialization offer broad and in-depth training in the scientific fields of the specializations. Furthermore, an effort has been made to ensure that each course, mandatory or elective, is designed so that students acquire knowledge and skills that allow them to:

- Search, analyze and synthesize data and information, using the necessary technologies,
- Engage in autonomous work,
- Develop creative and inductive thinking,
- Make decisions,
- Have beneficial participation in teamwork and in an interdisciplinary/international environment,
- Apply their knowledge to problem solving and turn theory into practice,
- Adapt to new situations,
- To generate new research ideas.

Specializations

The PP leads to the awarding of a master's degree in "Quantitative Investing" with the following specializations:

- **Mathematical Finance & Risk Analysis (MFRA)**
- **Real Estate Investing & Estimation (REIE)**

after full and successful completion of studies based on the curriculum. The titles are awarded by the Department of Economics of the National and Kapodistrian University of Athens.

General information

I. Academic calendar of the Department of Economics

Teaching and Examination period of academic year 2022-2023

Winter semester

Teaching Period:	From October 3, 2022 to January 13, 2023
Exams:	From January 31, 2023 until February 24, 2023
Holidays - Holidays:	
National holiday	Friday, October 28, 2022
Polytechnic revolt remembrance	Thursday, November 17, 2022
CHRISTMAS holidays	From December 26, 2022 until January 6, 2023

Spring semester

Teaching Period:	From February 28, 2023 until June 9, 2023
Exams:	From June 19, 2023 until July 14, 2023

Holidays - Holidays

Day of occupation in 1973 of the Law School building (Theoretical Sciences Hall) by students of the University of Athens against the dictatorship:

	February 21, 2023
Ash holiday:	February 27, 2023
Independence Day:	March 25, 2023
Easter holiday:	By Holy Monday 04-10-2023 until 21-04-2023
1 st May Day:	May 1, 2023
Holy Spirit:	June 5, 2023
September Examination Period:	From 01-09-2023 to 29-09-2023

II. Benefits and Services of the University

The National and Kapodistrian University of Athens (NKUA) offers its students a series of educational and social programs. Postgraduate students can take advantage of several benefits and facilities, such as:

- TEACHING FOREIGN LANGUAGES
- UNIVERSITY GYM
- CULTURAL GROUPS OF STUDENTS
- SCHOLARSHIPS - PRIZES
- FOOD SERVICES FOR STUDENTS
- STUDENT DORMITORIES
- HOUSING BENEFIT
- STUDENT'S ADVOCATE
- CAREER OFFICE
- ACCESSIBILITY UNIT FOR STUDENTS WITH DISABILITIES
- HEALTH SERVICES
- CENTER FOR PSYCHOLOGICAL CONSULTING

Search the website of the National and Kapodistrian University of Athens, <http://www.uoa.gr>, to see what is offered to students, what is the structure and organization of the University, as well as a large amount of information.

III. Instructions for Newly Admitted Postgraduate Students

1. Acquiring Academic Identity (Pass)

For the process of issuing a student pass for postgraduate students of the "Quantitative Investing" PP, go to the relevant website:

<http://academicid.minedu.gov.gr/>

or

[Online Academic Identity Acquisition Service](#)

where on the right side of the screen you select the "Register/Login" icon and then to register in the application select the user category you belong to Graduate **Student**.

In the following link you will find detailed instructions https://academicid.minedu.gov.gr/xrisima-egxeiridio_xrisis.html


2. Creation of an Access Account to the electronic services of the University of Athens

The University's online services are provided through the Network Operation and Management Center (KEY). For postgraduate students, the following are important:

- For the application to create a university account and its subsequent activation:

<https://webadm.uoa.gr/katsika/users/src/index.php>

Then after clicking on "New Account Application" select the "Graduate Students" category.


Υπηρεσίες Διαχείρισης Λογαριασμού
 Πανεπιστήμιο Αθηνών - Κέντρο Λειτουργίας και Διαχείρισης Δικτύου

Δημιουργία Νέου Λογαριασμού

Αίτηση Νέου Λογαριασμού	Βήμα 1 ^ο : Ηλεκτρονική Υποβολή της Αίτησης για εγγραφή στο Κ.ΛΕΙ.ΔΙ., απόκτηση λογαριασμού και όλων των προνομίων και υπηρεσιών που παρέχονται.
Ενεργοποίηση Λογαριασμού (PIN)	Βήμα 2 ^ο : Έλεγχος της κατάστασης της αίτησής σας μέσω του PIN που αποκτήσατε μέσω της παραπάνω αίτησης & Ενεργοποίηση του Λογαριασμού και των υπηρεσιών που σας ενδιαφέρουν.

Μετάβαση στο Νέο Σχήμα Υπηρεσιών

Μετάβαση στις Νέες Δικτυακές Υπηρεσίες	Αίτηση Μετάβασης στις Νέες Δικτυακές Υπηρεσίες. <i>Πριν προχωρήσετε παρακάτω ελέγξτε το πρόγραμμα μετάβασης.</i>
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Διαχείριση Λογαριασμού

Αίτηση Μεταβολής Στοιχείων	Αίτηση μεταβολής στοιχείων (π.χ. αλλαγή σχέσης με το ίδρυμα). Τα στοιχεία αυτά εμφανίζονται στην Υπηρεσία Καταλόγου και καθορίζουν τα δικαιώματά σας στις προσφερόμενες δικτυακές υπηρεσίες.
Διαχείριση Υπηρεσιών	Πληροφορίες για τις προσφερόμενες υπηρεσίες. Ενεργοποίηση και παραμετροποίηση υπηρεσιών.
Αλλαγή Password	Αλλαγή του μυστικού κωδικού, για όλες τις υπηρεσίες (ηλεκτρονικό ταχυδρομείο, απομακρυσμένη πρόσβαση μέσω τηλεφώνου κ.λπ.).



Αίτηση Νέου Λογαριασμού

Πανεπιστήμιο Αθηνών - Κέντρο Λειτουργίας και Διαχείρισης Δικτύου

Επιλέξετε Κατηγορία


Μέλη Δ.Ε.Π.	Μέλη Δ.Ε.Π. <input type="button" value="Αίτηση"/>
Προσωπικό	Μόνιμο / Διοικητικό Προσωπικό (Όλοι όσοι έχουν μόνιμη σχέση με το Ε.Κ.Π.Α. εκτος των μελών Δ.Ε.Π.) <input type="button" value="Αίτηση"/>
Συνεργάτες	Όσοι έχουν εξαρτημένη σχέση με το Ε.Κ.Π.Α. στα πλαίσια των χρονικών περιορισμών κάποιας σύμβασης. (π.χ. επιστημονικοί συνεργάτες, ερευνητές, γιατροί σε πανεπιστημιακές κλινικές κ.λπ.) <input type="button" value="Αίτηση"/>
Προπτυχιακοί Φοιτητές	Προπτυχιακοί Φοιτητές <input type="button" value="Αίτηση"/>
Μεταπτυχιακοί Φοιτητές	Μεταπτυχιακοί Φοιτητές <input type="button" value="Αίτηση"/>
Υποψήφιοι Διδάκτορες	Υποψήφιοι Διδάκτορες <input type="button" value="Αίτηση"/>
Μέλη/Επισκέπτες	Μέλη/Επισκέπτες <input type="button" value="Αίτηση"/>

You will follow the steps defined by K.LEI.DI. (Personal details, etc.) and you will print your final application for registration in the Services of K.LEI.DI., in which the Protocol number will be printed. You will sign the specific application yourself and then send it to the PP email so that it can be signed by the PP Administration.

The signed application from the Administration will be sent as an attached file (surname.pdf) via email to helpdesk@noc.uoa.gr. After 3 working days from the date of sending the above email you must visit the website webadm.uoa.gr and select the "Account Activation (PIN)".

es Διαχείρισης Λογ... X

<https://webadm.uoa.gr/katsika/users/src/index.php>

 **Υπηρεσίες Διαχείρισης Λογαριασμού**
Πανεπιστήμιο Αθηνών - Κέντρο Λειτουργίας και Διαχείρισης Δικτύου

Δημιουργία Νέου Λογαριασμού

Αίτηση Νέου Λογαριασμού	Βήμα 1ο: Ηλεκτρονική Υποβολή της Αίτησης για εγγραφή στο Κ.ΛΕΙ.ΔΙ., απόκτηση λογαριασμού και όλων των προνομίων και υπηρεσιών που παρέχονται.
Ενεργοποίηση Λογαριασμού (PIN)	Βήμα 2ο: Έλεγχος της κατάστασης της αίτησης σας μέσω του PIN που αποκτήσατε μέσω της παραπάνω αίτησης & Ενεργοποίηση του Λογαριασμού και των υπηρεσιών που σας ενδιαφέρουν.


Μετάβαση στο Νέο Σχήμα Υπηρεσιών

Μετάβαση στις Νέες Δικτυακές Υπηρεσίες	Αίτηση Μετάβασης στις Νέες Δικτυακές Υπηρεσίες. Πριν προχωρήσετε παρακάτω ελέγξτε το πρόγραμμα μετάβασης.
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Διαχείριση Λογαριασμού

Αίτηση Μεταβολής Στοιχείων	Αίτηση μεταβολής στοιχείων (π.χ. αλλαγή σχέσης με το ίδρυμα). Τα στοιχεία αυτά εμφανίζονται στην Υπηρεσία Καταλόγου και καθορίζουν τα δικαιώματά σας στις προσφερόμενες δικτυακές υπηρεσίες.
Διαχείριση Υπηρεσιών	Πληροφορίες για τις προσφερόμενες υπηρεσίες. Ενεργοποίηση και παραμετροποίηση υπηρεσιών.
Αλλαγή Password	Αλλαγή του μυστικού κωδικού, για όλες τις υπηρεσίες (ηλεκτρονικό ταχυδρομείο, απομακρυσμένη πρόσβαση μέσω τηλεφώνου κ.λπ.).

On the next page you will be asked for the protocol number (located on the first page of the attached pdf) as well as the PIN number that was given to you by the system on the day you first entered your details into the system.

 **Ενεργοποίηση Λογαριασμού**
Πανεπιστήμιο Αθηνών - Κέντρο Λειτουργίας και Διαχείρισης Δικτύου

Είσοδος

Αρ. Πρωτοκόλλου:	<input type="text"/>
PIN:	<input type="text"/>
<input type="button" value="Αποστολή"/>	

Finally, follow the rest of the instructions to complete the process. For any further questions regarding the procedure, you can contact 210 727-5600 by selecting options 2 and 2 respectively.

3. Create an Account on the e-class online platform

To create an account on the e-class online platform, you must first have created an Access Account to the online services of the University of Athens (see above procedure in 2). The next step is to enter the address

<https://eclass.uoa.gr/modules/auth/altnewuser.php?auth=4>

and you will log in with the username/password of your university e-mail.

4. Digital Services

Postgraduate students gain access with the same Username and Password to other services provided by the University of Athens, such as

- the Multimedia Content Hosting and Search service (<https://delos.uoa.gr/opendelos/>)
- The Electronic Mail Service provides an electronic address at the University of Athens, in the format username@department.uoa.gr and access to mail via Webmail (webmail.noc.uoa.gr)
- the Personal Website Posting Service (http://email.uoa.gr/help/uoa/ftp_instructions.php)
- Access to the Institution's Wireless Network (<http://email.uoa.gr/help/uoa/wifi.php>)
- the Connection through a Virtual Network (VPN) to the Institution's Network (http://email.uoa.gr/help/uoa/vpn_instructions.php)
- the ability to Acquire Microsoft Software and Licenses (www.dreamspark.com)
- Access to Electronic Libraries (<http://www.lib.uoa.gr/>)
- the possibility of Wireless Internet Access ([Maps of Access Points - WiFi Hotspots](#))

5. Library

The Department's Library operates at 13A Navarinou Street, on the second floor, in the New Chemistry building. The contact telephone numbers are 210-3688023-25, 210-3688086 and email: oikonepist@lib.uoa.gr.

The library with a total area of 800 square meters. It consists of two reading rooms, a computer room, a loan department and a material processing department. It houses approximately 22,000 volumes of books dating from the early 20th century to the present, divided into old and new collections. It has 170 financial magazine titles in print, of which 17 titles are still in print, while the rest are now available online. Specifically, NKUA provides electronic access to more than 9,000 journal titles with a wide thematic coverage through the Hellenic Academic Libraries Network (HEAL - Link).

The website of the Libraries of the National and Kapodistrian University of Athens, <http://www.lib.uoa.gr/>, provides services such as:

- **Catalog (OPAC):** Search in the unified catalog of the Libraries of the University of Athens
- **Bibliographic Bases:** Search for articles (abstracts and/or full text), books, conference proceedings and their bibliographies in various Databases
- **Magazines (Electronic and Print):** Title lists, as well as article search (abstracts and/or full text) in the electronic journals of the University of Athens
- **Order Articles:** Order Articles from either the ECB's Collective Catalog of Journals or the British Library
- **Lending of Books:** Book lending service through the Hellenic Library Lending Network (HLLN) and the "Iris" book lending system that have been developed within the framework of actions of the Association of Greek Academic Libraries of Higher Education Institutions (AGALHEI).
- **E-books:** Access to a wide range of e-books, dictionaries and encyclopedias.

- **Digital Collections:** Visit the Digital Collections of the University of Athens
- **Thematic Portals:** Visit the Thematic Portals of the University of Athens
- **For People with Disabilities:** Services addressed to Persons with Disabilities (PWDs)

Other Services of the Library

- a. Computer room for Internet use, exclusively for educational purposes.
- b. Photocopiers for user service. The machines work with a special magnetic card which can be obtained from the librarians.
- c. Equipment for access to bibliographic bases and other sources of information for People with Special Needs.

The library is open: **Monday – Thursday 09:00 to 19:30**
 Friday 09:00 to 16:00

**Due to maintenance work on the Navarinou building 13A, from November 2022, the Library of the Department of Economics will be temporarily housed on the ground floor of Sofokleous 1 & Aristidou (Gryparion Megaro), until the completion of the work on the Navarinou building.*

Chapter 1: ORGANIZATION

1.1 Administrative Organization of PP

Pertinent bodies for the organization and operation of the PP "Quantitative Investing" in accordance with the law [4957/2022](#) are:

A. The Senate of NKUA

- a) approves the establishment of the PP or the amendment of the decision establishing the PP,
- b) approves the extension of the duration of the operation of the PP.

B. The Assembly of the Department of Economics

The Assembly of the Department is responsible for the organization, administration, and management of the PP and especially:

- Appoints the members of the Coordinating Committee (C.C.),
- Assigns the teaching work to the teachers of the PP,
- Forms committees for the selection or examination of prospective graduate students and approves their registration at the PP,
- It verifies the successful completion of the course to award the MSc,
- Exercises any other legal authority provided by the applicable provisions.

C. The Coordinating Committee (Coordinating Committee)

The C.C. consists of the Director of PP and four (4) members of the Teaching-Research Staff (T.R.S.) of the Department, who have academic concentration related to that of the PP and undertake teaching work at the PP. The members of the C.C. are determined by a decision of the Assembly of the Department. The President of the CC is the Director of the PP.

The C.C. is responsible for monitoring and coordinating the operation of the program and in particular:

- Prepares the initial annual budget of the PP and its amendments and recommends its approval to the Research Committee of the Special Research Funds Account (SRA),
- Approves the expenditures of the PP,
- It recommends to the Assembly of the Department the distribution of the teaching work, as well as the assignment of teaching load to the categories of staff of the PP.
- Suggests to the Assembly of the Department the redistribution of courses between academic semesters, as well as issues related to the quality upgrade of the study program.
- Appoints the supervisor and the members of the three-member thesis examination committee, whose appointment is ratified by the Department's Assembly.
- Examines student matters such as applications for suspension of studies, extension of studies, etc. and makes a recommendation to the Assembly of the Department.

D. The Director of PP

- The Director of PP comes from the members of D.E.P. of the Department by priority at the rank of Professor or Associate Professor and is appointed by decision of the Department's Assembly for a two-year term, with the possibility of renewal without limitation.
- The Director of PP has the following powers:
 - presides over the C.C., prepares the agenda, and convenes its meetings,
 - advises the issues concerning the organization and operation of the PP to the Assembly of the Department,
 - recommends to C.C. and the other organs of the PP and of University issues related to the effective operation of the PP,
 - is Scientific Manager of the Program and exercises the corresponding responsibilities,
 - monitors the implementation of the decisions of the bodies of the PP and of the Internal Regulation of postgraduate and doctoral study programs, as well as the monitoring of the implementation of the budget of the PP,
 - exercises any other authority, which is defined in the decision establishing the PP.

1.2 Administration

The "Quantitative Investing" Program is supported by a Program Administration located in the Department of Economics of NKUA and under the supervision of the Department's Administration. The PP Administration is tasked with the secretarial support of the PP, such as the preparation of the candidate selection process, the keeping of the financial data of the Program, the secretarial support of the C.C., the registration of scores, etc. In addition, it keeps the register and file of the students, as well as the minutes of the meetings of the C.C., issues the necessary certificates and processes the correspondence for the Postgraduate Studies. It also offers secretarial support in the organization of scientific events of the PP.

Secretary of the Department of Economics

Ekaterini Skoura

e-mail: askoura@econ.uoa.gr

PP Secretarial Support

Specialization "Mathematical Finance & Risk Analysis": Christina Serifi
 Specialization "Real Estate Investing & Estimation": Ioulia Loverdou
 Administration Email: mscmfrisk@econ.uoa.gr

1.3 Buildings of the Department

PP houses its activities in the following buildings:

Sofokleous 1 & Aristidou (GRYPARIO MEGARO)

- 4th floor: the offices of the Administration, the office of the Department Chair, the Lecture Hall, the Conference Hall, and the offices of faculty members are located.
- 5th floor: Houses offices of faculty members - Graduate Administration

- 6th floor: Houses offices of faculty members

Aristidou 11

- The Angelopoulou room is located.

14 Euripidou

- It houses the Department's master's Programs, the Doctoral Program, the Administration that serve them, Computer Laboratories, the Library of the Doctoral Program and classrooms.

Solon and Sina

For the teaching needs of the PP, the following are used:

- rooms in the New Building of the Megaron of Theoretical Sciences (MTHE)
- rooms in the renovated MTHE building.

1.4 Informatics Laboratory

Director: Associate Prof. V.N. Katsikis

This Laboratory provides IT education and training for the Department's students. The Informatics Laboratory operates under the responsibility of the Division of Mathematics - Informatics and Statistics - Econometrics and is located on the 3rd floor of the renovated MTHE (Marseille section and Sina section) as follows: it has two rooms with computers, three rooms for classes and one meeting room. It has two additional laboratories with computers, one on the 1st and one on the 6th floor of 14 Evripidou Street.

The Laboratory assists the educational work of the Department's faculty members who need computing support and provides educational seminars on computer handling, IT applications, programming, etc. The Laboratory, since its establishment (1990) until today, has trained more than 20,000 students (until the year 2000 it also trained students of the Law and NOPE School, while until the year 2004 also students of the Department of Political Science and Public Administration).

The electronic equipment of the Laboratory consists of modern PCs running Windows 10 on a local network and Internet access through the University network. The Laboratory's software library now includes Microsoft Office, statistical and mathematical software, various programming languages, etc.

The seminars are announced on the website of the Laboratory usually in September and December, but it is generally recommended to get in touch with the people in charge.

Chapter 2: STUDY PROGRAM

2.1 Organization

2.1.1 Method of Entry

The selection of students is made in accordance with the current legislation, the Regulation of Postgraduate and Doctoral Studies of NKUA and the provisions of this Regulation.

Every March, by decision of the Assembly of the Department of Economics of NKUA, a notice

for the admission of postgraduate students to PP is published and posted on the website of the Department and the Institution. The relevant applications along with the necessary supporting documents are submitted to the Secretariat of PP, within a deadline specified in the announcement and may be extended by decision of the Assembly of the Department.

- Necessary supporting documents are:

- Application form
- Curriculum vitae
- Photocopy of two sides of the identity card
- Copy of degree or certificate of completion of studies
- Transcript of courses
- English language certificate (language level B2). Exempt from proof of foreign language proficiency are those who have a satisfactory performance in the GMAT or GRE.
- Reference Letter
- Scientific publications, if any
- Evidence of professional or research activity, if they exist
- Certificate of attainment in Greek or sufficient, certified by the CC, knowledge of the Greek language for foreign candidates
- Recognition of a foreign academic degree.

In case candidates have not completed the first cycle of studies (undergraduate) during the application period, they must submit a declaration of N.1599/86 that their acceptance is conditional on obtaining the required degree before the beginning of the first winter semester of the MSc. The transcript of grades should be accompanied by a solemn declaration stating the number of courses remaining to obtain the degree, as well as the average resulting from the courses included in the transcript submitted.

For students from foreign institutions who do not present a certificate of recognition of an academic degree from DOATAP, the following procedure is followed:

The Assembly of the Department appoints a committee responsible for determining whether a foreign institution or a type of title of a foreign institution is recognized. To be recognized, the following must be satisfied:

- The institution awarding the titles is included in the list of foreign institutions maintained and updated by DOATAP,
- The student must provide a certificate of place of study, which is issued and sent by the foreign university. If the Greek territory is certified as the place of study or part thereof, the degree is not recognized, unless the part of studies completed in the Greek territory is in a public University.

The evaluation of candidates and the selection of admissions is based on the following criteria:

- Degree grade (10%)
- Grade in undergraduate courses related to the Postgraduate Program (20%)
- Relevance of the university degree and the candidate's knowledge to the subject of the MSc (15%)
- Letters of recommendation (15%)

- Oral interview in a three-member committee appointed by the C.C. (40%)

Based on the overall criteria, the C.C. prepares the evaluation table of students and submits it to the Assembly for approval.

Successful candidates must register at the Secretariat of the Postgraduate Program within thirty (30) days from the decision of the Assembly.

Successful candidates must register at the Secretariat of the Postgraduate Program within thirty (30) days from the decision of the Assembly.

2.1.2 Duration of study

MFRA specialization: The normal duration of study is defined as a minimum of four (4) consecutive academic semesters.

REIE specialization: The normal duration of study is defined as a minimum of one (1) academic year of full-time study (without providing for student holidays), which includes an intensive program during the summer period (until the end of July).

In both specializations, a part-time program may be provided which lasts for up to twice the continuous period of the corresponding full-time program. The redistribution of courses in a part-time study program is done following relevant decisions of the C.C..

After a reasoned application by the student, the Assembly can approve an extension of studies, which does not exceed half of the normal duration of study. Thus, the maximum time allowed to complete the studies of the full-time program is set at eight (8) academic semesters for the MFRA specialization and at four (4) for the REIE specialization.

If there are reasons of force majeure, for which the Assembly of the Department decides, the postgraduate student can request the suspension of his/her studies for one year. A student may be given only one suspension. The student must complete his/her studies in the Program within four years from the date of admission.

2.1.3 Obligations and rights of postgraduate students

1. Postgraduate students have all the rights and benefits provided for students of the 1st cycle of studies, except for the right to provide free textbooks.
2. Postgraduate students are invited to participate and attend seminars of research groups, bibliographic information discussions, laboratory visits, conferences/workshops with a subject related to that of the PP, lectures, or other scientific events of the PP, etc.
3. The amount of tuition fees amounts to a total of €6,000 and is paid in four equal installments (MFRA specialization) or €4,800 and is paid in two (REIE specialization) equal installments before the start of each semester.
4. If a student wants to stop attending the program, the following rule applies per semester:
 - If the student has not attended any courses, 15% of the fees paid is withheld.
 - If the student has attended courses that do not exceed 50% of the total number of courses, 50% of the fees paid is withheld.
 - If the student has attended courses that exceed 50% of the total number of courses, 100% of the fees paid are withheld, i.e. no refund is made.
5. The Assembly of the Department, after the proposal of the C.C., may decide to delete postgraduate students if:

- 5.1. exceed the maximum absence limit,
 - 5.2. have failed the examination of a course or courses and have not successfully completed the program, in accordance with what is defined in the regulation,
 - 5.3. exceed the maximum duration of studies in the Postgraduate Program, as defined in the Regulation,
 - 5.4. have violated the applicable provisions regarding the handling of disciplinary misconduct by the competent disciplinary bodies,
 - 5.5. do not pay the prescribed tuition fee,
 - 5.6. apply for deletion themselves.
6. Students who meet the economic or social criteria and the conditions of excellence during the first cycle of studies, in accordance with current legislation, are exempt from tuition fees. This exemption is provided for participation in only one PP. In any case, exempt students do not exceed thirty percent (30%) of the total number of students admitted to the Postgraduate Program per academic year.
7. For the realization of their studies, students can receive scholarships and awards. The amount and procedure of granting scholarships is determined for each academic year depending on the availability of resources in accordance with the principles of transparency, meritocracy and the specific objectives of the Program.
8. At the end of each semester, an evaluation of each course and each teacher is carried out by the postgraduate students. A specific questionnaire with evaluation questions is distributed using a structured questionnaire to the students of the program who, within a certain period of time, have the right to evaluate the PP. The results of the evaluation of each teacher are communicated to him and to the CC and the Department Assembly and are taken into account for the improvement of the PP.

2.2 Curriculum Structure and Educational Process

The Program starts in the winter semester of each academic year. The course includes sixteen courses or fifteen courses and writing a diploma thesis and four workshops for the MFRA specialization and eleven courses and a seminar and a workshop for the REIE specialization. The courses are divided between mandatory courses of this PP and elective courses – either of this PP or other PP of the Department. Each mandatory or elective course or workshop of the MFRA specialization corresponds to 6 teaching credits. The courses of the A and B semesters of the REIE specialization correspond to 6 teaching credits each. The course, the seminar, and the workshop of the intensive period of the REIE specialization correspond to 5 teaching credit units each. To obtain the PP's diploma, a total of at least one hundred and twenty (120) credit units (ECTS) are required for the MFRA specialization or seventy-five (75) for the REIE specialization.

Courses may be accompanied by preparatory courses, tutorials, laboratory exercises and free-choice seminars that help students supplement their training, gain a deeper understanding of financial concepts and experiment with real data.

Courses are taught in person and/or remotely, as required by law. The courses are organized in semesters, the teaching of which, as well as the required bibliography, may also be in English.

Before the start of each educational period, under the responsibility of the Director of the PP,

the course schedule for each specialization and the corresponding exam schedule are announced. The two specializations of the PP can carry out condensed and intensive courses. The teaching of the courses takes place on days and hours of operation of the University, but the possibility of conducting courses on weekends is foreseen.

The Assembly of the Department at the beginning of each academic year may adjust the courses and their material depending on the developments of science, the needs of the students and the availability of the teaching staff.

2.3 Courses

The educational work of each academic year is structured as follows:

- For the MFRA specialization in two semesters of study, the winter and the spring, each of which includes at least 13 weeks of teaching and four weeks of exams. The courses of the winter and spring semesters are reviewed repeatedly during the September period.
- For the REIE specialization in two semesters of study, the winter and spring and the summer period. The first two include at least 13 weeks of teaching and two weeks of exams, while the summer term 12 weeks of teaching and one week of exams. The courses of all periods are re-examined in September.

In the event of an obstacle to the conduct of a course, its reimbursement is foreseen. Announcements on the postponement and on the date and time of the make-up are posted on the e-class platform of the course and/or the students are informed electronically by the PP Administration.

A. The indicative program of the courses for the MFRA specialization is structured as follows:

BEFORE THE START OF THE FIRST SEMESTER (SEPTEMBER OR OCTOBER)			
PREPARATION MANDATORY	COURSE TITLE		COMMENTS - NOTES
(The grade of these courses is included in the grade of the corresponding courses of the 1st semester)	Introduction to Mathematics & Statistics ¹		for Economics Graduates (or related Departments)
	Introduction to Economics ²		for Graduates of Positive Sciences (or related Departments)
First Semester		Second Semester	
LESSONS	ECTS	LESSONS	ECTS
Economic - Financial Theory	6	Risk Analysis I	6
Introduction to the Mathematics of Financial Science	6	Mathematical Finance and applications in MATLAB II	6
Distribution Theory and Estimation	6	Statistical Inference, & Simple Linear Regression	6
Mathematical Finance and applications in MATLAB I	6	Computational Mathematics – Monte Carlo	6
MATLAB Lab	6	EXCEL laboratory	6
Total	30	Total	30
Third Semester		Fourth Semester	
LESSONS	ECTS	LESSONS	ECTS
Numerical Methods and Optimization in Finance	6	Databases – Intelligent Algorithms	6
Multivariate Methods & Models	6	Elective Courses (3 options): Algorithmic Trading – Machine Learning Supervisory framework of Financial Institutions Applied Econometrics Stochastic Mathematics II Bachelor's thesis	18
Risk Analysis II	6		
Stochastic Mathematics I	6		
Python Lab	6		
		Laboratory R	6
Total	30	Total	30

¹corresponding courses: Introduction to the Mathematics of Finance and Distribution Theory and Estimation

²Corresponding course: Economic - Financial Theory

B. The indicative program of courses for the REIE specialization is structured as follows:

First Semester		Second Semester	
LESSONS	ECTS	LESSONS	ECTS
Introduction to Economics	6	Real Estate Investing Analysis Issues	6
Real Estate Estimation	6	Real Estate Development - Elements of real estate law	6
Real Estate Economics	6	Real Estate Investing Finance	6
Mathematics	6	Business Statistics II	6
Business Statistics I	6	Analysis of Financial Statements – Administrative Accounting	6
Total	30	Total	30
Summer Program: COURSES-WORKSHOPS-SEMINARS			
LESSONS	ECTS	LABORATORIES	ECTS
Quantitative Methods for Business Analytics	5	IT: Python & EXCEL	5
Research Methods Seminar	5		
Total 15			

2.4 Examinations and Evaluation of Postgraduate Students

A. The evaluation of postgraduate students and their performance in the courses they are required to attend in the framework of the PP is carried out at the end of each semester with written exams. Grading is done on a scale of 1-10 (rounded to one decimal place). The grades of the courses are submitted to the PP Administration within 20 days from the end of the examination period.

B. To obtain the master's degree, it is necessary for the student to achieve a grade of at least five (5) in all the courses of the program (thus accumulating one hundred and twenty (120) ECTS, for the MFRA specialization and seventy-five (75) for the specialization REIE) and to collect an average score of at least six (6) for all courses. If a student has been successfully examined in all courses but does not have an average of six (6), he may request to be re-examined in a maximum of three courses to improve his/her average. The re-examination of the course takes place in the re-examination of September.

C. If the graduate student fails all the exams of a course (including the September exam), he/she is examined, following his application, by a three-member committee of members of the Teaching staff of the school, which are experts on the same or related subject as the course being examined and are defined by the Department's Assembly. The teacher in charge of the previous examinations is excluded from the committee. Otherwise, the student maybe removed from the degree-seeking status.

Master thesis

At the latest by the beginning of the 4th semester, the student of the MFRA specialization, proposes to the C.C. the topic of his\her work and a supervising professor from among the members of the Teaching and Research Staff (T.R.S.) of the Department of Economics or the lecturers of the Faculty of Economics. After approving the subject and the supervisor, the committee also proposes two evaluators from among the Department's faculty members or the PP lecturers, after the supervisor's recommendation. The evaluation and grading of the work is done by the three-member committee consisting of the supervisor and the two evaluators, with their written recommendation to the C.C., after a public presentation of the work and an oral examination. The last date for submitting the thesis is the end of the fourth semester of studies. A change of thesis topic can be made after the candidate's request and by decision of the Assembly, but no later than March 31 of the 4th semester. The student has the right to request, from the Assembly, an extension of the delivery of the thesis. His/her request should be based on a serious reason and the necessary supporting documents should be presented.

The writing language of the master's thesis can be in Greek, English or another European language. The instructions for writing the postgraduate diploma thesis are posted on the PP website.

Master theses, once approved by the examination committee, must be posted on the website of the Department of Economics.

Also, electronic deposit of the thesis is made in the "PERGAMOS" Digital Repository, in accordance with the decisions of the NKUA Senate.

2.5 Teachers

1. The teaching activities are assigned, following a decision of the competent body of the PP in the following categories of teachers:

- a) members of Teaching Research Staff (T.R.S.), Special Educational Staff (S.E.S.), Laboratory Teaching Staff (L.T.S.) and Special Technical Laboratory Staff (S.T.L.S.) of the Department or other Departments of NKUA or another Higher Educational Institution (H.E.I.) or Higher Military Educational Institution (H.M.E.I.), with additional employment beyond their legal obligations,
- b) emeritus Professors or retired members of the Department of Economics or other Departments of NKUA or other HEIs,
- c) cooperating teachers,
- d) commissioned teachers,
- e) visiting professors or visiting researchers,
- f) researchers and specialist scientists of research and technological institutes of article 13A of Law 4310/2014 (A' 258) or other research centers and institutes of the country or abroad,
- g) scientists of recognized prestige, who have specialized knowledge and relevant experience in the subject matter of the PP

2. The lecturers of part a) to f) of paragraph 1 have the right to supervise theses, if they hold a doctoral degree.

By decision of the PP, the supervision of diploma theses may also be assigned to members of T.R.S., S.E.S. and L.T.S. of the Department, who have not undertaken teaching work at PP.

3. By decision of the Assembly of the Department, an auxiliary teaching project may be assigned to the Phd candidates of the Department or School, under the supervision of one member of the teaching staff of the PP.

2.6. Academic Advisor

At the beginning of the first semester of studies, the Program Coordinating Committee designates for each student a member of the teaching staff as an Academic Advisor for Postgraduate Studies (AAPP). The AAPP cooperate with the students throughout their studies, are in frequent communication with them and have the responsibility to advise them, helping them to complete their studies smoothly and on time.

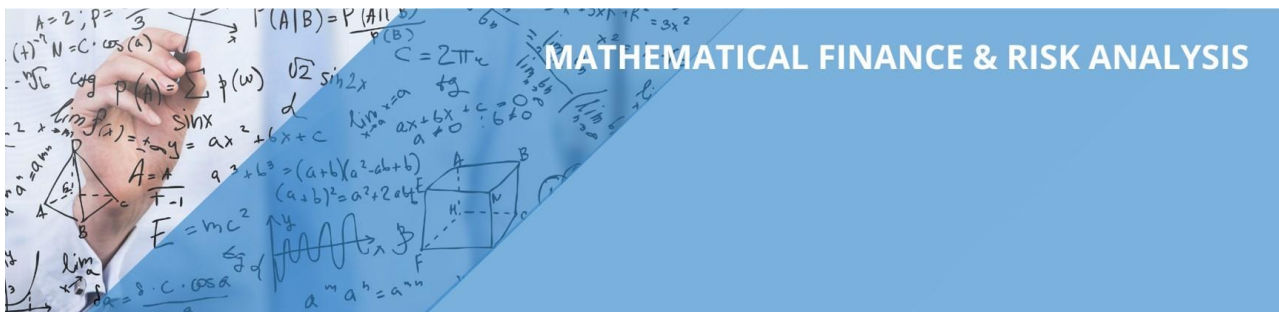
2.7. Obtaining and degree of Postgraduate Diploma

The student completes the studies to obtain the master's degree (M.Sc.) by completing the minimum number of courses and credits required to obtain the M.Sc. The degree of M.Sc. it is obtained from the average of the sum of the marks of the courses and is calculated, with a precision of two decimal places.

The announcement of the postgraduate students as PP graduates and the awarding of postgraduate diplomas takes place in a special ceremony, with the necessary presence of the graduates, in the premises of the Department or School, in the presence of the Director of the PP, the President of the Department or the deputy President and, if possible, possibly the Rector's representative. Prior to the announcement, the graduates may be given a relevant certificate for the successful completion of their studies.

The master's degree is issued in the Greek language. Postgraduate students can request the free issuance of a diploma supplement in Greek and English. In the following link, "<https://papyrus.uoa.gr>" graduates can request the issuance of the degree in parchment, paying the fee set by the Rector's Council.

Specialization Courses



SEMESTER 1

LESSON CODE	QIM-E101	SEMESTER OF STUDY	1st
COURSE TITLE	INTRODUCTION TO ECONOMICS AND FINANCE		
PREREQUISITE COURSES:	PREPARATION LESSONS: 1. Introduction to Mathematics and Statistics		
TEACHERS	G. SAVVAKIS		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON638		
LEARNING RESULTS			
Upon completion of the course, the student will be able to:			
<ul style="list-style-type: none">• they can use basic economic concepts and financial theories.• they know the pricing of risky assets.• analyze the functioning of markets.• they can recognize the risk in the preferences of actors (consumers, businesses, investors, etc.), expectations for the evolution of economic phenomena and securities valuation models.• explain in depth concepts such as supply and demand, preferences, value for money, markets, derivatives, efficiency and complex issues of risk and return.			
COURSE CONTENT			
This course is an introduction to economic concepts widely used by applied economists in Finance. Its main objective is to combine economic and financial theory at postgraduate level. The main learning objectives of this course are for students to be able to use basic economic concepts and financial theories to price risky assets. The aim is to deepen at a postgraduate level the functioning of the markets, the analysis regarding the preferences of the actors (consumers, businesses, investors, etc.), expectations for the evolution of economic phenomena and securities valuation models, etc. Concepts are explained in depth such as supply and demand, preferences, value for money, markets,			
The course is developed in 13 weekly lessons. The numbering refers to the corresponding week of the course.			
1. Introduction to economics and business. 2. Longitudinal Business Accounting (Present and Future Values) 3. Investing Decisions 4. Net present value and other investment criteria 5. Business Financing 6. Risk and Cost of Capital 7. Cost of capital and risk, best practices in cost of capital 8. The Capital Asset Pricing Model and its extensions 9. Estimating expected portfolio return, measuring portfolio risk, portfolio diversification 10. Introduction to Derivatives Markets 11. Options, forward contracts, futures 12. Swaps and other derivative products 13. Introduction to financial and fundamental analysis of securities			
Student evaluation methods			
Proposal 1	Written exams (final exam) (mandatory) (70%)		
Proposition 2	Semester Work (mandatory) (30%)		
RECOMMENDED BIBLIOGRAPHY			
<ul style="list-style-type: none">• Brealey Richard, Myers Brealey, R., Myers, S., & Allen, F. (2014). Principles of Business Finance. UTOPIA Publishing, Athens.• Brealey, R., Myers, S., & Allen, F. (2014). Principles of Corporate Finance, 12th Edition, McGraw Hill.• Bradfield, J. (2007). Introduction to the Economics of Financial Markets. Illustrated Edition, Oxford University Press.			

- Melicher, RW, & Norton, EA (2017). *Introduction to Finance: Markets, Investments, and Financial Management*. 16th Edition. John Wiley & Sons, of Business, UTOPIA Publishing, Athens, 2014.

LESSON CODE	QIM-M101	SEMESTER OF STUDY 1o
COURSE TITLE	INTRODUCTION TO THE MATHEMATICS OF FINANCIAL SCIENCE	
PREREQUISITE COURSES:	PREPARATION LESSONS: 1. Introduction to Mathematics and Statistics	
TEACHERS	ST. KOTSIOS	
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON411/	
LEARNING RESULTS		
Upon completion of the course, the student will be able to:		
<ul style="list-style-type: none">• recognize the different types of mathematical tools used in finance and risk analysis and their characteristics.• understands how to model a financial problem.• understands basic concepts of linear mathematics.• understands basic analysis concepts.• understands basic concepts of differential and difference equations.• uses the methodologies of algebra and analysis applied to economic problems.• Uses methodologies for maxima or minima.		
COURSE CONTENT		
This course introduces students to the basic mathematics used in finance and risk analysis. It is a link to undergraduate mathematics and equips students with the necessary tools to take subsequent courses. By completing it, they will know advanced linear algebra topics, special analysis topics, and be able to solve ordinary differential equations, basic partial differential equations, and difference equations. The material is divided into 13 weeks as follows:		
<ol style="list-style-type: none">1. Eigenvalues-Eigenvectors2. Diagonalization-Strength matrix3. Symmetric Tables, Quadratic Forms, Sign Table4. Derivatives-Integrals5. Total Differential-Extrema6. Taylor theorem7. 1st order differential equations (DE)8. 2nd order differential equations9. Higher order differential equations10. DE systems11. Partial DE, an introduction.12. Difference Equations – Linear13. Difference Equations – Systems		
STUDENT EVALUATION		
The course is evaluated based on a final written exam. Final written exams include multiple choice and development questions. Students are assessed for their understanding of key concepts, critical thinking and analysis as well as their ability to search, analyze and synthesize data and information, using the necessary technologies. The evaluation criteria are communicated to the students through the detailed outline of the course posted on the course page.		
RECOMMENDED-BIBLIOGRAPHY		
-Gilbert Strang: LINEAR ALGEBRA AND APPLICATIONS, PEC		

-Knut Sydsaeter and Peter Hammond, *Essential Mathematics for Economic Analysis* Prentice-Hall, 3rd Edition, 2008.
 -General Mathematics for Economics and Management volume ii -(3rd edition)
 Katsikis V.N. Kotsios ST. (2021), Tsiortas publications.
 -Teacher's notes.

LESSON CODE	QIM-S101	SEMESTER OF STUDY	1st
COURSE TITLE	DISTRIBUTION THEORY AND ESTIMATION		
PREREQUISITE COURSES:	PREPARATION LESSONS: 1. Introduction to Mathematics and Statistics		
TEACHERS	I. BASSIAKOS		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON412/		
LEARNING RESULTS			
Upon completion of the course, the student will be able to:			
<ul style="list-style-type: none">• understand the relationship between populations and random samples through their estimators and distributions.• predicts the shape of (unknown) random samples from known populations.• describes unknown populations from known random samples.• calculates probabilities of simple and complex events• to use probability distributions.• to calculate probability distributions of unknown random variables.• construct estimators of population parameters and find their distributions.			
COURSE CONTENT			
Brief Course Description: This course is an in-depth study of Random Variable Distributions and Estimation. Covers the definitions of distributions and cumulative probability distributions and their properties. Examines moment generating functions and distributions of transformations of random variables. Introduces methods of finding estimators, their useful properties, and their distributions.			
The course is developed in 13 weekly lessons. The numbering refers to the corresponding week of the course.			
<div>1. First lecture: Random variables and probability distributions</div> <div><div>1. probability density function</div><div>2. cumulative probability distribution</div><div>3. Properties of distributions: moment generating functions and moments</div></div> <div>2. Second lecture</div> <div><div>1. Joint and marginal distributions of two random variables</div><div>2. Distributions of conditional random variables</div><div>3. Covariance and correlation coefficient</div></div> <div>3. Third lecture: moment generating functions</div> <div>4. Fourth lecture: Useful distributions of discrete random variables and related properties</div> <div><div>1. Bernoulli distribution</div><div>2. Binomial distribution</div><div>3. Geometric Distribution</div><div>4. Hypergeometric Distribution</div><div>5. Poisson distribution</div></div> <div>5. Fifth lecture: Useful distributions of continuous random variables and related properties</div> <div><div>1. Uniform distribution</div><div>2. Gamma distribution</div><div>3. Exponential distribution</div><div>4. Pareto distribution</div></div> <div>6. Sixth Lecture: Useful Distributions of Continuous Random Variables and Related Properties</div> <div>(continued)</div>			

1. Normal distribution
 1. Standard Normal Distribution
 2. Properties of Normal Distribution
7. Lecture Seven: Useful Distributions of Continuous Random Variables and Related Properties (continued)
 1. Student's distribution (Student's t)
 2. The chi-square distribution
 3. The F distribution (Snedecor's F)
8. Eighth lecture
 1. Distributions in EXCEL
9. Ninth lecture: Distributions of Functions of Random Variables – Transformations
10. Tenth lecture: Assessment:
 1. The method of Maximum Likelihood
 2. The method of moments
11. Eleventh lecture: Sampling distributions (distributions of estimators)
 1. Properties of Estimators
 1. Unbiased
 2. Consistency
 3. Adequacy
 4. Arguments about adequacy
12. Twelfth lecture: Sampling distributions (distributions of estimators)
 1. Distributions of estimating functions
 2. Weak Law of Large Numbers
 3. Central Limit Theorem
 4. Sampling distribution of a mean with known variance: standard normal distribution
 5. Sampling distribution of variance: chi-square distribution
13. Thirteenth lecture: Sampling distributions (distributions of estimators)
 1. Sampling distribution of a mean with unknown variance: Student's t distribution
 2. Sampling distribution of variance ratio: F distribution
 3. Sampling distribution of percentage: standard normal distribution
 4. Sampling distribution of difference of means with known variances: standard normal distribution
 5. Sampling distribution of difference of means with unknown and equal variances: Student's t distribution
 6. Sampling distribution of difference of means with unknown and unequal variances: Student's t distribution
 7. Sampling distribution of percentage difference: standard normal distribution

Student evaluation methods:

Written exams (progress and final exam) (mandatory) (100%)

RECOMMENDED BIBLIOGRAPHY

- Richard J. Larsen & Morris L. Marx, *Introduction to Mathematical Statistics and its Application*, Prentice Hall, 4th Edition, 2006.
- AT Adams, PM Booth, DC Bowie, DS Freeth, *Investment Mathematics*, Wiley, 2003.

LESSON CODE	QIM-M102	SEMESTER OF STUDY 1st
COURSE TITLE	MATHEMATICAL FINANCE WITH APPLICATIONS IN MATLAB I	
PREREQUISITE COURSES:	PREPARATION LESSONS: 1. Introduction to Mathematics and Statistics 2. Introduction to Economics	
TEACHERS	V.N. KATSIKIS	

COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON413
LEARNING RESULTS	
<p>Upon completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> • recognize the different types of mathematical financial tools and the their characteristics • understands how financial product markets work • understands the concept of replication and hedging • uses options valuation methodologies • constructs buying and selling strategies with options • understands the concept of arbitrage • uses methodologies to discover arbitrage • using the MATLAB software to apply the techniques he has been taught in practice with real data. 	
COURSE CONTENT	
<p>Brief Course Description: This course is an introduction to Mathematical techniques widely used by applied economists in finance. The first section describes the basics of the one-period model, shows how securities can be represented by vectors and matrices, and introduces the concept of hedging. The second section introduces important economic concepts, such as returns, arbitrage, state prices in both complete and incomplete markets. The MATLAB programming language is used extensively in this course. Students will be able to use mathematical and computational techniques to solve pricing and portfolio management problems. They will learn to use MATLAB software on real portfolio management problems.</p>	
<p>The course is developed in 13 weekly lessons. The numbering refers to the corresponding week of the course.</p>	
<ol style="list-style-type: none"> 1. The simplest model of financial markets. The one-period model- Securities and their returns. 2. Securities as vectors. Transactions with Securities. 3. Tables and Securities. Multiplying tables and portfolios. Replication and hedging 4. Linear independence and Redundant Securities. The structure of the Marketed Subspace. Arrow-Debreu Securities. 5. Inverse matrix and Hedging Portfolios. 6. Applications in MATLAB. 7. Arbitrage and pricing. Hedging with Redundant Securities in Incomplete Markets. 8. Approximate calculation of the optimal trade-off. 9. Minimize the expected squared replication error. 10. Numerical stability in least squares. Prices and returns. 11. Arbitrage. Arbitrage Free Pricing. 12. State prices and the Arbitrage theorem 13. Applications in MATLAB 	
Student evaluation methods:	
Proposal 1	Written exams (progress and final exam) (mandatory) (70%)
Proposition 2	Semester Work (mandatory) (30%)
RECOMMENDED BIBLIOGRAPHY	
<ul style="list-style-type: none"> • Kamran Dadkhah, <i>Foundations of Mathematical and Computational Economics South-Western</i>, 2006. • KnutSydsaeter and Peter Hammond, <i>Essential Mathematics for Economic Analysis Prentice-Hall</i>, 3rd Edition, 2008. • John L. Teall and Iftekhar Hasan, <i>Quantitative Methods for Finance and Investments Blackwell Publishing</i>, 2002. • AliHirsa, Salih Neftci, <i>An introduction to the Mathematics of Financial Derivatives</i>, Academic Press, Elsevier, 2014. • ManfredGilli, Dietmar Maringer, Enrico Schumann, <i>Numerical Methods and Optimization in Finance</i>, Academic Press, Elsevier, 2011. • ManfredGilli, <i>Numerical Methods in Finance, Web Notes</i>, 2008. 	

LESSON CODE	QIM-L101	SEMESTER OF STUDY	1st
COURSE TITLE	MATLAB LABORATORY		
PREREQUISITE COURSES:	NO		
TEACHERS:	V.N. KATSIKIS		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON748		
LEARNING RESULTS			
Upon completion of the course, the student will be able to:			
<ul style="list-style-type: none">• handles fluently the MATLAB computing environment• constructs functions and subfunctions in MATLAB• constructs various types of graphs in MATLAB• programs complex algorithms using control and flow structures			
COURSE CONTENT			
Brief Description of the Course: This course introduces the MATLAB programming language with an emphasis on all the necessary tools that the student will use during his graduate studies.			
The course is developed in 13 weekly lessons.			
The numbering refers to the corresponding week of the course.			
<ol style="list-style-type: none">1. Introduction to the MATLAB GUI.2. Basic commands in MATLAB.3. Programming and applications I.4. Programming and applications II.5. Flow Control Structures in MATLAB and Applications I.6. Flow Control Structures in MATLAB and Applications II.7. Linear Algebra in MATLAB.8. Advanced plotting in MATLAB I.9. Advanced plotting in MATLAB II.10. Functions and subfunctions I.11. Functions and subfunctions II.12. Insert and use of financial Data I.13. Insert and use of financial Data II.			
Student evaluation methods			
Proposal 1	Written exams (progress and final exam) (mandatory) (70%)		
Proposition 2	Semester Work (mandatory) (30%)		
RECOMMENDED BIBLIOGRAPHY			
<ul style="list-style-type: none">• Paolo Brandimarte, <i>Numerical Methods in Finance and Economics: A Matlab-Based Introduction</i>, 2nd Edition, John Wiley & Sons, New York, 2006.• Manfred Gilli, Dietmar Maringer, Enrico Schumann, <i>Numerical Methods and Optimization in Finance</i>, Academic Press, Elsevier, 2011.• MATLAB OPTIMIZATION TOOLBOX, Mathworks.			

SEMESTER 2

LESSON CODE	QIM-E201	SEMESTER OF STUDY	2nd
COURSE TITLE	RISK ANALYSIS I		
PREREQUISITE COURSES:	NO		
TEACHERS:	E. ROUBIS		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON582/		
LEARNING RESULTS			
Upon completion of the course, the student will be able to:			
<ul style="list-style-type: none">• understands the concept of risk, risk categories and approaches to its calculation• it delves in particular into the mechanisms of operation and the methods for the analysis of risks applied by financial institutions• develop practical knowledge in dynamic methods, statistical tools, quantitative models and effective risk management techniques• delves into the critical parameters of financial performance and risk• apply using the PYTHON software the risk management techniques that have been taught in practice with real data			
COURSE CONTENT			
Brief Course Description: This course is an introduction to Risk Analysis. Its main objective is to analyze the main financial, and non-financial, risks of a financial organization, within the framework defined by the regulatory and supervisory authorities, of a business, but also of private investors. The main learning objectives are for students to be able to identify risks and quantify them using appropriate methods and models, such as Value at Risk, Conditional VaR, Monte Carlo simulation, historical simulation, credit rating models, models for assessing the effect of interest rate changes (Repricing, Maturity and Duration Model). More specifically, operational risk, liquidity risk,			
The course is developed in 13 weekly lessons. The numbering refers to the corresponding week of the course.			
<ul style="list-style-type: none">1. Introduction to financial risks2. Risk and return analysis3. Market risk I4. Market risk II5. Credit Risk I6. Credit Risk II7. Operational Risk8. Exchange Risk9. Interest Rate Risk10. Liquidity Risk11. Liabilities and liquidity management12. Operational Risk13. Exchange Risk			
Student evaluation methods			
Proposal 1		Written exams (final exam) (70%)	
Proposition 2		Semester Assignment (30%)	
RECOMMENDED BIBLIOGRAPHY			
<ul style="list-style-type: none">• Saunders A. and Cornett MM. Financial Institution Management and Risk Management. Broken Hill Publications. 2017			

- Sapundzoglou G. and Pentotis X, *Banking and Finance*, Benou Publications, 2019.
- Zapranis, A., *Financial Risk Management with MATLAB: An Applied Approach*, Keydarithms Publications, 2009.
- Choudhry, M., *An Introduction to Value at Risk*, Wiley, 2013
- Hull, J., *Basic Principles of Contracts and Rights Markets*, Kleidaritmos Publications, 2017.
- Bodie Z., Kane A. and Marcus A., *Investments*, Utopia Publishing, 2014
- Schoiniotakis N. and Sylligardos G., *Money, Banks, Markets and Risk Management*, Disigma Publications, 2018

LESSON CODE	QIM-M201	SEMESTER OF STUDY	2nd
COURSE TITLE	COMPUTATIONAL MATHEMATICS – MONTE CARLO		
PREREQUISITE COURSES:	NO		
TEACHERS:	ST. KOTSIOS		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON779/		
LEARNING RESULTS			
Upon completion of the course, the student will be able to:			
<ul style="list-style-type: none">• recognize the different types of computing tools and their characteristics• understands how the Monte Carlo method works• understand the concept of computational randomness• uses computational mathematics methodologies to solve financial and risk analysis problems.• uses Monte Carlo methodologies to solve probability problems.• using MATLAB software to apply the techniques learned in practice with real data.			
COURSE CONTENT			
The purpose of the course is for students to learn the basic numerical techniques used in solving mathematical problems with a computer. Emphasis is placed on solving differential equations as well as developing algorithms for simulating stochastic phenomena (Monte Carlo). The content of the course detailed in a 13-week range, is:			
<div><div>1.</div><div>Computer representation of numbers</div></div> <div><div>2.</div><div>Numerical solution of algebraic equations</div></div> <div><div>3.</div><div>Numerical solution of linear systems</div></div> <div><div>4.</div><div>Interpolation</div></div> <div><div>5.</div><div>Method of Least Squares</div></div> <div><div>6.</div><div>Numerical Solution of Differential Equations</div></div> <div><div>7.</div><div>Pseudorandom numbers.</div></div> <div><div>8.</div><div>Implementation of distributions on the PC</div></div> <div><div>9.</div><div>Solving probability problems with Monte Carlo – Part A</div></div> <div><div>10.</div><div>Solving probability problems with Monte Carlo – Part B</div></div> <div><div>11.</div><div>Solving Finance Problems with Monte Carlo – Part A</div></div> <div><div>12.</div><div>Solving Finance Problems with Monte Carlo – Part B</div></div> <div><div>13.</div><div>Review lesson</div></div>			
STUDENT EVALUATION			
The course is evaluated based on three equivalent individual assignments and oral assignments. The assignments aim to familiarize students with the use of computational techniques in solving financial problems in practice. Assignments include solving exercises and developing code. Students are assessed for their understanding of key concepts, critical thinking, and analysis as well as their ability to search, analyze and synthesize data and information, using both the necessary technologies and the ability to develop code. The evaluation criteria are communicated to the students through the detailed outline of the course posted on the course page.			
RECOMMENDED BIBLIOGRAPHY			

- Kamran Dadkhah, *Foundations of Mathematical and Computational Economics South-Western*, 2006.
- Manfred Gilli, *Numerical Methods in Finance, Web Notes*, 2008.
- FAMELIS IOANNIS, *COMPUTER MATHEMATICS, REVIEW*, 2021
- *Handbook in Monte Carlo Simulation*, PAOLO BRANDIMARTE, Wiley, 2014

LESSON CODE	QIM-S201	SEMESTER OF STUDY	2nd
COURSE TITLE	STATISTICAL INFERENCE, & SIMPLE LINEAR REGRESSION		
PREREQUISITE COURSES:	NO		
TEACHERS:	I. BASSIAKOS		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON535/		

LEARNING RESULTS

Upon completion of the course, the student will be able to:

- draw inferences about parameters of unknown populations through known random samples
- to apply statistical methods to solve economic problems
- to discover and quantify the relationship between two quantities that describe random phenomena
- design and perform (statistical) hypothesis testing
- to construct confidence intervals of population parameters

The course is developed in 13 weekly lessons.

The numbering refers to the corresponding week of the course.

1. Hypothesis tests and confidence intervals (CI)
 1. Introduction – likelihood ratio criterion
 2. Examples of simple checks
2. Controls and CI for the mean value
 1. Properties of controls
 2. Examples of complex controls
 3. With known variance
 4. With an unknown variance
3. Checks and CI for percentages
4. Controls and CI for variation
5. Exercises
6. Controls and CI for the reason of variations
7. Controls and CI for average price difference
 1. With known variations
 2. With unknown (equal) variances
 3. With unknown (unequal) variances
8. Checks and CI for percentage difference
 1. Based on the normal distribution
 2. Based on the chi-square distribution
9. Power analysis of controls – sample size calculation
10. Exercises
11. Analysis of variance – introduction – Analysis of variance with respect to one factor
12. Analysis of variance in terms of two factors with and without interaction – test for equality of variances
13. Exercises

Student evaluation methods

Proposal 1	Written exams (progress and final exam) (mandatory) (100%)
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RECOMMENDED BIBLIOGRAPHY

- Richard J. Larsen & Morris L. Marx, *Introduction to Mathematical Statistics and its Application*, Prentice Hall, 4th Edition, 2006.
- AT Adams, PM Booth, DC Bowie, DS Freeth, *Investment Mathematics*, Wiley, 2003.

LESSON CODE	QIM-M202	SEMESTER OF STUDY	2nd
COURSE TITLE	MATHEMATICAL FINANCE WITH APPLICATIONS IN MATLAB II		
PREREQUISITE COURSES:	PREPARATION LESSONS: 1. Introduction to Mathematics and Statistics 2. Introduction to Economics		
TEACHERS:	V.N. KATSIKIS		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON528		
LEARNING RESULTS			
Upon completion of the course, the student will be able to:			
<ul style="list-style-type: none">• recognizes the mathematical concept of utility• understands expected utility maximization methods• uses measures such as the Sharpe ratio• uses options valuation methodologies• constructs numerical techniques for selecting optimal portfolios in incomplete markets• understands the concept of arbitrage• uses utility functions such as , CRRA and HARA to select the optimal investment• using MATLAB software to apply the techniques learned in practice with real data.			
The course is developed in 13 weekly lessons.			
The numbering refers to the corresponding week of the course.			
<ul style="list-style-type: none">1. Risk and returns in the one-period model. Utility functions.2. Maximization of expected utility. The existence of optimal portfolios.3. Translating expected utility into monetary terms.4. Normalized utility. The quadratic utility function.5. Sharpe's criterion. Adjusted Sharpe's criterion.6. Applications in MATLAB.7. Numerical techniques for selecting optimal portfolios in incomplete markets.8. Sensitivity analysis and portfolio selection with the CRRA utility function.9. Newton's algorithm, CRRA utility function and optimal investment selection.10. Optimal CRRA investment using the distribution of empirical returns.11. HARA utility function and optimal portfolio.12. HARA utility function and portfolio optimization with multiple risky assets. Maximizing the quadratic utility function with multiple assets.13. Applications in MATLAB			
Student evaluation methods			
Proposal 1	Written exams (progress and final exam) (mandatory) (70%)		
Proposition 2	Semester Work (mandatory) (30%)		
RECOMMENDED-BIBLIOGRAPHY			
<ul style="list-style-type: none">• Paolo Brandimarte, Numerical Methods in Finance and Economics: A Matlab-Based Introduction 2nd Edition, John Wiley & Sons, New York, 2006.			

- Manfred Gilli, Dietmar Maringer, Enrico Schumann, *Numerical Methods and Optimization in Finance*, Academic Press, Elsevier, 2011.
- Manfred Gilli, *Numerical Methods in Finance*, Web Notes, 2008.

LESSON CODE	QIM-L201	SEMESTER OF STUDY	2nd
COURSE TITLE	EXCEL LABORATORY		
PREREQUISITE COURSES:	NO		
TEACHERS	K. STRATIS		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON635/		

LEARNING RESULTS

Upon completion of the course, the student will be able to:

- Leverages spreadsheets to organize, sort and clean data-sets from different sources and at different levels of detail
- Uses complex functions and advanced tools (add-ins) to analyze data in spreadsheets
- Understands the potential of automating repetitive tasks in spreadsheets
- Uses the VBA programming language to automate tasks and/or create an easy-to-use interface for the end user
- Leverages the Power Query environment to connect spreadsheets to different data sources and process them before importing them for analysis
- Builds complex data models in the Power Pivot environment to perform complex analyses
- Utilizes basic statistical/econometric methods in spreadsheets
- Generates random numbers in spreadsheets
- Produces easy-to-read and useful reports for the visualization of the results of its analysis
- Presents the result of his/her analyzes to the public (with and/or without technical expertise in the relevant subject)

The course is developed in 13 weekly lessons.

The numbering refers to the corresponding week of the course.

1. Import: Entering values into Excel cells, copy/cut & paste formulas and values
2. Boolean values, criteria checking, the IF function
3. More complex if implementations (nested IF) & conditional formatting
4. Descriptive statistics in Excel (using functions and the data analysis add-in), calculating measures for subsets of data
5. Pivot tables in Excel
6. Estimating distributions of observations using functions (COUNTIF & FREQUENCY) and the data analysis plugin (and briefly repeating pivot tables until about 00:28)
7. "Excel as a database tool": the VLOOKUP, HLOOKUP & MATCH functions
8. Using the equation solver and maximization/minimization problems (solver) plugin
9. Data validation rules, naming cells (named ranges) & use of scripts
10. Introduction to Excel's VBA programming environment
11. Introduction to Power Query & Power Pivot Add-ins
12. Estimating an OLS model in Excel using functions and an add-in,
13. Generating random values in Excel

RECOMMENDED BIBLIOGRAPHY

- *Excel VBA Programming For Dummies*, by Dick Kusleika
- *Microsoft Excel VBA and Macros*, by Bill Jelen and Tracy Syrstad

- *Top 20 MS Excel VBA Simulations!: VBA to Model Risk, Investments, Growth, Gambling, and Monte Carlo Analysis*, by Andrei Besedin
- *Excel Power Pivot & Power Query For Dummies*, by Michael Alexander
- *Power Pivot and Power BI: The Excel User's Guide to DAX, Power Query, Power BI & Power Pivot in Excel 2010-2016*, by Avichal Singh and Rob Collie
- *Mastering Microsoft Power BI: Expert techniques to create interactive insights for effective data analytics and business intelligence*, by Greg Deckler, Brett Powell, et al.
- *Microsoft Corporation websites for using functions etc. tools (add-ins)*

SEMESTER 3

LESSON CODE	QIM-E301	SEMESTER OF STUDY	3rd
COURSE TITLE	RISK ANALYSIS II		
PREREQUISITE COURSES:	NO		
TEACHERS:	E. ROUBIS		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON598/		
LEARNING RESULTS			
Upon completion of the course, the student will be able to:			
<ul style="list-style-type: none">• become familiar with the importance and uses of financial derivatives (futures contracts, options, etc.) as risk management tools.• understands the basic features and use of derivative products, as well as their pricing models.• get to know practical ways of exploiting maritime derivatives, mainly in applications of risk hedging strategies.• become familiar with the use of MATLAB and PYTHON software for pricing financial derivatives and hedging financial risks.			
<div>The course is developed in 13 weekly lessons. The numbering refers to the corresponding week of the course.</div>			
1. Introduction to financial derivatives			
2. Futures Markets			
3. Determination of future contracts			
4. Interest market			
5. Interest rate futures			
6. Hedging			
7. Exchange Agreements			
8. Buying options			
9. Properties of rights			
10. Rights Strategies			
11. Rights Valuation with Binomial Trees			
12. Valuation of rights with the Black and Scholes model			
13. The Greek parameters			
Student evaluation methods			
Proposal 1	Written exams (final exam) (60%)		
Proposition 2	Semester Assignment (40%)		
RECOMMENDED BIBLIOGRAPHY			
<ul style="list-style-type: none">• Hull, J., <i>Basic Principles of Contracts and Rights Markets</i>, Kleidaritmos Publications, 2017.• Navin, R., <i>The Mathematics of Derivatives: Tools for Designing Numerical Algorithms</i>, Wiley, 2007.			

- Whaley, R., *Derivatives: Markets, Valuation, and Risk Management*, Wiley, 2006.
- Cuthbertson, K., Nitzche, D. and O'Sullivan, N., *Derivatives: Theory and Practice*, Wiley, 2019.
- Lu, D., *The XVA of Financial Derivatives: CVA, DVA and FVA Explained*, Palgrave Macmillan, 2015.
- Deventer, DV, Imai, K. and Mesler, M., *Advanced Financial Risk Management: Tools and Techniques for Integrated Credit Risk and Interest Rate Risk Management*, Wiley, 2013.
- Higham, D., *An Introduction to Financial Option Valuation*, Cambridge University Press, 2004
- Gottesman, A., *Derivatives Essentials: An introduction to Forwards, Futures, Options, and Swaps*, Wiley, 2016
- Bossu, S., *Advanced equity derivatives: Volatility and Correlation*, Wiley, 2014.
- Angelopoulos, P., *Derivatives of Financial Products & Commodities: Financial & Commodity Derivatives*, Unibooks Publications, 2022.

LESSON CODE	QIM-M301	SEMESTER OF STUDY	3rd
COURSE TITLE	STOCHASTIC MATHEMATICS I		
PREREQUISITE COURSES:	NO		
TEACHERS:	ST. KOTSIOS		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON574/		
LEARNING RESULTS			
Upon completion of the course, the student will be able to:			
<ul style="list-style-type: none">• knows the concept of Brownian motion.• understands how Brownian motion works and how it is implemented computationally• understands the concept of Martingales• understands the concept of Thoughtful Integration• knows the concept of Stochastic Differential Equation.• solves stochastic differential equations• uses all of the above to deal with financial problems• fully understand and apply the Black-Sholes model• uses Monte Carlo methodologies to solve stochastic problems.			
COURSE CONTENT			
The purpose of the course is to acquaint students with Brownian motion, Ito's formula and stochastic differential equations and their application in Finance through the Black-Scholes equation. The content of the course, detailed in a 13-week range, is:			
<ol style="list-style-type: none">1. Random Walks2. Brownian motion3. Brownian motion with shift4. Geometric Brownian motion5. Martingales6. Stochastic Integrals7. Ito formula8. Stochastic Differential Equations9. Solving Stochastic Differential Equations10. Basic Stochastic Differential Equations11. Introduction to Portfolio analysis12. Black-Scholes formula13. Applications – Implementation with Monte Carlo.			
RECOMMENDED BIBLIOGRAPHY			
<ul style="list-style-type: none">• T. Mikosch, <i>Elementary Stochastic Calculus with Finance in View</i>, Wiley.• Ovidiu Calin, <i>An Introduction to Stochastic Calculus with Applications to Finance</i>• BC VASSILEIOU, <i>STOCHASTIC FINANCE</i>			

- *M. LOULAKIS, INTRODUCTION TO MATHEMATICAL FINANCE, KALLIPOS*

LESSON CODE	QIM-S301	SEMESTER OF STUDY	3rd
COURSE TITLE	MULTIVARIABLE METHODS AND MODELS		
PREREQUISITE COURSES:	NO		
TEACHERS:	I. BASSIAKOS, D. KYRIAKOPOULOU		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON559/		

LEARNING RESULTS

Upon completion of the course, the student will be able to:

- draw inferences about parameters of unknown populations through known random samples
- apply statistical methods to solve economic problems
- discover and quantify the relationship between two or more variables that describe random phenomena
- forecast based on regression models

The course is developed in 13 weekly lessons.

The numbering refers to the corresponding week of the course.

- Simple Linear Regression
 - 1.1. Introduction: the simple linear model, and its conditions
 - 1.2. Estimation of Model Parameters
- Properties of estimators and Related Hypothesis Testing
 - 2.1. Average values and variances of estimators
 - 2.2. Impartiality
 - 2.3. Allocations of estimators
 - 2.4. Checks for β_1
 - 2.5. Checks for β_0
- Exercises
- Measures of Model Goodness of Fit and Analysis of Variance
 - 4.1. The Coefficient of Determination R^2
 - 4.2. Assumption checks for R^2
 - 4.3. Analysis of Variance Regression
 - 4.4. Regression significance tests, based on Analysis of Variance
- Forecasting
 - 5.1. Forecasting for an observation
 - 5.2. Forecasting of the mean value of many observations
- Exercises
- Linear Regression with Two Independent Variables
 - 7.1. Assumptions
 - 7.2. Solving the model
- Measures of Model Goodness of Fit
 - 8.1. Multi-collinearity
 - 8.2. Heteroscedasticity
 - 8.3. Multiple coefficient of determination
- Exercises
- Multiple Linear Regression
 - 10.1. Basic conditions
 - 10.2. Properties of estimators
 - 10.3. Cases related to the model
 - 10.4. Analysing of variance

11. Exercises
12. Forecasting and Advanced Topics
13. Review Exercises

Student evaluation methods

Proposal 1	Written exams (progress and final exam) (mandatory) (100%)
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RECOMMENDED-BIBLIOGRAPHY

- *Richard J. Larsen & Morris L. Marx, Introduction to Mathematical Statistics and its Application, Prentice Hall, 4th Edition, 2006.*
- *AT Adams, PM Booth, DC Bowie, DS Freeth, Investment Mathematics, Wiley, 2003.*
- *Thomas P. Ryan, Modern Regression Methods, 2nd edition, Wiley, 2009*
- *Sanford Weisberg, Applied Linear Regression, 3rd edition, Wiley, 2005*

LESSON CODE	QIM-M302	SEMESTER OF STUDY	3rd
COURSE TITLE	NUMERICAL METHODS AND OPTIMIZATION IN FINANCE		
PREREQUISITE COURSES:			
TEACHERS:	V.N. KATSIKIS		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON576		
LEARNING RESULTS			
Upon completion of the course, the student will be able to:			
<ul style="list-style-type: none">has an in-depth understanding of various modern optimization methodsbuilds optimization models on problems with real dataimplements optimization methods in the MATLAB languageapplies the methods he has been taught in case studies			
The course is developed in 13 weekly lessons.			
The numbering refers to the corresponding week of the course.			
1. Review of basic numerical methods for finding roots. Review of basic arithmetic methods for solving linear systems.			
2. Optimization without constraints. Convergence. Categories of problems.			
3. Unconstrained optimization in one dimension. Newton's method.			
4. The golden ratio method. Unconstrained optimization in many dimensions.			
5. Steepest Descent Method. Newton Method.			
6. Quasi-Newton method. Direct search methods (Direct search methods).			
7. MATLAB Optimization Toolbox. Optimization in one variable.			
8. Function optimization of many variables, without constraints.			
9. Function optimization of many variables, under constraints. Linear programming.			
10. Quadratic programming.			
11. Applications: Bond Allocation, Bond Dedication, Fund Allocation, Workforce Planning.			
12. Portfolio selection and asset allocation I (Markowitz Theory)			
13. Portfolio selection and asset allocation II (Markowitz Theory)			
Student evaluation methods			
Proposal 1	Written exams (progress and final exam) (mandatory) (70%)		
Proposition 2	Semester Work (mandatory) (30%)		
RECOMMENDED-BIBLIOGRAPHY			
<ul style="list-style-type: none">Paolo Brandimarte, Numerical Methods in Finance and Economics: A Matlab-Based Introduction, 2nd Edition, John Wiley & Sons, New York, 2006.Manfred Gilli, Dietmar Maringer, Enrico Schumann, Numerical Methods and Optimization in Finance, Academic Press, Elsevier, 2011.MATLAB OPTIMIZATION TOOLBOX, Mathworks.			

LESSON CODE	QIM-L301	SEMESTER OF STUDY	3o
COURSE TITLE	PYTHON LABORATORY		
PREREQUISITE COURSES:	NO		
TEACHER:	E. PETRAKI		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON609/		
LEARNING RESULTS			
The course aims to teach students the basic principles of software design and their implementation in the environment of the Python programming language as well as how Python can be used as a tool to solve problems in different scientific fields.			
Upon successful completion of the course, the student will:			
<ul style="list-style-type: none">• has familiarized himself with the Python environment, the data structures it provides as well as many of the useful modules of the language• knows the principles of structured programming and will be able to apply them to create programs in the Python environment• is able to solve scientific problems by writing well-structured programs in the Python environment• is able to choose and use the appropriate (for the problems to be solved) module(s) of the Python language			
The course is developed in 13 weekly lessons. The numbering refers to the corresponding week of the course.			
<div>1. Introduction to Algorithms: Solving problems, basics of algorithms, programs. Introduction to programming with the Python language. Installing Python and familiarizing yourself with the environment.</div> <div>2. Values and data types. Variables. Performers. Numerical expressions, basic commands.</div> <div>3. The command If - Boolean Operators and Boolean Conditions in Python.</div> <div>4. The command for</div> <div>5. The command While</div> <div>Lists. Built-in libraries and functions</div> <div>6. Functions</div> <div>7. Review. Basic algorithms</div> <div>8. Dictionaries. Strings</div> <div>9. Exceptions. Permanent data storage. Python and sqlite. Database connection with Python program and database management with SQL.</div> <div>10. Familiarity with Jupyter lab. External code libraries - packages: pandas. Management - Data analysis with pandas</div> <div>11. Familiarity with code libraries: matplotlib and numpy</div> <div>12. Object Oriented Programming in Python</div> <div>13. Sets-Pleiades</div>			
RECOMMENDED-BIBLIOGRAPHY			
<ul style="list-style-type: none">• <i>Python Introduction to Computers (4th Revised Edition), Nikolaos Avouris, Michael Koukias, Paliouras Vasilios, Sgarbas Kyriakos, 2018, University Press of Crete</i>• <i>The Python book, Nikolaos Samaras, Konstantinos Tsiplidis, SBN: 978-960-586-312-8, KRITIKI Publications</i>• <i>Introduction to Computation and Programming with Python [Authors: Gutttag John V. / ISBN: 978-960-491-159-2], Publications A. Papasotiriou & Co. I.K.E.</i>• <i>Introduction to programming with Python, Panetsos Spyridon, 2019, Giola Scientific Publications</i>• <i>Introduction to Python-Assisted Programming, Georgios Manis, 2015, Greek Academic Books and aids, Ebook edition: SEAB, KALLIPOS</i>• <i>Think Python: How to Think Like a Computer Scientist 2nd Edition by Allen Downey (Author), ISBN-13: 978-1491939369</i>			

SEMESTER 4

LESSON CODE	QIM-C401	SEMESTER OF STUDY	4o
COURSE TITLE	DATA BASES-INTELLIGENT ALGORITHMS		
PREREQUISITE COURSES:	NO		
TEACHERS:	V.N. KATSIKIS, E. PETRAKI		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	NO		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON819/		
LEARNING RESULTS			
Upon successful completion of the course, the student will be able to:			
<div><div>1.</div><div>to know the role of data and its management in applications</div></div> <div><div>2.</div><div>know the basic advantages and limitations of using databases</div></div> <div><div>3.</div><div>draw Entity Relationship (ER) Diagrams according to the requirements analysis of an application that requires a database</div></div> <div><div>4.</div><div>convert an ER diagram into a database</div></div> <div><div>5.</div><div>implement relational schemas in a Database Management System (MS-Access, Oracle)</div></div> <div><div>6.</div><div>to use the SQL language both to define the schema of the database and to manage the data (search, modify, insert, delete)</div></div> <div><div>7.</div><div>to know the current trends in the field of data management and information search</div></div> <div><div>8.</div><div>understand the concept of neural network</div></div> <div><div>9.</div><div>to design neural networks</div></div> <div><div>10.</div><div>to use neural networks in Classification problems</div></div> <div><div>11.</div><div>to use neural networks in Forecasting problems</div></div>			
COURSE CONTENT			
Content: This course consists of 2 parts. In the 1st part topics related to databases are taught and in the 2nd part an introduction to neural networks and their applications in financial problems.			
<div><div>1.</div><div>Introductory Concepts: Data and Information, Storage Units, Data Files, Databases and Logical Data Models, Database Systems Architecture and Overview</div></div> <div><div>2.</div><div>Conceptual Design and Entity Relationship (ER) Diagrams</div></div> <div><div>3.</div><div>Transition from the conceptual model (ER diagrams) to the logical model. The Relational Database Model</div></div> <div><div>4.</div><div>Introduction to Relational Algebra</div></div> <div><div>5.</div><div>Relational Database Design Principles and Normalization</div></div> <div><div>6.</div><div>Search methodologies and languages. The SQL language.</div></div> <div><div>7.</div><div>SQL Data Definition, Data Manipulation, and Access Control statements</div></div> <div><div>8.</div><div>Database Management Systems in the context of laboratory training: Microsoft Access, introduction to the Oracle Database environment</div></div> <div><div>9.</div><div>Introductory concepts in neural networks</div></div> <div><div>10.</div><div>The concept of supervised learning</div></div> <div><div>11.</div><div>Multi-layer neural networks</div></div> <div><div>12.</div><div>Applications to classification problems</div></div> <div><div>13.</div><div>Applications to forecasting problems</div></div>			
RECOMMENDED-BIBLIOGRAPHY			
<div><div>●</div><div>Relational Databases, New revised edition, Kehris Evangelos, 2015, Kritiki Publications SA</div></div> <div><div>●</div><div>Databases and SQL: A Practical Approach, Athanasios Stavroudis, 2nd edition, 2015, Keydarithms Publications Ltd.</div></div> <div><div>●</div><div>R. Ramakrishnan, J. Gehrke: Database Management Systems, 3rd Edition. McGraw Hill, 2000, Database Management Systems 3rd Edition, Volume A, Giola Publications 2012</div></div>			

- *Fundamental Principles of Database Systems, R. Elmasri, SB Navathe, Translation - Scientific Editing by Michalis Hatzopoulos, Diaulos Publications*
- *Jeffrey Ullman, Jennifer Widom, A First Course in Database Systems, Fundamentals of Database Systems, Key Editions, 2008*
- *E.I.Giannakoudakis: Database Systems, Second Edition, Volume A, Benou Publications, 2009*
- *Martin T. Hagan, Howard B. Demuth, Mark Hudson Beale, Neural Network Design, 2nd Edition*

LESSON CODE	QIM-L401	SEMESTER OF STUDY	4 o
COURSE TITLE	LABORATORY R		
PREREQUISITE COURSES:	PREPARATION LESSONS: Introduction to Mathematics and Statistics		
TEACHERS:	T. NIKOLERIS		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON778/		
LEARNING RESULTS			
Upon completion of the course, the student will be able to:			
<ul style="list-style-type: none">• program in R and perform a comprehensive data analysis• install and operate software necessary in a statistical programming environment• understand and implement general concepts of a programming language• addresses practical problems in statistical calculations such as: reading data in R, writing R functions, control structures, loops, debugging etc works on examples with real data.			
<p style="text-align: center;">The course is developed in 13 weekly lessons. The numbering refers to the corresponding week of the course.</p>			
<p>1. Introduction to R-basic concepts 2. Data processing 3. Data frames - the dplyr package 4, 5, 6. Control structures 7,8. functions 8,9. Loop functions 10,11. Graphic representations in R 13. Simulations 13. Case studies-applications</p>			
Student evaluation methods			
Proposal: 4 quizzes and 3 programming assignments			
RECOMMENDED-BIBLIOGRAPHY			
<ul style="list-style-type: none">• <i>Dimitrios Ioannidis, Ioannis Athanasiadis, Statistical and Machine Learning with R: Theory and Applications.</i>• <i>Roger D. Peng R Programming for Data Science, e-book.</i>			

LESSON CODE	QIM-C402	SEMESTER OF STUDY	4th
COURSE TITLE	ALGORITHMIC TRADING - MACHINE LEARNING		
TEACHERS:	H.L. KAMOUZIS, G. RIGOPOULOS		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON551/		
LEARNING RESULTS			
Upon completion of the course, the student will be able to:			
<ul style="list-style-type: none">● knows the main categories of financial products			

- knows the main financial products trading markets
- understand and process the basic parameters of online trading and carry out online trades
- understand the basic principles of fundamental analysis, the efficient market hypothesis, and use analytical methods to value financial products
- understands the basic methods of technical analysis
- understand the basic principles of Dow theory
- understands the basic types of diagrams
- develops philosophy and methods of approaching the market with technical analysis charts
- knows the four basic categories of technical analysis indicators
- knows the meaning of each index
- calculates the index values
- to read price trends on indicator prices
- implements targeted investment strategies using combination tools with technical analysis indicators
- deeply understands the principles of machine learning
- understand and describe basic supervised learning algorithms
- understand and describe basic unsupervised machine learning algorithms
- designs and develops machine learning applications using appropriate technologies
- evaluates and chooses the appropriate solutions depending on the problem it is called upon to solve

**The course is developed in 13 weekly lessons.
The numbering refers to the corresponding week of the course.**

1. Online investments, Algorithmic trading, automated trading, organized markets, OTC markets, derivative financial products, contracts for differences
2. Fundamental analysis, Gordon model, intrinsic stock price, CFD parameter analysis.
3. Introduction to Technical Analysis, Theory of Efficient Markets, Dow Theory, Candlestick, Bar and Line Charts, Description and Analysis.
4. Market entry and exit strategies with one, two, or three candles, Trend lines, trading volume, double top patterns, double low patterns, head and shoulders patterns.
5. Technical analysis indicators, description, analysis, practice on online platform.
6. Voltage and momentum oscillators, description, analysis, practice on online platform.
7. 11. Volume and volatility oscillators description, analysis, practice on online platform, Development of integrated strategies, practice online platform.
8. Machine Learning Introduction, Data Warehouses
9. Data Preparation, Clustering: criteria, utility, applications, clustering methods: Divisive algorithms, Hierarchical, density-based, subspace clustering.
10. Classification: applications, Categorization methods: Decision Trees, Bayesian classification, Neural Networks
11. Association rules: what are they, Apriori algorithm.
12. Laboratory, Introduction to Weka, Weka classification.
13. Weka clustering, Weka association rules

Student evaluation methods

Proposal	Semester Work (mandatory) (100%)
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RECOMMENDED-BIBLIOGRAPHY

- Thomas N. Bulkowski, *Investment Candles* by Thomas N. Bulkowski – TASC, Apr 2011, *Stocks & Commodities* V. 29:5 (24-28):
- Eugene F. Fama and Kenneth R. French, "Luck Versus Skill in the Cross-Section of Mutual Fund Returns." , *The Journal of Finance*, 2010, 65(5), pp. 1915-47.
- Eugene F Fama and Kenneth R French, "The Capital Asset Pricing Model: Theory and Evidence.", *Journal of Economic Perspectives*, 2004, 18(3), pp. 25.
- Eugene F. Fama, "Multifactor Portfolio Efficiency and Multifactor Asset Pricing." *Journal of Financial and Quantitative Analysis*. 1996, 31:4, pp. 441–65.

- Eugene F. Fama and Kenneth R. French, "Size and Book-to-Market Factors in Earnings and Returns." *Journal of Finance*, 1995 50:1, pp. 131–55.
- Eugene F. Fama and Kenneth R. French, "Common Risk Factors in the Returns on Stocks and Bonds." *Journal of Financial Economics*, 1993, 33:1, pp. 3–56.
- Eugene F. Fama and Kenneth R. French, "The Cross-Section of Expected Stock Returns." *Journal of Finance*, 1992, 47:2, pp. 427–65.
- Dennis D. Peterson, *Working Money: Trading Candlestick Patterns - TASC*
- May 2003, *Stocks & Commodities* V. 21:6 (42-45).
- Robert Rhea, *The Dow Theory*, Barrons, 1932.
- CENTRAL BANK OF IRELAND, 'Central Bank inspection identifies compliance concerns in Contracts for Difference and Financial Spread Betting Firms', Information Release, 16th of June, 2011.
- Christine Brown, Jonathan Dark, Kevin Davis, 'Exchange Traded Contracts for Difference: Design, pricing and effects', Working Paper Series, University of Melbourne, Department of Finance, June 2009.
- Copeland and Weston, 1988, 3rd Edition, Addison-Wesley
- John Hull, 7th Edition, *Options, Futures and Other Derivatives*, John Hull, 7th Edition.
- Konstantinos Diamantaras, Dimitris Botsis, "Machine Learning", Keydarithms Publications Ltd., Edition: 1st/2019
- Michel, T., 'Machine Learning', McGraw Hill, 1997
- Ethem Alpaydin, *Introduction to machine learning*, The MIT Press, 2020.

LESSON CODE	QIM-E401	SEMESTER OF STUDY	4th
COURSE TITLE	SUPERVISORY FRAMEWORK FOR FINANCIAL INSTITUTIONS		
PREREQUISITE COURSES:	NO		
TEACHERS:	K. LEFKADITIS		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON581/		
LEARNING RESULTS			
Upon completion of the course, the student will be able to understand the basic supervisory framework of credit institutions in terms of risk management. Particularly:			
<ul style="list-style-type: none">• Understands the role of supervisory authorities (BASEL, EBA)• Understands the differences between Basel I, II, III regulatory frameworks• Understands the importance of DAEEK and DAEER in credit institutions and their contents• He/She understands the importance of existence as well as the key points of the Recovery Plan• Understands the methodology for calculating banks' capital requirements for key risks• Understands the methodology for the evaluation of credit institutions by supervisory authorities (SREP)• He/She understands the importance of ESG risks for credit institutions and their clients• Be informed about the new and most important supervisory directives, such as the new definition of default, Loan origination, etc.• Understands basic concepts in risk management, such as: risk management framework, risk culture, risk appetite, etc.• Understands the connection of the specific course with the other courses of the postgraduate program and in particular with the management of the financial risks of credit institutions			
Understand the new IFRS 9 framework for calculating expected loss and how it differs from unexpected loss			
The course is developed in 13 weekly lessons. The numbering refers to the corresponding week of the course.			
<ol style="list-style-type: none">1. Basel Supervisory Framework2. Basel Credit Risk, part 13. Basel Credit Risk, part 24. Basel Operational Risk			

5. SREP
6. ICAAP
7. ILAAP
8. Risk Appetite
9. ESG
10. Recovery Plan
- 11 and 12. Other EBA Regulation
13. Recap previous lectures

Student evaluation methods

Written exams

RECOMMENDED-BIBLIOGRAPHY

EBA, BIS, ECB websites which include all publications and regulations related to the supervisory framework of financial institutions

LESSON CODE	QIM-S401	SEMESTER OF STUDY	4th
COURSE TITLE	APPLIED ECONOMETRICS		
PREREQUISITE COURSES:	NO		
TEACHER:	D. KYRIAKOPOULOU		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON714		
LEARNING RESULTS			
Upon completion of the course, the student will be able to:			
<ul style="list-style-type: none">• applies econometric methods to solve economic problems in empirical finance and risk analysis• draw conclusions about the relationships examined according to economic theory and interpret the results of econometric analysis• to predict magnitude values based on specialized time series models			
COURSE CONTENT			
<ol style="list-style-type: none">1. Introduction to time series, related concepts, and time series estimation methods2. Estimating the regression model, applying diagnostics and testing hypotheses about the estimated parameters based on relevant economic theory3. Exercises - applications in R4. Univariate time hand (AR, MA) modeling methodologies and their properties5. Box-Jenkins methodology (ARMA models) and their use for forecasting purposes6. Exercises - applications in R7. Multivariate modeling techniques such as simultaneous equations, VAR/VEC models and causality models8. The concept of cointegration and the error correction mechanism, interpretation of results of cointegration checks and estimation of error correction models (ECM)9. Exercises - applications in R10. Estimation of autoregressive models subject to heteroskedasticity (ARCH) and their extensions.11. Special topics in risk management and econometric techniques and applications12. Exercises - applications in R13. Review Exercises			
Student evaluation methods			
Written exams (final exam) (100%)			
RECOMMENDED-BIBLIOGRAPHY			
<ul style="list-style-type: none">• Gujarati, DN, Porter, DC, <i>Econometrics, Principles and Applications</i>, Ed. Giola• Wooldridge, JM, <i>Introduction to Econometrics, A Modern Approach</i>, Ed. Papazisi• Stock, JH, Watson, MW, <i>Introduction to Econometrics</i>, Ed. Gutenberg			

- Asteriou, D, Hall, SG, *Applied Econometrics*, Ed. Propombos
- Tsionas, E. G., *Applied Econometrics*, Ed. Opa
- Johnston, J., DiNardo, J, *Econometric Methods*, Ed. Kleidarithmos

LESSON CODE	QIM-M401	SEMESTER OF STUDY	4th
COURSE TITLE	STOCHASTIC MATHEMATICS II		
PREREQUISITE COURSES:	NO		
TEACHERS:	ST. KOTSIOS		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON526/		
LEARNING RESULTS			
Upon completion of the course, the student will be able to:			
<ul style="list-style-type: none">• Knows the concept of Poisson evolution• Knows the concept of Markov evolutions• He/She knows the processes of Birth-Death• Knows the basics of actuarial-insurance mathematics• He/She knows how to deal with problems of the above branches with Monte Carlo techniques.• He/She knows how to apply the above.			
COURSE CONTENT			
The purpose of the course is to introduce students to basic stochastic evolutions such as Poisson evolution and discrete and continuous time Markov evolutions and their application to actuarial Mathematics problems. The objectives of the course are to acquaint the students with modeling through Poisson evolutions, Markov evolutions and their use to deal with practical problems. The content of the course, detailed in a 13-week range, is:			
<ol style="list-style-type: none">1. Poisson evolution2. Strict Definition of Poisson Evolution3. Intermediate times, allocations4. Composition of Poisson evolutions5. Applications6. Discrete Markov Evolution7. Types of situations8. Marginal Outcome9. Chapman – Kolmogorov equations10. Continuous Markov11. Developments of Birth and Death12. Applications13. Introduction to Actuarial Mathematics			
STUDENT EVALUATION			
The course is evaluated based on 3 individual assignments and six-monthly exams. The assignments aim to acquaint students with the use of computational techniques in solving financial problems with stochastic mathematics methods in practice. Students are assessed for their understanding of key concepts, critical thinking, and analysis as well as their ability to search, analyze and synthesize data and information, using both the necessary technologies and the ability to develop code. The evaluation criteria are communicated to the students through the detailed outline of the course posted on the course page.			
RECOMMENDED-BIBLIOGRAPHY			
<ul style="list-style-type: none">• Taylor – Larlin, <i>An Introduction to Stochastic Modelling</i>, 3rd edition, Academic Press• BC VASSILEIOU, <i>STOCHASTIC FINANCE</i>• M. LOULAKIS. <i>STOCHASTIC PROCESSES</i>. KALLIPOS			

LESSON CODE	QIM-D401	SEMESTER OF STUDY	4th
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COURSE TITLE	Master's Diploma Thesis
PREREQUISITE COURSES:	[REQUIRED KNOWLEDGE BACKGROUND]: As the case may be (depending on the subject of the Diploma Thesis)
COURSE WEBSITE (URL)	https://qi-uoa.gr/eidikeyseis/mathimatiki-xrimatooikonomiki-kai-analysi-kindynou/d-eksamino
LEARNING RESULTS	
<p>Through the Diploma Thesis (DT), under the guidance of the supervisor, the student is invited to develop the skills of critical and combinatorial thinking, organization, and analysis for the in-depth investigation of a distinct subject of specialization that interests him/her, applying a rigorous, systematic and scientific approach. Through the DT preparation, the student is provided with the opportunity to synthesize and utilize, both in the theoretical and experimental fields, the knowledge acquired during his/her studies, to promote the scientific way of thinking and research.</p> <p>However, the content of the Diploma Thesis is shaped according to the subject of specialization under study. In this sense, during the preparation of the Diploma Thesis, the knowledge acquired from the courses to which the Diploma Thesis is related is assumed.</p> <p>After the successful completion of the Diploma Thesis, the student will be able to:</p> <ul style="list-style-type: none"> • To clearly recognize the boundaries of a problem to be solved and to fully recognize all its main and secondary aspects, focusing on the key points. • To use with a critical and synthetic spirit the available bibliography for a specific thematic area. • To design a research plan and to develop an appropriate methodology for approaching and investigating a topic under study. • Document his/her opinions and argumentation. • To recognize and evaluate the reliability and validity of the results of solving a problem • Generalize the conclusions of his/her study, in relation to the wider group to which the problem studied belongs. • Suggests future study perspectives • To know how to write a scientific essay. • To successfully carry out a comprehensive presentation of a topic through ICT. 	
COURSE CONTENT	
<p>By the beginning of the 4th semester at the latest, the students who have chosen to prepare a diploma thesis, propose in writing to the SE the topic of their thesis and a supervising professor from among the members of the Teaching and Research Staff (TRS) of the Department of Economics or teachers of PP. After approving the topic and the supervisor, the Committee also proposes two evaluator professors from the Department's faculty members or the PP lecturers, after the supervisor's recommendation.</p> <p>The evaluation and grading of the work is done by the three-member committee consisting of the supervisor and the two evaluators, with their written recommendation to the CC, after a public presentation of the work and an oral examination. The last date for submitting the thesis is the end of the fourth semester of studies.</p> <p>Breakdown into weekly employment:</p> <p>Weeks 1-3: Introduction Brief description and delimitation of the object. Its significance and scientific interest. Epigrammatic reference to the research directions found in the international literature. Central idea of the present work, the main research objective as well as the adopted methods. Individual objectives, expected contribution, structure of the DT.</p> <p>Weeks 4-7: Detailed item description The main development of the topics/objects related to this, accompanied by the bibliographic reference. It is good to divide it into sub-sections and individual paragraphs of the same conceptual content, so that it is easier to focus on the more specific aspects explored in the work.</p>	

Weeks 8-10: Methodological approach

Reference to methodological developments, fields of application based on the literature review and the theoretical framework, Analytical presentation of the methodological approach adopted.

Weeks 11-12: Results - Conclusions

Data and assumptions. Structured presentation and commenting of results.

Summary of object and objectives, Synthetic and critical presentation of results, Report problems presented (how they were dealt with), Underlining the innovative elements and the contribution of the work.

Week 13: Prospects for future research, bibliographic references**STUDENT EVALUATION**

Public Presentation and Final examination (100%) by the designated three-member committee of the PP. The examination includes the evaluation of the delivered essay of the Diplomatic Thesis and the evaluation - through the presentation by the student - of the following points:

- Understanding of the specialization subject under study and overview of the relevant literature.
- Organization and planning of the required steps to complete the subject.
- Presentation of the elaboration of the required steps according to the chosen solution approach.
- Contributing to the scientific dialogue through the findings.
- Analysis of the results and drawing the corresponding conclusions.

RECOMMENDED-BIBLIOGRAPHY

[DEPENDING ON THE SUBJECT OF THE DIPLOMA THESIS]

APPENDIX A

Specialization Courses



SEMESTER 1

LESSON CODE	QIR-E103	SEMESTER OF STUDY	1st
COURSE TITLE	INTRODUCTION TO FINANCE		
PREREQUISITE COURSES:	NO		
TEACHER:	H. VAVOURA		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON637		

LEARNING RESULTS

The main objective of the course is to familiarize students with the main terms and basic tools of Economics, so that they can better understand the current economic environment and predict the effects of an exogenous or endogenous change in this environment. Upon completion of the course the student will be able to:

- understands how the markets of goods and services, the labor market, the capital market, and the markets of financial products work, but also how the produced product of a closed and an open economy is formed and changes over time.
- describes how the overall economy works, using theoretical models, suitable for the study of the markets that make up and to interpret empirical data based on these models.
- draws conclusions about the causes of major economic problems, taking into account the combination of appropriate theoretical models and available statistical data.
- makes predictions for the future development of the aims and objectives of the economic policy of a state in general and of a member state of the European Union in particular.

The course is developed in 13 weekly lessons.

The numbering refers to the corresponding week of the course.

1. Introductory Concepts (Basic Principles Governing Economics, How an Economy Works, How Economists Describe the Functioning of an Economy, Circular Flow Diagram).
2. Supply and Demand (Supply Curve, Demand Curve, Competitive Equilibrium, Consumer Surplus, Producer Surplus, Social Welfare, Microeconomics - Macroeconomics Relationship).
3. Basic Concepts of Microeconomics (Elasticity, Production Function, Cost Curves, Revenue Curves, Profit, Profit Maximization, Maximizing Behavior of a Competitive Firm)
4. Market Forms and Introduction to Game Theory (Monopoly, Oligopoly, Bertrand Model, Cournot Model, Monopolistic Competition, Nash Equilibrium, Prisoner's Dilemma, Stackelberg Model, Hotelling Model, Repeated Games, Cooperation and Cartels)
5. Basic Concepts of Macroeconomics (Definition and introduction to the concepts and the corresponding statistical data available: Economic cycle, Economic growth, Economic growth, Economic policy, Inflation, Employment and unemployment, Open economy).
6. Gross Domestic Product (Gross Domestic Product - Definition and Measurement, Statistics, Shadow Economy, and Tax Evasion).
7. Economic Development and Economic Growth (Technological Progress and Productivity, Total Production Function, Production Possibilities Curve, Economic Growth and Economic Development, Sustainability).
8. Financial System (Interest Rates, Saving and Investment, Markets of Debt Capital, Financial Data, Financial Intermediaries, Financial System, Financial Fluctuations, Decisions under Uncertainty, Risk Sharing, Risk Aversion, Introduction to Insurance Science).
9. Aggregate Supply and Aggregate Demand (Aggregate Supply, Aggregate Demand, Multiplier, Short-term Macroeconomic Equilibrium, Short-term Macroeconomic Equilibrium, Neoclassical and Keynesian Model).
10. Fiscal Policy (Expansionary and Restrictive Fiscal Policy, Public Debt, Fiscal Policy in the EMU Framework).
11. Monetary Policy (Role of Money, Money Supply, Money Demand, The Monetary Role of Banks, Monetary Policy, Monetary Policy in the Framework of EMU).

12. Unemployment and Inflation (Labor Market, Full Employment, Unemployment Rate, Inflation, Consumer Price Index, International Inflation Comparisons).

13. International Trade and International Macroeconomics (Domestic Demand, Domestic Supply, International Price and Small Open Economy, Imports, Exports, Ricardo Model, Heckscher - Ohlin Model, Protectionism, International Trade with Large Firms, Balance of Payments Accounts, Improving the Balance of Balance of Payments, Exchange Rate, Exchange Rate Regimes, Exchange Policy, Exchange Policy in the EMU Framework).

How to evaluate students

Written exams (progress and final exam)

RECOMMENDED BIBLIOGRAPHY

- *Sloman, John, Alison Wride, and David Garratt. Introduction to Economics: Microeconomics. Publishers: Broken Hill Publishers Ltd. 2017.*
- *Parkin Michael, Melanie Powell, and Kent Matthews. Principles of Economics. Critique Editions. 2013.*
- *David Begg, Gianluigi Vernasca, Stanley Fischer and Rudiger Dornbusch. Introduction to Economics. Critique Editions. 2015.*
- *Mankiw N. Gregory and Mark P. Taylor. Principles of Economic Theory: With Reference to European Economies. Gutenberg Publications. 2011.*
- *Mankiw N. Gregory and Mark P. Taylor. Economics: 3rd Edition. Giola Publications. 2017.*
- *Krugman, Paul and Robin Wells. Economics in Teaching Units. Gutenberg Publications. 2018*
- *Arnold, Roger. Introduction to Economics. Epicenter Publications. 2009.*
- *Mankiw, N. Gregory, and Laurence Ball. Macroeconomics and the Financial System. Gutenberg Publications. 2013.*
- *McConnell, Campbell, Sean Flynn and Stanley Brue. Introduction to Economics. Rosili Editions. 2016.*
- *Samuelson, Paul and William Nordhaus. Economics (Volume A and B). Papazisi Publications. 2000.*
- *Vavouras, Ioannis in collaboration with Hara Vavouras. Economic Policy (Third Revised Edition). Papazisi Publications. 2019.*
- *De Grauwe, Paul. Economics of the Monetary Union. Papazisi Publications. 2018.*

LESSON CODE	QIR-R101	SEMESTER OF STUDY	1st
COURSE TITLE	PROPERTY VALUATION		
PREREQUISITE COURSES:			
TEACHERS:	GREEK AND ENGLISH		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	F. MOUZAKIS, K. GATIS		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON681/		
LEARNING RESULTS			
Upon completion of the course, the student will be able to:			
<ul style="list-style-type: none">● recognize the cognitive dimensions of the appraisal profession.● know the alternative sources of relevant information in Greece● understand the differences between the different branches of real estate in Greece and abroad.● know all the alternative methods of calculating the commercial value of real estate and be able to apply them properly in every case in practice.● know the structure and contents of assessment standards and their transfer to practical application.● know the importance and directions of professional ethics for the real estate appraiser.● understand the workings of the real estate profession, which is an operational hub as well as an important source of information for the real estate appraiser.● recognize the international dimension of the profession.			
The course is developed in 13 weekly lessons. The numbering refers to the corresponding week of the course.			
<ol style="list-style-type: none">1. Introduction to real estate estimation2. Purchases of residential real estate3. Commercial real estate purchases4. Evaluative standards 15. Comparative Data Method and data sources			

6. Income Method
7. Method of Earnings
8. Residual Value Method - Depreciated Replacement Cost Method
9. Evaluative standards 2
10. Professional ethics
11. International real estate markets
12. Introduction to real estate brokerage
13. Repetition and applications

Student evaluation methods

Proposal 1	Written exams (progress and final exam) (mandatory) (65%)
Proposition 2	Semester Work (mandatory) (35%)

RECOMMENDED BIBLIOGRAPHY

- Ko Wang, Wolverton & Marvin L. (Eds.) (2002) Real estate valuation theory, Springer.
- Mooya MM (2016) Real estate valuation theory - a critical appraisal, , Springer.
- Baum A, Nunnington N. & Mackmin D. (2011) The income approach to property valuation, 6th ed., May, EG Books.
- Shapiro E., Mackmin D. & Sams G. (2019) Modern methods of valuation, 12th ed., Jan., Routledge.
- Isaac D. & O'Leary J. (2012) Property valuation principles, 2nd ed., Jan., Macmillan International Higher Education.
- Scarrett D. (2008), Property valuation – the five methods, 2nd ed. Routledge.
- Armatys J., Askham P. & Green M. (2009) Principles of valuation, Routledge.
- Sayce S., Smith J, Cooper R. & Venmore-Rowland P. (2006) Real estate appraisal – from value to worth, Blackwell Publishing.

LESSON CODE	QIR-E104	SEMESTER OF STUDY	1st
COURSE TITLE	REAL ESTATE ECONOMICS		
PREREQUISITE COURSES:			
TEACHERS:	F. MOUZAKIS		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON633/		

LEARNING RESULTS

Upon completion of the course, the student will be able to:

- knows the fundamental structural economic analysis of real estate markets and the interaction of sub-markets with each other.
- understands the rebalancing process in real estate markets and its dynamic characteristics.
- knows the cyclical process of real estate fluctuations and its macroeconomic causes and interpretation.
- knows the theoretical foundations of the financial area and understands its connection with the economics of real estate.
- understands the interaction of urban planning policy with real estate markets and investments.
- knows the evolution of quantitative theoretical standards and their application in practice for commercial and residential real estate markets.
- be able to develop quantitative models based on real estate theory on a case-by-case basis and to generate forecasts.

The course is developed in 13 weekly lessons.

The numbering refers to the corresponding week of the course.

1. Equilibrium of real estate markets and the use of models
2. Market structures
3. The interaction of real estate markets
4. Measurement of the real estate market I
5. Measurement of the real estate market II
6. Macroeconomics and property market cycles

7. Economics of space and real estate markets
8. Introduction to urban planning theory
9. Theoretical patterns of investment property purchases I
10. Theoretical patterns of investment property purchases II
11. Theoretical patterns of residential purchases
12. Value indices and hedonistic residential models
13. Review and applications

Student evaluation methods

Proposal 1	Written exams (progress and final exam) (mandatory) (65%)
Proposition 2	Semester Work (mandatory) (35%)

RECOMMENDED BIBLIOGRAPHY

- Geltner D. and Miller NG (2010) *Real Estate, Real Estate Values*, edited by Merikas A., published by Papazisis.
- Geltner D. and Miller NG (2001) *Commercial Real Estate Analysis and Investments*, South-Western.
- Ball M., Lizieri C. and MacGregor BD (1998) *The Economics of Commercial Property Markets*, Routledge.
- McKenzie DJ, Betts RM and Jensen CA (2011) *Essentials of Real Estate Economics*, 6th Edition, Cengage Learning.
- DiPasquale D. and Wheaton WC (1996), *Urban Economics and Real Estate Markets*.
- *Real Estate Issues series* – RICS Foundation, Blackwell Publishing.

LESSON CODE	QIR-M101	SEMESTER OF STUDY	1st
COURSE TITLE	MATHEMATICS		
PREREQUISITE COURSES:			
TEACHERS:	E. MELAS		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON585/		
LEARNING RESULTS			
Upon completion of the course, the student will be able to:			
<ul style="list-style-type: none">understand the logic of the models that exist for estimating the value of real estateunderstand the mathematical concepts and mathematical tools necessary to build real estate valuation modelsuse real data and with existing models to estimate the value of real estate using MATLAB software to apply the models for real estate valuation with real data.			
<div>The course is developed in 13 weekly lessons. The numbering refers to the corresponding week of the course.</div>			
<div>1. Matrices. Types of Matrices. Acts of Matrices.</div> <div>2. Determinants. Properties of Determinants. Inverse Matrix.</div> <div>3. Linear Systems. Solving Linear Systems with the Inverse Matrix method and the Cramer’s Rule</div> <div>4. Solving Linear Systems with the Gauss and Gauss-Jordan method.</div> <div>5. Introduction to Real Vector Spaces. Fundamental concepts in real Vector Spaces.</div> <div>6. The four Fundamental Vector Spaces of a Matrix.</div> <div>7. Projection Matrix. Line and plane of Least Squares.</div> <div>8. Eigenvalues and Eigenvectors of a Matrix.</div> <div>9. Functions of Many Variables. Derivative of a Function of Many Variables.</div> <div>10. Optimization of Multivariable Functions without Constraints.</div> <div>11. Least Squares Line and Least Squares (Hyper)plane. Examples.</div> <div>12. Optimization of Multivariable Functions with Constraints.</div> <div>13. Applications in MATLAB</div>			
Student evaluation methods			
Proposal 1	Written exams (final exam) (55%)		
Proposition 2	Written exams (progress) (30%)		
Proposition 3	Written assignments (15%)		

RECOMMENDED BIBLIOGRAPHY

- 1) Strang, Gilbert. *Introduction to Linear Algebra*. 5th ed. 2016. *Wellesley-Cambridge Press*. ISBN: 9780980232776.
- 2) Strang, Gilbert. *Linear Algebra and Learning from Data*. 2019. *Wellesley-Cambridge Press*. ISBN: 9780692196380.
- 3) Strang, Gilbert. *Linear Algebra for Everyone*. 2020. *Wellesley-Cambridge Press*. ISBN: 9781733146630.
- 4) Strang, Gilbert. *Differential Equations and Linear Algebra*. 2014. *Wellesley-Cambridge Press*. ISBN: 9780980232790.
- 5) Strang, Gilbert. https://ocw.mit.edu/courses/res-18-010-a-2020-vision-of-linear-algebra-spring-2020/13c014d45cb504519389d6640e673ba4_ZoomNotes_18-010.pdf
- 6) Hass, Heil and Weir Thomas' *Calculus* Pearson 2017

LESSON CODE	QIR-S101	SEMESTER OF STUDY	1st
COURSE TITLE	BUSINESS STATISTICS I		
PREREQUISITE COURSES:	NO		
TEACHERS:	I. BASSIAKOS		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON586/		

LEARNING RESULTS

Upon completion of the course, the student will be able to:

- draw inferences about parameters of unknown populations through known random samples
- to apply statistical methods to solve economic problems
- design and perform (statistical) hypothesis testing
- to construct confidence intervals of population parameters

The course is developed in 13 weekly lessons.

The numbering refers to the corresponding week of the course.

1. First lecture: Introduction
 - 1.1. Types of data and variables & Descriptive Statistics
 - 1.2. Possibilities
 - 1.2.1. Definitions
 - 1.2.2. Properties
2. Second lecture: Exercises
3. Third lecture: Random variables and their distributions
 - 3.1. Definitions
 - 3.2. Properties of distributions
 - 3.3. Moments
4. Fourth lecture: Exercises
5. Fifth lecture: Examples of Distributions of Discrete Random Variables
 - 5.1. Bernoulli distribution
 - 5.2. Binomial distribution
 - 5.3. Hypergeometric distribution
 - 5.4. Poisson distribution
 - 5.5. Geometric distribution
6. Sixth lecture: Examples of Distributions of Continuous Random Variables
 - 6.1. Uniform distribution
 - 6.2. Exponential distribution
 - 6.3. Gamma distribution
 - 6.4. Normal distribution
7. Seventh lecture: sampling distributions
 - 7.1. Standard Normal Distribution
 - 7.2. Student's distribution (Student's t)
 - 7.3. The chi-square distribution

- 7.4. The F distribution (Snedecor's F)
8. Eighth lecture: Exercises
9. Ninth Lecture: Hypothesis Tests and Confidence Intervals
 - 9.1. Introduction to hypothesis testing
 - 9.2. Controls and confidence intervals for the mean value
 - 9.3. Controls and confidence intervals for variance
 - 9.4. Tests and confidence intervals for the percentage
10. Lecture Ten: Hypothesis Tests and Confidence Intervals (continued)
 - 10.1. Tests and confidence intervals for the ratio of variances
 - 10.2. Tests and confidence intervals for the difference in means
 - 10.3. Tests and confidence intervals for the difference in percentages
11. Eleventh lecture: Exercises
12. Twelfth lecture: Analysis of variance
 - 12.1. One-factor analysis of variance
 - 12.2. Two-way analysis of variance (no interaction)
 - 12.3. Two-way analysis of variance (with interaction)
13. Thirteenth lecture: Exercises

Student evaluation methods

Proposal 1	Written exams (progress and final exam) (mandatory) (100%)
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RECOMMENDED BIBLIOGRAPHY

- Richard J. Larsen & Morris L. Marx, *Introduction to Mathematical Statistics and its Application*, Prentice Hall, 4th Edition, 2006.
- AT Adams, PM Booth, DC Bowie, DS Freeth, *Investment Mathematics*, Wiley, 2003.
- P. Zairi, *Statistical Methodology*, Kritiki Publications, Athens

SEMESTER 2

LESSON CODE	QIR-R203	SEMESTER OF STUDY	2nd
COURSE TITLE	REAL ESTATE INVESTMENT ANALYSIS		
PREREQUISITE COURSES:			
TEACHERS:	F. MOUZAKIS		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON691/		

LEARNING RESULTS

Upon completion of the course, the student will be able to:

- know the historical development of the banking system, real estate financing and Real Estate Investment Corporations in Greece.
- understand the impact of international investments on the real estate portfolio.
- understand alternative methodologies for real estate market forecasting and quality control.
- know the development of systemic approaches and the use of panel element methods in structural models of real estate markets.
- understand modern approaches to the economic significance of urban planning policy.
- know the behavioral dimension of real estate investments and the methodology with which quantitative research approaches them.
- understand the logic of applying investment theory to practice.

The course is developed in 13 weekly lessons.

The numbering refers to the corresponding week of the course.

1. Review of the use of financial methods in real estate valuation
2. Banks, Real Estate Lending in Greece and AEEAP
3. Investment in international real estate.
4. Real estate market forecast
5. The use of partial correction models (ECM) in real estate
6. Valuation of systems of equations in real estate
7. Urban planning and economic development
8. The behavioral dimension of real estate investment
9. Evaluation of hedonistic residential models
10. Evaluation of hedonic residential models
11. Theoretical patterns of residential purchases
12. Application of investment theory in practice
13. Presentation of the works

Student evaluation methods

Proposal 1	Written exams (65%)
Proposition 2	Semester Thesis and presentation (mandatory) (35%)

RECOMMENDED BIBLIOGRAPHY

- Adams A., Booth P., Bowie D. and Freeth D. (2003) *Investment Mathematics*, Wiley.
- Brown G. and Matysiak G. (2000) *Real Estate Investment*, Financial Times – Prentice Hall.
- Brueggeman WB & Fisher JD (2011) *Real Estate Finance and Investments*, 14th edition, McGraw-Hill Irwin.
- Geltner D. and Miller NG (2010) *Real Estate Real Estate Values*, edited by Merikas A., published by Papazisis.
- Geltner D. and Miller NG (2001) *Commercial Real Estate Analysis and Investments*, South-Western.
- Ball M., Lizieri C. and MacGregor BD (1998) *The Economics of Commercial Property Markets*, Routledge.

- McKenzie DJ, Betts RM and Jensen CA (2011) *Essentials of Real Estate Economics*, 6th Edition, Cengage Learning.
- DiPasquale D. and Wheaton WC (1996), *Urban Economics and Real Estate Markets*.
- *Real Estate Issues series – RICS Foundation*, Blackwell Publishing.
- Hoesli M. & Macgregor BD (2000) *Property Investment*, Longman.
- Wiedemer JP & Goeters JE (2003) *Real Estate Investment*, Thomson South-Western.

LESSON CODE	QIR-R204	SEMESTER OF STUDY	2nd
COURSE TITLE	REAL ESTATE DEVELOPMENT-ELEMENTS OF REAL ESTATE LAW		
PREREQUISITE COURSES:			
TEACHERS:	F. MOUZAKIS		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON692/		
LEARNING RESULTS			
Upon completion of the course, the student will be able to:			
<ul style="list-style-type: none">• know the purpose, goals, and means for real estate development.• understand the analytical methods available to complete a modern proposal for development.• select critically from alternative approaches to proceed with application on a case-by-case basis.• know the dimensions of business risk and the financing of development projects.• understand how the development proposal must be flexed/adapted to address institutional constraints and identify win-win solutions.• prepare a complete proposal for development according to modern standards.			
<div>The course is developed in 13 weekly lessons. The numbering refers to the corresponding week of the course.</div>			
<div>1. The relationship of the construction industry to real estate markets.</div> <div>2. The development of the construction sector in Greece.</div> <div>3. Factors influencing the decision to develop.</div> <div>4. Introduction to the evaluation of development plans.</div> <div>5. Alternative analytical approaches.</div> <div>6. Real estate development risk</div> <div>7. Financing of real estate development.</div> <div>8. Real estate development joint ventures.</div> <div>9. Town planning, development activity and building restrictions.</div> <div>10. Modern trends in real estate development.</div> <div>11. Overview of real development examples.</div> <div>12. Presentation of projects I</div> <div>13. Presentation of projects II</div>			
Student evaluation methods			
Proposal 1	Individual semester assignment (mandatory) submitted in text (65%) and presentation in class (35%)		
RECOMMENDED BIBLIOGRAPHY			
<ul style="list-style-type: none">• Brett, M (1997) Money and Property. London: Estates Gazette (2nd ed.)• Guy S. and Henneberry J. (2002) Development and Developers, Ed. , Real Estate Issues, Blackwell Publishing - RICS Foundation.• Isaac D., O'Leary J. & Daley M. (2016) Property Development: Appraisal and Finance (Building and Surveying Series), 2nd Ed., Palgrave Macmillan.• Millington, AF (2000) Property Development. London: Estates Gazette.			

- Reed R., Sims S. and Cadman D (2015) Property Development, 6th Edition, Routledge – Taylor & Francis Group.
- Suires G. and Jeykens E. (2015) International Approaches to Real Estate Development, edited by, Routledge – Taylor & Francis Group.
- Geltner D. and Miller NG (2010) Real Estate, Real Estate Values, edited by Merikas A., published by Papazisis.
- Geltner D. and Miller NG (2001) Commercial Real Estate Analysis and Investments, South-Western.

LESSON CODE	QIR-R201	SEMESTER OF STUDY	2nd
COURSE TITLE	REAL ESTATE INVESTMENT AND FINANCE		
PREREQUISITE COURSES:			
TEACHERS:	F. MOUZAKIS		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON634/		

LEARNING RESULTS

Upon completion of the course, the student will be able to:

- have an in-depth understanding of real estate purchase and investment valuation techniques, including closed form and cash flow analytical approaches.
- Be familiar with commercially available historical value measurement methods and the complications they present in implementation.
- understand the concept of real estate investment risk and can make a calculation under various circumstances.
- understand the impact on portfolio risk arising from real estate and know methods to manage it.
- know the alternative possibilities of bank lending for real estate investments.
- know the alternative forms of investment in real estate (direct or indirect).

The course is developed in 13 weekly lessons.

The numbering refers to the corresponding week of the course.

1. Quantitative finance and real estate
2. Closed form estimation
3. Valuation of real estate investments and performance measurement
4. Measurement and evaluation of real estate investment returns
5. On the risk of real estate investments
6. Portfolio risk measurement
7. Bank lending for real estate investments
8. Property portfolio management
9. The role of real estate in the wider portfolio
10. Corporate forms of investment in real estate
11. Corporate forms of investment in real estate
12. Real Estate Investment Trusts
13. Review and applications

Student evaluation methods

Proposal 1	Written exams (progress and final exam) (mandatory) (65%)
Proposition 2	Semester Work (mandatory) (35%)

RECOMMENDED BIBLIOGRAPHY

- Adams A., Booth P., Bowie D. and Freeth D. (2003) Investment Mathematics, Wiley.
- Brown G. and Matysiak G. (2000) Real Estate Investment, Financial Times – Prentice Hall.
- Brueggeman WB & Fisher JD (2011) Real Estate Finance and Investments, 14th edition, McGraw-Hill Irwin.
- Geltner D. and Miller NG (2010) Real Estate Real Estate Values, edited by Merikas A., published by Papazisis.
- Geltner D. and Miller NG (2001) Commercial Real Estate Analysis and Investments, South-Western.
- Hoesli M. & Macgregor BD (2000) Property Investment, Longman.

- Wiedemer JP & Goeters JE (2003) Real Estate Investment, Thomson South-Western.

LESSON CODE	QIR-S201	SEMESTER OF STUDY	2nd
COURSE TITLE	BUSINESS STATISTICS II		
PREREQUISITE COURSES:			
TEACHERS:	D. KYRIAKOPOULOU, F. MOUZAKIS		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON623/		

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Upon completion of the course, the student will be able to:

- search, analyzes and synthesize data and information, using the necessary technologies
- utilize decision making
- work autonomously.
- work in an international environment
- work in an interdisciplinary environment
- generate new research ideas
- promote the free, creative, and inductive thinking

**The course is developed in 13 weekly lessons.
The numbering refers to the corresponding week of the course.**

- Simple linear regression
- Assessment and properties
- Confidence intervals and hypothesis testing, analysis of variance
- Residue criteria and hypothesis testing
- Forecasting
- Multiple linear regression
- Linear regression in practice.
- Correctness checks – application
- Autocorrelation and real estate models
- Dynamic real estate models
- Econometric applications in real estate I
- Econometric applications in real estate II
- Review

Student evaluation methods

Proposal 1	Written exams for part A (mandatory) (50%)
Proposition 2	Semester Assignment for part B (mandatory) (50%)

RECOMMENDED BIBLIOGRAPHY

- Gujarati, D. (2003) Basic Econometrics, edition 4/e, McGraw – Hill (now a 5/3 2009 is also available).
- Hill RC, Griffiths WE and Lim GC (2008) Principles of Econometrics, Wiley.
- Gujarati DN (2003) Student Solutions Manual for use with Basic Econometrics, McGraw Hill, fourth edition.
- Brooks, C. (2002) Introductory Econometrics for Finance.
- Brown, GR & Matysiak, GA (2000) Real Estate Investment - A Capital Market Approach, Prentice Hall, Financial Times.
- Larsen, RJ & Marx, ML An Introduction to Mathematical Statistics and its Applications, Pearson Prentice Hall.
- Adams, AT, Booth, PM, Bowie, DC, Robertson, H. & Freeth, DS Investment Mathematics, Wiley.
- Kleinbaum, DG & Kupper, LL Applied Regression Analysis and other Multivariate Methods, Duxbury Press.
- Zairis P.E.M. Statistical Methodology, Kritiki Publications, Athens.

LESSON CODE	QIR-E204	SEMESTER OF STUDY	2o
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COURSE TITLE	ANALYSIS OF FINANCIAL STATEMENTS – ADMINISTRATIVE ACCOUNTING
PREREQUISITE COURSES:	
TEACHERS:	T. KOUNADEAS
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON785/

LEARNING RESULTS

The course is an introduction to Management Accounting and financial statement analysis. The course material aims at familiarizing students with the concept of cost and its distinctions and understanding its use in the basic functions of Management. Special emphasis is placed on understanding the elements of production costs, costs produced, and costs sold, with the ultimate goal of preparing and understanding the Statement of Profit and Loss of an economic unit. In addition, the concept and method of preparing budgets are presented. Finally, the basic Accounting Statements are presented, and the method of their preparation is analyzed.

Upon completion of the course, the student will be able to:

- acquire basic knowledge of costing - various forms of costs (direct and indirect costs, variable and fixed costs),
- plans and manages projects,
- calculate costs produced and sold and the elements of production costs and the allocation of costs between departments,
- become familiar with the issues of preparation, monitoring and control of the overall budget of businesses as well as the analysis of discrepancies arising from the comparison of budgets with accounts both in terms of income and expenses,
- know the methodology that should be followed for short-term decision-making based on cost information as well as for the analysis of cost-volume-profit relationships,
- recognize and be able to prepare the basic accounting statements.

**The course is developed in 13 weekly lessons.
The numbering refers to the corresponding week of the course.**

1. Introduction to Financial Statements
2. Balance sheet
3. Results Statement
4. Statement of Cash Flows
5. Statement of Changes in Equity
6. Analysis of Financial Statements
7. Basic concepts of Administrative Accounting - Costing
8. Costing primary data
9. Custom Production Costing
10. Continuous Production Costing.
11. Costing Systems
12. Decision making in the short term
13. Budgets

STUDENT EVALUATION

The course is assessed based on an individual assignment (15% homework and 15% oral presentation) and grade 1/2 (progress test + final written exam) (70%). The assignment aims to familiarize the students with the issues presented during the lectures. Final written exams include multiple choice questions, development, and exercises. Students are assessed for understanding of key concepts, critical thinking, and analysis. The evaluation criteria are communicated to the students through the detailed outline of the course posted on the course page.

RECOMMENDED BIBLIOGRAPHY

- A. Ballas, D. Hevas and O. Vlismas, "Cost Accounting", Benou Publications, p2020
- Vassiliou D., Ireioti N., Baliou D. (2019), *Principles of Financial Accounting – Financial Analysis and Decision Making*, Rosili

Publications

- *Dimitras, A., Ballas, A., Management Accounting, Publications: Gutenberg, 2010*
- *N. Niarchos (2004) "Financial Analysis of Accounting Statements" 7th edition, Stamouli Publications SA.*

SUMMER PROGRAM

LESSON CODE	QIR-S301	SEMESTER OF STUDY	3rd
COURSE TITLE	QUANTITATIVE METHODS FOR BUSINESS ANALYTICS		
PREREQUISITE COURSES:	NO		
TEACHERS:	I. BASSIAKOS, F. MOUZAKIS		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON686/		

LEARNING RESULTS

Upon completion of the course, the student will be able to:

- search, analyze and synthesize data and information, using the necessary technologies
- utilize decision making
- work autonomously.
- work in an international environment
- work in an interdisciplinary environment
- generate new research ideas
- promote of free, creative, and inductive thinking

**The course is developed in 12 weekly lessons.
The numbering refers to the corresponding week of the course.**

1. Types of variables
2. Development of questionnaires
3. Simple random sampling
4. Stratified random sampling
 - 4.1. General method
 - 4.2. proportional distribution of the sample in the layers
5. Stratified random sampling (optimal distribution of the sample in the strata)
6. Sample size calculation (with a given level of precision)
7. Modeling in Operations Research & Introduction to Linear Programming
8. Linear Programming
9. Linear Programming: Application with Excel
10. Dynamic Programming
11. Decision Theory
12. Game theory

Student evaluation methods

Proposal 1	Semester Assignment for part A (mandatory) (50%)
Proposition 2	Semester Assignment for part B (mandatory) (50%)

RECOMMENDED BIBLIOGRAPHY

- Poseidon Zairis, (1991) *Sampling Research Techniques*, Athens (self-published by the author)
- William Cochran, (1977) *Sampling Techniques*, 3rd edition, Wiley
- Leslie Kish, (1995), *Survey Sampling*, Wiley
- Nikolaos Farmakis, 2015, *Sampling and Applications*, Kallipos, Open Academic Editions, <https://repository.kallipos.gr/handle/11419/4840>
- Ypsilantis P. (2015) *Operations Research*, 5th edition, Propompos Publications.
- Kiener S., Maier-Scheubeck N., Obermaier R. & Weiß M. (2012) *Production Management*, 9th edition, Propompos Publications.
- Sherman R. (2015) *Business Intelligence Guidebook: From Data Integration to Analytics*, 1st Ed., Morgan Kaufmann, Elsevier Inc.
- Carter MW & Price CC (2001) *Operations Research: A Practical Introduction*, 1st ed., CRC Press.

- Srinivasan, G. (2010) *Operations Research: Principles and Applications*, 2nd ed., PHI Learning Private Limited, New Delhi.
- Fakinou D. & Oikonomou A. (2003) *Introduction to Operations Research*, Athens, Symmetria Publications.
- illier SF & Lieberman JG (1985) *Introduction to Operations Research*, Papazisi Publications.
- Taha AH (2018) *Introduction to Operations Research*, June, Tziolas.

LESSON CODE	QIR-L302	SEMESTER OF STUDY	Summer Program
COURSE TITLE	IT: PYTHON AND EXCEL		
TEACHERS:	G. RIGOPOULOS		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON822/		

LEARNING RESULTS

The course aims to equip students with all the fundamental knowledge of the Python programming language and how it can be used to solve computational problems. Also, to present advanced techniques in spreadsheets and use of the VBA (Visual Basic for Applications) programming language which can be used within spreadsheets (but also other MS Office applications) to solve complex problems. Students will be able to utilize the languages and techniques in a multitude of scientific fields, but in the specialization of Real Estate Investment & Estimation.

The course combines an extensive reference to the theoretical principles of software development and design with a broad reference to the ecosystem of each language and at the same time laboratory exercises.

Upon completion of the course, the student will be able to:

In terms of knowledge

- know and understand data structures and basic principles of programming computer systems
- knows the basics of the Python programming language and the VBA language and the program development environment of each
- know each language's ecosystem of packages and functions, and search for and find appropriate libraries and packages of each language for use in applications

In skill level

- has acquired programming skills in the Python programming language
- has acquired programming skills in the VBA programming language
- develops software applications with the Python programming language
- develops software applications with the VBA programming language
- solves computational problems using programming methods and the application of the Python programming language and the VBA language
- work on complex computational problems having developed analytical skills and synthetic thinking

At the skill level

uses Python, excel and VBA to develop programs to solve computational problems in Real Estate Investment & Estimation.

**The course is developed in 12 weekly lessons.
The numbering refers to the corresponding week of the course.**

1. Introduction to Python and the development environment
2. Variables and Data Types, Operators, Data Structures
3. Strings, Lists, Tuples, Dictionaries, Sets
4. Control Structures, Loops
5. Functions & Methods
6. Graphs / matplotlib
7. . Numerical calculation modules and packages (scipy/numpy)
8. Data analysis (pandas)
9. Conditional Formatting. Descriptive statistics using functions and add-ins. Descriptive statistics for subsets of data (functions SUMIF(s), COUNTIF(s), AVERAGEIF(s), SUMPRODUCT)

10. Excel as a database tool (HLOOKUP, INDEX, OFFSET functions). Visualization of information in diagrams of Excel
11. Introduction to Excel VBA (record macros, "communication" between VBA & Excel, msgbox, inputbox) and the Excel object model
12. Programming with VBA (if checks, loops, while, for, for each). Create a VBA form from the user with different objects and its use. Using the Power Pivot add-in. Using the Power Query add-in.

Student evaluation methods

Proposal	Semester Work (mandatory) (100%)
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RECOMMENDED BIBLIOGRAPHY

- 1) Tony Gaddis, *Getting Started with Python*, DaVinci Publishing, 2020
- 2) N. Avouris, M. Koukias, V. Paliouras, K. Sgarbas. *Python, Introduction to Computers*, University Press of Crete, 4th Edition, Heraklion 2018
- 3) Karolidis Dimitrios A., *Learn Python easily*, Avakas Publications, 2018
- 4) Kafes Manos, *Exploring Python*, Kleidaritmos Publications, 2017
- 5) Nikolaos Samaras, Konstantinos Tsimplidis, *The Python book*, Kritiki Publications, 2019
- 6) AB Downey, *Think in Python*, Keydaritmos Publications, Athens 2020
- 7) TR Padmanbhan. *Programming with Python*, Springer, Singapore, 2016
- 8) *Python eBooks from python.org*
- 9) Deitel, Paul J., Deitel, Harvey M., (2010). "Visual Basic 2010 Programming", M. Giourdas Publications.
- 10) John Walkenbach. (2010). *Microsoft Excel 2010 Programming Manual with VBA*, 1st ed./2011, ISBN:978-960-512-6278, CH. GIOURDA & SIA EE
- 11) Teacher notes

LESSON CODE	QIR-RM301	SEMESTER OF STUDY	SUMMER PROGRAM
COURSE TITLE	RESEARCH METHODS SEMINAR		
PREREQUISITE COURSES:	NO		
TEACHERS:	SP. MURTA		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/ECON829/		
LEARNING RESULTS			
Upon completion of the course, the student will be able to:			
<ul style="list-style-type: none">• knows directions and tools for conducting a scientific investigation in various research fields• is aware of the importance of research ethics• know modern methods for developing qualitative and quantitative surveys, forming samples, constructing questionnaires, testing questionnaires, conducting surveys, analyzing data and commenting on survey findings• distinguish and choose between alternative research methods depending on the type and nature of the problem he must deal with• understand the steps it will take to complete (and review) his/her research process• write a reflective report of a research project• design a presentation of a project using slides• generates new research ideas			
The course is developed in 12 weekly lessons. The numbering refers to the corresponding week of the course.			
<ol style="list-style-type: none">1. The purpose of the research2. Theory and research3. The meaning of the methodology			

4. Research proposal
5. Literature review
6. Research design
7. Research ethics
8. Data Design: Sampling
9. Data design: Data collection
10. Data analysis
11. Research Report
12. Process for publishing research papers

Student evaluation methods

Proposal 1	Semester Work (mandatory) (50%)
Proposition 2	Presentation of Work (mandatory) (50%)

RECOMMENDED BIBLIOGRAPHY

- Mark NK Saunders, Philip Lewis and Adrian Thornhill, (2015) *Research Methods for Business Students*, 7th edition, Pearson
- William MK Trochim, James P. Donnelly, (2006) *The Research Methods Knowledge Base*, 3rd edition, Atomic Dog
- Kerry E. Howell, (2012) *An Introduction to the Philosophy of Methodology*, 1st edition, SAGE Publications Ltd
- William Cochran, (1977) *Sampling Techniques*, 3rd edition, Wiley
- Louis Cohen, Lawrence Manion and Keith Morrison, (2000) *Educational Research Methodology*, Metaichmio
- Ioannis Halikias, (2017) *Statistics - Analysis Methods for Business Decisions*, Rosili Publications
- Poseidon Zairis, (1991) *Sampling Research Techniques*, Athens (self-published by the author)

APPENDIX B

LIST OF TEACHERS WITH ELECTRONIC ADDRESSES

Full name	Known object	E-mail
TEACHERS FACULTY MEMBERS		
Katsikis Vasilios	Mathematics-Informatics	vaskatsikis@econ.uoa.gr
Kyriakopoulou Dimitra	Econometrics	dimkyriak@econ.uoa.gr
Kotsios Stelios	Mathematics-Informatics	skotsios@econ.uoa.gr
Basiakos Ioannis	Applied Statistics	ybassiak@econ.uoa.gr
Nikoleris Theodoros	Quantitative Methods with an emphasis on Statistics	tnicoleris@econ.uoa.gr
Petraki Evangelia	Informatics	evpetra@econ.uoa.gr
Rigopoulos Georgios	Informatics of economic Sciences	rigopgeo@econ.uoa.gr
Roubis Efthymios	Maritime Economics	eroumpis@PP.uoa.gr
Full name	Known object	E-mail
EXTERNAL SCIENTIFIC PARTNERS		
Vavoura Hariklia	Economics	cvavoura@econ.uoa.gr
Gatis Konstantinos	Real estate estimation	kostasgatis@gmail.com
Kamouzis Ilias	Applied mathematics	ecamouzis@ba.uoa.gr
Kounadeas Theodoros	Managerial accounting	tkounadeas@econ.uoa.gr
Lefkaditis Konstantinos	Risk Management	klefkaditis@econ.uoa.gr
Melas Evangelos	Applied mathematics	evanmelas@gmail.com
Mouzakis Fotios	Real Estate Finance	f.mouzakis@frynon.com
Savvakis George	Financial analysis	gsavvakis@econ.uoa.gr
Mourtas Spyridon	Intelligent Systems and Applications in Finance	spirosmourtas@gmail.com
Stratis Konstantinos	Data analysis	kstratis@econ.uoa.gr