ΟΙΚΟΝΟΜΙΚΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΑΘΗΝΩΝ

ATHENS UNIVERSITY OF ECONOMICS AND BUSINESS

List of Courses Offered in English

Academic Year 2025-2026

IKY

Erasmus+

Erasmus+

Academic Year 2025-2026

1. All the Erasmus incoming students are kindly requested to take into consideration that the above-mentioned dates MUST be respected according to the Erasmus student Charter ***Erasmus students should comply with internal regulations of the host institution.*** As a result, they should not reserve their return tickets for earlier dates.

2. **Exceptional Changes to the Study Programme**

   Changes to the study programme should be exceptional, as the three parties have already agreed on a group of educational components that will be taken abroad, based on the course catalogue that the Receiving Institution has committed to publish well in advance of the mobility period and to update regularly.

   Any party can request changes to the study programme within two weeks after the start of each semester. These changes should be agreed by all parties as soon as possible within two-weeks following.

3. Attendance at each course is compulsory, after submission of the final Learning Agreement. **Four justified absences** from each course are accepted. The same applies for the Greek Language course, which is offered free of charge at each semester.

INTERNATIONAL RELATIONS OFFICE
76 PATISSION STR, ATHENS 104 34, GREECE
Tel:+ 30 210-8203 188, 250, 270
http://www.aueb.gr

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SCHOOL OF BUSINESS

DEPARTMENT OF MANAGEMENT SCIENCE AND TECHNOLOGY

FALL SEMESTER

Innovation in Organizations: Knowledge, Creativity and the Processes of Innovation

Code: 9037

Instructor: Klas Eric Soderquist

ECTS Credits: 6

Communication with the Instructor

soderq@aueb.gr

Knowledge, Creativity and the Processes of Innovation

- **Type of course (compulsory, optional)**

Optional.

- **Level of course** (e.g., first, second or third cycle; sub-level if applicable)

Advanced

- **Learning outcomes**

Today, all kinds of organizations and businesses must have the ability of constantly innovating and turning environmental uncertainty into exploitable advantages. In this context, demands for creative thinking, and better use of organizational knowledge for enhanced innovation performance and innovation output are raised on employees at all levels. This course provides an introductory overview of innovation, innovation processes and innovation management, placing particular emphasis on the underlying phenomena of knowledge and creativity. The objective is to improve the students' understanding the nature and dynamics of organizational knowledge, the prerequisites and processes of organizational creativity, and how knowledge and creativity relate to innovation.

Innovation in itself is central to the course. Various forms of innovation that can be pursued by organizations will be explained, and the students will develop frameworks for analyzing how different organizational structures, processes and management methods can be used for implementing and managing innovation. The course aims at opening up the black box of innovation and equipping the students with concepts and frameworks that will help them to apprehend and better manage innovation.

- **Mode of delivery (face-to-face, distance learning)**

Face-to face teaching, individual student work and student presentations. Three (3) effective face-to-face teaching hours per week.

- **Prerequisites and co-requisites**

Introductory courses in Management and/or Business Strategy and/or Organizational Behaviour are recommended.

Recommended optional programme components

Independent research and use of bibliographical sources to synthesize material and analyze specific topics related to innovation.

- **Course contents**

INTRODUCTION TO THE COURSE (SESSION 1)

- Structure and Requirements
- Overview of the three subject topics – Innovation, Creativity and Knowledge.

INNOVATION (SESSIONS 2-3 & 5 & 7)

- What is innovation and where does it happen? Definitions, Terminology, Types and Forms of Innovation,
- Determinants of Creativity and Innovation,
- Insights from Innovation Leaders. Open Innovation,
- Drivers for innovation,
- Innovation management frameworks, the new product and service development process, brining innovation to the market,
- Opportunities for Innovation: Ten Types of Innovation.

BASICS OF CREATIVITY AND KNOWLEDGE AND THEIR MANAGEMENT (SESSION 4)

- Overview of creativity as a concept – Core elements, Myths & Truths,
- The language of knowledge.

INTERMEDIARY PRESENTATIONS (SESSION 6)

FURTHER ON CREATIVITY (SESSION 8)

- Creative Strategizing - Strategic management frameworks and their relation to creativity and innovation,
- Creativity Tools - Developing the creative potential of human resources,
- Blockages to innovation and creativity.

FURTHER ON KNOWLEDGE (SESSIONS 9-10)

- Forms of organizational knowledge,
- The Knowledge Effect – Valuing Intellectual Capital,
- Knowledge Management – What and How,
- Tools for Knowledge Management,
- In-Term Exam.

FINAL PRESENTATIONS (SESSIONS 11-12)

- **Recommended or required reading**

📖 Textbooks:

Textbooks are recommended mostly for the part on innovation management. One of the following textbooks is a useful background reading for the entire course:

- Keely, L. et al (2013), *Ten Types of Innovation: The Discipline of Building Breakthroughs*, John Wiley.
- Schilling, M. (2016), *Strategic Management of Technological Innovation*, 5th Edition, McGraw-Hill. Earlier editions are also still relevant!
- The OSLO MANUAL, OECD, chapters 2 and 3.

📖 Other important books in the innovation field:

- Burgelman, R.A. Christensen, C.M. & Wheelwright, S.C. (2008), *Strategic Management of Technology and Innovation*, 5th Edition, McGraw-Hill.
- Chesbrough, H.W. (2006) *Open Innovation The New Imperative for Creating and Profiting from Technology*, Harvard Business School Publishing.

- Christensen, C.M. (1997), *The Innovators Dilemma*, Harvard Business School Press.
- Christensen, C.M. & Raynor, M.E., (2003), *The Innovators Solution*, Harvard Business School Press.

📖 Highly rated books on Knowledge and Creativity

- Milton, N. & Lambe, P. (2016), *The Knowledge Manager's Handbook*, Kogan Page Publishers.
- Easterby-Smith M and Lyles M. (eds), (2011), *Handbook of Organizational Learning and Knowledge Management*, 2nd Edition, Wiley.
- Michalko, M. (2001), *Cracking Creativity: The Secrets of Creative Genius for Business and Beyond*, Ten Speed Press.

📖 Articles

In the following, articles are listed for each of the three different parts of the course. Two articles in each part are compulsory readings for all students. These articles are listed first in bold. Another three articles are listed per part, as an indication of important readings depending on the subject of the dissertation selected by the students.

INNOVATION

– Crossan, M.M. & Apaydin, M (2010) "A Multi-Dimensional Framework of Organizational Innovation: A Systematic Review of the Literature", *Journal of Management Studies*, 47(6): 1154-1191.

– Dyer, J.H., Gregersen, H.B. & Christensen, C.M. (2009) "The Innovator's DNA", *Harvard Business Review,* December: 61-67.

– Christensen, C.M., Raynor, M. & McDonald, R. (2015), "What is Disruptive Innovation", Harvard Business Review, Dec ember: 44-53.

– Huston, L. & Sakkab, N. (2006) "Connect and Develop: Inside Procter & Gamble's New Model for Innovation", *Harvard Business Review*, March: 58-66.

– West, J. & Bogers, M. (2013), "Leveraging external sources of innovation: A review of research on open innovation", *Journal of Product Innovation Management*, 31(4): 814-831.

CREATIVITY

– Herrmann, D. & Felfe, J. (2014), "Effects of Leadership Style, Creativity Technique and Personal Initiative on Employee Creativity", *British Journal of Management*, 25(2): 209-227.

– Florida, R. & Goodnight, J. (2005), "Managing for Creativity", *Harvard Business Review*, July-August: 124-131.

– Amabile, T.M. et. al. (2002) "Creativity under the Gun", *Harvard Business Review*, August: 52-61.

– Kelley, T. & Kelley, D. (2012), "Reclaim Your Creative Confidence", *Harvard Business Review*, December: 115-118.

– Sutton, R.I. (2001), "The Weird Rules of Creativity", *Harvard Business Review*, September: 94-103.

KNOWLEDGE

– Nonaka I, von Krogh, G. & Voelpel, S., (2006), "Organizational Knowledge Creation Theory: Evolutionary Paths and Future Advances", *Organization Studies* 27(8): 1179-1208.

– Johns, T. & Gratton, L. (2013), "The Third Wave of Virtual Work", *Harvard Business Review, January-February*: 66-73.

– Huang, P., Tafti, A., & Mithas, S. (2018). The secret to successful knowledge seeding. MIT Sloan Management Review, 59(3), 10-13.

– Soderquist, K.E. (2006), "Organizing Knowledge Management and Dissemination in New Product Development: Lessons from 12 Global Corporations", *Long Range Planning*, 39(5): 497-523.

- **Planned learning activities and teaching methods**

Nine lectures and three presentation sessions. Lectures, reading assignments, exercises, games, individual student work and student presentations.

- **Assessment methods assessment methods and criteria**

70% of the grade is based on a **dissertation** (60% written report, 10% presentation), which can be done by 1 – 3 students. It is recommended that students do it in pairs of two.

30% of the grade is based on an individual **In-Term Exam**.

Two individual **reading assignments** are also required to pass the course. These are not graded, only "Pass" or "Fail & Resubmit" to enable Pass. The reading assignments relate to the following three articles (also among the **bold** above):

INNOVATION

Crossan, M.M. & Apaydin, M (2010) "A Multi-Dimensional Framework of Organizational Innovation: A Systematic Review of the Literature", *Journal of Management Studies*, 47(6): 1154-1191.

CREATIVITY

Herrmann, D. & Felfe, J. (2014), "Effects of Leadership Style, Creativity Technique and Personal Initiative on Employee Creativity", *British Journal of Management*, 25(2): 209-227.

KNOWLEDGE

Nonaka I, von Krogh, G. & Voelpel, S., (2006), "Organizational Knowledge Creation Theory: Evolutionary Paths and Future Advances", *Organization Studies* 27(8):1179-1208.

Each student must do the **first** reading assignment on the **Innovation article by Crossan & Apaydin**. Then, each student selects **one of the other two papers** for their **second** reading assignment. More details about the reading assignment (2 articles) will be handed out separately.

The **In-Term Exam** will take place in session 10, approximately 2 weeks before the Christmas break.

Concerning the **dissertation**, it is recommended that it is done in pairs of two students. Each student must explicitly indicate his/her individual contribution to the whole and the presentation must be shared between the students.

Students will select topic area as soon as possible (emphasis on Innovation *or* Creativity *or* Knowledge – integrated subjects are also encouraged). The final dissertation must contain a synthesis of various literatures on the selected subject (topic area and specific theme within selected topic area), and an integration of examples from practice through the study of company/organization cases and company/organization websites. Students are also encouraged to enrich their dissertation with primary data, e.g., from interviews with managers or other relevant actors in Greece or in their home country of studies.

A template for the dissertation will be handed out at the beginning of the class. Indicatively, the dissertation should be about 6.500 words (between 6.000 and 7.000 words).

It is estimated that the dissertation will require at least another three (3) effective study hours per week and student.

- **Language of instruction**

English

- **Work placement(s)** N.A.

Managerial Decision Making

Code: 9047

Instructor: Manolis Kritikos

ECTS credits: 6

Level: Advanced

Communication with the Instructor
kmn@aueb.gr

Course Outline
This course outline describes the course Managerial Decision Making. It has been organized into the following sections:
1. Basic Information about the Course
2. Aim of the course
3. Planned learning activities and teaching methods
4. Learning Outcomes
5. Reading List
6. Syllabus
7. Course Assessment.

Basic Information about the Course
Prerequisites: None
Teaching Methods: The class meets once a week

Course Objectives
The course introduces the student to the methodology of decision making, as well as to the major models used today. Decision making is one of the most important functions of management. The three major categories of models are covered: Linear and Integer Programming, Decision Analysis, and Simulation. In each unit, the student is exposed to a number of applications, and has the opportunity to apply his/her knowledge to a number of problems such as Transportation, Assignment and Network models. In addition to developing models, the student is exposed to a number of computer packages, most of them based on Excel, to use in order to solve the problems.

Planned Learning Activities and Teaching Methods

We cover the course material in lectures. Attending lectures is compulsory. This is the best way of being introduced to a topic. Self-study is a vital and significant part of studying for the course.

Learning Outcomes

Decision-Making is one of the most important functions of management. Today's business environment is characterized by high competition, constant changes, extensive globalization, large availability of data and information, and the huge penetration of information and telecommunications technology. In this environment, decision making is increasingly based on the use and analysis of data, through the development of "models", and the use of user-friendly, PC-based computer packages.

On completion of this course, students should be able to: to understand and formulate decision making problems, and to use the computer technology efficiently in order to make the best decision.

Reading List

Required Textbook

G.P.Prastacos, (2008), Managerial Decision Making Theory and Practice, Tsinghua University Press

Recommended Reading

N.Balakrishnan, B.Render, and R.M.Stair, Jr. (2013), Managerial Decision Modeling with Spreadsheets, Pearson Education Inc.

C.P.Bonini, W.H.Hausman and H.Bierman, (1997), Quantitative Analysis for Management, McGraw-Hill / Irwin

G.L.Nemhauser and L.A.Wolsey, (1999), Integer and Combinatorial Optimization, Wiley Interscience

W.L.Winston and S.C. Albright,(2002), Practical Management Science, South-Western College Pub.

Syllabus

Managerial Decision Making

Overview

The Fundamentals of Operations Research: Introduction to management Science; The methodology of Decision Making; Models in Managerial Decision Making

Linear Programming (LP): Introduction; Characteristics of LP Problems; Graphical solution of a LP problems; A Maximization Problem; a Minimization Problems; Problems General Formulation and Assumptions of LP problems
Sensitivity analysis in Linear Programming: Dual Prices in LP; Reduced costs in LP; Changes in the Objective Function's Coefficients; Changes in the Right Hand Sides (RHS) of the Constraints; Evaluation of a New Activity
Using Solver to Solve Linear Programming Problems: Introducing the model in Excel; Solving the Problem; Understanding and Analyzing the Solution – SOLVER Reports.
Integer Programming (IP): Introduction; Formulating IP Problems with Binary Variables; Formulating IP Problems; Solving IP problems; Solving Integer Programming Problems with SOLVER.
Implementing Management Science in Practice: Marketing and Sales problems; Production and Inventory problems; Networks and Transportation problems; Logistics and Supply Chain problems; Investments problems; Human Resources problems.
Decision Analysis and Precision Tree: Introduction; Criteria for Making Decision under Uncertainly; The Expected Value of Perfect Information; Decision Tree; Calculating the Risk Profile a Strategy; Sensitivity Analysis; Using Precision Tree to Solve Decision Analysis Problems.
Simulation: Introduction; Implementation of Simulation under Conditions of Uncertainty
Using Excel and @Risk in Simulation: Introduction; Simulation of Queuing Systems; Simulation of an Inventory System; Analysis of Simulation Results.

Course Assessment

The following notes offer guidance on how you will be assessed for the course. The final grade will be based on homework, classroom participation, an individual essay, case studies and a final exam. The breakdown of the final grade will be approximately as follows:

20% homework and classroom participation
30% individual essay and group case studies
50% final written exam

Modern Enterprise Information Systems

Code: 9049

Instructor: George Ioannou

ECTS credits: 6

Instructor: George Ioannou

Level: Advanced

Communication with the Instructor
ioannou@aueb.gr

Web: www.msl.aueb.gr/people.html

COURSE DESCRIPTION

Modern Enterprise Information Systems include all the transactional level platforms and integrated software applications that enable the capturing of company data within data bases in a structured and efficient way. The most typical such system is the ERP, which incorporates functionalities that cover all business tasks, from the procurement of materials to the collection of payments from customers, and from the issue of a production order to the delivery of consolidated shipments to the customers' warehouse, all within a single and totally integrated system. The specific course will address ERP in its whole, i.e., will cover all applications areas in enterprises of today and will also provide additional knowledge about systems that go beyond and complement ERP's transactions such as CRM, WMS, etc. Practical sessions on widely used ERP systems will be offered on top on theoretical and applied-knowledge lectures. Lab exercises, case studies and assignments will be the basis of grading in this course.

COURSE OBJECTIVES

Students will:

Analyze a business' enterprise activities, workflow and process to identify problems, weaknesses, strengths, threats, opportunities, stakeholders and entities interacting with the enterprise;
Propose reengineered enterprise processes that optimize the enterprise's performance;

Design integrated organizational structures and business processes that optimize the enterprise's performance, overcome problems and weaknesses of current processes;
Understand the scope of ERP systems and corporate motivation for implementing ERP;
Appreciate the challenge associated with implementing such large-scale systems and the dramatic impact these systems have on key business processes;
Gain an understanding of process integration inherent in ERP;
Solve optimization models for production planning and models for operations management;
Gain an appreciation of related concepts, technologies, and trends in ERP including forward, backward, and upward integration of the enterprise using supply chain management and customer relationship management;
Experience the Microsoft Office Excel, Microsoft Office Visio, Expert Choice and Microsoft Dynamics NAV software.

COURSE TOPICS

The course will cover the following topics:

Supply Chain Management Overview
Enterprise Resource Planning (ERP) Systems Overview
Optimization Models for Production Planning (Microsoft Office Excel)
Models for Operations Management (Microsoft Office Excel)
Business Process Reengineering (BPR) using Microsoft Office Visio
Multi-criteria Decision Making (The Analytic Hierarchy Process, AHP) using Expert Choice
Microsoft Dynamics NAV – An ERP System

COURSE METHODOLOGY

The goal of this course is to develop analytical and critical thinking skills for the development of integrative plans for enterprise-wide systems that optimize enterprise performance. Most class sessions will involve lecture and extensive discussion of ERP based on content contained in the textbooks, readings and cases. Students will be expected to make substantial contributions to the learning process through participation in class

discussion. In addition, they will be responsible for several individual assignments.
To pass this course students should:
Prepare: Spend as much time needed to study the assigned topics before coming to class;
Practice: Review and practice the lab exercises at their own pace;
Present: complete the homework assignments, come to class, and deliver their work to the instructor.

COURSE PLATFORM

Students will find course lectures, assignments, useful links etc. at the following links:
E-learning portal: https://edu.dmst.aueb.gr/
Management Science Support: http://www.msl.aueb.gr/msupport.html

COURSE MATERIAL

Hamilton S. *Managing your Supply Chain using Microsoft Navision*. New York: McGraw-Hill; 2004.
Hamilton S. *Maximizing your ERP System: A Practical Guide for Managers*. New York: McGraw-Hill; 2003.
Presentations (Lectures)

REQUIRED SOFTWARE

Microsoft Office Excel (to solve optimization models for production planning and operations management)
Microsoft Office Visio (business process reengineering)
Expert Choice (multi-criteria decision making - AHP)
Microsoft Dynamics NAV (ERP System)

ASSIGNMENTS

The assignments are designed to familiarize students with the major challenges involved in specifying, selecting and implementing ERP. Assignments include lab exercises and cases studies related to optimization models for production planning, models for operations management, business process reengineering methodology, analytic hierarchy process and Microsoft Dynamics NAV. Students will be responsible for individual assignments.

STUDENT RESPONSIBILITIES

This class requires a consistent and substantial week to week commitment on the part of the student. Students are expected to complete reading assignments prior to class and to participate actively in class discussion. Assignments should be emailed on the specified due date. Late work will receive no credit.

Class participation is measured by student's active involvement in discussion of the lab exercises and cases.

ACADEMIC INTEGRITY POLICY

In accordance with The Athens University of Economics and Business' Academic Regulations, cheating in any form will not be tolerated. This includes plagiarism or receiving inappropriate assistance on examination and/or assignments. Cheating is an extremely serious academic offence

TENTATIVE SCHEDULE

Topic	Sub-topic	Specialty
Introduction	ERP Systems Overview	Introduction to Enterprise Resource Planning Systems (ERPs) Architecture and Technical Specifications of ERPs Operational Issues and Modern ERPs Advantages of using ERPs in Modern Enterprise Critical Issues for a Successful ERP Integration Methodological Approach for choosing and Integrating ERPs
Maximizing your ERP System I	Supply Chain Management Overview	Logistics in Supply Chain Management Technology Structure Operations Network Designs Administration Optimization Models for Production and Operations

		Management
Maximizing your ERP System II	Material Requirement Planning	Needs for Material Planning Basic MRP Concepts Factor Affecting the Computation of MRP Objectives of MRP System Prerequisites and Assumptions of MRP Inputs to MRP MRP Outputs MRP Logic in Brief Manufacturing Resource Planning (MRP II) MRP Implementation How Can Industry Benefit from MRP?
Material Requirement Planning **(Lab Exercises)**		
Technology Platforms for ERP Systems		
Multi-criteria Decision Making	Analytic Hierarchy Process	Decision Hierarchy Preferences Synthesization Applications Decision Making using Expert Choice
	Lab Exercises	
	Assignment	Case Study
Managing your Supply chain using Microsoft Dynamics	**Lab Exercises**	Case Study
Managing your Supply Chain using Microsoft Dynamics NAV II	**Lab Exercises**	Case Study

Applied Software Engineering

Code: 9002

Instructor: Diomidis Spinellis

ECTS credits: 6

Level: Advanced

Communication with the Lecturer
dds@aueb.gr

Objective of the course (expected learning outcomes and competences to be acquired)
While most Information Systems and Computer Science courses traditionally deal with the development of new systems, in practice developers spend the largest part of their time in software life-cycle activities that follow the development phase. The objective of the course is to allow students to read and understand a system's software elements (code, structure, architecture). Having followed this course, students should be able to intelligently decide on how existing systems will be maintained, setup design and evolution strategies for legacy code, and prescribe the use of refactoring for dealing with architectural mismatches and low-quality code. An innovative aspect of the course involves the use of Open Source Software (OSS) in course examples and exercises. Through the study of OSS students will be able to see how non-trivial applications like the Apache Web server, the Postgres Relational Database Management System, the Jakarta Java servlet container and the Cocoon framework are structured.

Prerequisites
Proficiency in programming and software development

Course contents
Course outline: Course Introduction; Code as Part of the Software Development Process; The Open Source Landscape; Tackling Large Projects; Version Control; Declarative Drawing; Build Management; Code-Reading Tools; General Purpose

Tools; Performance Measurement and Management; Inspection and Testing; Coding Standards and Conventions; Documentation; Maintainability.

Recommended reading

Pierre Bourque and Richard E. Fair (editors). Guide to the software engineering body of knowledge. IEEE Computer Society Press, 2014.
Diomidis Spinellis. Code Reading: The Open Source Perspective. Addison-Wesley, 2003.
Diomidis Spinellis. Code Quality: The Open Source Perspective. Addison-Wesley, 2006.
Martin Fowler. Refactoring: Improving the Design of Existing Code. Addison-Wesley, 2000.
Michael Feathers. Working Effectively with Legacy Code. Prentice-Hall, Englewood Cliffs, NJ, 2005.

Mode of delivery

Lectures, labwork, and coursework
Assessment methods
Coursework

Language of instruction

Greek & English

Production and Operations Management

Code: 9030

Instructor: Dimitrios Zissis

ECTS credits: 6

Level: Advanced

Communication with the Instructor
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Learning Outcomes
The aim of the course is to introduce the student to the design, analysis, reengineering, optimisation and functional control of Manufacturing and Service operations, and to highlight the need for effective management of the constrained resources of operations systems. Through the course, the student will understand the organizational structure and the various components and functions of a Production or Service Operations System. They will practice basic analysis and problem-solving methods that are used by all kinds of organizations to understand and optimize operations.

The topics of the course cover the major business processes inherent in the operation systems, starting from operations strategy – showing the bigger picture of operations in a transforming global economy. Then the course delves into product, service and process design, forecasting, facility location and layout, procurement and inventory management, operations scheduling, and, finally, quality control. In summary, the course provides: a) an introductory overview of the major areas of operations management, b) an understanding of the practical and theoretical problems encountered in operations, and, c) practice of tools and techniques for effective operations management emphasizing both qualitative reflection and quantitative methods.

Mode of delivery (face-to-face, distance learning)
Face-to face teaching, individual work on cases and exercises.

Prerequisites and co-requisites
Fundamentals in quantitative methods. Fundamentals in management.

Recommended optional programme components

Simulation Game.

Video Tours of operations issues in companies and organizations.

Course contents

The topics included within the scope of Production and Operations Management (POM) are numerous and diverse. The following list provides the areas that will be covered within the course including recommended readings, which are available to the students through the AUEB Library and e-Library.

1. Introduction – Definitions
- Course content and structure
- Context and definitions of POM

Readings:

o "Operations as a Competitive Weapon", Chapter 1 in Operations Management, L.J. Krajewski & L.P. Ritzman.

o Merrifield, R. et al (2008), "The Next Revolution in Productivity", Harvard Business Review, June, pp. 73-80.

2. Operations Strategy and Lean Production
- The strategic framework, Illustration and deployment of operations strategies
- "New" operations strategies – Agile Operations

Readings:

o "Operations Strategy", Chapter 2 in Operations Management, L.J. Krajewski & L.P. Ritzman.

o Pisano, G.P. & Shih, W.C. (2009), "Restoring American Competitiveness", Harvard Business Review, July-August, pp. 114-125.

o Womack, J.P. & Jones, D.T. (2005), "Lean Consumption", Harvard Business Review, March, pp. 59-68.

3. Product, Service and Process Design and Development
- Key concepts in product and service design
- The product development process and project
- Classifications of production process structures (product and process). Video

Readings:

o "Process Design Strategy", Chapter 3 in Operations Management, L.J. Krajewski & L.P. Ritzman.
o Bonabeau, E et al (2008), A More Rational Approach to New Product Development, Harvard Business Review, March, pp. 96-102.

4. Facility Location
- Factors affection location decisions

- Locating a single facility

Readings:
o "Location", Chapter 10 in Operations Management, L.J. Krajewski & L.P. Ritzman.
o Article

5. Facility Layout
- Layout types and performance
- Product and process layout designs - models/algorithms
- Application exercises in class

Readings:
o "Process Layout", Chapter 7 in Operations Management, L.J. Krajewski & L.P. Ritzman.
o Article

6. Capacity Planning
- Capacity strategies and tools
- Basic forecasting methods
- Application exercises in class

Readings:
"Process Capacity", Chapters 6 in Operations Management, L.J. Krajewski & L.P. Ritzman.
o Article

7. Forecasting
- Basic forecasting methods
- Application exercises in class

Readings:
o "Forecasting", Chapter 13 in Operations Management, L.J. Krajewski & L.P. Ritzman.

o Saffo, P. (2007), "Six Rules for Effective Forecasting", Harvard Business Review, July-August, pp. 122-131.

8. The Beer Game

• Business game in class where students are practically familiarized with the problems of inventory control and management.

Readings (common to sessions 8-10):

o "Inventory Management", Resource Planning", and "Lean Systems", Chapters 15, 16, and 11 in Operations Management, L.J. Krajewski & L.P. Ritzman.

o Abernathy, F.H. et al, (2000), "Control Your Inventory in a World of Lean Retailing", Harvard Business Review, Nov-Dec, pp. 169-176.

o Liker, J.K. & Choi, T.Y. (2004), "Building Deep Supplier Relationships", Harvard Business Review, December, pp. 104-113.

9. Production Planning and Inventory Control I

• Deterministic models: Economic Order Quantity
• Materials Requirements Planning (MRP)
• Application exercises in class

10. Production Planning and Inventory Control II

• Just-In-Time – KANBAN
• Integrated exercise: Determining inventory strategy

11. Production Scheduling

• Operations Scheduling and Monitoring
• Application exercises in class

Readings:

o "Scheduling", Chapter 17 in Operations Management, L.J. Krajewski & L.P. Ritzman.

o Article

12. Statistical Quality Control and Total Quality Management – TQM

• Overview and introduction to Quality Management, Fundamental definitions
• Basics of Statistic Process Control (SPC)
• Application exercises in class

Readings:

o "Process Performance and Quality", Chapter 5 in Operations Management, L.J. Krajewski & L.P. Ritzman.
o Grant, R.M. et al (1994), "TQM's Challenge to Management Theory and Practice", Sloan Management Review, Winter, pp. 25-35.

Recommended or Required Reading
Krajewski, L.J. and L.P. Ritzman (2005). Operations Management: Strategy and Analysis, 7th Edition, Addison-Wesley, NY. (Newer and older editions, as well as any other Operations Management textbook cover all relevant issues).
Articles according to the above list.

Planned learning activities and teaching methods
Lectures, exercises in class, case assignments and readings, video illustrations and Business Game. Cases and readings are discussed in class, case assignments are also handed in written and can be part of formal assessment.

Assessment methods assessment methods and criteria
- Two case studies to accomplish in groups of two students (30% (2*15%) of final grade).

- One individual reading note (10% of final grade).
- Final individual written exam (60% of final grade).

The first case study "Disney" consists of various documents that assess the students' understanding of fundamental introductory aspects of operations management and operations strategy. Students are asked to reflect on how an entertainment company and especially entertainment parks take into account different operational and strategic changes, and how operations interact with other functions of the enterprise.

The second case study "Fitness Plus Part A" (Krajewski & Ritzman, 2005, p. 272) is a capacity analysis and planning case. Students are faced with the problem of a fitness center that operates a number of training areas all which have different demand and different capacity. Students should calculate capacity of each area as well as total capacity for the center, and suggest how capacity should be balanced and what moves the center should make in view of maximizing utilization and customer satisfaction. The case requires calculation, reflection and use of capacity notions such as peak and effective capacity, capacity cushions and break-even analysis.

The reading note will be accomplished on the basis of one of the suggested articles (above list) selected by each student. Students can also propose a topic of their own choice. A template for the reading note will be distributed separately.

The final exam lasts for three hours and is composed of two parts. The first assesses through short questions and mini-cases the understanding of fundamental operations management concepts such as different operations paradigms (standardized and diversified mass production, lean production), product, service and process development concepts, procurement, location and lay out issues, forecasting issues and quality management. The second part is based on problems and assesses the different quantitative aspects of the course focusing on inventory management, capacity planning and statistic process control. The above are indicative areas covered, each exam is tailored to the specific emphasis given in class and adapted to what was examined in the case studies.

DEPARTMENT OF BUSINESS ADMINISTRATION

FALL SEMESTER

Advertising and Communication Management

Code: 9003

Instructor: TBA

Communication with the instructor:

ECTS credits: 6

Level: Advanced

Course Objective

The aim of this course is to examine the promotional function and the role of advertising for contemporary companies. The course focuses on the promotional elements in the marketing programs of domestic and foreign companies. Students will be introduced to the concept of integrated marketing communications (IMC) and consider how it evolves. Also, the course examines how various marketing and promotional elements must be coordinated to communicate effectively. Different IMC models are examined in addition with the steps in developing a marketing communication program.

Prerequisites

Two marketing courses, at least an introductory one.

Course Content

- Integrated marketing communication
- Setting communication objectives
- Advertising Planning & Decision Making
- Sales Promotion, Direct marketing & Personal Selling
- Public relations & Corporate Advertising

- Creative strategy
- Media Planning-Strategy &Tactics Media Evaluation
- Advertising Ethics
- Global Advertising
- Advertising and the law

Recommended Reading Material

R.White Advertising 4th ed. Mc Graw Hill

Belch & Belch Advertising & Promotion 6th ed. Mc Graw Hill

Teaching Methods

Lectures, Case studies, Video & Multimedia materials

Assessment Methods

70% written assignment, 30% written exams

Strategic Management

Code: 9097

Instructor: TBA

Communication with the instructor:

ECTS credits: 6

Prerequisites

None

Objectives

The course aspires to:

1. Help participants understand:

a) the external environment in which our companies operate,
b) the role and significance of core competences not only in offering competitive advantage, but also in providing the foundation upon which strategies are based,
c) the role and significance of corporate mission/vision statements in success.

2. Help participants craft and implement strategy, given a number of alternative strategic options (choices include: in which areas should we diversify, in which products/services should we expand, how we are going to implement this expansion, are we going to acquire, merge, or form an alliance with another business).

3. Develop understanding on how to build and sustain competitive advantage

4. Realize what type of structure, systems, people, a company needs to successfully implement a chosen strategy.

5. To spot and discuss the most common strategy mistakes taking place, and to offer participants ideas as to how to avoid them.

Course Outline

The course comprises of the following modules:

1. How to analyze the external environment of the company: (Structural Analysis of Industries-5 Forces, Strategic Groups, Scenario Planning, PESTEL Analysis)

2. How to exploit and build resources and capabilities needed to achieve, maintain and improve the firms market positioning (strategy as the creation of dynamic capabilities, Value Chain, Organizational Culture)

3. How to direct the company into the future (mission/vision/strategic intent)

4. How to make a strategic choice, given a number of alternative strategic options (choices include: in which areas should we diversify, in which products/services should we expand, how we are going to implement this expansion, are we going to acquire, merge, form an alliance with another business).

5. How to build and sustain competitive advantage (Porter's Generic Competitive Strategies, Value Disciplines, Strategy Clock)

6. What type of structure, systems, people, does a company need to successfully implement a chosen strategy (McKinsey's 7S's).

7. The course will provide frameworks for identifying the challenges of different competitive environments. We will give you some analytical approaches that are useful to widely different strategic problems. Our final aim is to help you understand how to build a strategically responsive organization by tuning systems, structures and people to strategy, and how to effectively manage the process of strategizing.

Assessment Methods

Final written exam and group case studies.

Reading List

- **Johnson,** G., R. Whittington, K. Scholes, D. Angwin, and P. Renger, Exploring Strategy Pearson, 11th Edition, 2017.
- **Hill,** C., G. Jones and M.A. Schilling, Strategic Management Theory, Cengage Learning, 11th edition, 2015.
- **Thompson**, A.A., M.A. Peteraf, J.E. Gamble and A.J. Strickland III, Crafting and Executing Strategy: Concepts and Readings, 20th edition, McGraw-Hill, 2016.
- **Hitt**, M.A., R.D. Ireland and R.E. Hoskisson, Strategic Management: Competitiveness and Globalization, Cengage Learning, 12th edition, 2017.

Entrepreneurship

Code: 9019

Instructor: SALAVOU E.

ECTS credits: 6

Level of course: Undergraduate

Year of study: Advanced

Communication with the Instructor: esalavou@aueb.gr

Objectives of the course

Entrepreneurship is both a way of thinking and of doing. It deals with "creating something from nothing". The course cultivates an entrepreneurial mindset and focuses on skills necessary for writing a comprehensive business plan. Upon completion of the course, students should be able to:

- understand key concepts of entrepreneurship
- successfully develop viable business ideas
- consider entrepreneurship as a professional career choice

Prerequisites

This course synthesizes concepts from various courses at business schools. Students with managerial know-how are allowed to follow this course. Students registered in the Business Policy and Strategy course during the fall semester of this University are not allowed to attend this course.

Course content

This course introduces the nature of entrepreneurship. It helps students to successfully develop viable business ideas. This is a teaching-mentoring course. You are going to write and present business plans based on teamwork.

Recommended reading

Together with a list of recommended references, the following book is required:

- Hisrich R. (2014). Advanced Introduction to Entrepreneurship. USA: Edward Elgar Publishing Ltd.

Teaching methods

Lectures and students' presentations

Assessment methods

Written exams and project

Financial Management

Code: 9023

Instructor: TBA

ECTS credits: 6

Level: Intermediate

Communication with the Instructor:

Course outline

This module examines various items in the area of Corporate Finance. For that reason, it is divided into 2 major groups:

a) The first group includes the most important methods concerning Investment Appraisal.

b) The second group is concerned with Financing Decisions.

Reading Material

The required text for the course is:

- Brigham and Erhardt. Financial Management - Theory and Practice. DRYDEN PRESS HARCOURT

Some highly recommended texts are the following:

- Brealey, A., Mayers, C., (1997): Principles of Corporate Finance, Mc – Graw Hill, New York.
- Lumby, S., (1996): Investment Appraisal and Financing Decisions, Chapman and Hall.

Components of the Course

The major components of the course are the following:

- Introduction to Investment Appraisal
- Methods and Criteria of Investment Appraisal
- Net Cash Flow Analysis
- Investment Appraisal and Inflation
- Risk Analysis
- Capital Markets
- Bond and Share Valuations
- Cost of Capital
- Capital Structure
- Dividend Policy
- Portfolio Considerations

Money and Capital Markets

Code: 9051

Instructor: KASIMATIS K.

Communication with the instructor: kkassima@aueb.gr

ECTS credits: 6

• Type of course unit (compulsory, optional)

Undergraduate course in English for Erasmus students.

• Level of course unit (e.g. first, second or third cycle; sub-level if applicable)

Advanced

• Semester/trimester when the course unit is delivered

Both Spring and Fall

• Learning outcomes of the course unit

At the end of the course students should know:

- How securities prices are determined and how to price securities.

- How to structure an efficient portfolio and understand the importance to financial institutions of risk reduction through holding portfolios of assets.

- How futures contracts are used for risk reduction or speculation.

• Mode of delivery (face-to-face, distance learning)

Class teaching

• Prerequisites and co-requisites

None.

• Recommended optional programme components

None.

• Course contents

The course covers the following topics:

- Money and Capital Markets: an overview.
- Intermediaries, Markets and Trading – an overview of the type of companies operating in the money and capital markets and the kinds of transactions they engage into.
- Compounding, Present and Future Value – basic principles used for quantitative analysis of financial assets and instruments.
- Bonds and Interest Rates – an overview of debt instruments, pricing and risk assessment.
- Stocks – pricing techniques for stocks
- Portfolio Theory – how to choose assets in order to build an efficient portfolio
- Futures contracts – an overview of the futures market, pricing of futures contracts, speculation, arbitrage and hedging strategies through futures contracts.

• Recommended or required reading

1. Bodie Z, Kane A. and Marcus A.J., (2014) Investments, 10th edition, McGraw Hill.

2. Brealey R.A. and Myers S.C. (2017) Principles of Corporate Finance 12th edition, McGraw Hill.

3. Lecture notes and case studies.

• Planned learning activities and teaching methods

The module is taught through a series of three-hour lectures.

• Assessment methods and criteria

Final written two-hour exam.

• Language of instruction

English

International Management

Code: 9077

Instructor: TBA

Communication with the instructor:

ECTS credits: 6

Objectives of the course

The core aim of the course is to familiarize students with the fundamental dimensions of international management. Basic management principles remain the same during the internationalization stage of a corporation; however, they should be placed in a context of different markets and macro-environmental characteristics. In this vein, international management should bridge the divide between global integration and national responsiveness as far as resource selection and deployment decisions, strategy adaptation and challenges from global operations are concerned.

Course content

This course in International Management provides an understanding of how the economic, technological geopolitical and social dimensions of the international business environment shape international business investment and transacting, and how international firms are managed within this environment. It provides students with an appreciation of the increased complexities and opportunities that international markets provide as opposed to operations exclusively focused in the home market. Key issues covered in this course include: macro environmental characteristics, motives for international expansion, entry and global strategies, trade theories, government interventions, foreign direct investments and subsidiary roles and the organizational challenges of the contemporary multinational enterprise.

Anticipated Learning Outcomes

As a result of taking this course, students should be able to:

- Describe and elaborate on the major cultural, political, economic and technological changes that impact on international management.
- Identify the opportunities, challenges, threats and problems faced by multinational managers.

- Analyze and critically evaluate the impact of globalization and national responsiveness on international management and global strategies.
- Analyze internationalization and market entry strategies.
- Classify and describe the role of subsidiaries and their impact on the economic development of host countries.
- Critically evaluate the diverse organizational structures that govern the relationships of the international corporation.
- Describe and evaluate elements of knowledge-related competitiveness that lead to superior performance in the global marketplace.
- Relate theoretical foundations to actual international management practices.

Conflict Management and Negotiations

Code: 9082

Instructor: TBA

Communication with the instructor:

ECTS credits: 6

Level: Undergraduate

Objectives of the course

Negotiation is a complex process that requires knowledge, skill, and practice. The aim of this course is to provide the necessary knowledge to effectively prepare for a negotiation, plan a negotiation strategy and deal with conflicts and contingencies. The course also aims at developing those skills that will enable students to effectively communicate with others, manage their emotions, decode their counterparts' interests, etc. Finally, students will participate in negotiation role-plays to apply theory, get feedback, reflect on the outcome and, hence, further enhance their knowledge and abilities.

Prerequisites

There is no prerequisite for participation in this course.

Course content

- Managing conflict, building blocks and the process of negotiation
- Preparation: What to do before negotiation
- Creating and claiming value in negotiation
- Managing emotions and building trust in negotiations
- Power, ethics, and reputation
- Multi-party negotiations, coalitions, and team negotiation
- Cross-cultural negotiations and negotiating remotely
- Negotiating a job offer
- Dispute resolution using third parties

Anticipated Educational Results

Upon completion of this course, the students will be able to:

1. Demonstrate the ability to apply fundamental concepts and theories in conflict management and negotiations to real-world business situations.
2. Be able to analyze the behavior and motives of individuals and the contextual parameters of negotiation and integrate this information into their own behavior.
3. Appraise the advantages and disadvantages of alternative types of competitive and cooperative behavior.
4. Be able to integrate theory and feedback from in-class negotiation simulations and case studies to future negotiations.

Recommended reading

The following book is required:

- Thompson, L. (2021). The mind and heart of the negotiator, 7th Edition (Global edition). Pearson. ISBN-10: 1292399465; ISBN-13: 978-1292399461.

Together with a list of recommended references for background reading:

- Brett, J. M. & Ramirez-Marin, J. & Galoni, C. (2021). Negotiation Strategy: A Cross-Cultural Meta-Analytic Evaluation of Theory and Measurement. Negotiation and Conflict Management Research 14(4). doi: https://doi.org/10.34891/20210918-525.
- Fisher, R., Ury, W., & Patton, B. (2011). Getting to Yes: Negotiating agreement without giving in, 3rd revised edition, Penguin. ISBN-10: 1844131467; ISBN-13: 978-0143118756.
- Ingerson, M. C., DeTienne, K. B., Hooley, J. M., & Black, N. A. (2020). Dealing with dysfunction: Negotiating with difficult individuals. Negotiation Journal, 36(3), 287-307.
- Kapoutsis, I., & Volkema, R. (2019). Hard-core toughie: Donald Trump's negotiations for the United States presidency. Negotiation Journal, 35(1), 47-63.
- Malhotra, D. (2015). Control the negotiation before it begins. Harvard Business Review, December 2015, pp. 3-8.
- Malhotra, D. & Bazerman, M. (2008). Negotiation Genius: How to Overcome Obstacles and Achieve Brilliant Results at the Bargaining Table and Beyond. Bantam.
- Volkema, R. J., & Kapoutsis, I. (2016). From Restaurants to Board Rooms How Initiating Negotiations Teaches Management Principles and Theory. Journal of Management Education, 40(1), 76-101.
- Volkema, R.,1999, The Negotiation Toolkit: How to get exactly what you want in any business or personal situation, AMACOM.

- Watkins, M. (2006). Shaping the Game: The New Leaders Guide to Effective Negotiating. Harvard Business School Press.

Teaching methods

Lectures, case studies, role-plays, videos, and self-assessment tests.

Assessment methods

Final written exam (80%) and class participation (participation in role-plays; 20%).

SPRING SEMESTER

International Marketing Management

Code: 9018

Instructor:

Communication with the Instructor:

ECTS credits: 6

Type: Elective

Level: Advanced

Teaching and learning strategy implementation (4 pillars)

• Pillar 1: Active learning

o The course is highly interactive o Students prepare to participate in class activities before the course, while their comprehension and integration are used in-class o We extend the learning process beyond class through individual and collaborative practice

• Pillar 2: Adaptive learning o This course is guided by in-class differentiation, allowing students to tailor their learning experience to match their professional and personal objectives o We stimulate the development of the students' individual professional paths by applying the offered content to targeted functions/jobs/areas of expertise including (creating brands of their own and introduce them to a cross-cultural setting): o The professional experience and challenges (needs/expectations) of the students guide the learning process and the offered content. o The professor engages in individual coaching throughout the course

• Pillar 3: Interdisciplinary learning o Real corporate issues are used and discussed, and participants are exposed to the real-life experience of a practitioner o Students are stimulated to use their own work experience/work context in order to stimulate 'the transversality' in this course o Case studies are used to realize the integration of content and disciplines (like Communications, strategic management and negotiations) o An interdisciplinary approach is reinforced in this course referring to other courses in their programme (especially Management and negotiations)

• Pillar 4: Competency-based education o Competency-based learning is guided by targeting a specific skill set connected with the designated learning goals and objectives of this course o An interdisciplinary learning experience is offered in order to acquire managerial competencies such as a business entering a new market (of a different cultural setting) and a global vision of business and management o Participants are asked to discuss their own professional expertise in order to identify necessary areas of skill, attitude and knowledge development (Therefore, students will have the chance to develop a new brand idea of theirs and to envision it in a global setting. Some are relying on their already gained professional expertise and developing it further in an international setting).

Learning objectives

1A - 1.A Demonstrate an international mindset, 1B - 1.B Successfully collaborate within a intercultural team, 1C - 1.C Communicate effectively in English, 2A - 2.A Assess the values of the organization in which they work, 2B - 2.B Solve professional dilemmas using concepts of CSR and ethics, 2C - 2.C Generate sustainable solutions for organizations, 4A - 4.A Appraise the performance of a team, 4B - 4.B Compose constructive personal feedback and guidance, 5A - 5.A Predict how business and economic cycles could affect organizational strategy, 6C - 6.C Combine different skills and management disciplines in support of interdisciplinary responsibilities

Additional learning objectives

• Identify the key characteristics of international markets that are important to international marketers and derive implications for marketing to these markets. • Develop an integrated view of cross-cultural markets in terms of their operating environment and consumer behaviour. • Develop a set of recommendations for the development and/or introduction of products and services in these markets. • Assess and synthesise information from various sources and about different fields. • Analyse and evaluate the relative importance of the cultural element to work in multicultural environments. • Demonstrate an intercultural open mindset and work efficiently in an international professional environment. • Make a professional quality oral presentation by using digital tools and based on academic references and relevant terminology (e.g. Decision Making Unit (DMU), OGSM, Hofstede)

Course presentationl

he course enables students to understand the particular challenges and opportunities (via OGSM framework) which markets present for international

marketers while focusing on marketing aspects (e.g. 4Ps, PEST analysis). In the first instance, the particular context characteristics of cross-cultural markets will be considered, and students, in multicultural teams, will apply this knowledge to research a specific cross-cultural market. Then, the marketing challenges relating to entering and developing products for cross-cultural markets will be considered. Cross-cultural market strategies (such as adaptation or standardisation strategy) will be analysed. The particular role of technology and its disruptive use in these types of markets will be considered. Students will reflect on what responsible marketing in cross-cultural markets might entail. Industry insights (via case studies) will provide concrete examples of how, in practice, they enter and compete in cross-cultural markets.

Bibliography

- Ghauri, P. and Cateora, P. International Marketing. McGraw Hill Education, 2021 (5th edition)
- Engelen, A., & Brettel, M. (2011). Assessing cross-cultural marketing theory and research. Journal of Business Research, 64(5), 516-523
- Filieri, R., Lin, Z., D'Antone, S., & Chatzopoulou, E. (2019). A cultural approach to brand equity: The role of brand mianzi and brand popularity in China. Journal of Brand Management, 26(4), 376-394
- Kusawat, P., & Teerakapibal, S. (2022). Cross-cultural electronic word-of-mouth: a systematic literature review. Spanish Journal of Marketing-ESIC
- Minkov, M. (2012). Cross-cultural analysis: The science and art of comparing the world's modern societies and their cultures. SAGE publications
- Woo, H., Kim, S., & Childs, M. L. (2019). Is this for our sake or their sake? Cross-cultural effects of message focus in cause-related marketing. International Marketing Review
- UNIQLO: A supply chain going global (https://hbsp.harvard.edu/product/HK1085-PDF-ENG)
- ANCIENT GREEK SANDALS: The Case of Ancient Greek Sandals: Ethnic Heritage and Celebrity Endorsement (https://www.bloomsburyfashioncentral.com/search-results?any=chatzopoulou)

Financial Management

Code: 9023

Instructor: TBA

Communication with the Instructor:

ECTS credits: 6

Level: Intermediate

Course Outline

This module examines various items in the area of Corporate Finance. For that reason, it is divided into 2 major groups:

The first group includes the most important methods concerning Investment Appraisal.

The second group is concerned with Financing Decisions.

Reading Material

The required text for the course is:

- Brigham and Erhardt. Financial Management - Theory and Practice. DRYDEN PRESS HARCOURT

Some highly recommended texts are the following:

- Brealey, A., Mayers, C., (1997): Principles of Corporate Finance, Mc – Graw Hill, New York.
- Lumby, S., (1996): Investment Appraisal and Financing Decisions, Chapman and Hall.

Course Components

The major components of the course are the following:

- Introduction to Investment Appraisal
- Methods and Criteria of Investment Appraisal
- Net Cash Flow Analysis
- Investment Appraisal and Inflation
- Risk Analysis
- Capital Markets
- Bond and Share Valuations
- Cost of Capital
- Capital Structure

- Dividend Policy
- Portfolio Considerations

Money and Capital Markets

Code: 9051

Instructor: TBA

Communication with the Instructor:

ECTS credits: 6

• Type of course unit (compulsory, optional)

Undergraduate course in English for Erasmus students.

• Level of course unit (e.g. first, second or third cycle; sub-level if applicable)

Advanced

• Semester/trimester when the course unit is delivered

Both Spring and Fall

• Learning outcomes of the course unit

At the end of the course students should know:

- How securities prices are determined and how to price securities.

- How to structure an efficient portfolio and understand the importance to financial institutions of risk reduction through holding portfolios of assets.

- How futures contracts are used for risk reduction or speculation.

• Mode of delivery (face-to-face, distance learning)

Class teaching

• Prerequisites and co-requisites

None.

• Recommended optional programme components

None.

• Course contents

The course covers the following topics:

- Money and Capital Markets: an overview.
- Intermediaries, Markets and Trading – an overview of the type of companies operating in the money and capital markets and the kinds of transactions they engage into.
- Compounding, Present and Future Value – basic principles used for quantitative analysis of financial assets and instruments.
- Bonds and Interest Rates – an overview of debt instruments, pricing and risk assessment.
- Stocks – pricing techniques for stocks
- Portfolio Theory – how to choose assets in order to build an efficient portfolio
- Futures contracts – an overview of the futures market, pricing of futures contracts, speculation, arbitrage and hedging strategies through futures contracts.
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• Recommended or required reading

1. Bodie Z, Kane A. and Marcus A.J., (2014) Investments, 10th edition, McGraw Hill.

2. Brealey R.A. and Myers S.C. (2017) Principles of Corporate Finance 12th edition, McGraw Hill.

3. Lecture notes and case studies.

• Planned learning activities and teaching methods

The module is taught through a series of three-hour lectures.

• Assessment methods and criteria

Final written two-hour exam.

• Language of instruction

English

Business Strategy

Code: 9064

Instructor: TBA

Communication with the Instructor:

ECTS credits: 6

Prerequisites

None

Objectives

The course aspires to:

6. Help participants understand:

a) the external environment in which our companies operate,
b) the role and significance of core competences not only in offering competitive advantage, but also in providing the foundation upon which strategies are based,
c) the role and significance of corporate mission/vision statements in success.

7. Help participants craft and implement strategy, given a number of alternative strategic options (choices include: in which areas should we diversify, in which products/services should we expand, how we are going to implement this expansion, are we going to acquire, merge, or form an alliance with another business).

8. Develop understanding on how to build and sustain competitive advantage

9. Realize what type of structure, systems, people, a company needs to successfully implement a chosen strategy.

10. To spot and discuss the most common strategy mistakes taking place, and to offer participants ideas as to how to avoid them.

Course Outline

The course comprises of the following modules:

1. How to analyze the external environment of the company: (Structural Analysis of Industries-5 Forces, Strategic Groups, Scenario Planning, PESTEL Analysis)
2. How to exploit and build resources and capabilities needed to achieve, maintain and improve the firms market positioning (strategy as the creation of dynamic capabilities, Value Chain, Organizational Culture)
3. How to direct the company into the future (mission/vision/strategic intent)
4. How to make a strategic choice, given a number of alternative strategic options (choices include: in which areas should we diversify, in which products/services should we expand, how we are going to implement this expansion, are we going to acquire, merge, form an alliance with another business).
5. How to build and sustain competitive advantage (Porter's Generic Competitive Strategies, Value Disciplines, Strategy Clock)
6. What type of structure, systems, people, does a company need to successfully implement a chosen strategy (McKinsey's 7S's).
7. The course will provide frameworks for identifying the challenges of different competitive environments. We will give you some analytical approaches that are useful to widely different strategic problems. Our final aim is to help you understand how to build a strategically responsive organization by tuning systems, structures and people to strategy, and how to effectively manage the process of strategizing.

Assessment Methods

Final written exam and group case studies

Reading List

- **Johnson,** G., R. Whittington, K. Scholes, D. Angwin, and P. Renger, Exploring Strategy Pearson, 11th Edition, 2017.
- **Hill,** C., G. Jones and M.A. Schilling, Strategic Management Theory, Cengage Learning, 11th edition, 2015.
- **Thompson**, A.A., M.A. Peteraf, J.E. Gamble and A.J. Strickland III, Crafting and Executing Strategy: Concepts and Readings, 20th edition, McGraw-Hill, 2016.
- **Hitt**, M.A., R.D. Ireland and R.E. Hoskisson, Strategic Management: Competitiveness and Globalization, Cengage Learning, 12th edition, 2017.

Conflict Management and Negotiations

Code: 9082

Instructor: TBA

Communication with the Instructor:

ECTS credits: 6

Level: Undergraduate

Objectives of the course

Negotiation is a complex process that requires knowledge, skill, and practice. The aim of this course is to provide the necessary knowledge to effectively prepare for a negotiation, plan a negotiation strategy and deal with conflicts and contingencies. The course also aims at developing those skills that will enable students to effectively communicate with others, manage their emotions, decode their counterparts' interests, etc. Finally, students will participate in negotiation role-plays to apply theory, get feedback, reflect on the outcome and, hence, further enhance their knowledge and abilities.

Prerequisites

There is no prerequisite for participation in this course.

Course content

- Managing conflict, building blocks and the process of negotiation
- Preparation: What to do before negotiation
- Creating and claiming value in negotiation
- Managing emotions and building trust in negotiations
- Power, ethics, and reputation
- Multi-party negotiations, coalitions, and team negotiation
- Cross-cultural negotiations and negotiating remotely
- Negotiating a job offer
- Dispute resolution using third parties

Anticipated Educational Results

Upon completion of this course, the students will be able to:

5. Demonstrate the ability to apply fundamental concepts and theories in conflict management and negotiations to real-world business situations.
6. Be able to analyze the behavior and motives of individuals and the contextual parameters of negotiation and integrate this information into their own behavior.
7. Appraise the advantages and disadvantages of alternative types of competitive and cooperative behavior.
8. Be able to integrate theory and feedback from in-class negotiation simulations and case studies to future negotiations.

Recommended reading

The following book is required:

- Thompson, L. (2021). The mind and heart of the negotiator, 7th Edition (Global edition). Pearson. ISBN-10: 1292399465; ISBN-13: 978-1292399461.

Together with a list of recommended references for background reading:

- Brett, J. M. & Ramirez-Marin, J. & Galoni, C. (2021). Negotiation Strategy: A Cross-Cultural Meta-Analytic Evaluation of Theory and Measurement. Negotiation and Conflict Management Research 14(4). doi: https://doi.org/10.34891/20210918-525.
- Fisher, R., Ury, W., & Patton, B. (2011). Getting to Yes: Negotiating agreement without giving in, 3rd revised edition, Penguin. ISBN-10: 1844131467; ISBN-13: 978-0143118756.
- Ingerson, M. C., DeTienne, K. B., Hooley, J. M., & Black, N. A. (2020). Dealing with dysfunction: Negotiating with difficult individuals. Negotiation Journal, 36(3), 287-307.
- Kapoutsis, I., & Volkema, R. (2019). Hard-core toughie: Donald Trump's negotiations for the United States presidency. Negotiation Journal, 35(1), 47-63.
- Malhotra, D. (2015). Control the negotiation before it begins. Harvard Business Review, December 2015, pp. 3-8.
- Malhotra, D. & Bazerman, M. (2008). Negotiation Genius: How to Overcome Obstacles and Achieve Brilliant Results at the Bargaining Table and Beyond. Bantam.
- Volkema, R. J., & Kapoutsis, I. (2016). From Restaurants to Board Rooms How Initiating Negotiations Teaches Management Principles and Theory. Journal of Management Education, 40(1), 76-101.
- Volkema, R.,1999, The Negotiation Toolkit: How to get exactly what you want in any business or personal situation, AMACOM.

- Watkins, M. (2006). Shaping the Game: The New Leaders Guide to Effective Negotiating. Harvard Business School Press.

Teaching methods

Lectures, case studies, role-plays, videos, and self-assessment tests.

Assessment methods

Final written exam (80%) and class participation (participation in role-plays; 20%).

Case Studies in Corporate Finance (Reading Course)

Code: 9108

Instructor: Drakos A.

Communication with the Instructor: adrakos@aueb.gr r

ECTS credits: 6

Teaching Methods: Reading Course on Case Studies

Prerequisites: Financial Management, Accounting

AIM OF THE COURSE

The course aims at bringing students, closer to contemporary corporate practice by solving certain financial problems using Microsoft excel. In this respect the course consists of 10 financials problems, which are met in the context of the company's financial activity and are associated, among others, in calculating a Loans amortization table, estimating the Net Present Value for various Investment Decisions, choosing between mutually exclusive investment projects, estimating the company's costs of capital, as well as the Enterprise and Equity Value of a firm.

1.STUDY AND ATTENDANCE

- Reading Course on the basis of Case Studies in Microsoft Excel

2.LEARNING OUTCOMES

On completion of the course, students will be able to :

- Calculating a Loan Amortization Table
- Estimating the Net Present Value and IRR of certain investment decisions
- Choosing between mutually exclusive Investments
- Calculating the Cost of Capital for a company with multiple financing sources
- Calculating and commenting Financial Ratios on the basis of Financial Statements
- Estimate the Enterprise and Equity Value of a firm using DCF modelling

3.READING MATERIAL

Case Studies in Microsoft Excel

4.EVALUATION

Final Exam Paper – on 3 excel based financial problems.

The Corporate Debt Financing (Reading Course)

Code: 9109

Instructor: Drakos A.

Communication with the Instructor: adrakos@aueb.gr r

ECTS credits: 6

Teaching Methods: Reading Course

Prerequisites: Financial Management, Accounting

1.AIM OF THE COURSE
The course aims at providing a fundamental understanding on how the corporations employing and raising Debt to finance their operation and/or projects. Students with basic knowledge on Financial Management, should study in depth a selection of chapters from an International and reputable handbook of Corporate Finance, associated to the different types of corporate debt and their impact on the value of the corporation.

2.STUDY AND ATTENDANCE
Reading Course

3.LEARNING OUTCOMES
On completion of the course, students will be able to :

- Understand the risks associated to the Debt financing (Credit Risk)
- Understand the many different kinds of Debt and how these are used by the company
- Understand the Leasing as a medium term financing option
- Understand the impact of Debt instruments on the company's value

4.READING MATERIAL
Principles of Corporate Finance, Brealey-Myers-Allen, 2022, 2018, McGraw Hill

5.SYLLABUS

- Measuring Credit Risk / Value at Risk
- Type of Bonds as source of Debt Financing/ Bonds Rating
- Operating vs Financial Leasing
- Cost of Debt components and their impact on Capital Structure / Company's value

6.EVALUATION

Final Exam Paper on the basis of 25 multiple choice questions.

DEPARTMENT OF ACCOUNTING AND FINANCE

FALL SEMESTER

Behavioral Finance (Reading Course)

Code: 9004

Instructor: SPYROU S.

ECTS credits: 6

Communication with the Instructor
sspyrou@aueb.gr

Traditional economics and finance is developed on the assumption of a rational utility maximizing economic agent. Recent empirical evidence, however, suggests that real people behave differently than assumed. This module reviews the literature on cognitive psychology as regards to human and investor behaviour and contrasts this with the behavior that is expected from traditional models. We discuss Prospect Theory (PT), i.e. a theory alternative to Expected Utility Theory (EUT), and show that many empirical phenomena that are considered as 'anomalies' by traditional finance can be explained within this framework. The module also discusses empirical findings on various related issues such as herding behaviour, measures of herding, investor overreaction and under-reaction, measurement of investor sentiment, mental accounting, overconfidence, the house-money effect, the dividend puzzle, the equity premium puzzle, the closed-end fund puzzle, among others.

The main aims of the module are:

- To help you understand the most important issues in Behavioral Finance
- To provide an opportunity for the critical evaluation of recent empirical studies and empirical findings in the area
- To examine phenomena that affect investment decisions / behavior
- To discuss behavioral explanations of observed capital market inefficiencies

Course Outline:

- Prospect Theory
- Heuristics / Investor Biases
- Overconfidence
- Empirical Puzzles and Behavioral Explanations
- Over-reaction / Under-reaction
- Herding Behavior in Financial Markets
- Investor Sentiment: Measurement & Empirical Evidence
- Behavioral Finance Theories
- Empirical Findings

Methods of Assessment

A 3000 to 4000 word essay (see eclass for suggested essay questions etc)

Suggested Reading:

A. Suggested Textbooks / Reading / Lecture Notes

- Lecture notes / slides
- Academic papers as suggested in lectures
- Barberis, Nicholas, and Richard Thaler, 2003. "A survey of behavioral finance." in G. Constantinides, M. Harris, and R. Stulz (editors) *Handbook of the Economics of Finance* North-Holland, Amsterdam.
- Forbes, W. (2009). Behavioral Finance, John Willey & Sons Ltd.
- Kahneman, D., Slovic, P. andTversky, A. (eds.) (1982), Judgment under Uncertainty: Heuristics and Biases, Cambridge University Press, New York.
- Kahneman, D. andTversky, A. (eds.) (2000), Choices, Values, and Frames, Russell Sage Foundation and Cambridge University Press, New York.
- Shefrin, H. (2002). Beyond greed and fear: Understanding behavioral finance and the psychology of investing, Oxford University Press

B. Suggested Articles

- Antoniou, A., Galariotis, E. and Spyrou, S., (2006), Short-term contrarian strategies in the London Stock Exchange: Are they profitable? Which factors affect them?, *Journal of Business Finance & Accounting*, 33, 839-867
- Barberis, N., Shleifer, A., & Vishny, R., 1998. A model of investor sentiment. *Journal of Financial Economics* 49, 307–343.

- Baddeley, M., 2010. Herding, social influence and economic decision-making: socio-psychological and neuroscientific analyses. *Philosophical Transactions, The Royal Society B* 365, 281–290.
- Bikhchandani, S., Sharma, S., 2000. Herd Behavior in Financial Markets. *IMF Staff Papers* 47, 279–310.
- Benartzi, S. and Thaler, R., (2001), Naïve diversification strategies in defined contribution savings plans, *American Economic Review*, 91, 79-98.
- De Bondt, W.F.M., and Thaler, R.H. (1985), Does the Stock Market Overreact? *Journal of Finance*, 40, 793–808.
- Chiang, T., Zheng, D., 2010. An empirical analysis of herd behaviour in global stock markets? *Journal of Banking and Finance* 34, 1911–1921.
- Galariotis, E., Rong, W., & Spyrou, S. (2015). Herding on fundamental information: A comparative study. *Journal of Banking and Finance*, 50, 589-598.
- Grinblatt, M., Titman, S., Wermers, R., 1995. Momentum Investment Strategies, Portfolio Performance, and Herding: A Study of Mutual Fund Behavior. *The American Economic Review* 85, 1088–1105.
- Kahneman, D. and Tversky, A., (1984), Choices, Values and Frames, *American Psychologist*, 39, 341–50.
- Kahneman, D. and A. Tversky, (1979) "Prospect Theory: An Analysis of Decision Making Under Risk," *Econometrica*
- Porter, D. P., and Smith, V., (2003), Stock market bubbles in the laboratory, *Journal of Behavioral finance*, 4, 7-21.
- Ritter, J. R. (2003), Behavioral finance, *Pacific-Basin Finance Journal*, 11, 429-437.
- Shefrin, H. & Statman, M., (2003), The contributions of Daniel Kahneman and Amos Tversky, *The Journal of Behavioral Finance,* 4, 54-58.
- Spyrou, S., 2013. Herding in Financial Markets: A Review of the Literature. Review of Behavioral Finance 5, 175-194.
- Other articles as indicated in Lectures.

Cost and Management Accounting

Code: 9011

Instructor: Sotiris Karatzimas

ECTS credits: 6

Level: Intermediate progressing to advanced

Communication with the Instructor
skaratzimas@aueb.gr

Course Objectives – Content
Learning Objectives
Upon successful completion of the course, the students will be able to understand the:

1. content of cost accounting,
2. concepts and categories of cost,
3. determinants of production cost (raw materials, direct labor and overheads),
4. costing systems (traditional costing and activity-based costing),
5. costing methods (job order costing and process costing),
6. costing techniques (absorption costing, variable costing and standard costing),
7. allocation and reallocation of overheads,
8. cost-volume-profit analysis, and
9. costing of joint products and by-products.

Course Structure
The structure of the course includes the following sections:

1. Product Costing Systems: Concepts and Design Issues (Chapter 2)
2. Cost Accumulation for Job Shop and Batch Production Operations (Chapter 3)
3. Activity-Based Costing Systems (Chapter 4)
4. Process Costing Systems (Chapter 8)
5. Joint Process Costing (Chapter 9)
6. Managing and Allocating Support-Service Costs (Chapter 10)
7. Financial and Cost-Volume-Profit Models (Chapter 12)

8. Standard Costing, Variance Analysis and Kaizen Costing (Chapter 16)

Course Assesment

Final two-hour written examination comprising exercises and case studies.

Bibliography

Course Textbook

Hilton, Maher and Selto (2008), "Cost Management: Strategies for Business Decisions", Fourth Edition, McGraw-Hill. (You may borrow copies of the book from the school's library).

Corporate Finance (Reading Course)

Code: 9085

Instructor: Athanasios Sakkas

ECTS credits: 6

Level: Intermediate progressing to advanced

Communication with the Instructor

asakkas@aueb.gr

This module concentrates on the major investment and financial decisions made by managers within a firm. The idea that managers should operate in the interests of shareholders is examined and we explore the consequences. We then look at the types and sources of finance for a company. Next, we seek to understand the cost of capital and the major theories that guide us. Finally, we delve into the sources of long-term finance: equity capital, debt and hybrid finance.

The main aim of the module is

To gain a sound understanding of the basic principles of corporate finance. Having successfully completed the module, you will be able to demonstrate knowledge and understanding of:

1. the types and sources of finance for a company;
2. the capital structure and the associated cost of capital;
3. the dividend policy and other payouts;
4. the capital budgeting;
5. the sources of long-term finance.

Course contents

1. Shareholders, stakeholders, agents, and financial decision making
2. Cash flow for Budgeting
3. Capital asset pricing model (CAPM), Factor Models, and Arbitrage Pricing Theory (APT)
4. Capital structure
5. Dividend policy and other payouts
6. Valuation and Capital budgeting
7. Initial public offerings (IPOs) and Seasoned equity offerings (SEOs)
8. Warrants, convertible, and exchangeable bonds

Suggested Reading:

A. Lecture Slides
B. Suggested Textbooks

Berk, Jonathan, and Peter DeMarzo, 2020, Corporate Finance, fifth edition, Pearson Education. ISBN 978-1292304151

Brealey, R.A., S.C. Myers, F. Allen, 2017, Principles of Corporate Finance, twelfth edition, McGraw Hill. ISBN 978-1259253331.

Copeland, T.E., J.F. Weston, K. Shastri, 2005, Financial Theory and Corporate Policy, fourth edition, Addison Wesley. ISBN 978-0321127211.

Hillier, D., S. Ross, R. Westerfield, J. Jaffe, B. Jordan, 2016, Corporate Finance, third edition, McGraw Hill. ISBN 978-0077173630

C. Journal Articles (more details in the eclass)

Methods of Assessment
A set of exercises + a 3000-word essay

SPRING SEMESTER

Financial Statement Analysis

Code: 9021

Instructor: Konstantinos Chalevas

ECTS credits: 6

Communication with the Instructor
chaleas@aueb.gr

Important Note: The course presupposes a good knowledge of the basics of financial accounting. The students should already be:

- **familiar with the main accounting concepts and principles**
- **able to understand financial statements**
- **aware of the financial statements preparation processes.**

Core Text : Business Analysis and Valuation : IFRS Edition (5th edition)
Healy P, Palepu G., Peek E.

This course introduces and develops a framework for business analysis and valuation using financial statement data. Key components of effective financial statement analysis are discussed:

- ❖ A Framework for Business Analysis and Valuation Using Financial Statements
- ❖ Business Analysis and Valuation Tools
  - ○ Industry Analysis
  - ○ Competitive Strategy Analysis
  - ○ Corporate Strategy Analysis
- ❖ Overview /Implementing Accounting Analysis
  - ○ Factors Influencing Accounting Quality
  - ○ Steps in Accounting Analysis
  - ○ Accounting Analysis Pitfalls
- ❖ Financial Analysis

- Ratio Analysis
- Cash Flow Analysis

❖ Prospective Analysis: Forecasting-Valuation Implementation

- Defining Value for Shareholders
- The Discounted Cash Flow model
- The Discounted Abnormal Earnings Valuation model

❖ Case Studies

*** Photocopying the book and the use of photocopies are illegal**

Course Requirements

- Written Exams
- Paper Summaries

Market Microstructure and Dealing Room Simulations

Code: 9092

Instructor: Georgios Chalamandaris

ECTS credits: 5

Communication with the Instructor
gchalamandar@aueb.gr

Course title: Market Microstructure and Dealing Room Simulations
Type of course: Elective
Level of course: Undergraduate
Year of study: 3rd
Semester/trimester: Spring
Number of credits allocated (based on the student workload required to achieve the objectives or learning outcomes)**:** 5 Credits

Objective of the course:
Students who complete the course will be able to identify the main market structures, understand their principles, as well as main types of participants operating therein. The student will be able to interpret the very short-term market dynamics, as well as to assess the possible strategic decisions that traders face over the course of a day.

Prerequisites:
Undergraduate level courses in Probability and Statistics.

Course contents:
Market Microstructure is the field that deals with the organization of markets and their participants. Specifically, the dynamics of trade and price developments in different markets are examined by studying:

- the rules governing trading.
- the types of market-participants.
- their incentives, and
- the strategies they choose to achieve their objectives.

The course covers the following topics:

- Market Industry: Buy/Sell side, dealers, brokers, clearing and settlement.
- Orders, Algos and algorithmic trading.
- The role of dealers, brokers.
- Main categories of market-users (profit-motivated, utilitarian, noise traders) and their incentives.
- Basic strategies of each of these categories and how they affect the market mechanism.
- Price discovery in exchanges and OTC markets.
- The incorporation of information in market prices and the informational content of trades.
- Market structures: Order-driven, Dealer-to-Customer, Crossing-networks and hybrid markets.
- The nature of liquidity and volatility, their relationship and how they both affect market efficiency.
- Manifestations of asymmetric information, strategies for exploiting the information advantage and ways of protection against the risk arising from it.
- Key microstructure models: Garman, Roll, Glosten-Millgrom, Kyle.

Recommended reading:
The students will be given lecture notes and simulation software. In addition, we suggest the following books:

- L. Harris, "Trading and Exchanges – Market Microstructure for Practitioners", Oxford University Press, 2003
- J. Hasbrouck, "Empirical Market Microstructure – Economic and Statistical Perspectives on the Dynamics of Trade in Securities Market", Teaching Notes, 2003
- M. O'Hara, "Market Microstructure Theory", Basil Blackwell, Cambridge, 1995.

Teaching methods: Distance-learning methods during the pandemic, otherwise, it is taught in class with 3 extra sessions in the lab for applied work. In these workshops students will be able to perform simulations of short-term trading strategies under hypothetical scenarios, observe order-book simulations, and analyze stylized stock market dynamics.

Assessment methods:
Written exam (100%)

Language of instruction:
English

DEPARTMENT OF MARKETING AND COMMUNICATION

FALL SEMESTER

Retail Sales Promotions

Code: 9055

Instructor: Paris Argouslides

ECTS credits: 6

Communication with the Instructor: pargousl@aueb.gr

Course description and content
The present course includes 13 weekly sessions on sales promotions in the sector of retailing. Such promotions are initiated by manufacturers of consumer products, by retailers or by both of them. The course covers the following topics:

- Fundamentals of retail sales promotions.
- Alternative methods of retail sales promotions.
- General conditions leading to retail sales promotions campaigns.
- Design and implementation of retail sales promotions campaigns.
- Post-promotion issues.

Course delivery
Lectures are based on findings from empirical research published in premier journal outlets, practical examples, and illustrations of sales promotions from retail stores. Students will get electronic access to the theoretical material that will be covered during lectures. Specifically, before each lecture the corresponding slides will be available on e-class and students will have to register to get access. Regular class attendance is important because lectures include additional material that will not appear on e-class.

Course assessment
Though not formally assessed, the course requires students to work on several individual assignments and be ready to discuss them during lectures.
Formal assessment involves a written exam (**weight: 100% of the final mark**).

Key benefits

Students attending this course will likely get a job with a manufacturer of consumer goods (e.g. grocery or durables) or with a domestic or global retailer. It is, therefore, of particular importance to acquire knowledge about retail sales promotions. By combining empirical evidence with practical illustrations and case studies, this course aims at offering students a thorough understanding of the nature, content and context of retail sales promotions. Specifically, by course completion students will be able to know:

1. The philosophy of retail sales promotions.
2. The alternative methods of retail sales promotions.
3. The conditions justifying a retail sales promotion campaign.
4. Issues relating to the design, implementation, and post-promotion evaluation of retail sales promotions campaigns.
5. Promotions for perishable products.
6. Promotions for durable products.
7. Framing of retail sales promotions.
8. The role of gifts in retail sales promotions.

Key references

Ailawadi K.L., Gedenk K., Lutzky, C., and Neslin S.A. (2007), 'Decomposition of the sales impact of promotion-induced stockpiling', ***Journal of Marketing***, 44 (August), pp. 450-467.

Chen, H.A., Marmorstein, H., Tsiros, M., and Rao, A.R., (2012), 'When more is less: the impact of base value neglect on consumer preferences for bonus packs over price discounts', ***Journal of Marketing***, 76 (July), pp. 64-77.

DelVecchio D., Krishnan S., and Smith D.C. (2007), 'Cents or percent? The effects of promotion framing on price expectations and choice,' ***Journal of Marketing***, 71 (July), pp. 158-170.

Laran, J. and Tsiros, M. (2013), 'An investigation of the effectiveness of uncertainty in marketing promotions involving free-gifts', ***Journal of Marketing***, 77 (March), pp. 112-123.

Liu Y. (2007), 'The long-term impact of loyalty programs on consumer purchase behaviour and loyalty', ***Journal of Marketing***, 71 (October), pp. 19-35.

Ramanathan S. And Dhar S.K. (2010), 'The effect of sales promotions on the size and the composition of the shopping basket: regulatory compatibility from the framing and temporal restrictions', ***Journal of Marketing Research***, 47 (June), pp. 542-552.

Tsiros, M. and Chen, H. A. (2017), 'Convexity neglect in consumer decision making', ***Journal of Marketing Behavior***, 2 (4), pp. 253-290.

Tsiros M. and Heilman C. M. (2005), 'The effects of expiration dates and perceived risk on purchasing behaviour in grocery store perishable categories', ***Journal of Marketing***, 69 (April), pp. 114-129.

Tsiros M. and Hardesty D. M. (2010), 'Ending a price promotion: retracting it on one step or phasing it out gradually', ***Journal of Marketing***, 74 (January), pp. 49-64.

Innovation Management

Code: 9117

Instructor: Gkypali A.

ECTS credits: 6

Communication with the Instructor: agkypali@aueb.gr
Year of study: 4th Year

Semester: 7th Semester (Spring)

Relevant Scientific Journals: Research Policy, Journal of Product Innovation Management, Technological Forecasting and Social Change, R&D Management

Course description

The course aims to provide students with the necessary knowledge and skills to understand concepts related to technology and innovation, and how they influence in financial, administrative and organizational terms, the overall strategy and performance of businesses. Theoretical models are presented and analysed, and learning tools are used to explore and understand the field of Innovation and Technology Management.

Also, the aim of the course is for students to be able to understand and identify the driving factors that (i) influence the decision-making process at all times throughout the innovation process, (ii) guide the selection of optimal innovation strategies, and (iii) shape the respective enabling environments for the development of new products and services.

Learning outcomes

Upon successful completion of this course students will be able to cope with the basic principles of innovation and will be able to combine the knowledge they have acquired from previous courses, to discuss and critically analyse issues related to the creation and promotion of new products / services as well as to evaluate new business ventures and innovation strategies. Specifically, students will be able to understand and analyse topics related to:

- The basic concepts that underpin innovation management.
- The identification of sources of innovation and technology

- Understanding the innovation process, and the corresponding innovation inputs and outputs
- The analysis of the scope of innovation strategies (open innovation strategies, development of in-house innovation activities, outsourcing of innovation activities)
- Topics related to intellectual property rights management
- The emergence of new technologies (eg artificial intelligence) as catalysts in shaping the innovation process, and specifically regardig the decision-making process and the creation of new products / services.
- The development of critical analysis skills and presentation of case studies

Course content

The course includes the following lectures-modules:

- Innovation and business performance
- Product / technology life cycle
- The categories and types of innovation
- The process and sources of innovation
- Business Strategy and Innovation Management - Innovation Opportunities
- Digital Innovation - platforms, networks, technologies
- Organizational skills for innovation development
- Business models and innovation
- Commercial exploitation and diffusion of Innovation
- Open Innovation and Collaborations

Recommended reading material

I. J. Tidd , J. Bessant (2023). Managing Innovation: Integrating Technological, Market and Organizational Change, 7th Edition, Tziola and Sons publishers
II. M. Schilling (2018) «Strategic Management of Technological Innovation», Broken Hill- Paschalidis publishers
III. Teaching material in eclass (lecture notes, case studies)

Teaching methods

Lectures, case studies and use of multimedia content, critical review and analysis of selected theoretical and empirical research works.

Assessment methods

Student assessment is based on two criteria:

α. Bi-weekly group assignments + oral presentation (35%)

β. Final exams (65%)

SPRING SEMESTER

Change Management

Code: 9008

Instructor: Maria Vakola

ECTS credits: 6

Level: Advanced

Communication with the Instructor: mvakola@aueb.gr

General Aim and Rationale

The concept of change is not a new one. Indeed change has always been recognized as necessary and inherent to all aspects of life. However, the last decade has, for most organizations, been a time of totally unprecedented and seemingly ever accelerating change so that the phrase "change or die" has increasing resonance. Coping with change has become another element in organizations' battle to compete, thereby focusing attention on the need to manage change effectively. The aim of this course is to provide an understanding of the change management process and to present a framework for managing change in order for the participants to further explore advanced issues related to change management such as leadership, resistance to change, communication in a change context etc.

Specific Objectives

On successfully completing the module, participants will be able to do the following.

- Present a clear view of the theory and practice of managing change.
- Demonstrate an understanding of the choices and dilemmas facing organisations.
- Explain the nature and history of the theories, approaches and beliefs available to guide their action, in order to make informed choices when instigating and implementing change.

➢ Demonstrate a practical understanding of organizational change, of the approaches to change and the methods of identifying, planning and implementing change.

Methodology

The course is based on lectures, workshops and individual and group work . Please find below a detailed description of these scheduled meetings.

Weeks	CONTENT
1	Introduction to the course Introduction to change management
2	Selecting change agents/ Theory and team exercise
3	Culture change: Case study
4	Workshop: Identify success or failure factors in a culture change context
5	The role of culture in mergers and acquisitions
6	Resistance to change
7	Workshop: Antecedents and outcomes of resistance to change
8	Leadership and change management
9	Communication and change
10	Group presentations

Assessment

Course assessment is based on a group assignment and a group presentation:

Group report: In a group of 5-7 people, you try to explore a major change that took place in a European country. The aim is to collect information in order to write a case study of a major change presenting its main phases, ways of change implementation, main obstacles etc. This report counts for the 70% of your total mark.

Group presentation: You need to present to our group you main findings in a 10 minute presentation. This presentation counts for the 30% of your total mark. More information will be given in the first lecture.

Reading

Change is a broad subject and therefore students need to invest on searching and collecting materials from the library. Students will have access to e-class where there is recommended reading list.

Bibliography

- Alvesson, M., & Sveningsson, S. (2015). Changing organizational culture: Cultural change work in progress. Routledge.
- Beer, M., & Nohria, N. (2000). Cracking the code of change. HBR's 10 must reads on change, 78(3), 133-141.
- Bernick, C. L. (2001). When your culture needs a makeover. Harvard Business Review, 79(6), 53-8.
- Caldwell, R. (2003). Models of change agency: a fourfold classification. British Journal of Management, 14(2), 131-142.
- Hemerling, J., Kilmann, J., Danoesastro, M., Stutts, L., & Ahern, C. (2018). It's not a digital transformation without a digital culture. BCG, Boston, Massachusetts, USA.
- Kotter, J. P. (2007). Leading change: Why transformation efforts fail, Harvard Business Review, pp.2-12
- Oreg, S., Vakola, M., & Armenakis, A. (2011). Change recipients' reactions to organizational change: A 60-year review of quantitative studies. The Journal of Applied Behavioral Science, 47(4), 461-524.
- Probst, G., & Raisch, S. (2005). Organizational crisis: The logic of failure. Academy of Management Perspectives, 19(1), 90-105.

- Rousseau, D. M. (2006). Is there such a thing as "evidence-based management"? Academy of management review, 31(2), 256-269.
- Seo, M. G., & Hill, N. S. (2005). Understanding the human side of merger and acquisition: An integrative framework. The Journal of Applied Behavioral Science, 41(4), 422-443.
- Vakola, M (2012), Resistance to change: Technology implementation in the public sector, In Cases and Exercises in Organization Development, Anderson, D. (ed). pp 112-118, USA: Sage Publications

Marketing of Services

Code: 9020

Instructor: Kalipso Karantinou

ECTS credits: 6

Communication with the Instructor: kkarantinou@aueb.gr

Course Objectives

The service sector is the dominant driving economic force worldwide and marketing and management practices in this field are evolving rapidly. There is as a result an increasing academic and business interest in the service sector, where the manufacturing-based models of business and marketing practice are not always useful, relevant and appropriate. Service organizations differ in many important respects, posing a number of interesting challenges to managers, and thus requiring a distinctive approach to the development of marketing strategies. This course aims to provide the students with an extensive understanding of the distinguishing characteristics of services and their implications and to acquaint students with services marketing theories, models, applications, and best practices, as ways to deal effectively with the unique challenges in services.

Learning Outcomes

At the end of the course students should have developed a comprehensive understanding of the distinguishing characteristics of services, an appreciation of their multifaceted implications, and a resulting insight into the challenges of managing and marketing services. They should be able to identify optimal strategies for services and know how to implement them.

Course Content

- The Uniqueness and Characteristics of Services
- Managerial Implications and Challenges in Marketing Services
- Service Quality - Customer Care - Service Excellence
- Creating and Sustaining Competitive Advantages in Services
- Service Positioning and Branding
- Communicating an Offering the Customer Cannot See
- The Role of People in Services
- Internal Marketing in Services

- Loyalty and Relationship Development in Services
- The Importance of Physical Evidence in Services
- Developing Servicescapes
- Using Process as a Distinguishing Advantage in Services
- Blueprinting and Customer Journey Mapping
- Pricing for Optimal Yield and Demand Management

Teaching and Learning Methods and Style

Sessions will combine lecture style delivery with case studies, practical examples and extensive discussions of the application of theories in a variety of different sectors and situations. Student participation is particularly encouraged and facilitated. Case studies will be provided every week to facilitate understanding of the practical relevance of theoretical concepts and students will be asked to work on them individually or in groups. Students will also work on five practical projects enabling them to apply models and tools in practice.

Reading Material

Readings and case studies will be uploaded onto e-class every week, pertaining to each lecture, illustrating the discussed concepts and their applications.

Assessment

Assessment will be by a combination of:

Examination (70%),
Projects (30%).

Organizational Behaviour

Code: 9118

Instructor: Georgiou K.

ECTS credits: 6

Communication with the Instructor: kongeorgiou@aueb.gr

Learning Outcomes

After successfully completing the course, students will:

- Understand the key concepts and theories of organizational behavior.
- Analyze how individuals and groups behave within organizational settings.
- Be able to more effectively manage themselves and others at work.
- Apply strategies to enhance motivation, leadership, collaboration and decision-making in organizations.

Learning Outcomes

At the end of the course students should have developed a comprehensive understanding of the distinguishing characteristics of services, an appreciation of their multifaceted implications, and a resulting insight into the challenges of managing and marketing services. They should be able to identify optimal strategies for services and know how to implement them.

General Competences

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Adapting to new situations
- Team-work
- Criticism and self-criticism

Syllabus

This course aims to introduce participants to modern approaches to organizational behavior. Organizational behavior studies the behavior of individuals and groups in an organization, as well as the behavior of the organization itself, both internally and externally. Using theories and research methods from the social sciences, it deeply explores employees, teams and their interaction with the work environment, examining relationships between employees. The course provides practical insights on improving organizational

effectiveness and enhancing employee performance, satisfaction, and motivation.

Course Contents

- Introduction to Organizational Behavior: Definition of Organizational Behavior (OB), Importance of OB in Modern Organizations, Evidence-based OB
- Individual Behavior and Perception: Theories of Personality, Perception and Attribution
- Motivation and Job Satisfaction: Motivation Theories, Measuring Job Satisfaction
- Group Dynamics and Teamwork: Theories of Group Formation and Development, Team Dynamics and Team Building, Roles and Norms in Teams
- Leadership in Organizations: Leadership Theories (Trait, Behavioral, Contingency, Transformational)

The course is delivered in a way that supports students to apply the knowledge they acquire each week in practice. Each new concept or theory taught is accompanied by activities, providing students the opportunity to apply knowledge in real-life situations or scenarios.

Teaching Methods

Activity	Semester workload
lectures	39
project	50
study and analysis of bibliography	61
Course total	**150**

Assessment methods

- Final Exam: 70%

The exam questions will require students' in-depth knowledge of the topics discussed in class and critical reflection.

- Assignments: 30%

A team project involving critical reflection on issues and concepts that have been discussed during the course have been designed. Participants are asked to participate in a series of activities and assignments.

Evaluation criteria are given, and they are accessible to students via eclass.

Bibliography

- Arnold, J., Silvester, J., Patterson, F., Robertson, I., Cooper, C., and Burns, B. (2005), Work Psychology. Prentice Hall, London.
- Buchanan, D. A., and Huczynski, A. (2013) Organizational Behaviour. Pearson Education, Limited, United Kingdom.
- Kreitner, R., and Kinicki, A. (2004), Organizational Behavior, McGraw-Hill, New York.

Related academic journals:

- Academy of Management Executive
- Academy of Management Journal
- European Management Journal
- Harvard Business Review
- Journal of Applied Psychology
- Journal of Organizational Behavior
- Journal of Vocational behavior
- People Management
- Personnel Review

ΣΧΟΛΗ ΟΙΚΟΝΟΜΙΚΩΝ ΕΠΙΣΤΗΜΩΝ
SCHOOL OF ECONOMIC SCIENCES

SCHOOL OF ECONOMIC SCIENCES

DEPARTMENT OF INTERNATIONAL AND EUROPEAN ECONOMIC STUDIES

FALL SEMESTER

Economics of Globalization

Code: 9014

Instructor: MOUTOS T.

ECTS credits: 6

Level: Advanced (4th year course)

Communication with the Instructor: tmoutos@aueb.gr

Course Objective

The purpose of this course is to examine the forces that have shaped the evolution of the world economy during the last two centuries (with special emphasis on developments after World War II), and to study the consequences for national and individual welfare of the increased pace of worldwide economic integration.

Course Content

1. A Brief Historical Overview of the World Economy
2. International Trade in Goods

(a) Effects on National Welfare
(b) Distributional Implications
3. The Effects of Preferential Liberalization
4. Economic Integration, Labour Markets and Migration
5. Outsourcing
6. Capital Movements and Exchange Rate Regimes
(a) Fixed Exchange Rates
(b) Flexible Exchange Rates
(c) Monetary Unions

Recommended Prerequisite Knowledge

Intermediate-level knowledge of International Economics such as presented in Robert Feenstra and Alan Taylor, 2008, International Economics, Worth

Recommended Books on Globalization

Dani Rodrik, 1997, Has Globalization Gone too Far?, Peterson Institute
Joseph Stiglitz, 2003, Globalization and Its Discontents, Norton
Jeffry Frieden, 2006, Global Capitalism: Its Fall and Rise in the 20th Century, Norton
Dani Rodrik, 2011, The Globalization Paradox: Democracy and the Future of the World Economy, Norton

Additional reading of (mainly) journal articles will be provided after the first lecture.

Course Evaluation

The overall evaluation in this course is based on the following items:
1. Comprehensive Final Exam (50% of the final grade) covering all the units and topics presented in the lectures.
2. Students will have to work on a project (approximately 5000 words), to do in-class presentation (30 minutes), and to deliver the essay to their discussant a week prior to their presentation (35% of the final grade).
3. Students will have to write a comment on another student's project (maximum 1000 words) and to present it in class (15% of the final grade).

International Economics

Code: 9039

Instructor: CHRISTOPOULOS/HATZIPANAGIOTOU

ECTS credits: 6

Level: Intermediate

Communication with the Instructors: dchristop@aueb.gr / hatzip@aueb.gr

Course Description

Part A. International Trade: Theory and Policy

- Absolute and comparative advantage in international trade.
- The determination of relative prices; the gains from trade;
- The effects of productivity changes on domestic and foreign welfare.
- Gains and losses from trade in the specific-factors model;
- Trade policy: tariffs, subsidies, and quantitative restrictions.
- International Factor Movements: Winners, Losers?

Part B. International Monetary Economics: Theory and Policy

- National income and the Balance of Payments; the Current Account, foreign indebtedness.
- Money, interest rates and exchange rates; purchasing power parity; international interest-rate differences and the real exchange rate.
- National income and the exchange rate: Fixed versus flexible exchange rates; monetary, fiscal and exchange rate policy effectiveness under imperfect and perfect capital mobility. The insulating properties of alternative exchange rate regimes. Balance of payments crises and capital flight.
- The international monetary system; macroeconomic policy goals in the open economy: internal and external balance. International macroeconomic policy coordination.
-

Course Outline

Part A. International Trade: Theory and Policy

- Trade and Technology: The Ricardian Model (FT: 2)
- Factor Endowments and International Trade: The Specific Factors Model of International Trade (FT: 3)
- Import Tariffs and Quotas under Perfect Competition (FT: 8)
- Export Subsidies (FT: 10)

- International Factor Movements (FT: 5)

Part B. International Monetary Relations: Theory and Policy

- National and International Accounts: Income, Wealth, and the Balance of Payments (FT: 16)
- Exchange Rate Determination in the Short Run and in the Long Run (FT: 13, 14, 15)
- Output, Exchange Rates, and Macroeconomic Policies (FT:18)
- Fixed versus Floating Exchange Rates (FT: 19)
- Exchange Rate Crises (FT: 20)

Course Evaluation

The overall evaluation in this course is based on the following diagnostics:

1. Mid-term exam (Part A, 30% of the final grade): Week of 21-26, November 2022. Details to be announced in due time.
2. Comprehensive Final Exam (70% of the final grade). The exam covers the entire course material, PART A and PART B

Bibliography

Required Readings

- Course Textbook: Feenstra, Robert & Alan, Taylor: International Economics, Worth Publishers, 2008 (FT).
- E-class material

Supplementary Readings

- Krugman, Paul & Maurice Obstfeld, International Economics: Theory and Policy, 8th Edition, Addison-Wesley 2009
- Jagdish Bhagwati, Protectionism, MIT Press, 1988
- Jagdish Bhagwati, The World Trading System at Risk, MIT Press, 1991. Paul Krugman, Pop-Internationalism, MIT Press, 1995

Legal Aspects of European Integration

Code: 9043

Instructor: TBA

ECTS credits: 6

Level: Advanced

Communication with the Instructor:

Course Objective

The aim of the course is to analyze the most fundamental aspects of the process of European integration. Its objective is to provide an overview of the basic EU institutional and Economic law issues. It will help students understand how EU law can facilitate the process of the European Integration and promote or impede business transactions taking place at the European as well national level.

Course Outline

1. The History of European Integration

2. The Creation of the European Communities

3. The Creation of the European Union

4. EU Institutions

5. EU Decision Making System

6. The Protection of Fundamental Rights

7. The Citizenship of the European Union

8. EU-Member States: the Principles

9. The Internal Market of the EU

10. Economic and Monetary Union

11. EU Competition Policy

12. EU Social Policy

13. Freedom, Security and Justice

14. External action by the EU

Course material

EU Law, Chalmers/Davies/Monti, 2015 (CUP)

EU Law, R. Schütze, 2015 (CUP)

Applied Machine Learning in Economics

Code: 9087

Instructor: BILIAS I.

ECTS credits: 6

Communication with the Instructor
bilias@aueb.gr

Course Objective

Machine learning, originally a development in computer science, combined with ideas of statistical analysis, offers the basis for a set of tools for modeling and understanding complex datasets. This introductory course gives an overview of different concepts, techniques, and algorithms in machine learning with a view towards applications in economics. We begin with topics such as linear Regression, Classification, Model Selection, and we move to methods of improved predictive accuracy like Regularized Regression, Decision Trees, Boosting, Support Vector Machines, and Neural Networks as time permits.

The course will be delivered from the vantage point of user and provide the student with skills of implementation of the basic machine learning methods in economic problems using the R programming language.

Learning Outcomes

The aim of the course is to acquaint students with the basic methodological tools of machine learning, providing a comprehensive background. Upon successful completion of the course students will be able to:

- Understand the basic types and issues of a machine learning problem.
- Understand the standard learning methods for regression and classification problems.
- Estimate the test error rates using cross validation.
- Use R libraries to implement machine learning methods.
- Apply methods to analyze data on relevant economic questions.

Course Content

- Basic trade offs when we train a method.
- Linear Regression, Ridge Regression, Lasso.
- Logistic classification, KNN, Naïve Bayes.
- Cross-Validation approaches.
- Tree-based methods (Bagging, Random Forest, Boosting)
- Support Vector machines.
- Deep Learning.

Delivery Method

- Lectures on the basic concepts followed by computer implementation of the methods using R.

Evaluation

- Final written exam (25%), Midterm written exam (20%)
- Project (35%) and Assignments (20%)

Level

Intermediate level, appropriate mainly for third year students of economics or related subjects.

Recommended Prerequisite Knowledge

Introductory one-sample statistics and basic linear regression model.

Textbooks

An Introduction to Statistical Learning, (with Applications in R), by James, Witten, Hastie, Tibshirani.

Empirical Economics

Code: 9080

Instructor: TBA

ECTS credits: 6

Communication with the Instructor:

Course Objective

The course is an introduction to practical problems of applied econometrics. The approach followed will be very practical, emphasizing the empirical aspects of economic problems. This requires a good knowledge of econometric theory as it is essential to have a good idea of what the computer does, when asked to estimate and evaluate a model. Each section will begin with a presentation of the main theoretical econometric results that are required, followed by an economic/financial problem of interest and concluded with empirical applications. The analysis of the issues will be performed using real data.

Learning Outcomes

The aim of the course is to acquaint students with the basic methodological tools of modern empirical analysis, providing a comprehensive background. Upon successful completion of the course students will be able to:

- Understand and analyze the fundamental problems associated with empirical analysis of financial problems.
- Collect data suitable for empirical research and evaluate empirical models.
- Understand the concept of causality and how the causal effect of a variable can be calculated experimentally.
- Estimate linear regression models.
- Estimate and evaluate discrete choice models and use them for classification.

- Use instrumental variable techniques to estimate causal effects of interest
- Estimate models with panel data or repeated cross-sections, and use these in policy analyses

Course Content

- Understanding cause and effect in Economics
- Review of the simple and multiple regression model
- Pooled Cross Sections and Panel Data Models (DID methodology)
- Instrumental Variables Regression and Systems of Equations
- Models with binary dependent variables and classification
- Other limited dependent variable models (Tobit, Poisson)

Delivery Method

- Lectures followed by computer sessions to get a hands-on experience with the use of R

Evaluation

- Final Written Exam (40%)
- Projects and Assignments (60%)

Level

Intermediate level, appropriate mainly for third year students of economics or related subjects.

Recommended Prerequisite Knowledge

Introductory econometrics (basic linear model and deviations from classical assumptions).

Textbooks

Wooldridge, J. M. (2018*) Introduction to Econometrics: A Modern Approach*, 7th ed, Cengage

Stock, J. H. and Watson, M. W. (2019) *Introduction to Econometrics*, 4th ed, Pearson Education.

Other Material

Angrist, J. and Pischke, J.-S. (2014) *Mastering 'Metrics. The Path from Cause to Effect*. Princeton University Press
Angrist, J. D. and Pischke, J.-S. (2009) *Mostly Harmless Econometrics: An Empiricist's companion*, Princeton University Press.
Greene, W. H. (2018) *Econometric Analysis*, 8th ed, Pearson
Kleiber, C. and Zeileis, A. (2008) *Applied Econometrics with R*, Springer
Hanck, C., Arnold, M., Gerber, A. and Schmelzer, M. (2020) Introduction to Econometrics with R, https://www.econometrics-with-r.org
Heiss, F. (2020) *Using R for Introductory Econometrics*, http://www.urfie.net

Industrial Economics

Code: 9106

Instructor: Chrysovalantou Milliou

ECTS credits: 6

Level: Advanced (appropriate mainly for 3rd or 4th year students of Economics)

Communication with the Instructor: cmilliou@aueb.gr

Prerequisites

Intermediate knowledge of Microeconomics (2 courses in Microeconomics).

Familiarity with linear algebra and basic calculus (calculus-based profit maximization models so you should be comfortable with taking simple partial derivatives).

Teaching Method: Weekly lectures

Course Content & Outline

Industrial Economics (Industrial Organization) is the field of Microeconomics that studies the behavior/decisions of firms in markets with imperfect competition and their implications for welfare. Most markets nowadays are markets with imperfect competition and in such markets firms' interactions are strategic. We will focus on the analysis of firms' strategic interactions in different types of imperfectly competitive markets. We will also explore a number of business strategies, such as cartels and mergers, and their treatment by competition policy. To do so, we will use tools of Microeconomics and basic Game Theory. We will combine theoretical models with some real world applications. The topics covered will be as follows:

1. Introduction

2. Monopoly

3. Static Oligopoly

Game Theory: Review

Competition in Quantities (Cournot Model)

Competition in Prices (Bertrand Model)

Product Diffentiation

4. Dynamic Oligopoly

Sequential Decisions (Stackelberg Model)

Entry

R&D

Collusion

5. Vertically Related Markets

6. Competition Policy

Cartels & Vertical Restraints

Mergers

Abuse of Dominance Learning Outcomes

Reading List

Material (lecture slides) uploaded on the course's eclass

Belleflamme, P. and M. Peitz, (2015), *Industrial Organization: Markets and Strategies*, Cambridge University Press.

Pepall, L., D. Richards and G. Norman (2014), *Industrial Organization: Contemporary Theory and Empirical Applications*, Wiley Editions.

Course Assessment

30% mid-term written exam

70% final written exam

DEPARTMENT OF ECONOMICS

FALL SEMESTER

Public Economics

Code: 9026

Instructor: Petros Varthalitis

ECTS credits: 6

Level: 3rd year course

Communication with the instructor: pvarthalitis@aueb.gr

Level of course: **Undergraduate**

Year of study: **3RD year**

Assessment methods and criteria

The course grade will be based on written exams and (optional) assignments.

Prerequisites and co-requisites

Basic Microeconomics and Macroeconomics

Planned learning activities and teaching methods

Lectures, problem sets and assignments.

Objectives of the course:

This is the basic course in public economics. Public economics focus on the role of the government in the economy by answering key questions like:

- How do government policies affect the economy?

- How should government policies be designed to maximize economic welfare?

The main objective of the course is to equip students with the basic analytical concepts, theoretical and empirical tools in public economics so as to understand the 'real-world' policy making issues faced by policymakers and applied economists in national (e.g. Government Departments, Fiscal Councils and Central Banks) and international policy institutions (e.g. IMF, OECD, European Commission).

By the end of this course students will be able to use the main analytical tools, theoretical models and empirical evidence to:

- Understand and explain issues on public finances, e.g. tax and government expenditures, budget deficits/surpluses and public debt sustainability.
- Analyze efficiency and equity concepts.
- Market failures and government intervention.
- Political economy issues, e.g. how the government make decisions.
- The effect of taxation on the economy, types of taxation, principles of optimal taxation.

Students will learn how to use and interpret modern theoretical models so as to study economic policy issues as well as to process and interpret economic data for policy analysis. Ultimately, students will acquire necessary skills and competences so as to pursuit a professional career as applied economists to policy-orientated institutions.

Recommended optional programme components

N.A.

Course contents

In general, public economics is the study of economic efficiency, distribution and economic policies. Public economics attempts to understand how the government makes decisions and what decisions should make. The course will cover the following topics:

- Public Finances.

- Efficiency and Equity.
- Externalities.
- Public Goods.
- Political Economy and Democracy.
- Issues on taxation.
- Government policies in the era of COVID-19 crisis.

Recommended or required reading

- Gruber, Jonathan., Public Finance and Public Policy, 6th Edition, MacMillan (2019).
- Hindriks Jean and Myles D. Gareth., Intermediate Public Economics, MIT Press (2006).

Additional references and will be recommended during each lecture.

Topics in Corporate Finance

Code: 9116

Instructor: Pagratis S.

ECTS credits: 6

Communication with the Instructor: spagratis@aueb.gr

Course Overview

This course examines how firms access external funding in capital and money markets and factors that affect their capital structure decisions, namely the mix of various forms of financing. It also covers topics on investment valuation and capital budgeting decisions by corporates.
The course begins (Section 1) with an in-depth discussion of money-creation in a modern economy and how liquidity conditions in capital and money markets are affected by major asset purchase programs (dubbed as quantitative easing – QE) and other forms of open market operations by central banks. Special emphasis is placed on the toolkit of policy instruments used by the US Federal Reserve and the European Central Banks targeted to affect the cost of funding in the economy. By completion of this first part of the course students are enabled to navigate in the new era of central banks' open market operations and identify turning points in central bank policy that may have a profound impact on asset valuations and the cost of corporate financing.
The second part of the course (Section 2) discusses capital budgeting and business plans. A case study is discussed extensively in class. Following the basic steps of the case study, students are asked to prepare, submit and present their own analysis of a chosen Firm assuming that they represent the Firm in negotiations with its creditor Bank to reduce the interest rate of its long-term funding.
The third part of the course (Section 3) focuses on the micro-foundations of corporate financing. Using as a starting point the benchmark case of an economy without frictions, it shows that under such circumstances capital structure decisions would be irrelevant for the value of the firm. This, so called Modigliani-Miller (MM) irrelevance proposition, is discussed using basic concepts of real options where students have the opportunity to gain a deeper insight into the valuation of risky-debt and equity. The MM irrelevance proposition is used to guide students' thinking about the impact of financial transactions, such as share buybacks, on share valuations and the weighted

average cost of capital (WACC). Real-world examples are considered where capital markets are subject to distortions and frictions, such as financial distress costs, principle-agent problems, and asymmetric information. The teaching mode is to identify factors of first-order importance that affect capital structure decisions by corporates. Such factors are considered first in isolation, and then think towards an optimal capital structure when different factors interact.
In particular, the Static Trade-Off theory (STO) considers the balance between tax shields and financial distress costs in determining a firm's debt policy. As part of STO, students are introduced to problems of debt-overhang and underinvestment by firms due to legacy debts and learn how managers could deal with these problems, with a special emphasis on rights issues and debt restructurings. In the presence of managerial moral hazard, the Free-Cash-Flow theory (FCF) suggests that debt could act as disciplinary devise, facilitating better monitoring of managerial decisions. According to the Pecking-Order-Theory, information asymmetries lead to different degrees of mispricing of corporate securities. Therefore, corporate decisions on which type of securities to issue depend on information sensitivities. Aspects of crowdfunding, human capital and innovation are also considered.
Overall, students are equipped with the analytical apparatus to identify first-order issues relevant to corporate financing decisions and learn how to combine and apply them in practice.

Objectives of the Course - Learning Outcomes

The students taking this course should be able to:

1. Identify turning points in economic policy and analyse their material impact on funding conditions and corporate decisions to access external financing,
2. Understand the new era of extraordinary policy interventions by central banks and appraise their impacts on asset valuations and the cost of corporate financing,
3. Value investment projects and capital budgeting decisions and identify factors that affect corporate decisions to access different forms of financing,

4. Assess alternative ways of accessing capital markets, as well as corporate payout policies to shareholders, i.e share buybacks and dividend policy.

5. Identify issues of first-order importance that are relevant to corporate financing, combine them to make informed decisions and negotiate funding terms with financiers.

Course Content

Session 1. A primer on money creation in a modern economy

- Quantitative Easing (QE) and asset valuations.
- Quantitative Tightening (QT) and capital market turbulence. A view to the future.
- Long-term refinancing operations, targeted operations, credit easing, outright monetary operations (OMT) and the Covid-19 pandemic emergency programs.

Session 2. Capital Budgeting: Risk, return, and free cash flow analysis.

- CAPM, asset betas, WACC, and the internal rate of return (IRR) in practice.
- Data sources: Equity risk premium (ERP), marginal tax rates, sectoral betas and growth rates on operating income (EBIT).
- Free cash flow analysis: Working capital, sunk costs, tax shields (amortization-depreciation and interest costs).

Session 3. Capital Structure: Optimal debt-equity choice.

- Empirical patterns of corporate financing and possible explanations.
- Types of financial instruments and markets.
- Modigliani-Miller irrelevance proposition. An options-based approach to debt and equity valuations. The weighted average cost of capital (WACC) and WACC fallacies.
- Capital structure under financial frictions. Taxes, financial distress costs and the static trade off (STO) in practice.

- Debt-overhang: The underinvestment problem and the role of financial restructuring.
- Equity capital raising and the mechanics of rights issues.
- Incentives, asymmetric information and the pecking-order of financing choices.

Course Material– Recommended Readings

The course packet contains an extensive set of self-contained slides (approx. 150 slides) that are structured in three main sections, following the section list above. It also includes articles from business press (that students need to follow consistently). These are optional but highly recommended to expedite fluency in current financial affairs and galvanize finance-savvy profiles.

Auxiliary textbooks:

1. Jean Tirole. "The Theory of Corporate Finance", Princeton University Press.
2. Brealey, Myers, and Allen. "Principles of Corporate Finance", McGraw-Hill, New York, NY.
3. A series of topical articles from financial-press (mainly from Financial Times) that are frequently updated and links provided in relevant lecture slides.

Teaching Method

Lecturing will be supported by video presentations, in-class case analyses, and occasional invited lectures by market experts. Students are expected to be prepared for class at all times and to contribute to class discussions.

Course Evaluation – Assessment Methods

The course is evaluated through one final exam that counts for 100% of the course grade. The final exam is closed books and closed notes and lasts for 2

hours. It covers material from the entire course, including occasional invited lectures. Students are encouraged to use a calculator for the exam. This element is geared towards assessing students' ability to present concisely and quantitatively credible solutions to explicit corporate finance problems.

Language of Instruction

English

SPRING SEMESTER

Startup Entrepreneurship

Code: 9083

Instructor: Ioanna Sapfo Pepelasi**,** Emerita Professor

Communication with the Instructor: ioannasapfopepelasis@gmail.com

ECTS credits: 6

***This course is supported by ACEin , the incubator of AUEB.**

Course Objectives

To provide a basic knowledge and direct familiarity with: startup entrepreneurship and its links to innovation and sustainable economic growth , the steps required during the journey from business idea to early stage firm creation; the prerequisites for success; lessons from failure and developing familiarity with the startup ecosystem and how it has evolved..

Contents

1. Defining the entrepreneurial mindset and toolset from a variety of theoretical and practical based methodological approaches.
2. Startup entrepreneurs(ship): Basic features and varieties (past, present and 'tomorrow').
3. Startup entrepreneurship: significance and links to (sustainable) economic growth.
4. From idea to realization/maturity. The birth and (early) stages of growth of a startup.
5. Tools, case studies and information useful for prospective start uppers.
    5a. Business Model Canvas
    5b. Basic Business Plan/Financial Tool
    5c. Digital Transformation of an organization
    5d. Branding for Start ups
    5e. How to make a perfect Pitch for a Start up
6. Drivers of Success and dealing with failure.
7. Selected examples of successful startups and startup ecosystems.
8. Epilogue: Summary and looking towards the future.

Method

During the second part of each lecture we will have an invited speaker. These speakers will consist of members of ACEin, startuppers, other stakeholders of the startup/innovation ecosystems and academics. The study material will consist of a collection of written academic and practice based articles and videos.

Requirements

1. A short 5 minute presentation in class (on selected topics).
2. Final exam : open ended questions.

Indicative Wider Bibliography

- Aulet, Bill (2013), Disciplined Entrepreneurship, Wiley, (selected chapters).
- Baumol, W,(1996) ,. Entrepreneurship: Productive, unproductive, and destructive, Journal of Business Venturing, Volume 11, Issue 1. https://www.sciencedirect.com/science/article/abs/pii/088390269400014X
- Besis, Ioannis and Ioanna Sapfo Pepelasis (2020), Incubated early stage startuppers and their initiatives in Athens during the Crisis (2010-2016), Department of Economic, AUEB, Working Papers, https://www.hellenic.org/wp- content/uploads/2020/06/allWP-01-20-Besis-Pepelasis-03-June-2020-AUEB- Report.pdf
- Blank, Steve (2013), Why the Lean Start-Up Changes Everything A faster, smarter methodology for launching companies may make business plans obsolete., Harvard Business Review, May https://hbr.org/2013/05/why-the-lean-start-up- changes-everything
- Cassens, Nathalie (2021), The Lean Startup – A Systematic Literature Review Seminar paper FH Wedel, Wedel, Germany, bwl105273@fh-wedel.de Seminar IT-Management in the Digital Age (Winter), FH Wedel, Germany
- European Startup Monitor 2019/20 https://www.europeanstartupmonitor2019.eu/EuropeanStartupMonitor2019_20 20_21_02_2020-1.pdf
- European Startups (2021) , The Past, Present, Future of European Tech,(selected chapters). https://www.europeanstartups.co
- Ries, Eric, (2011) The Lean Startup, Crown Business,(selected chapters).
- Salamzadeh, Aidin and Kawamorita Kesim, Hiroko, (2015). Startup Companies: Life Cycle and Challenges. Proceedings of the 4th

International Conference on Employment, Education and Entrepreneurship (EEE), Belgrade, Serbia. https://tarjomefa.com/wp-content/uploads/2017/01/5929-English-TarjomeFa.pdf

- Senor,Dan and Singer, Saul, (2009)m Start-up Nation, Twelve, (selected chapters).
- StartupBlink, Global and Europe GUIDE https://www.startupblink.com/blog/a-startup-ecosystem-guide-europe/\

Business Economics

Code: 9006

Instructor: TBA

Communication with the Instructor

ECTS credits: 6

Course Description

Managerial (or Business) Economics is the application of economic theory to decisions made by firms. Our focus is on four topics. We start with demand theory and consumer behaviour, studying how consumers and other firms respond to price changes and thus how to decide what price to charge. We then move to production and cost theory, where we think about the most basic decisions of firms: how much to produce and what inputs to use (optimal boundaries). We then analyze pricing strategies under different market structures and the strategic world of managers (market and competitive analysis). Then we look at how firms choose (and maintain) their competitive advantage. Lastly, we look inside the firm, on how firms are organized and the way they evaluate and reward performance (optimal internal structure). Managerial economics provides a comprehensive application of economic theory and methodology to managerial decision making.

Course Objectives

The learning objectives of the course:

- To enable students to develop the skills and to provide the opportunity to practice the study of Managerial Economics.
- To develop a critical understanding of methods, procedures and current issues and debates appropriate to the study of Managerial Economics.

By the end of the course the students should:

- have gained a knowledge and understanding of the themes, issues and debates within the study of Managerial Economics
- be able to think critically and independently about what they have seen and read

- have been introduced to the range of skills and critical vocabularies needed to facilitate the study of Managerial Economics
- gained a critical understanding of the application of the methods involved in the study of Managerial Economics

Textbooks and Reading

The main textbook of the course is:

1. Besanko, D., Dranove, D., Shanley, M., Shaefer, S., Economics of Strategy, John Wiley and Sons, 5th edition, 2010.

Course participants will be given a package of additional reading in some sessions. For those interested in further reading the following books are recommended:

2. W. Bruce Allen, Neil Doherty, Keith Weigelt, and Edwin Mansfield, Managerial Economics, Norton, 7th edition, 2009.
3. Church J. and R. Ware (2000), Industrial Organization: A Strategic Approach, McGrawHill.
4. Keat, P. and Young, P., Managerial Economics, Prentice Hall, fifth edition, 2006.
5. Lazear E. and M.Gibbs, Personnel Economics in Practice, Wiley, 2nd edition, 2009.

Course Outline

ii. Introduction; Theory of the Firm
iii. Does Management matter?
iv. Basics of Demand and Supply & consumer behaviour
v. Individual and Market Demand; Estimating Demand
vi. Production and Cost Theory
vii. Profit maximization and competitive supply-optimal boundaries
viii. Market power and pricing
ix. Business strategy and game theory
x. Markets with Asymmetric Information
xi. Strategic position and dynamics
xii. Internal organization

ΣΧΟΛΗ ΕΠΙΣΤΗΜΩΝ & ΤΕΧΝΟΛΟΓΙΑΣ ΤΗΣ ΠΛΗΡΟΦΟΡΙΑΣ
SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY

SCHOOL OF INFORMATION SCIENCES AND TECHNOLOGY

DEPARTMENT OF INFORMATICS

Incoming Erasmus students who speak Greek may attend any of the undergraduate courses of the Department of Informatics (6 or 7 ECTS credits each); their descriptions (in Greek) can be found at: http://www.cs.aueb.gr/el/content/programma-spoydon.

Incoming students who speak English may also attend any of the following courses, which are offered as **taught** or **reading** courses.

Incoming ERASMUS undergraduate students are advised not to attend courses marked as 'Master's Course' in the list below.

FALL SEMESTER

Computer Graphics

Code: 9088

Instructor: G. Papaioannou

ECTS credits: 6

Communication with the Instructor: gepap@aueb.gr

Objectives

Learn the fundamentals of computer graphics and image synthesis (rendering), with a focus on real -time and interactive graphics.

Intended Audience

Mainly computer science students.

Course Description

Digital imaging synthesis, applications and spatial data representation models. Basic 2D shape drawing algorithms, antialiasing and supersampling. 2D and 3D transformations and coordinate systems, compound transformations and kinematic chains, scene graphs and modeling. Culling, viewing transformations and projections. Data structures for polygonal models. Back face removal. Hidden surface elimination and depth sorting. Scan-conversion and the Z-buffer algorithm. Illumination models, the bidirectional reflectivity distribution function and empirical local illumination models and algorithms. Texturing: Texture maps, texture coordinates and transformations, antialiasing and procedural textures. Introduction to shaders. Animation techniques and motion synthesis. Visibility computation (shadows): Shadow maps and their variants. Graphics hardware architectures. Modern computer game graphics. Laboratory courses on the Unity game engine (transformations, materials and shading, animation, shadows, baked and dynamic lighting, light probes, shaders). Optional lab courses on graphics programming using OpenGL and C/C++.

Prerequisites

Calculus, computer organization

Suggested textbooks

Graphics and Visualization: Principles & Algorithms, T. Theoharis, G. Papaioannou, N. Platis, N. M. Patrikalakis, A. K. Peters, Ltd., 2008.

Real-TimeRendering, T. Akenine-Möller, E. Haines, N. Hoffman, 3rd edition, CRCPress, 2008

Computer Graphics: Principles and Practice, J. F. Hughes, A. van Dam, M. McGuire, D. F. Sklar, J. D. Foley, S. K. Feiner, 3η έκδοση, Addison Wesley, 2013.

Assessment methods

Written examinations, optional: final assignment (small computer game in Unity or C++, using graphics APIs)

Distributed Systems, Cloud Computing, BigData (Master's Course)

Code: 9090

Instructor: V. Kalogeraki

ECTS credits: 6

Communication with the Instructor: vana@aueb.gr

Intended audience

Mainly Computer science students. Knowledge of a Programming language is required.

Course Description

Distributed systems and architectures, Communication protocols, Coordination systems, Message delivery systems, Parallel computing, The MapReduce Programming model, Cloud computing fundamentals, Cloud computing: properties, characteristics, benefits and disadvantages, Cloud computing models including IaaS, PaaS, SaaS, FaaS, Microservices, Cloud infrastructures, Virtualization, Resource Management and Scheduling, Elasticity, Scalability, Performance tuning, Storage systems, Pub/Subsystems, Apache systems and tools including Apache Hadoop, Yarn, Mesos, Kafka, Zookeeper and Redis.

Suggested textbooks

Collection of papers

Software Verification, Validation & Maintenance

Code: 9016

Instructor: N. Malevris

ECTS credits: 6

Communication with the InstructorQ: ngm@aueb.gr

Objectives

Learn the fundamentals of software quality and the way it can be achieved.

Intended Audience

Mainly computer science students.

Course Description

Importance of software specifications and user's requirements. Programming practice. Programming languages importance in software development. High quality software development. Software quality and methods for achieving it. Quality standards. Software verification – formal methods. Validation of software and techniques. Software testing. Strategies and methods for effective software testing. Test data generation. Software maintenance. Emphasis on effective methods for maintaining software. Importance of appropriate documentation in software development. Cost estimation of software development. Emphasis on special characteristics of object oriented software as well as web applications. Automated tools with respect to the topics listed above.

Prerequisites

Knowledge of a Programming language.

Suggested textbooks

M. PEZZE, M. YOUNG, «SOFTWARE TESTING AND ANALYSIS: PROCESS, PRINCIPLES AND TECHNIQUES» (WILEY) or

P. AMMANN, J. OFFUTT, INDRODUCTION TO SOFTWARE TESTING (CAMBRIDGE UNIVERCITY PRESS).

Wireless Networks and Mobile Communications

Code: 9065

Instructor: Vasilios Siris

ECTS credits: 6

Communication with the Instructor: vsiris@aueb.gr

Objectives

Learn the key principles, architectures, and operation of wireless networks and mobile communications to exploit and further expand their application to domains such as wireless Internet of Things, interconnected smart objects, intelligent mobility, mobile digital wallet applications, and Web 3.0 technologies.

Intended Audience

Primarily students in computer science. Students in other majors will be considered based on their background in computer science related courses and must be approved by the Instructor before registering for the course.

Course Description

Wireless networks and mobile communications is one of the fastest evolving areas in computer science, having a huge impact on economics and society, affecting how people work, communicate, and entertain themselves. Wireless and mobile communication technologies target to offer universal broadband connectivity to stationary and mobile users, as well as machines and objects, offering online access to information and data anywhere, anytime, and from any device.

The course's objective is to introduce the key principles, architectures, and operation of wireless networks and mobile communications. Understanding of these principles and fundamentals is necessary to exploit and further expand the application of wireless and mobile technologies in domains such as wireless Internet of Things, interconnected smart objects, smart cities,

smart homes, supply chain management, intelligent mobility, mobile digital wallet applications, and Web 3.0 technologies, among others.

Prerequisites

Introductory course on computer communications or computer networks.

Suggested textbooks

Wireless Communication Networks and Systems, C. Beard and W. Stallings, Pearson, 2016. A previous edition is freely available: Wireless Communications & Networks, William Stallings, 2nd Edition, 2005, Prentice Hall.

Assessment methods

The final grade will be computed as follows: 50% project (in teams of 2 students) and 50% final examination. Final examination score must be above 4/10 to get a passing grade.

Blockchains (Master's course)

Code: 9094

Instructor: S. Voulgaris

ECTS credits: 6

Communication with the Instructor: voulgaris@aueb.gr

Objectives

Demystify the innerworkings of blockchain systems and how intricate algorithms are combined to offer paramount trust out of non-trusted components.

Intended Audience

Computer science students with a solid understanding of algorithms and data structures.

Course Description

Basic cryptographic principles and tools, cryptographic hash functions, blockchains, smart contracts, detailed Bitcoin operation, UTXO payment model, detailed Ethereum operation, consensus protocols, Proof-of-Work, Proof-of-Stake, the Solidity programming language, security issues in Solidity, oracles, next generation blockchains: Algorand, Cardano, Filecoin, atomic swaps, side-chains, lightning network, Inter-Ledger Communication, Distributed Identifiers (DIDs), Verifiable Credentials (VCs).

Suggested textbooks

No textbook, just slides and papers.

Planned learning activities and teaching methods

In vivo teaching.

Assessment methods and criteria

A programming exercise during the semester and a written final exam.

SPRING SEMESTER

Computer Architecture

Code: 9093

Instructor: S. Voulgaris

ECTS credits: 6

Communication with the Instructor: voulgaris@aueb.gr

Objectives

Study modern computer architecture, understanding the principles, the theory and practice of designing processors, memory systems, and I/O devices.

Intended Audience

Computer science students with some background on computer hardware.

Course Description

Modern computer architectures and design cycle of integrated circuits and systems. MIPS assembly, compilers and their relation to computer architecture. Computer architecture and the VHDL language. Design of the datapath and control circuit for MIPS (one cycle), pipeline and MIPS design, MIPS of multiple cycles. Instruction-level parallelism, out-of-order execution, microprogramming, memory hierarchy, cache memories, I/O, and virtual memory.

Suggested textbooks

Computer Organization and DesignMIPSEdition: The Hardware/Software Interface, D. Patterson and J. Hennessy, 5th edition, MorganKaufmann, 2013. • Structured Computer Organization, A. S. Tanenbaum and ToddAustin, 6th edition, Pearson, 2013.

Planned learning activities and teaching methods

In vivo teaching

Assessment methods and criteria

Exercises during the semester and a written final exam.

Computability and Complexity (Reading Course)

Code: 9095

Instructor: E. Foustoucos

ECTS credits: 6

Communication with the Instructor: eugenie@aueb.gr

Course Description

Computability: Inductive proofs and recursive definitions. Encodings. Introduction to computation models. Primitive recursive functions and relations. Partial recursive functions and minimization. Device computability. Turing machines and Turing-computable functions. Equivalence between recursive functions and Turing-computable functions. Church-Turing Thesis. The basic theorems: normal type theorem, enumeration theorem and parameters theorem (s-m-n theorem). Recursively enumerable sets and unsolvable problems. Definability and arithmetical hierarchy. Turing-reducibility and degrees of unsolvability. Complexity: Classes NP and co-NP. NP-completeness. The classes of the polynomial hierarchy and the class PSPACE. PSPACE-completeness. Oracle Turing machines. Alternating Turing machines. If time allows, topics among the following may be covered: Complexity classes for finding problems (FP, FNP, PPAD). Counting problems: the class #P. Classes for optimization problems (APX, MAXSNP). Gap reductions and PCP theorem.

Prerequisite Courses: To enroll in the course, students must have successfully completed basic courses on Theory of Computation and/or on Algorithms. It is also recommended that students have successfully completed a basic course on (Mathematical) Logic.

Suggested textbooks

Introduction to the Theory of Computation, M. Sipser, Cengage Learning, 3rd edition, 2013.

Theory of Computation, Dexter Kozen, Texts in Computer Science, Springer, 2006.
Computable functions, A. Shen, N.K. Vereshchagin, Student Mathematical Library Vol 19, American Mathematical Society, 2003.
Theory of computation, George Tourlakis, Wiley Editions, 2012.
Computability Theory, R. Weber, Student Mathematical Library Vol 62, American Mathematical Society, 2012.

Computer Game Graphics and Virtual Reality (Master's course)

Code: 9089

Instructor: G. Papaioannou

ECTS credits: 6

Communication with the Instructor: gepap@aueb.gr

Objectives

Learn the theory and practical algorithms used in real-time rendering for computer games and immersive virtual environments.

Intended audience

Computer science, mathematics and statistics students. A background in fundamental computer graphics techniques is recommended but not required.

Course Description

This course introduces the students to the exciting world of computer graphics for computer games, extended reality and other interactive applications. The course covers both the theory and practical aspects of photorealistic, real-time rendering, including technologies for the display, animation and capture of 3D content and its motion. The lectures start by presenting fundamental theory and algorithms of real-time computer graphics and then move to more advanced techniques such as deferred shading and tiled rendering, screen-space effects, global illumination and ray tracing, skeletal animation, light probes and precomputed radiance transfer. Lectures are complemented with practical examples and specific techniques from commercial games and game engines.

Suggested textbooks

Graphics and Visualization: Principles & Algorithms, T. Theoharis, G. Papaioannou, N. Platis, N. M. Patrikalakis, A. K. Peters, Ltd., 2008.

Real-Time Rendering, T. Akenine-Möller, E. Haines, N. Hoffman, 3rd edition, CRC Press, 2008.

Computer Graphics: Principles and Practice, J. F. Hughes, A. van Dam, M. McGuire, D. F. Sklar, J. D. Foley, S. K. Feiner, 3rd edition, Addison Wesley, 2013.

Multimedia Technology

Code: 9098

Instructor: G. Xylomenos

ECTS credits: 6

Communication with the Instructor: xgeorge@aueb.gr

Objectives

Introduction to the technologies and applications of digital media and multimedia. Emphasis on multimedia for the Web and multimedia communications on the Internet.

Intended Audience

Mainly computer science students.

Course Description

Multimedia applications and systems. Definition and attributes of various media types. Media streams. Sound, images and video. Elements of information theory. Media coding and compression. Compression standards: JPEG, MPEG, H.26x, MP3 and AAC. Multimedia on the web and on the Internet. Multimedia communications, multicasting. Conferencing. Synchronization. Media streaming, RTP, IPTV and MPEG-DASH. Quality of service in multimedia communications. The course requires completing a development project related to multimedia (e.g. a game or a media manipulation application).

Suggested textbooks

Z.N. Li and M.S. Drew, Fundamentals of Multimedia, 2nd edition, Prentice Hall, 2014.

DEPARTMENT OF STATISTICS

ΣΧΟΛΗ ΕΠΙΣΤΗΜΩΝ & ΤΕΧΝΟΛΟΓΙΑΣ ΤΗΣ ΠΛΗΡΟΦΟΡΙΑΣ
SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY

ΤΜΗΜΑ ΣΤΑΤΙΣΤΙΚΗΣ
DEPARTMENT OF STATISTICS

All students should come from Department of Statistics or

Department of Mathematics

FALL SEMESTER

Actuarial Science II (Reading course)

Code: 9001

Instructor: ZYMBIDIS A.

Communication with the Instructor: aaz@aueb.gr
ECTS credits: 7

Level of course: Undergraduate
Year of study: 4th year
Objectives of the course:
At the end of the course, students can deal with the main problems of pricing and reserving of life insurance policies.

• **Prerequisites and co-requisites**
Basic knowledge of Mathematics, Probability and Statistics.

• **Recommended optional programme components**
N/A

• **Course contents**
Survival function, Simple mortality table and related functions, force of mortality, laws Classics mortality, actuarial tables and commutation functions, Stochastic approach to Life Insurance. Life annuities with one or more payments annually, Relationship between annuities, life insurance of various kinds, Relationship annuities and insurance, interest rate movements and mortality. Net premiums and gross premiums, concept and process of calculating reserves, Relationship between successive stock price. Tables and Actuarial functions for two or more persons, Contingent actuarial functions.

• **Recommended or required reading**
- Zimbidis A.(2009), «Actuarial Mathematics of Life Insurance»
- Neil A. (1986), «Life Contingencies» Heinemann Professional Publishing
- Etienne De Vylder (1997), "Life insurance : Actuarial Perspectives"
- Kluwer Academic Print

• **Planned learning activities and teaching methods**
Teaching Method: Reading Course

• **Assessment methods and criteria**
Courseworks during the semester plus oral exam at the end of the semester.

Computational Statistics (MSc in Statistics course)

Code: 9007

Instructor: TBA

ECTS credits: 7,5

Level of course: Postgraduate
Year of study: 1st year

Objectives of the course:
The students learn the basic principles of simulations and its usage in modern statistical analyses. They also learn how to make statistical inference using the computer and how to apply numerical methods to solve statistical problems like, estimation, calculation of quantities that it is not possible otherwise etc.

• Prerequisites and co-requisites
Probability, Statistics, Estimation-Hypothesis testing, Linear Modelling, Analysis of Variance.
The course is suitable for students from Statistics departments**.**

• Recommended optional programme components
None

• Course contents
R programming, simulation techniques, Monte Carlo methods, numerical methods for stats, smoothing, numerical optimization, bootstrap, MCMC.

• Recommended or required reading
- Venables, W.N., Ripley, B.D. (2002). Modern Applied Statistics with S (4th edn). Springer Crawley, M.J. (2002). Statistical Computing: An introduction to data analysis using S-Plus. Wiley
- Robert, C.P. and Casella, G. (2010). Introducing Monte Carlo Methods with R, Springer.
- Efron, B. and Tibshirani, R.J. (1993). An Introduction to the Bootstrap, Chapman & Hall.

• Planned learning activities and teaching methods
Teaching face to face

1-2 extra lab sessions, the students need to bring their laptop

• **Assessment methods and criteria**

30% by two projects during the course
70% final exam

Data Analysis (MSc in Statistics course)

Code: 9013

ECTS Credits: 7,5
Level of course: Postgraduate
Year of study: 1st year
Semester/trimester: Winter (1st Semester)

Objectives of the course:
Upon completion of the course, students will be able to:
1) To manipulate and analyze data in R
2) To perform basic hypothesis tests
3) To build and interpret regression models
4) To write statistical reports in a professional way.

• Prerequisites and co-requisites
Students should have good knowledge of estimation and statistical inference. It is also useful to have basic knowledge of the statistical language R and to be familiar with the statistical theory of regression

• Recommended optional programme components
None

• Course contents
Primary aim of this course is the understanding and the application of statistical method in real life problems of various scientific fields such as Management, Marketing, Psychology, Medicine, Sports and Social Sciences. Focus is given on the review of parametric and non-parametric hypothesis tests for one and two samples (t-tests και Wilcoxon tests), analysis of variance and regression models. Emphasis is given in the implementation of all methods using R and in problem solving. Interesting real-life datasets and problems are analyzed during this course with aim to provoke their attention and motivate them. Finally, the students are introduced to the basic principles of scientific report writing and story telling either in the form of a written report or in form of oral presentation.

• Recommended or required reading

- Diez, D., Barr, C., & Cetinkaya-Rundel, M. (2012). Open Intro statistics (Second. Edition). Free Open Book; available at http://www.openintro.org/stat/textbook.php.
- Fox J. & Weisberg H.S. (2011). An R Companion to Applied Regression. 2nd edition. SAGE Publications Inc.
- Faraway, J. (2002). Practical regression and ANOVA using R; available at http://cran.r-project.org/doc/contrib/Faraway-PRA.pdf
- James, G., Witten, D., Hastie, T., & Tibshirani, R. (2013). An introduction to statistical learning. Springer; available at http://www-bcf.usc.edu/~gareth/ISL/ .

• Planned learning activities and teaching methods

- Introductory motivational talk about the value and the fun part of Statistics.
- Introductory course in R
- Introductory videos (for R, for interpretation of Statistics by David Spiegelhalter, for the necessity of statistics in our daily life).
- Teaching in a classroom and computer labs.
- Laboratory exercises conducted during an extended lab session.
- Online game Quizizz (all together in the room - online version and asynchronously - offline).
- Guess the correlation game.

• Assessment methods and criteria

One assignment (50%) and one written examination (50%) with the requirement the grade in the written examination to be higher than 5 (out of 10).

Probability and Statistical Inference (MSc in Statistics course)

Code: 9075

ECTS Credits: 7,5
Level of course: Postgraduate
Year of study: 1st year

Objectives of the course:
Upon successful completion of the course, students will be able to handle issues related to: probability and distribution theory, principles of sufficiency and likellihood, and statistical inference with emphasis on the presentation of analytical methods of finding and evaluating: point estimators, interval estimators and hypothesis tests (using the Frequentist and the Bayesian approachs).

• Prerequisites and co-requisites
Undergraduate probability and calculus of functions of multiple variables.

• Recommended optional programme components
None

• Course contents
The aim of the course is to present key topics of probability and distribution theory and to place particular emphasis on statistical inference. Initially, the axiomatic definition of probability is given by using measure theory and its interpretation in the classical/Bayes approach. Then the conditional probability is given, the concept of random variable, transformations, moments, moment generating function and characteristic functions, followed by distribution theory, location/scale families, exponential family and measures of goodness of fit . The topics defined in the one-dimensional case are presented for multivariate distributions and furthermore the hierarchical models are defined. The concepts of independence, correlation and prediction, while some basic inequalities are given. Next, is the theory of order statistics, convergence (in probability, almost sure and by law), law of large numbers, central limit theorem and delta method. The principle of sufficiency and likelihood and completeness are also given. Finding point estimators (method of moments,

maximum probability, Bayes rule) and their evaluation (mean square error, uniformly minimum variance unbiased estimator, Cramer-Rao, Rao-Blackwell, decision theory). Hypothesis testing (likelihood ratio test, Bayesian testing, union-intersection tests) and their evaluation (size and level, p-value, type I and II errors, even more powerful test, Neyman-Pearson lemma, monotone probability ratio, Karlin-Rubin), hypothesis testing and large data, multiple comparisons and corrections. Finally, confidence interval material is covered by finding methods (inverting a test statistic, pivots and Bayes methods), their evaluation (coverage probability) and interpretation.

• Recommended or required reading

- R. Ash, Statistical Inference, Dover
- Jacod and Protter, Probability Essentials Springer.
- Berger and Casella, Statistical Inference

• Planned learning activities and teaching methods

In vivo and online teaching

• Assessment methods and criteria

Exercises during the semester, essays and written or oral exam.

Generalized Linear Models (MSc in Statistics course)

Code: 9081
ECTS Credits: 7,5
Level of course: Postgraduate
Year of study: 1st year
Semester/trimester: Winter (1st Semester)

Objectives of the course:
Upon successful completion of the course, students are expected to understand if the nature of their data allows application of a generalized linear model (knowledge and understanding). They should also be able to define the appropriate generalized linear model to the data at hand (application). They should be able to fit this model and interpret the results of analysis (skill). Finally, they should be able to explain to scientists of other disciplines the results of their analysis (synthesis).

• Prerequisites and co-requisites
Students should have basic knowledge of mathematical calculus, linear algebra, and probability theory

• Recommended optional program components
None

• Course contents
Introduction to statistical modeling, exponential family of distributions, part of a GLM, binomial data, logit models, contingency tables, Poisson models, log-linear models, overdispersion, normal data, Gamma data, polynomial-ordinal regression models, linear mixed effects models, GEE models, GLMM models. All applications include the use of the R language.

• Recommended or required reading
- Agresti (2013). Categorical data analysis, Wiley Atkinson (1985). Plots, transformations and regression, Oxford university Press Carroll and Ruppert

(1988). Transformation and weighting in regression, Chapman and Halλ Chatterjee and Price (1977). Regression analysis by example, Wiley.

- Christensen R. (1998). Analysis of variance, design and regression. Chapman and Hall. Collett, D. (1991) Modelling Binary data, Chapman and Hall Cook and Weisberg, S. (1982). Residuals and Influence in regression, Chapman and Hall
- Dobson, A., Barnett, A.G (2008). An introduction to generalized linear models, Chapman and Hall. Draper and Smith (1981). Applied regression analysis, Wiley.
- Fitzmaurice, Laird and Ware (2004). Applied longitudinal data analysis, Wiley. Hedeker and Gibbons (2006). Longitudinal data analysis.
- McCullagh, P and Nelder, J.A. (1989) Generalized Linear Models, Chapman and Hall.

Montgomery, D.C. (1989) Design and Analysis of Experiments, Wiley

- Montgomery, D.C., Peck, E.A. and Vining, G.G. (2001). Introduction to linear regression analysis. Wiley. Ryan (1997). Modern regression methods, Wiley. Weisberg, S. (1985) Applied Linear Regression, Wiley Venables W.N. and Ripley B.D (1999) Modern Applied Statistics with S-Plus, Springer

• Planned learning activities and teaching methods

One three-hour lecture per week, one one-hour laboratory, study exercises as homework (some to be submitted).

• Assessment methods and criteria

The final grade is the final examination grade.

Statistics I: Probability and Estimation

Code: 9079

ECTS credits: 6

Level of course: Undergraduate
Year of study: 1st year

Objectives of the course:

The students will be able to compute probabilities of events, expected values and variances of discrete and continuous random variables. They will also be able to apply the central limit theorem and find estimates of unknown parameters. Furthermore, they will have the necessary background for the construction of confidence intervals of the mean value and the variance of a normal population. The students will be able to solve realistic problems that are related with random experiments.

• **Prerequisites and co-requisites**

Knowledge of Calculus

• **Recommended optional programme components**

None

• **Course contents**

Random Experiment. Sample Space. Axioms of Kolmogorov. Properties of Probabilities. Law of total probability. Bayes's Rule. Discrete and Continuous random variables. Expected value and variance of random variables. Binomial distribution. Geometrical Distribution. Poisson Distribution. Hypergeometrical Distribution. Uniform Distribution. Exponential Distribution. Normal Distribution. Central Limit Theorem. Law of Large Numbers. Estimator of unknown parameter. Unbiased Estimator. Consistent Estimator. Sufficient Estimator. Rao-Blackwell Estimator. Cramer-Rao lower bound. Method of maximum likelihood. Methods of moments. Confidence Intervals for the Normal mean when (i) the population variance is known and (ii) when the population variance is unknown. Confidence Intervals for the difference of means of Normal populations. Confidence intervals for ratios. Confidence Intervals for the variance of a Normal distribution.

• Recommended or required reading

- S. M. Ross, "A first course in Probability", 8th Edition, 2010, Prentice Hall.
- S. M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, 2004, Elsevier.
- G. G. Roussas, "A Course in Mathematical Statistics", 2nd Edition, 1997, Academic Press.

• Planned learning activities and teaching methods

Teaching in Class, distant learning (if necessary)

• Assessment methods and criteria

Written final exam, Assignments

Estimation and Hypothesis Testing (Reading Course)

Code: 9091

ECTS Credits: 8

Year of study: 2nd year

Semester/trimester: Winter (3rd Semester)

Level of course: Undergraduate

Objectives of the course:

The students will be able apply the central limit theorem and find estimates of unknown parameters. Furthermore, they will have the necessary background for the construction of confidence intervals of the mean value and the variance of a normal population.

The students will be able to solve realistic problems that are related with random experiments.

• **Prerequisites and co-requisites**

Knowledge of Calculus and Probability

• **Recommended optional programme components**

None

• **Course contents**

Normal Distribution and the Central Limit Theorem. Law of Large Numbers. Estimator of unknown parameter. Unbiased Estimator. Consistent Estimator. Sufficient Estimator. Rao-Blackwell Estimator. Cramer-Rao lower bound. Method of maximum likelihood. Methods of moments. Confidence Intervals for the Normal mean when (i) the population variance is known and (ii) when the population variance is unknown. Confidence Intervals for the difference of means of Normal populations. Confidence Intervals for the variance of a Normal distribution. Confidence Intervals for proportions. Hypothesis testing, statistical hypothesis, test statistic, testing hypotheses for population

parameters such as: means, proportions, variances, mean difference in two populations. Significance level, p-value, power of a statistical test, sample size calculation.

• Recommended or required reading

- S. M. Ross, "A first course in Probability", 8th Edition, 2010, Prentice Hall.
- S. M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, 2004, Elsevier.
- G. G. Roussas, "A Course in Mathematical Statistics", 2nd Edition, 1997, Academic Press.

• Planned learning activities and teaching methods

Reading course with a few Class lectures.

• Assessment methods and criteria

Written final exam, Assignments

Introduction to Mathematical Analysis (Reading Course)

Code: 9114

ECTS Credits: 7

Year of study: 4th year

Semester/trimester: Winter (7th semester)

Level of course: Undergraduate

Objectives of the course
After successfully completing the course students will be familiar and able to use in concrete applications the basic concepts of mathematical analysis focusing on the future applications of these concepts in statistics, probability, and computer science as well as their applications in various fields of study related to economic sciences.

Prerequisites and co-requisites: None

Recommended optional programme components: None

Course contents
Introduction to Real Analysis. Fundamental concepts from set theory. The set of real numbers. Sequences and series of real numbers. Real functions, continuous, uniformly continuous, monotone and convex functions. Stieltjes integral and functions of bounded variation. Metric spaces and continuous functions in metric spaces. Uniform convergence of sequences and series of functions. Linear spaces with norm and inner product spaces (Banach and Hilbert spaces). Short introduction to Lebesgue measure and integration. Applications of these concepts in probability, statistics and scientific computation.

Recommended or required reading

- K. Saxe, Beginning Functional Analysis, Springer Series on Undergraduate Mathematics, 2002

- A.N. Yannacopoulos, Introduction to Mathematical Analysis, Lecture Notes (2016)
- Johnsonbaugh, R. and W. Pfaffenberger (1981). Foundations of mathematical analysis. M. Dekker (New York, NY).
- Labarre, A. E. (2008). Intermediate mathematical analysis. Dover Publications
- Bobrowski, A. (2005). Functional analysis for probability and stochastic processes: an introduction. Cambridge University Press.
- Rudin, W. (1964). Principles of mathematical analysis, Volume 3. McGraw-Hill New York.
- Severini, T. A. (2005). Elements of distribution theory, Volume 17. Cambridge University Press.
- Jacod, J. and P. E. Protter (2003). Probability essentials. Springer.

Planned learning activities and teaching methods

Face to Face. Teaching includes: Class lectures. Tutorial. Assignments. Self-Study.

Assessment methods and criteria

Written final exam, Home Assignment

Special Topics in Statistics and Probability: Methodological Tools of Machine Learning (Reading Course)

Code: 9115

ECTS Credits: 7

Year of study: 4th year

Semester/trimester: Winter (7th semester)

Level of course: Undergraduate

Objectives of the course
Students will be able to:
- Deeply understand the functions of fundamental methodological machine learning tools, both analytical and computational
- Apply those tools to study real problems
- Integrate them into developing new techniques

Prerequisites and co-requisites: None

Recommended optional programme components: None

Course contents
The course focuses on methodological tools of machine learning, such as:
- Reproducing kernel Hilbert spaces and applications
- Manifold learning, data geometry and applications
- Universal approximation theorems and applications to deep learning
- Probability Theory in high dimensions
- Gaussian processes and applications to machine learning
- Familiarization with Python

Recommended or required reading
- Hofmann, Thomas, Bernhard Schölkopf, and Alexander J. Smola. "A tutorial review of rkhs methods in machine learning." Technical Report (2005).

• Higham, Catherine F., and Desmond J. Higham. "Deep learning: An introduction for applied mathematicians." Siam review 61.4 (2019): 860-891.
• Calin, Ovidiu. Deep learning architectures. New York City: Springer International Publishing, 2020 Ch. 9

Planned learning activities and teaching methods
Face to Face. Teaching includes: Class lectures. Studying and analyzing bibliography. Assignments. Self-Study.

Assessment methods and criteria
Project Assignment or/and written exam at the end of the semester

SPRING SEMESTER

Actuarial Science I (Reading course)

Code: 9032
ECTS credits: 7
Level of course: Undergraduate
Year of study: 2nd year
Semester/trimester: Spring (4th Semester)

• **Objectives of the course:**
At the end of the lectures, the students are able to deal with the basic problems of pricing, reserving and reinsurance in a general insurance company.

• **Prerequisites and co-requisites**
Basic knowledge of Mathematics, Probability and Statistics.

• **Recommended optional programme components**
N/A

• **Course contents**
Uncertainty, Risk, Insurance, Insurance Companies, Actuaries, Insurance Concepts, Products, Actuarial base. Frequency, severity and pricing methodology premium adjustments, Projections and trends for the final payments by using linear and other models. Reserving methods, Analysis of Insurance Data, Triangular methods and olistic methods of reserving, Discounting reserves, and Confidence Intervals. Reinsurance schemes, «Bonus-Malus» and Markov Chains.

• **Recommended or required reading**
- Zimbidis A.(2008) "Actuarial Mathematics of Non-life Insurance"
- Brown R.L , Gottlieb L.R. (2005) -3rd edition
- "Introduction to Ratemaking and Loss Reserving for Property and Casualty Insurance", Actex Publications,
- Mikosch T. (2006) "Non-Life Insurance Mathematics: An Introduction with Stochastic Processes", Springer

• **Planned learning activities and teaching methods**
Teaching Method: Reading course.

• **Assessment methods and criteria**
Courseworks during the semester plus oral exam at the end of the semester.

Stochastic Models in Finance (MSc in Statistics course)

Code: 9034
ECTS Credits: 3
Level of course: Postgraduate
Year of study: 1st year
Semester/trimester: Spring (2nd Semester)

Objectives of the course
Familiarize the students with the use and construction of stochastic models for finance, as well as with the necessary analytic and computational methods which are used in finance and risk management both in academic as well as in real business environments.

• **Prerequisites and co-requisites**
None

• **Recommended optional programme components**
None

• **Course contents**
This course aims in introducing students in stochastic modeling in finance and the use of stochastic models in the description and forecast of prices of various assets such as stocks and indices, pricing of derivative products and bonds as well as their use in portfolio selection and risk management, focusing on models which are widely used in theory and practice. The course introduces fundamental concepts and analytic as well as computational methodologies such as for example martingale pricing methods, stochastic differential equations, simulation methods and estimation methods for financial models.

• **Recommended or required reading**
- Shreve, S. (2005), Stochastic calculus for finance, Springer
- Yannacopoulos A. (2014) Stochastic finance (notes)

• **Planned learning activities and teaching methods**
In vivo and by distance learning, computational applications.

• **Assessment methods and criteria**
Exercises during term and final project.

Financial Analytics (MSc in Statistics course)

Code: 9036

ECTS credits: 7,5

Level of course: Postgraduate

Year of study: 1st year

• Objectives of the course:

The aim of this module is to provide students with advanced statistical and econometric skills required to analyze empirical financial problems. On completion of this module, students will be able to:

- Implement statistical and econometric models and techniques for the analysis of financial time series
- use advanced econometric estimation techniques and tools to analyze models used in financial applications
- model the expected returns of financial assets
- model the variances and covariances/correlations of financial returns
- interpret the concepts of return and risk in financial markets
- forecast financial returns
- assess the performance of portfolio managers
- understand modern portfolio theory
- solve mean-variance optimization problems
- estimate the risk of financial assets

• Prerequisites and co-requisites

The students should have a basic statistical background. Specifically, basic knowledge in the fields of probabilities and distributions will be necessary for this course.

• Recommended optional programme components

None

• Course contents

This module provides a broad introduction to the theory and empirical analysis of econometric models to financial applications. Statistics/Econometrics is concerned with the systematic study of empirical financial problems using observed data. The aim of the course is to develop the relevant econometric tools for analyzing empirical problems in finance such as optimal portfolio construction, performance evaluation, and risk management among several

others. It presents and introduces the multifactor model, the basic theory of stationary processes, the Autoregressive Moving Average (ARMA) models and develops analytically the Box-Jenkins methodology for the empirical analysis of financial time series models. The course introduces the class of conditional heteroscedastic models (ARCH/GARCH/EGARCH) and presents estimation and forecasting techniques for practical implementation. It introduces the multivariate factor models, as well as the multivariate heteroscedasticity models for the analysis of time-varying volatilities and covariances/correlations. It describes analytically several empirical financial problems such as portfolio construction, performance evaluation and risk management. Illustrative examples applying econometric models and techniques to actual financial and economic data are also presented using the R package. The empirical analysis consists of (i) unit root testing to exchange rate series and financial series, e.g. stocks and indices, (ii) modeling and forecasting financial return series, (iii) performance evaluation of fund investments, e.g. mutual and hedge fund investment returns, (iv) optimal portfolio construction, and (v) estimating and forecasting risk measures.

• Recommended or required reading

Recommended textbooks:

- Hamilton, James D. Time Series Analysis. Princeton, New Jersey: Princeton University Press, 1994.
- Enders, Walter. Applied Econometric Time Series. New York: Wiley, 2010.
- Tsay, Ruey S. (2010). Analysis of Financial Time Series, New York: Wiley.
- Cowpertwait, Paul S.P., and Metcalfe V. Andrew. Introductory Time Series with R. New York: Springer Texts in Statistics, 2009.
- Cryer, Jonathan D., and Chan Kung-Sik. Time Series Analysis with Applications in R. Springer Texts in Statistics, 2010.
- Elton, E.J., Gruber, M.J., Brown, S.J., and Goetzmann W.N. (2014). Modern Portfolio Theory and Investment Analysis, 9th edition, Wiley.
- Sharpe, W.F., Alexander, G.J, and Bailey, J.V. (1999). Investments, 6th edition, Prentice-Hall.
- Vrontos, I.D. (2016) Financial Econometrics, Lecture Notes (In Greek).

Other Useful textbooks:

- Gujarati, Damodar N. Basic Econometrics. New York: McGraw-Hill, 2008.
- Harvey, Andrew. Time Series Models. Cambridge: MIT Press, 1993.
- Hendry, David F. Dynamic Econometrics. Oxford: Oxford University Press, 1995.
- Pindyck, R.S. and D.L. Rubenfeld. Econometric Models and Economic Forecasts. New York: McGraw-Hill, 1991.

- Shumway, Robert H. and David S. Stoffer. Time Series Analysis and Its Applications with R Examples. New York: Springer Texts in Statistics, 2011.
- Wooldridge, Jeffrey. Introductory Econometrics: A Modern Approach. South-Western College Publishing, 2009.
- Engle, Robert F. and C.W.J. Granger (eds.). Long-Run Economic Relationships: Readings in Cointegration. Oxford: Oxford University Press, 1992.
- Granger, C.W.J. and Paul Newbold. Forecasting Economic Time Series. San Diego, CA: Academic Press, 1986.
- Banerjee Anindya, Juan Dolado, J.W. Galbraith, and David F. Hendry. Co-integration, Error Correction, and the Econometric Analysis of Non-Stationary Data. Oxford: Oxford University Press, 1993.

• Planned learning activities and teaching methods

One three-hour lecture per week, study of the model theory, empirical applications in R package, programming exercises as homework (some to be submitted) and assignments.

• Assessment methods and criteria

The final grade is the weighted average of the final examination grade (weight 80%) and the grade of two homework assignments that will be submitted (weight 20%). Please note that one needs to pass the final exam, i.e. the final examination grade is at least 5/10 (independently of the grades in the homework assignments) in order not to fail the course.

Statistical Quality Control (Reading Course)

Code: 9057
ECTS credits: 7
Level of course: Undergraduate
Year of study: 3rd year

• **Objectives of the course:**

After the course the student will have the skills needed to deal with improving the quality of products or services using statistical methods.

• **Prerequisites and co-requisites**

Attendance and knowledge of topics related to Estimation-Hypothesis testing, are very useful.

• **Recommended optional programme components**

None

• **Course contents**

Basic concepts of quality control and statistical quality control. Cause and effect charts. Pareto charts. Control charts for variables (R,S). Attributes control charts (p,np,c,u). CUSUM and EWMA control charts. Capability indices. Introduction to multivariate control charts. The six sigma methodology. Acceptance sampling. Basic experimental design using principals of repetition and blocking.

• **Recommended or required reading**

- Montgomery D (2012) Introduction to Statistical Quality Control, 7th Edition Wiley.
- Ryan, T. (2000). Statistical methods for quality improvement. J. Wiley New York 2nd edition.

• **Planned learning activities and teaching methods**

Reading course with a few Class lectures

• **Assessment methods and criteria**

Written final exam, Assignments

Health Data Science (MSc in Statistics course)

Code: 9099

ECTS Credits: 7,5

Level of course: Postgraduate
Year of study: 1st year
Semester/trimester: Spring Semester

Objectives of the course:

At the end of the course students will have knowledge of the basic principles, methods and implementation tools of the main data science techniques that are being used in the analysis of health data.

• **Prerequisites and co-requisites**

Probability and Statistical Inference, Computational Statistics.

• **Recommended optional program components**

None

• **Course contents**

Basic concepts in survival analysis, definitions, hazard and survival functions, relationships, parametric methods, likelihood function, Exponential and Weibull Models, applications in R. Non-parametric methods: Kaplan-Meier estimator, Greenwood and Nelson-Aalen estimator, graphical goodness of fit, log rank test. Regression models, Cox proportional hazards, Survival Analysis theory, counting processes, applications in R. Martingale/Deviance/Schoenfeld residuals. Heterogeneity and frailty models, LASSO and elastic net, hyperparameter selection via cross-validation, applications in glmnet. Non-proportional hazards models, additive hazards, accelerated failure time, proportional odds, competing risks and (non-)identifiability, multi-state models. Prospective and retrospective studies, (non)interventional, AR, RR and OR, equivalence of OR. Screening tests, PPV/NPV and sensitivity/specificity. Clinical trial design and analysis, protocol, sample size calculations, phase I, MTD, 3+3 design, Phase II, safety and efficacy, phase III. Real world vs (and/or) randomised data. CRM+adaptive designs, Simon 2-stage design, Bayesian and historical/synthetic controls. Meta analysis, systematic reviews, fixed effects, heterogeneity, random effects, publication bias, funnel plots, indirect treatment comparisons and network meta analysis, example applications in health economics using ICER, INB and CEAC. Evidence synthesis and conflict

diagnostics. Introduction to Epidemic models, main results, vaccination and control. Basic stochastic models, branching processes and coupling, functional LLN and CLT, connections between the different types of model. Inference for chain binomial models using MCMC. Inference for deterministic models using HMC. Heterogeneity, multiple age-groups, contact matrices, epidemics among households. Epidemics on networks.

• **Recommended or required reading**

No single textbook covers the material presented. There will be lecture notes and course code from books in Biostatistics, Survival Analysis and Epidemic models as well as relevant research papers.

• **Planned learning activities and teaching methods**

Classroom teaching and assignments.

• **Assessment methods and criteria**

The main course assessment will be based upon assignments that will be prepared, given as reports and presented on an individual basis.

Categorical Data Analysis (Reading Course)

Code: 9084

ECTS Credits: 8
Level of course: Undergraduate
Year of study: 4th year
Semester/trimester: Spring (8th Semester)

Objectives of the course:
At the end of the course, students are expected to know how to quantify different dependency forms between two or more categorical data (knowledge), to control which form of dependency appears to apply to a particular set of data (aptitude), to fit logistic regression models and to interpret the results of their data fit (capability).

• Prerequisites and co-requisites
None

• Recommended optional programme components
None

• Course contents
Types of categorical data. Contingency tables, joint, marginal and conditional probabilities, independence, comparison of proportions in 2x2 contingency tables (difference of proportions, relative risk, odds ratio), types of observational studies (retrospective, cross-sectional, prospective), odds ratio and other measures of correlation in LxJ tables. χ^2 test of independence, exact tests, partition of the statistical function χ^2, test of independence for ordinal data, tests of linear trend for 2xL tables. Correlated data pairs, comparison of correlated proportions, Mc Nemar test for comparison of marginal proportions, measures of raters' agreement, odds ratio for agreement, kappa measure of agreement. Correlation in multidimensional contingency tables, conditional and marginal odds ratios, Simpson's paradox, partial-conditional independence, homogeneity, collapsibility, Cochran-Mantel-Haenszel tests. Logistic regression, interpretation of model parameters, inference in logistic regression, the case of categorical predictive variables, multiple logistic regression, model selection, test of goodness of fit. Models of logistic regression for polytomous variables.

• Recommended or required reading

- Agresti A., (2013). Categorical data analysis, Wiley
- Agresti A., (2007). An Introduction to Categorical Data Analysis, Wiley.
- Hosmer, D., Lemeshow, S. and Sturdivant, R. (2013) Applied Logistic Regression, Wiley
- Kateri, M. (2014). Contingency Table Analysis, Springer.

• Planned learning activities and teaching methods

Teaching includes: Reading course with a few Class lectures. Field exercise. Bibliography study and analysis Assignments. Self Study.

• Assessment methods and criteria

Assignment. Written exam at the end of the semester

Statistics II: Inference and Regression

Code: 9068

ECTS credits: 6

Level of course: Undergraduate

Year of study: 1st year

Semester/trimester: Spring (2nd Semester)

Objectives of the course:

By completing the course the students will be able to:
Learn the fundamentals in statistical inference allowing them to understand which type of analysis is necessary and how it can be correctly implemented.
Learn about the theory and the accurate practice of regression analysis.

• Prerequisites and co-requisites

Knowledge of Probability and (point/interval) Estimation Theory.

• Recommended optional programme components

None

• Course contents

Hypothesis testing, statistical hypothesis, test statistic, testing hypotheses for population parameters such as: means, proportions, variances, mean difference in two populations. Significance level, p-value, power of a statistical test, sample size calculation. Introduction to regression, simple linear model, statistical linear model, normal linear model. Inference in the normal linear model: confidence and prediction intervals, hypothesis testing. Transformations, residuals and diagnosis of violations of the linear model assumptions. Multiple linear model, variable selection, forward, backward, stepwise, all possible regressions, model selection with information criteria: AIC, BIC, Mallows Cp. One factor Analysis of Variance (ANOVA). Applications in R.

• Recommended or required reading

- "An Introduction to Probability and Statistical Inference", by G. Roussas, 2nd edition, 2014, Academic Press
- "Statistical Inference" by G. Casella and R.L. Berger, 2nd edition, Duxbury Press, 2001
- "Applied Linear Regression", by S. Weisberg, 3rd edition, Wiley 2005
- "An R Companion to Applied Regression", by J. Fox and S. Weisberg, 2nd edition, SAGE Publications Inc, 2011.

• Planned learning activities and teaching methods

Teaching in Class, distant learning (if necessary)

• Assessment methods and criteria

Written final exam, Assignments

Linear Models (Reading Course)

Code: 9096

ECTS Credits: 8

Level of course: Undergraduate

Year of study: 2nd year

Semester/trimester: Spring (4th Semester)

Objectives of the course:

By completing the course the students will be able to:
Understand point and interval estimates for parameters of linear models. Assess the validity of the model. Perform hypothesis testing. Interpret the fitted model. Perform model selection.

• Prerequisites and co-requisites

Knowledge of:

- Linear Algebra (matrix algebra: multiplication, inversion, rank, projections to sub-spaces)
- Calculus (multivariate functions, differentiation and optimization)
- Probability (univariate random variables, probability mass and density functions, moments, multivariate random variables, joint density function, conditional probability)
- Statistics: estimation (Theory of point and interval estimation, maximum likelihood inference)
- Statistics: Hypothesis testing (test statistics, rejection regions, p-values, z-test, t-test, F-test)

• Recommended optional programme components

R programming language

• Course contents

Introduction to simple linear regression, model coefficients estimates. Properties of estimated coefficients, mean value, variance, confidence intervals, hypothesis testing, estimation of conditional variance. Predicted values, simple linear regression ANOVA, R^2, F-test. Introduction to multivariate normal distribution. Multiple regression, design matrix, introduction to pseudo variables, general form of linear model, LS estimates and properties. Unbiased estimate of data variance. Maximum likelihood estimation. Multiple correlation coefficient, model ANOVA, partial F-tests. Simple residuals, standardized and studentized residuals, normality test, Q-Q plots, residual plots, added variable plots. Transformations, influence statistics and diagnostic tests, multicollinearity. Model choice, forward, backward, stepwise methods, all possible regressions, model choice using AIC, BIC, Mallows Cp.

• Recommended or required reading

- Montgomery, D.C., Peck, E.A. and Vining, G.G. (2012). Introduction to Linear Regression Analysis, Wiley.
- Weisberg, S. (2014). Applied Linear Regression, Wiley

• Planned learning activities and teaching methods

Teaching includes: Reading course with a few Class lectures. Field exercise. Bibliography study and analysis.

• Assessment methods and criteria

Written final exam, Assignments

Advanced Methods in Survey Sampling (MSc in Statistics course)

Code: 9100

ECTS Credits: 3
Level of course: Postgraduate
Year of study: 1st year
Semester/trimester: Spring Semester

Objectives of the course:
Upon completion of the course, the students will be able to identify the type of the statistical problem in real survey sampling situations, as well as to choose and apply in any case the appropriate methodology. Furthermore, they will be able to evaluate the quality of the results of the chosen methodology.

• **Prerequisites and co-requisites**
Basic knowledge of Statistics

• **Recommended optional programme components**
None

• **Course contents**
The module refers to the problem of inference for survey populations adopting the design-based approach. Topics include: Basic theory of survey sampling in finite populations. A brief presentation of basic sampling designs and methodology for estimation of parameters of populations. Use of auxiliary information to introduce weights and improve statistical errors. Methods include ratio and regression estimation, probability proportional to size and calibration. Variance estimation in complex surveys. Methods of adjustment for non-response.

• **Recommended or required reading**
- Lohr, S.L (2021). Sampling: Design and Analysis. Third edition. Chapman and Hall/CRC.
- Lu, Y. and Lohr, S.L. (2022) R Companion for Sampling Design and Analysis. Third edition.
- Lumley, T. (2010) Complex Surveys: A Guide to Analysis Using R. Wiley.

• **Planned learning activities and teaching methods**

Six weekly three-hour lectures and homework/projects.

• **Assessment methods and criteria**

Grade of final exam (70%) and projects during the teaching weeks (30%)

Topics in Applied Statistics: Statistical Genetics – Bioinformatics (MSc in Statistics course)

Code: 9101

ECTS Credits: 3
Level of course: Postgraduate
Year of study: 1st year
Semester/trimester: Spring Semester

Objectives of the course:
After completing the course, the students will:
- know the basic statistical challenges in bioinformatics
- properly deal with large scale hypothesis testing
- learn many novel statistical ideas and methods developed in the last 20 years, such as
- hybridizations of Bayesian and frequentist data analysis
- put their hands on many different types of data that modern biologists have to deal with,
- including microarrays, RNA-Seq, chip-Seq and single cell measurements
- know how to apply the relevant methods using R and Bioconductor.

• Prerequisites and co-requisites
This course is tailored to a statistically trained audience. More specifically:
- Prerequisites
- Estimation/Hypothesis Testing theory
- (Generalized) Linear Models

Some basic knowledge on:
- Computational Statistics
- Bayesian Inference
- R programming

Students will also benefit from the following courses (not required):
- Bayesian Statistics
- Statistical Learning
- Statistics for Big Data

• Recommended optional programme components
None

• Course contents

Modern biology is a data-rich science. This course will expose the students to high-throughput biological datasets (such as microarrays, RNA-Seq, ChIP-Seq) and present the main inferential tools to deal with challenges they impose to the statistician. These methods include techniques for:

- controlling the False Discovery Rate in multiple testing (such as the Benjamini-Hochberg procedure)
- modelling high-throughput count data (multifactorial designs, generalized linear models)
- performing differential expression analysis in microarray and RNA-Sequencing data
- taking into account heterogeneity in sizeable data (mixture models)
- fitting (frequentist or Bayesian) models specifically designed for estimating gene and tran- script expression given a known genome/transcriptome annotation and (big) datasets of short nucleotide reads

• Recommended or required reading

- Holmes, Susan and Wolfgang Huber. Modern Statistics for Modern Biology. Cambridge University Press, 2019
- Efron, Bradley. Large scale inference: Empirical Bayes Methods for Estimation, Testing and Prediction. Cambridge University Press, 2010
- Gentleman, Robert, et al., eds. Bioinformatics and computational biology solutions using R and Bioconductor. Springer Science & Business Media, 2006
- McLachlan, Geoffrey and David Peel. Finite Mixture Models. Wiley Series in Probability and Statistics, 2000
- Benjamini, Yoav and Hochberg, Yosef. Controlling the false discovery rate: a practical and powerful approach to multiple testing. Journal of the Royal statistical society: series B, 1995
- Dudoit, Sandrine and Shaffer, Juliet Popper and Boldrick, Jennifer C. Multiple hypothesis testing in microarray experiments. Statistical Science, 2003
- Robinson MD, McCarthy DJ, Smyth GK. edgeR: a Bioconductor package for differential expression analysis of digital gene expression data. Bioinformatics, 2010
- Love MI, Huber W, Anders S. Moderated estimation of fold change and dispersion for RNA-seq data with DESeq2. Genome Biology, 2014
- Li, B., Dewey, C.N. RSEM: accurate transcript quantification from RNA-Seq data with or without a reference genome. BMC Bioinformatics, 2011

- Glaus, P, Honkela, A, Rattray, M. Identifying differentially expressed transcripts from RNA-seq data with biological variation. Bioinformatics, 2012
- Hensman, J, Papastamoulis, P, Glaus, P, Honkela, A, Rattray, M. Fast and accurate approximate inference of transcript expression from RNA-seq data. Bioinformatics, 2015
- Lönnstedt, Ingrid and Speed, Terry. Replicated Microarray data. Statistica sinica, 2002
- Smyth, G.K. Linear models and empirical Bayes methods for assessing differential expression in microarray experiments. Statistical applications in genetics and molecular biology, 2004

• Planned learning activities and teaching methods

The computational aspects of this course will be implemented in R, a free software environment for statistical computing and graphics. R can be downloaded at https://www.r-project.org and installed on all types of environments (Windows, Mac, Linux). The R programming language will be enhanced by the specialized method packages from the Bioconductor project https://www.bioconductor.org, such as limma, DeSeq2, edgeR, BitSeq, rsem-EBSeq. Supplementary command line tools (such as Bowtie2) will also be used.

• Assessment methods and criteria

There will be a total of 2 homework assignments that will contribute ≈ 50% in the final grade. The remaining ≈ 50% will be determined by the final exam.

Statistical Machine Learning (MSc in Statistics course)

Code: 9102

ECTS Credits: 7,5
Level of course: Postgraduate
Year of study: 1st year
Semester/trimester: Spring Semester

Objectives of the course:
Upon completion of the course, students will have the knowledge and the skills
- to implement statistical methods aiming to deal with the problem of data dimension reduction,
- to apply classification models/algorithms and access their performance
- to apply clustering and access its performance
- to be familiar with new methodologies developed to deal with big data

• Prerequisites and co-requisites

Statistical Inference

• Recommended optional programme components
None

• Course contents
A range of statistical and machine learning methods will be described for supervised and unsupervised learning problems. Unsupervised learning: clustering (hierarchical, partition clustering, k-means and its variants, model-based clustering), data reduction methods. Model Assessment and Selection. Supervised learning: Methods of Linear Discriminant Analysis (LDA), Quadratic Discriminant Analysis (QDA), k-nn, decision trees, random forests, SVM, naïve Bayes and others. Cross-validation methods. Statistics for big data problems, new approaches. Regularizations. Statistical methods for networks. Smoothing approaches in regression.

• Recommended or required reading
- T. Hastie, R. Tibshirani and R. Friedman (2009) Elements of Statistical Learning, Springer.
- Witten, J, Hastie, T. and Tibshirani, R. (2011) Introduction to Statistical Learning with applications in R, Springer.

- C. Giraud (2015). Introduction to High-Dimensional Statistics. Philadelphia: Chapman and Hall/CRC.
- E. D. Kolaczyk (2014) Statistical Analysis of Network Data with R. Springer.

• Planned learning activities and teaching methods

Course lasts 12 3-hours lectures (one each week). Every week there will be exercises as homework (some to be submitted). There will be also a team project.

• Assessment methods and criteria

The final grade is the weighted average of the final examination grade (80%) and the assignment/projects (20%).

Bayesian Models in Statistics (MSc in Statistics course)

Code: 9103

ECTS Credits: 3
Level of course: Postgraduate
Year of study: 1st year
Semester/trimester: Spring Semester

Objectives of the course:

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

- Understand the basic theory and philosophy of Bayesian Statistics
- Understand the basic notions of Bayesian computation
- Analyze data using WinBUGS
- Build models (glm and hierarchical) in WinBUGS
- Perform Bayesian variable selection using WinBUGS and BAS package in R

• Prerequisites and co-requisites

The students should have a good quantitative and computational background. Specifically, knowledge in the fields of calculus, probability/distribution theory, statistical modelling and R programming will be necessary for this course

• Recommended optional programme components
None

• Course contents
This course will provide the introduction to the Bayesian approach in statistics both from the theoretic and the computational perspective using R and WinBUGS. The course syllabus includes: Bayesian inference. Conjugate Analysis. Simulation and random number generation. Markov models and hidden Markov (MCMC) methods. Metropolis-Hastings algorithm, Gibbs sampling. Introduction to WinBUGS. Bayesian inference for Regression and GLMs. Hierarchical models. Bayesian model and variable selection.

• Recommended or required reading

- Ntzoufras, I. (2009). Bayesian Modeling Using WinBUGS. Wiley. Hoboken. USA.

- Carlin B. and Louis T. (2008), Bayes and Empirical Bayes Methods for Data Analysis. 3rd Edition, London: Chapman and Hall.
- Gelman A., Carlin J.B., Stern H.S., Dunson, D.B., Vehtari, A. and Rubin D.B. (2013). Bayesian Data Analysis. Third Edition. Chapman and Hall/CRC.
- P. Dellaportas and P. Tsiamyrtzis, "Introduction to Bayesian Statistics" (in Greek)

• Planned learning activities and teaching methods

- Live teaching in a lecture room or computer labs
- Informal labs for using R and WinBUGS/OpenBUGS/JAGS
- Evaluation of current knowledge using Kahoot web game
- Interim optional exercises
- Personalized assignment/project

• Assessment methods and criteria

The course is examined by a big project/assignment that contributes 100% of the final grade. The students can break the final outcome/assignment in smaller landmark exercises (optional) that will help him to construct the final project report.

Applied Stochastic Modelling (MSc in Statistics course)

Code: 9104

ECTS Credits: 3
Level of course: Postgraduate
Year of study: 1st year
Semester/trimester: Spring Semester

Objectives of the course:

On successful completion of the module, students will:

- Appreciate the importance of computing for modern statistical analysis.
- Appreciate the breadth and importance of modern statistical methods.
- Be able to describe a number of practical areas where statistical modelling is of importance.
- Have enhanced their computer skills.
- Have encountered a range of complex data.
- Have an appreciation of how probability models may be formulated for atypical data sets.
- Have a good understanding of how likelihood-based classical procedures operate in practice.
- Have experience of running a wide range of modern statistical procedures through running computer programs in R.

• Prerequisites and co-requisites

Probability and Inference. Regression. R.

• Recommended optional programme components

None

• Course contents

The aim of this module is to present modern statistical methods and associated theory for the construction, fitting and evaluation of statistical stochastic models. Highlighting modern computational methods, the module provides students with the practical experience of scientific computing in applied statistics through a range of interesting real-world applications from the natural and social sciences. In more complex situations this will mean using optimisation routines to obtain maximum likelihood estimates for the

parameters. You will also learn how to take advantage of advanced likelihood tools, and simulation techniques, for inference. The module is a blend of descriptions of statistical methods, and the associated computational algorithms needed to perform the methods. The programming language R is used to illustrate the statistical computing algorithms, in the context of fitting models to data.
Lecture Syllabus:
Introduction and examples: Motivation through a range of real examples. Model fitting by maximum-likelihood: Progression from explicit estimates to non-linear problems. Importance of modelling through example results. Function optimisation: Modern deterministic and stochastic methods. Newton vs EM. Computational Likelihood Tools: profile likelihood; use of information criteria; Wald tests, likelihood ratio tests; confidence interval construction. Fundamental principles of modelling: Parameterisation: staying in range; delta method; orthogonality. Application to multinomials, mixtures, truncated data. Simulation techniques: Monte Carlo inference; confidence interval construction; bootstrap; goodness of fit testing. Case studies: Hierarchical Models. Capture-recapture. Hidden Markov.

• **Recommended or required reading**

- Morgan, BJT 2009 Applied Stochastic Modelling, 2nd Edition. Chapman and Hall

• **Planned learning activities and teaching methods**

18 hours of lectures and terminal classes. 60 hours independent study

• **Assessment methods and criteria**

The unit is assessed by continuous assessment. Continuous Assessment: This will consist of several open book written assessments started in the terminal sessions and completed in independent study hours. These consist of questions on numerical problems along with R computing problems which test the learning outcomes.

Topics in Computational Statistics: Data Engineering (MSc in Statistics course)

Code: 9105

ECTS Credits: 3
Level of course: Postgraduate
Year of study: 1st year
Semester/trimester: Spring Semester

Objectives of the course:

Upon completion of the course, students will

- Understand the principles of data engineering and their significance on statistical analysis.
- Have a solid foundation in SQL and Python programming.
- Comfortably perform standard data engineering tasks with focus on statistical modeling.
- Have hands on experience on in-memory computing technologies.

• Prerequisites and co-requisites

None

• Recommended optional programme components

None

• Course contents

The course lays proper foundations in Data Engineering with emphasis on Statistical and Data Science applications. We will begin with basic SQL concepts such as queries, joins and aggregation as well as fundamental databases and in-memory analytics notions. In addition, we will introduce standard Python syntax, modules, data types and structures, operations control flow and input/output operations and database connectivity. Then, topics from the entire data lifecycle will be covered including data ingestion, transformation, loading, visualization, modeling, deployment, update, monitoring, maintenance, and documentation. More advanced or modern subjects with software engineering flavor such as parallelism, cloud computing, error handling, testing and version control will also be sampled for exposition.

• Recommended or required reading

- McKinney, Wes. Python for data analysis: Data wrangling with Pandas, NumPy, and IPython. "O'Reilly Media, Inc.", 2012.
- Fangohr, Hans. Python for Computational Science and Engineering. Online Resource 2022
- Crickard, Paul. Data Engineering with Python: Work with massive datasets to design data models and automate data pipelines using Python. Packt Publishing Ltd, 2020.
- Beaulieu, Alan. Learning SQL: master SQL fundamentals. " O'Reilly Media, Inc.", 2009.
- Tanimura, Cathy. SQL for Data Analysis. " O'Reilly Media, Inc.", 2021

• Planned learning activities and teaching methods

The course is delivered in six weekly 3-hour lectures. Every week homework will be assigned (some to be submitted). A team project will also be assigned.

• Assessment methods and criteria

The final grade is the weighted average of the final examination grade (50%) and the assignment/projects.

Official Statistics (Reading Course)

Code: 9058

ECTS Credits: 3
Level of course: Undergraduate
Year of study: 3rd year
Semester/trimester: Spring (6th Semester)

Objectives of the course:

After successfully completing the course, students will be able to understand the basic concepts and principles of international and National official statistics. They will also be able to know the basic concepts and principles of constructing, estimating and using index numbers.

• Prerequisites and co-requisites

None

• Recommended optional programme components

N/A

• Course contents

Introduction, indices, simple and complex numbers, simple size indices, individual indices behavior, base, base change, errors, heterogeneity, sampled indices in EU. Family budget surveys, Metadata. Describing and using data and surveys by EUROSTAT, OECD, UN, etc.

• Recommended or required reading

- OECD (2008) "Handbook on Constructing Composite Indicators – Methodology And User Guide.
- Notes

• Planned learning activities and teaching methods

Teaching includes: Reading course with a few Class lectures. Field exercise. Bibliography study and analysis. Educational Visits. Conducting a study. Assignments. Self study.

• Assessment methods and criteria

Written exam. Project presentation. Practical exercises.

Numerical Methods in Statistics (Reading Course)

Code: 9110

ECTS Credits: 7
Level of course: Undergraduate
Year of study: 3rd year
Semester/trimester: Spring (6th Semester)

Objectives of the course
At the end of the course the student should be able to: use a pc to perform statistical inference. Write basic programs in R to apply statistical inference. Analyze data using computational methods and approaches.

Prerequisites and co-requisites: None

Recommended optional programme components: None

Course contents
General principles of arithmetic calculations and basic tools in estimating accuracy of said calculations. Arithmetical solving of one variable functions. Bisection methods. Point method. Newton method. Secant method, False position method. Function approximation. Function approximation using least squares. Interpolation and multinomial function approach. Orthogonal polynomials and applications. Curve fit. Spline functions. Approximation using kernels. Arithmetical linear algebra. Direct methods. Linear systems stability. Matrices factorization, special matrices. LU decomposition, the Cholesky decomposition. Iterative methods of solving linear systems. The Jacobi method, the Gauss-Seidel method and its variants, general iterative method. Special linear systems. Numerical solving of nonlinear systems. Point method for multiple variable functions, Newton method in the multidimensional case. Numerical integration and differentiation methods. Taylor series approach. Monte Carlo integration. Numerical differentiation. Calculating derivatives using interpolation polynomials. Numerical optimization methods. Typical optimization problems, using LaGrange method of multipliers in optimization theory and the Karush–Kuhn–Tucker conditions (KKT). The Steepest Descent method, the Newton method for solving optimization problems with or without equality constraints. Interior point methods – central path method and using bounded functions for solving optimization problems with mixed constraints. Principles of simulation and random search algorithms. Basic idea

of global optimization methods. Simulated Annealing algorithmic method. The EM algorithm and its variations.

- **Recommended or required reading**
- Burden, R., Faires, J., (2010). Numerical Analysis. Cencage Learning.
- Chapra, S., Canale, R. (2016). Αριθμητικές Μέθοδοι για Μηχανικούς. Εκδόσεις Τζιόλα.
- Gentle, J. (2009). Στοιχεία Υπολογιστικής Στατιστικής. Εκδόσεις Παν. Μακεδονίας.
- Lange, K. (2010). Numerical Analysis for Statisticians. Springer.
- Monahan, J. F. (2011). Numerical methods of statistics. Cambridge University Press.

Planned learning activities and teaching methods
Face to Face. Class lectures. Tutoring.

Assessment methods and criteria
Written exam at the end of the semester

Special Topics in Statistics and Probability: Introduction to Measure Theory with Reference to Probability and Statistics (Reading Course)

Code: 9111

ECTS Credits: 7
Level of course: Undergraduate
Year of study: 4th year
Semester/trimester: Spring (8th Semester)

Objectives of the course
After successfully attending the course students will become familiar with the basic concepts of measure theory and integration and will be able to use some of its basic tools. Thus, they will be able to approach the techniques used in the probabilities and statistics from a point of view of measure theory, as well as the techniques of statistical/ mechanical learning.

Prerequisites and co-requisites: None

Recommended optional programme components: None

Course contents
Sets and functions. Algebra and Sigma-algebra of sets. Borel sets and Borel Sigma-algebra. Open, closed and compact subsets of the real numbers. Constructing the Lebesgue measure in real numbers. Measurable sets according to Borel and Lebesgue. The Cantor set and the Cantor function. Non-measurable sets according to Lebesgue. Measurable functions according to Lebesgue. Borel Functions. Measure Space, Probability Space, Random variables. Sequences of functions and random variables and convergence concepts (almost sure, in measure, L^p). The Lebesgue integral, construction and properties. Basic convergence theorems, (the Fatou Lemma, monotonous convergence theorem, dominated convergence theorem). Expectation. Convergence in distribution and applications in statistics (estimation, simulation, Weak and Strong Law of Large Numbers, Central Limit Theorem, etc). Lebesgue spaces of integrable functions and random variables and their structure as metric spaces. Holder and Minkowski inequities, the Beppo-Levi theorem and completeness. Convergence in Lebesgue spaces and applications. The case of L^2, its structure as a Hilbert space, the projection theorem and its

relation to conditional expectation, bases and expansions (eg Karhunen-Loeve transform, etc.). Product measure, construction and properties and relation to independence. Integration and product measure, Fubini theorem. Absolute continuity and measure singularity. Hahn-Jordan decomposition. Radon-Nikodym derivation. Measure space as an extension of the functions. Applications in statistics (the conditional expectation under a new prism, likelihood, extreme event simulation, consistency) in finance. Measure space as a metric space and applications. Total change distance, Helinger distance, Kuhlback-Leibler distance (entropy), transportation distance. Applications in model selection statistical and machine learning, etc**.**

Recommended or required reading

- Athreya, Krishna B., and Soumendra N. Lahiri. Measure theory and probability theory. Springer Science & Business Media, 2006.
- Billingsley, P. 2008. Probability and measure. John Wiley & Sons.
- Capinski, M., & Kopp, E., (2003). Measure, Integral and Probability. Springer-Verlag.
- Jacod, J., & Protter, P. E. (2003). Probability essentials. Springer Science & Business Media.
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Planned learning activities and teaching methods

Face to Face. Class lectures.

Assessment methods and criteria

Assignments. Written exam at the end of the semester and/ or assignment.

Probability Theory (MSc in Statistics course)

Code: 9112

ECTS Credits: 3
Level of course: Postgraduate
Year of study: 1st year
Semester/trimester: Spring (2nd Semester)

Objectives of the course
At the end of the course the students will be familiar with the measure-theoretic foundation of probability theory. They will be able to find the expected value of a random variable that is neither discrete nor continuous. They will be able to use the dominated convergence theorem, the bounded convergence theorem, the monotone convergence theorem. They will know how some very significant theoretical results as the weak law of large numbers, the strong law of large numbers and the central limit theorem are proved.

Prerequisites and co-requisites
Elementary probability theory, Calculus.

Recommended optional programme components: None

Course contents
A non-measurable event. Countable and uncountable sets. Probability spaces. Probability measure. Borel sigma field. Lebesgue measure. Continuity property of probabilities. Random variables. Distribution function of a random variable. Independent random variables. Definition of the expected variable of a random variable. Markov's inequality. Chebyshev's inequality. Almost sure convergence of random variables. Dominated convergence theorem. The monotone convergence theorem. Fatou's Lemma. Convergence in probability and in distribution. Borel-Cantelli Lemma. Skorokhod's representation theorem. The weak law of large numbers. The strong law of large numbers. The Central limit Theorem.

Recommended or required reading
Ross S. M. and Pekoz E., A second course in probability.
Grimmet and Stirzaker, Probability and Random Processes

Planned learning activities and teaching methods
Face to Face Class lectures. Tutoring.

Assessment methods and criteria
Written exam at the end of the semester

Advanced Stochastic Processes (MSc in Statistics course)

Code: 9113

ECTS Credits: 3
Level of course: Postgraduate
Year of study: 1st year
Semester/trimester: Spring (2nd Semester)

Objectives of the course

- The students, after following (and successful examination of) this course will understand the notion of Martingales which plays a crucial role in Financial and Actuarial applications.
- Moreover, they will learn applications of the Optional Stopping Theorem.
- They will study the Poisson Process and the Brownian motion, and they will get familiarised with Stochastic Calculus and Stochastic Differential Equations (with applications in Finance and in other fields).

Prerequisites and co-requisites

Probability Theory (probability measures, random variables, independence, expectation, conditional probability, Moment Generating function, Characteristic function, Law of Large Numbers, Central Limit Theorem), Basic Stochastic Processes, Calculus (limits, series, continuity, derivative, Riemannian integral), Basic knowledge of Lebesgue Integral.

Recommended optional programme components: None

Course contents

Reminder on basic knowledge of probability and Stochastic Processes. Conditional Expectation. Discrete Time Martingales (Filtrations, Martingales, Random Games, Stopping Times, Optional Stopping Theorem). Martingale Inequalities and Convergence (Doob's Martingale Inequalities, Doob's Martingale Convergence Theorem, Uniform Integrability and L1 Convergence of Martingales). Poisson Process, Compound Poisson Process, Queueing Theory. Brownian motion (Definition and basic properties, sample paths, Doob's L2 Maximal Inequality for Brownian motion). Itô's Stochastic Calculus (Itô's Stochastic Integral, Properties of Stochastic Integral, Itô's Formula, Stochastic Differential Equations).

Recommended or required reading

- P. Billingsley, Probability and measure, Wiley, 1979.
- Z. Brzezniak, T. Zastawniak, Basic Stochastic Processes, Springer, 1998.
- S. Karlin, A. M. Taylor, A Second Course in Stochastic Processes, Academic Press, 1981.
- D. Revuz, M. Yor, Continuous Martingales and Brownian motion, Springer Science & Business Media, 2013.
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Planned learning activities and teaching methods

In class (In person) lectures, Exercises, Assignments, Presentations.

Assessment methods and criteria

Final exam, Assignments.

INDEPENDENT COURSES

FALL & SPRING SEMESTER

Greek Language

Code: 9029

ECTS credits: 6

Course Description

This lesson addresses those who are taught Greek as a foreign language. It is an instructive lesson focusing on students who belong to the beginners' level (A1) and attend an intensive and short course on Modern Greek language. The aim of the lesson is to help learners obtain basic skills, so as to be able to respond to real-life communication circumstances and formulate an indicative perception of the Greek culture and civilization. In shaping the course what has been taken into consideration is the relevant curriculum of Athens University as well as the levels of language proficiency, defined by the Common European Framework of Reference for Languages (CEFR).

During the lessons, we try to employ a variety of current communication circumstances with timely themes and present many phenomena of grammar and syntax, which are essential to this level. The lessons is framed by images, sketches and songs, aimed at making even more lively the journey of language learning and the acquaintance with the Greek civilization. The exercises that have been selected cover the spectrum of both grammar and vocabulary of beginners' levels as well as the range of skills needed to understand and produce verbal and written speech.