ΟΙΚΟΝΟΜΙΚΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΑΘΗΝΩΝ

ATHENS UNIVERSITY OF ECONOMICS AND BUSINESS

List of Courses Offered in English

Academic Year 2026-2027

IKY

Erasmus+

Erasmus+

Academic Year 2026-2027

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

13 ELPIDOS STR, ATHENS 104 34, GREECE

Tel:+ 30 210-8203 947, 250

http://www.aueb.gr

Contents

SCHOOL OF BUSINESS

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

Code: 9037

Instructor: Klas Eric Soderquist

ECTS Credits: 6

Level: Advanced

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: Intermediate

Communication with the Instructor

kmn@aueb.gr

Course Outline

This course outlines 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

SPRING SEMESTER

Applied Software Engineering

Code: 9002

Instructor: Diomidis Spinellis

ECTS credits: 6

Level: Intermediate

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: Introductory

Communication with the Instructor

dzisis@aueb.gr

Learning Outcomes

The aim of the course is to introduce the student to the design, analysis, reengineering, optimization 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 program 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.

- Article

5. Facility Layout

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

Readings:

- "Process Layout", Chapter 7 in Operations Management, L.J. Krajewski & L.P. Ritzman.
- 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.

- Article

7. Forecasting

- Basic forecasting methods
- Application exercises in class

Readings:

- "Forecasting", Chapter 13 in Operations Management, L.J. Krajewski & L.P. Ritzman.
- 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.

Advertising and Communication Management

Code: 9003

Instructor: TBA

Communication with the instructor:

ECTS credits: 6

Level: Intermediate

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: PSILOUTSIKOU MARINA

Communication with the instructor: mpsilout@aueb.gr

ECTS credits: 6

Level: Intermediate

Prerequisites

None

Objectives

The course aspires to:

1. Help participants understand:

) the external environment in which our companies operate,

) the role and significance of core competences not only in offering competitive advantage, but also in providing the foundation upon which strategies are based,

) 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 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 H.

ECTS credits: 6

Level of course: Advanced (Undergraduate)

Communication with the Instructor: esalav@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
- cultivate creativity and innovation
- 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.

Course content

This course introduces the nature of entrepreneurship. It helps students to be creative and successfully develop viable business ideas. Students are going to write 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

Assessment methods

Written exams, presentation and deliverable

Financial Management

Code: 9023

Instructor: TBA

ECTS credits: 6

Level: Introductory

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: 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.

• 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

Level: Intermediate

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: KAPOUTSIS ILIAS

Communication with the instructor: ikapoutsis@aueb.gr

ECTS credits: 6

Level: Intermediate

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 participating 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%).

International Marketing Management

Code: 9018

Instructor: CHATZOPOULOU ELENA

Communication with the Instructor: elenachatz@aueb.gr

ECTS credits: 6

Type: Elective

Level: Intermediate

Teaching and learning strategy implementation (4 pillars)

• Pillar 1: Active learning

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. 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. 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 standardization 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

ECTS credits: 6

Level: Introductory

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: 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

Business Strategy

Code: 9064

Instructor: TBA

Communication with the Instructor:

ECTS credits: 6

Level: Intermediate

Prerequisites

None

Objectives

The course aspires to:

6. Help participants understand:

) the external environment in which our companies operate,

) the role and significance of core competences not only in offering competitive advantage, but also in providing the foundation upon which strategies are based,

) 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

ECTS credits: 6

Level: Intermediate

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%).

Capital Markets & Perspectives: SIU & More

Code: 9128

Instructor: Christina Tarnanidou

Communication with the instructor: chtarn@aueb.gr

ECTS credits: 6

Level: Intermediate

Course Objective

The purpose of this course is to examine the EU capital markets' design and perspectives. The analysis takes into account all related market aspects including products, services, infrastructures, service providers and investors, and assesses the policymaking and rulemaking approaches of EU.

The course includes three main parts, i.e. (a) module 1 related to markets and services, (b) module 2 related to corporate governance rules and market model, (c) module 3 referring to sectorial rules of energy financial markets that is included in the course as special part due to the importance of the referred sector for the development of energy / power markets. Students will be introduced to the concept of capital markets and consider how such markets operate and evolve. SIU (Savings and Investments Union) is also part of the course's agenda considering the new approaches, methods and ideas that it introduces. The course provides various examples and practical guidance on capital markets operations, related risks as well as best market practices, rules and solutions aiming at addressing any relevant pathology.

Prerequisites

1 course on sectorial aspects of financial markets, services or other related finance/financing sector and/or other related, at least an introductory one.

Course Content

- Introductory remarks
    - Practical aspects in securities
    - Main concepts
- Securities and listed companies
    - Listing
    - Prospectus
    - Transparency
- Product development in Europe
    - EU financial instruments and product development
    - Service model
    - Organizational rules
    - Investors protection
- Financial Markets operations
    - Market model
    - Clearing model and CCPs
    - Post-trading profile – CSDs
- Practical aspects – Case studies
- Internal/external corporate governance
    - Examples – Case studies
- Energy markets & Europe
    - Policy issues of regulation
    - The Greek initiative
- Energy markets as commodity markets
    - Energy as commodity
    - The wholesale market
- Energy Markets & HEnEx
- Energy Derivatives Market

Recommended Reading Material

Tarnanidou Ch.I.:

- Stock lending and short selling mechanisms under the new Greek regulatory approach», Butterworths Journal of International Banking and Financial Law (April 2007), 246-248
- Post trading after Mifid, International Financial Law Review (IFLR) (June 2009), 60-63.
- Record Date Rule for Corporate Actions: An Overview of its Implementation in the Greek Capital Markets», Journal of International Banking and Financial Law, (July/August 2009 issue), 434et. seq.
- Shareholding in EU: Is "indirect holding" approach appropriate in achieving EU integration? (corresponding author, prof. G. Kouretas), Financial Regulation and Compliance, Vol. 22/1, 2014, 15-25
- EU Financial Collateral Arrangements and Re-hypothecation in the Shadow of "Shadow Banking": To further regulate or not?, Journal of Banking Regulation advance online publication 11 February 2015; doi: 10.1057/jbr .2014.22
- From the Home Member State Principle to EMIR, ESMA and the Colleges, Financial Regulation International, March 2015, Issue 18.2, pp. 13-20
- Book-entry securities reform in Greece: National Law no. 4569/2018 and CSDR, Financial Regulation International, March 2019, 10-20
- DLT in the Execution and Clearing Process of Transactions in Securities (the Greek example), *Springer 2026*

Teaching Methods

Lectures, Case studies, Video & Multimedia materials

Assessment Methods

80% written assignment, 20% written exams

DEPARTMENT OF ACCOUNTING AND FINANCE

FALL SEMESTER

Behavioral Finance

Code: 9004

Instructor: A. Karagiorgis

ECTS credits: 6

Level: Intermediate

Communication with the Instructor:

ariskaragio@gmail.com

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

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 Assessment

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

Code: 9085

Instructor: Athanasios Sakkas

ECTS credits: 6

Level: Introductory

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

Financial Statement Analysis

Code: 9021

Instructor: Konstantinos Chalevas

ECTS credits: 6

Level: Advanced

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: 6

Level: Introductory

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)**:** 6 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 protecting 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

Retail Sales Promotions

Code: 9055

Instructor: Paris Argouslides

ECTS credits: 6

Level: Advanced

Communication with the Instructor: pargousl@aueb.gr

Description and content

Twelve weekly sessions on retail sales promotions. Such promotions are initiated by manufacturers of consumer products, retailers or both. The following broad topics are covered:

1. Fundamentals of retail sales promotions.
2. Conditions leading to retail sales promotions campaigns.
3. Alternative methods of retail sales promotions.
4. Design and implementation of retail sales promotions campaigns.
5. Post-promotion issues.

Delivery

Lectures are based on empirical research published in premier journal outlets, practical examples, and illustrations of sales promotions from retail stores.

Assessment

A technical written exam at the end of the semester (100% of the final mark).

Key benefits

Upon course completion students will be able to know:

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

Who can choose the course

Given its advanced level and conceptual technicalities, this course can be included in the learning agreements of those incoming Erasmus students who meet the following two academic criteria:

1. Have a marketing major in their home university.
2. Have successfully passed a course on Consumer Behaviour in their home university.

Maximum attendance allowed

As academic substance from this course is a function of a knowledgeable, compact, dedicated, and punctual audience, this course accepts ***no more than 70*** eligible incoming Erasmus students, on ***a first-come***, ***first-served*** basis. This maximum threshold will not be exceeded.

Key readings

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.

Huang, S. C., Maimaran, M., & Kupor, D. (2024), "Using price promotions to drive children's healthy choices in a developing economy", ***Journal of Marketing Research***, 61(6), pp. 993-1014.

Kan, C., Liu, Y., Lichtenstein, D.R., & Janiszewski, C. (2023), "The negative and positive consequences of placing nonpromoted products next to promoted products", ***Journal of Marketing***, Vol. 87, No. 6, pp. 928-948.

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.

Park, H., Kwon, J., and Bagchi, R. (2024), "Is "4 for 16"better than"4 for 15.30"? The price divisibility effect in multipack purchases", ***Journal of Consumer Research***, 51(3), pp. 455-473.

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.

Human Resource Management

Code: 9031

Instructor: TBA

Level: Intermediate

Semester: Fall

6 ECTS

Aims

This course aims at familiarizing students with the theoretical background of Human Resource Management. The subjects covered throughout the lectures will introduce students to the current way of managing employees in modern organizations. More specifically, after the completion of the course, the participants will be able to understand:

• The important role of HRM in supporting organizational strategy
in the modern firm.

• HRM practices and current trends.

• Issues in international HRM Learning Outcomes

Course Outline

In addition to the material covered in the transparencies, we will use the open source book Human Resource Management, by Debra Patterson, 2023, 3rd edition. It can be found in the following link:
https://ecampusontario.pressbooks.pub/humanresourcesmgmt/
The following chapters will be covered (linked to the main units of the course as presented in e-class):

Strategic HRM

- Ch. 1: HR Strategy

Talent Acquisition

- Ch. 2: HR Planning & Analytics
- Ch. 4: Job Analysis and Design
- Ch. 5: Talent Acquisition

Performance Management

- Ch. 6: Training and Development
- Ch. 8: Performance Management
- Ch. 7: Compensation & Benefits

International HRM

- § Ch. 11: Global Human Resour

Teaching Method

- Interactive lectures enriched with videos, case studies and group discussions, based on the above structure.
- All teaching material can be found in e-class

Assessment of the Course

- Written exam→ 70%. (Note: You should receive a passing grade in the written exam in order for the assignments to be added to your final grade).
- Participation → 10%.
- Group assignment→ 20%.

The group presentations will take place on the last lecture.

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 fundamental to all aspects of organizational life. Over the past decade, organizations have experienced unprecedented and increasingly rapid transformations, making the phrase "change or die" ever more relevant for those competing in dynamic environments. Effective change management has become critical to organizational survival and competitiveness.

This course provides a comprehensive understanding of the change management process and offers a practical framework for managing organizational change. Participants will explore critical issues including change theories and models, systemic thinking, organizational responses to change, organizational culture as a change catalyst, psychological safety and trust, the role of change agents, and change leadership. The course integrates theoretical foundations with practical applications grounded in real-world organizational contexts.

Specific Learning Outcomes

Upon successful completion of this module, participants will be able to:

•Present a clear, theoretically grounded understanding of change management theory and practice

•Apply major theories and models of organizational change to real-world situations

•Analyze organizations as complex systems and apply systemic thinking to change initiatives

•Understand and manage diverse responses to change, including resistance and support

•Recognize and leverage organizational culture as a critical change catalyst

•Design and implement culture change strategies aligned with organizational objectives

•Build psychological safety and trust as foundations for organizational change

•Identify, select, and develop effective change agents

•Demonstrate change leadership competencies and personal influence

•Apply job crafting principles to enhance engagement during change processes

•Critically analyze real-world change cases and develop evidence-based change strategies

Course Structure & Content Overview

This course integrates multiple pedagogical approaches including lectures, interactive workshops, case study work, individual and collaborative activities, and experiential learning.

Weekly Module Schedule

Week 1: Introduction to Change Management

Foundational concepts, definitions, and the imperative for change; why change matters; historical context of organizational change; environmental drivers; organizational imperatives in dynamic markets.

Week 2: Theories and Models of Change

Foundational and contemporary change theories including Lewin's three-stage model, Kotter's 8-step change process, the ADKAR model.

Week 3: Change as a System – Systemic Thinking and Agile Methodology

Organizations as complex adaptive systems; Sinterconnectedness within organizations; agile methodology principles; iterative change processes; and rapid development cycles.

Week 4: Responses to Change – Causes and Ways of Dealing with Them

Understanding diverse organizational and individual responses to change initiatives; examining resistance, support, and ambivalence; exploring emotional responses and personality factors; recognizing individual differences in change readiness; identifying causes of negative responses; and implementing effective intervention strategies.

Week 5: Organizational Culture as a Catalyst for Change

Culture as the invisible yet powerful force enabling or inhibiting change; defining organizational culture; cultural dimensions and assessment tools; alignment between change strategy and culture; cultural readiness.

Week 6: How to Change the Culture

Practical approaches to deliberately shifting organizational culture; culture change models; role of leadership; symbolic management; stories, symbols, rituals, and ceremonies; reward systems; measurement and assessment.

Week 7: Psychological Safety and Trust as Allies to Change

Trust and psychological safety as foundations for successful change; Amy Edmondson's psychological safety framework; trust dimensions; fear and organizational costs; organizational silence;

Week 8: The Role of Change Agents; How to Select Them

Change agents as catalysts for change; identification and selection criteria;

Week 9: Change Leadership

Leadership as driving force for change; distinctive leadership competencies; transformational leadership; visionary leadership; authentic leadership; emotional intelligence; communication and narrative; systems thinking; adaptive capacity.

Week 10: Job Crafting

Individual agency in shaping work experience during change; task crafting, relational crafting, cognitive crafting; meaning-making during change; proactive work behaviors; employee agency; engagement and resilience.

Week 11: Synthesis and Preparation for Exams

Assessment Methods

Written Exams (70%)

Written examinations will assess participants' understanding and application of change management concepts, theories, and frameworks covered throughout the course. Exams will test knowledge across all eleven weeks and participants' ability to apply theoretical perspectives to organizational scenarios.

Group Work (30%)

In groups, students will have the opportunity to work on a change project applying the knowledge they acquired from the course.

Reading Resources & Bibliography

Change is a broad and multifaceted subject requiring engagement with diverse theoretical and practical perspectives. Students are expected to conduct independent research using library resources and electronic databases. A comprehensive recommended reading list and electronic resources are available on the e-class platform. The following sources form the core bibliography for this course:

Core References

Armenakis, A. A., Harris, S. G., & Mossholder, K. W. (1993). Creating readiness for organizational change. Human Relations, 46(6), 681-703.

Dweck, C. S. (2016). What having a 'growth mindset' actually means. Harvard Business Review, 94(12), 2-5.

Edmondson, A. C. (2018). The fearless organization: Creating psychological safety in the workplace for learning, innovation, and growth. Wiley.

Kotter, J. P. (2007). Leading change: Why transformation efforts fail. Harvard Business Review, 85(1), 96-103.

Oreg, S., Vakola, M., & Armenakis, A. 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.

Schwarz, G. M., Bouckenooghe, D., & Vakola, M. (2021). Organizational change failure: Framing the process of failing. Human Relations, 74(1), 159-184.

Wrzesniewski, A., & Dutton, J. E. (2001). Crafting a job: Revisioning employees as active crafters of their work. Academy of Management Review, 26(2), 179-201.

Pedagogical Approach & Learning Support

This course employs an integrated pedagogical model combining theoretical foundations with applied practice, individual reflection with collaborative learning, expert-led instruction with peer learning, and evidence-based frameworks with real-world case analysis.

The teaching approach emphasizes personal development of change leadership competencies alongside theoretical understanding, enabling participants to become more effective change agents in their organizations.

Course Expectations & Participation

Participants are expected to attend all sessions and actively engage in discussions, workshops, and group activities. Respectful engagement with diverse perspectives and support of peer learning are essential components of this course.

Communication & Support

Instructor Contact: mvakola@aueb.gr

Students are encouraged to contact the instructor for clarifications, additional resources, guidance on assignments, or academic support related to course content and change management topics. Office hours and virtual consultations are available upon request.

Marketing of Services

Code: 9020

Course level: Intermediate

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 several 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 Services capes
- 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%).

Innovation Management

Code: 9117

Instructor: Dr. Gkypali Areti

ECTS credits: 6

Communication with the Instructor: agkypali@aueb.gr

Year of study: 4th Year

Semester: 8th Semester (Spring)

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

Language of Instruction: English

Course Level (Erasmus Classification): Intermediate

Prerequisites: A solid foundation in Microeconomics is required. Prior exposure to Industrial Organisation and/or Business Strategy courses is strongly recommended, as the course builds on concepts from these fields.

Maximum Enrolment: 70 students

Erasmus Course Type: Dedicated Erasmus course (taught exclusively in English, open to Erasmus students)

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) always influence the decision-making process 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 analyze 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 analyze 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 (e.g. artificial intelligence) as catalysts in shaping the innovation process, and specifically regarding 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:

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

b. Final exams (65%)

Exam Scheduling (Erasmus Students): Exam dates announced by the University are binding for all Erasmus students. Every effort will be made to schedule Erasmus exams at the beginning of the examination period to facilitate timely return to students' home institutions.

Organizational Behavior

Code: 9118

Instructor: Georgiou K.

ECTS credits: 6

Level: introductory

Communication with the Instructor: kongeorgiou@aueb.gr

Course Level

This course is classified as introductory course and is designed to provide students with a foundational understanding of Organizational Behavior concepts and theories.

No prior knowledge or formal prerequisites are required for enrollment. However, previous exposure to introductory courses in Management, Business Administration, Psychology, or Human Resource Management may be beneficial in supporting students' understanding of individual, group, and organizational dynamics within the workplace.

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.

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
- Attitudes and Job Satisfaction: Relationship between attitudes and behavior, Job Attitudes, Measuring Job Satisfaction
- Employee Motivation: Motivation Theories, Effectively motivating employees
- 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.

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.
- Robbins, S. P., & Judge, T. A. (2022). Organizational Behavior (18th ed.). Pearson Education.

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

Level: Advanced

The purpose of this course is to examine the forces that 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. The course presents a brief historical overview of the World Economy and discusses the effects of international trade, the effects of factor movements (i.e. immigration and foreign direct investment) and recent ways of organizing the allocation of economic activity across countries (i.e. outsourcing and global value chains), the proliferation of Regional Trade Agreements, as well as factors contributing to the emergence of global imbalances.

Recommended Prerequisite Knowledge

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

International Economics

Code: 9039

Instructor: CHRISTOPOULOS/MOUTOS

ECTS credits: 6

Level: Intermediate

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

Level: Intermediate

Among the topics covered in the International Trade part of the course are: the classical and neoclassical theories of international trade (Ricardian, Heckscher-Ohlin, and Specific-Factors Models), with emphasis on the concepts of absolute and comparative advantage and on the determination of relative prices and the gains from trade, as well as on the effects on income distribution; trade policy under perfectly, and imperfectly competitive settings, and the political economy of trade policy. The International Monetary Economics part covers topics related to: national income accounting and the balance of payments, including the current account and foreign indebtedness; the functioning of the foreign exchange market, exchange-rate determination, and currency trading. Topics also include money, interest rates and exchange rates; spot and forward exchange rates, arbitrage, the law of one price, absolute purchasing power parity (PPP), international interest-rate differentials, and the real exchange rate. National income and exchange-rate determination are analyzed through the open-economy IS/LM model. The course also examines fixed versus flexible exchange-rate regimes, the effectiveness of monetary, fiscal, and exchange-rate policies under perfect and imperfect capital mobility, the insulating properties of alternative exchange-rate systems, balance-of-payments crises,

capital flight, the international monetary system, internal and external balance, and international macroeconomic policy coordination.

Recommended Prerequisite Knowledge

Introductory-level knowledge of Microeconomics and Macroeconomics, such as presented in N. Gregory Mankiw, Principles of Economics.

Empirical Economics

Code: 9080

Instructor: TBA

ECTS credits: 6

Level: Intermediate

Communication with the Instructor: TBA

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 we have to 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 and with observational data.
- 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 (Diffenece-In-Differences methodology)
- Instrumental Variables Regression and Systems of Equations
- Models with binary dependent variables and classification
- Other limited dependent variable models (Tobit, Poisson)

In some detail the lectures will follow the following scheme

1. Multiple Linear Regression (MLR): Overview of Main Results & Deviations that make our work difficult (interesting/challenging)
2. Introduction to R
3. Problems with MLR
4. Causality and Directed Acyclic Graphs (I will only sketch the latter)
5. Regressions with Time Series Data (intermediate step for (6))
6. Pooled Cross-Sectional and Panel Data Models - Difference-in-Differences estimation
7. Instrumental Variable Estimation and Systems of Equations
8. Models of Binary Dependent Variables and Classification; Other Limited Dependent Variable (LDV) models (e.g. Tobit, Poisson, Sample Selection Correction)

Delivery Method

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

Evaluation

- Final Project with presentation (40%)
- Projects and Assignments along with presentations (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), Statistics.

COURSE WEBSITE (URL)	https://eclass.aueb.gr/courses/DEOS389/

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.

Cunningham, S. (2021) Causal Inference. The Mixtape, Yale University Press, https://mixtape.scunning.com/

Greene, W. H. (2018) Econometric Analysis, 8th ed, Pearson

Huntington-Klein, N. (2021) The Effect: An Introduction to Research Design and Causality, Chapman and Hall/CRC. https://theeffectbook.net/

Kleiber, C. and Zeileis, A. (2008) Applied Econometrics with R, Springer

Hanck, C., Arnold, M., Gerber, A. and Schmelzer, M. (2026) Introduction to Econometrics with R, https://www.econometrics-with-r.org

Heiss, F. (2020) Using R for Introductory Econometrics 2nd edition, http://www.urfie.net

SPRING SEMESTER

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 takin g 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 market's 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

Legal Aspects of European Integration

Code: 9043
Instructor: A. Pliakos
ECTS credits: 6
Level: Advanced
Communication with the Instructor: pliakos@aueb.gr

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)

DEPARTMENT OF ECONOMICS

FALL SEMESTER

Applied Macroeconomics

Code: 9120

Instructor: Petros Varthalitis, Assistant Professor

ECTS credits: 6

Level: Intermediate

Communication with the instructor: pvarthalitis@aueb.gr

Level of course: Undergraduate/Post-graduate

Year of study: 2,3,4 post-graduate year

Course objectives:

The main objective of the course is to equip students with the basic analytical, theoretical and numerical tools needed to understand the real-world policy issues faced by policymakers and applied economists. Students will become familiar with the modern skills and instruments used in national institutions, such as government departments, fiscal councils, and central banks, as well as in international organizations such as the IMF, the OECD, the European Commission, and international investment institutions like private and investment banks.

The course is designed in particular for students aspiring to build international careers in financial and policy institutions, and it provides a thorough but approachable introduction to international and macro finance, with a focus on

money, banking, and the macroeconomic forces that drive financial markets and exchange rate movements.

In summary, the course aims to enable students to:

- Understand how monetary, exchange rate, and fiscal policy shape the economy in both stable and turbulent periods, and how policies should be designed to improve economic stability.
- Acquire the analytical and empirical tools used in national and international policy institutions, as well as in private and investment banks.
- Analyze major international economic crises — including the Global Financial Crisis (2008–09), the Irish Banking Crisis (2009–10), and the European Debt Crisis (2010) — and work with real macroeconomic and financial data from these episodes.

Course contents

National Accounts — how GDP, income, and expenditure are measured and linked.

Inflation and Prices — price indices, causes of inflation, and its macroeconomic effects.

Public Debt — government budgets, debt dynamics, and sustainability.

Macroeconomic Policy — monetary, fiscal, and exchange rate policy in normal and crisis periods.

Central Banks and Fiscal Institutions — their roles, instruments, and interaction in shaping the economy.

Teaching Method

The course is taught with a strong emphasis on clarity and accessibility, so that even advanced material feels approachable. Concepts are introduced gradually, starting from intuition and moving toward more formal analysis only once the underlying ideas are clear.

Teaching combines several complementary elements:

- Simple theoretical models, presented in a clear and intuitive way, that give students the analytical foundation needed to understand applied problems.
- Numerical tools such as Python and MATLAB, introduced step by step and used to process macroeconomic and financial data.
- Workshops with a hands-on approach on laptops, where students work directly with data, models, and policy reports to apply what they have learned in class.
- Practical examples drawn from real economies, used to illustrate every theoretical concept introduced in class.
- Analysis of reports from real policy-making institutions, such as central banks, the IMF, the OECD, and the European Commission, so that students learn to read and interpret the documents actually used by professionals.

The overall philosophy is consistent throughout the course: precise definitions first, intuitive explanations next, and applied examples last. The goal is to ensure that every student finishes the course feeling that applied macroeconomics is a subject they can confidently understand and use in real-world policy and financial settings.

Course Evaluation – Assessment Methods

Student performance is assessed through a combination of activities designed to reward both consistent engagement and the ability to apply the material in practice. Evaluation is based on active participation during lectures, the organization of a students' workshop, the presentation of individual or group projects, and an overall final examination covering the main themes of the course. This mix ensures that students are evaluated not only on their theoretical understanding, but also on their capacity to communicate ideas, work collaboratively, and apply analytical tools to real macroeconomic and financial questions.

Course Material- Recommended or required reading

Lecture slides

Blanchard, O. J. (2025). Convergence? Thoughts about the evolution of mainstream macroeconomics over the last 40 years (PIIE Working Paper No. 25-8). Peterson Institute for International Economics. https://www.piie.com/publications/working-papers/2025/convergence-thoughts-about-evolution-mainstream-macroeconomics

Markus K. Brunnermeier and R. Reis (2023): A crash course on crises: macroe-conomic concepts for run-ups, collapses and recoveries. Princeton University Press

Carmen M. Reinhart and Kenneth Rogoff (2009). This time is different: Eight Centuries of Financial Folly. Princeton University Press.

Stephanie Schmitt-Grohe, Martin Uribe and Michael Woordford (2022). In-ternational Macroeconomis: A Modern approach. Princeton University Press.

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, sank 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 occasionally invited lectures by market experts. Students are expected to be always prepared for class 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

Applied Time Series Econometrics

Code: 9121

Instructor: Anastasia Zervou

ECTS credits: 6

Level: Intermediate

Communication with the instructor: azervouv@aueb.gr

Level of course: Undergraduate

Year of study: 3rd or 4th year

Course objectives:

The course aims to provide students with the tools to analyze time series data, with an emphasis on empirical applications in macroeconomics and finance. A central goal is to understand not just how to estimate time series models, but how to choose the right model for the right question, whether that question is about forecasting inflation, measuring the impact of a monetary policy shock, or modeling volatility in financial markets. Students will be exposed to the techniques used in current applied economic and financial research, working directly with real data throughout the course. Students will build and estimate time series models appropriate for different macroeconomic questions, and will be exposed to current techniques used in applied economic research. Students will complete a research project and present their work in a research poster format.

Course contents

The course begins with the special features of time series data that distinguish it from cross-sectional analysis, persistence, trends, seasonality, and the complications these introduce for standard regression. Students then study ARMA models, learning how to capture the dynamic structure of series such as

interest rates, inflation, and asset returns, and how to use autocorrelation and partial autocorrelation functions to guide model selection. Autocorrelation and heteroskedasticity in time series residuals are examined in depth, both as diagnostic problems and as phenomena of interest in their own right. Unit roots and their implications are then covered, including why a random walk in asset prices or interest rates changes everything about how we model and forecast, followed by formal testing procedures and model selection using information criteria. The course then turns to ARCH and GARCH models of volatility, which have become indispensable in empirical finance for capturing the clustering of large moves in asset returns and exchange rates. Forecasting with estimated time series models is covered as a standalone topic, with attention to forecast evaluation and the practical challenges of out-of-sample performance. Vector autoregressions are introduced as a framework for modeling the joint dynamics of multiple time series, with applications including the simultaneous relationship between macroeconomic variables and asset prices, identification strategies, impulse response functions, and variance decompositions. Applications are drawn throughout from both macroeconomics, monetary policy shocks, inflation dynamics, interest rate transmission, and finance, i.e., stock return predictability, exchange rate modeling, and volatility spillovers across markets.

Teaching Method

Face-to-face

Course Evaluation – Assessment Methods

Exam

Course Material- Recommended or required reading

Brooks, C. Introductory Econometrics for Finance, Cambridge University Press (latest edition)

International Monetary Relations and Policy

Code: 9122

Instructor: Anastasia Zervou

ECTS credits: 6

Level: Intermediate

Communication with the instructor: azervouv@aueb.gr

Level of course: Undergraduate

Year of study 3rd or 4th year course

Course objectives:

The course aims to provide students with the tools to understand the functioning of modern central banks, the design and transmission of monetary policy, and the institutional architecture of major monetary authorities, with emphasis on the European Central Bank and the Federal Reserve. Students will develop practical literacy in reading and interpreting central bank communications like policy statements and speeches, and in engaging with empirical policy analysis from sources such as the ECB and the Bank for International Settlements Working Papers. Through hands-on applications, students will estimate and interpret monetary policy reaction functions, including Taylor rules under different mandates and exchange rate regimes, using real data from major central banks. The course is particularly suited to students interested in careers at central banks, international financial institutions, or economic policy bodies.

Course contents

The course opens by building the analytical toolkit that central banks themselves use to think about inflation, output, and interest rates, giving students the modeling foundations to understand not just what central banks do, but why. From there, the course examines the institutional architecture of

major central banks, comparing the ECB and the Federal Reserve and asking how the choice between a price stability mandate and a dual mandate shapes policy behavior in ways that are consequential and often underappreciated. Students then explore a range of monetary policy instruments, from conventional interest rate setting to the unconventional tools deployed during crises, including quantitative easing and forward guidance, and examine how these decisions transmit to the real economy through interest rate, credit, and exchange rate channels. The unique challenge of conducting a single monetary policy across heterogeneous economies gives the eurozone a central place in the course, making it one of the most instructive case studies in modern economic policy. Students then work with real data to estimate the reaction functions that describe how central banks actually behave, testing whether the ECB's mandate translates into measurably different policy choices from the Fed, and examining whether exchange rates play a role that official mandates do not acknowledge. The course culminates in major policy episodes, like the global financial crisis, the eurozone sovereign debt crisis, and the post-2021 inflation surge, examined through the models and frameworks developed throughout. Students engage directly with central bank communications and policy research, developing the practical literacy to follow and interpret real-world monetary policy debates.

Teaching Method

Face-to-face

Course Evaluation – Assessment Methods

Final exam

Course Material, Recommended Readings

De Grauwe, P. (2022), Economics of Monetary Union, 14th edition, Oxford University Press.

Garin, J., Lester, R. & Sims, E., Intermediate Macroeconomics (latest edition, freely available at sites.nd.edu/esims)

Carlin, W. and Soskice, D. (2023), Macroeconomics: Institutions, Instability, and Inequality, Oxford University Press.
ECB and BIS Working Papers (selected, freely available)

SPRING SEMESTER

Business Economics

Code: 9006

Instructor: Daphne Nicolitsas, Associate Professor

Communication with the Instructor: nikolitsa@aueb.gr

Level : Intermediate

ECTS credits: 6

Code: 9006

Instructor: Daphne Nicolitsas, Associate Professor

Communication with the Instructor: nikolitsa@aueb.gr

Level : Intermediate

ECTS credits: 6

Course Description

Business Economics uses economic theory to inform firms' decision-making. The curriculum connects abstract economic concepts with real-world business choices, focusing on market forces, firm behaviours, and the global macroeconomic context. The course is structured into four parts: the economic and business environment; microeconomics and market dynamics; firm behaviour and decision-making; macroeconomics and the global economy.

The course is **of intermediate** difficulty and designed for individuals interested in how companies operate. No prior economic knowledge is required.

Course Objectives

The learning objectives of the course are for students to:

- Understand scarcity by recognising the basic economic problem of unlimited wants and scarce resources, and how this necessitates trade-offs and opportunity costs.
- Be able to analyse the business environment using well-known tools, such as the PESTLE framework.

- Differentiate between the primary objectives of business (e.g., profit maximisation) and the broader needs of various stakeholders.
- Understand how market forces allocate resources and how to calculate and apply price elasticity of demand and supply.
- Assess market efficiency by analysing consumer and producer surplus, and recognise when and why markets fail (e.g., externalities or public goods).
- Evaluate pricing strategies and corporate behaviour across different competitive environments, including perfect competition, monopoly, monopolistic competition, and oligopoly.
- Use marginal costs and marginal benefits to make informed operational decisions, such as setting prices or determining production output.
- Comprehend the relationship between production functions, costs, and revenues to optimise a firm's inputs and outputs.
- Analyse how businesses interact in labour and financial markets to acquire necessary resources and capital.
- Interpret macroeconomic indicators.
- Evaluate government policy.
- Assess the implications of globalisation, international trade, and sustainability on global business operations.

Textbooks and Reading

The main textbook for the course is:

Mankiw, N.G., Taylor, M.P., Ashwin, A. (2024). *Business Economics*, 4th Edition, Andover, Hampshire, United Kingdom: Cengage Learning.

Additional reading material will be used on some topics.

The following textbooks could also be used for the course as an alternative to the main textbook proposed:

1. Salvatore, D. (2025). *Managerial Economics in a Global Economy*, 9th edition, Oxford: Oxford University Press.

2. Baye, M.R. (2022). *Managerial Economics and Business Strategy*, 10th edition, New York: McGraw-Hill Education.
3. Perloff, M.J & J.A. Brander (2025). *Managerial Economics and Strategy*, 4th edition, New York: Pearson.

Course Outline

Unit 1: The economic and business environment

- Basic principles of economics
- The basic economic problem: scarcity relative to wants/needs
- Business decision-making
- The business environment

Unit 2: The market system

- Supply and demand: how markets work
- Elasticity and its applications
- Taxes and subsidies

Unit 3: The limitations of markets

- Factors affecting firm behaviour
- Factors affecting consumer behaviour

Unit 4: The economics of firms in markets

- Costs and revenues in production
- Business objectives and behaviour
- Organisation of firms

Unit 5: Market structures

- Perfect competition
- Monopoly
- Monopolistic competition
- Oligopoly

Unit 6: Business strategy & pricing policy

- Business strategy
- Alternative pricing strategies

Unit 7: Supply chains

- The importance and role of supply chains

- Procurement policies

Unit 8: Factor markets

- Labour market
- Financial markets

Unit 9: Macroeconomic environment

- Properties of economic fluctuations
- Economic policy and effects on firms

Unit 10: Business activity in an international environment

- Business activity and international trade
- Causes and effects of globalisation
- International trade

Assessment

The course will be assessed through a final written exam.

SCHOOL OF INFORMATION SCIENCES AND TECHNOLOGY

DEPARTMENT OF INFORMATICS

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

ΤΜΗΜΑ ΠΛΗΡΟΦΟΡΙΚΗΣ
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

Level of difficulty: Intermediate

Instructor: A. A. Vasilakis (abasilak@aueb.gr)

Intended Audience

Mainly computer science students.

Course Objectives and Outcomes

The course introduces fundamental algorithms and models for creating and rendering digital images, focusing on the rasterization graphics pipeline, geometric transformations, and basic rendering techniques. After successfully completing the course, students will be able to:

- understand how basic image synthesis algorithms and the rendering pipeline work
- apply transformations and projections to model 2D and 3D scenes
- understand core techniques such as rasterization, visibility, shading, and texturing
- develop simple graphics applications using tools such as Unity or OpenGL.

Course Outline

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++.

Necessary Background

Linear algebra & Calculus, computer architectures (recommended), Basic programming skills (preferably in C/C++).

Recommended 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).

Computer and Communication Networks

Code: 9123

(undergraduate course, taught to Erasmus students only)

6 ECTS credits

Level of difficulty: Introductory/Intermediate

Instructors

Iordanis Koutsopoulos (jordan@aueb.gr)

Vasilios A. Siris (vsiris@aueb.gr)

George Xylomenos (xgeorge@aueb.gr)

Intended Audience

Computer Science students without previous experience with Communications or Networking, other students interested in an introductory Networking course.

Course Objectives and Outcomes

The goal of this course is to provide an overview of networking technologies and protocols from basic connectivity to network applications, in a single semester. Upon completion of the course, students will be able to:

- Understand the different architectural layers and building blocks of Computer and Communication Networks, including the physical, medium access control, network, transport and application layers
- Solve problems related to the design and operation of organizational and wide-area networks at the physical and logical levels.
- Understand how the TCP/IP protocols influence the performance of network applications.
- Exploit network traffic analysis tools in order to pinpoint network problems.

- Evaluate the performance of modern network technologies with basic performance metrics and understand the research trends in the area of communication networks.

Course Outline

Overview of the technologies, architecture and protocol philosophy of the Internet. Basic connectivity technologies, local area switching networks and VLANs. Data link layer: error control, error detection and correction, standards and protocols. Multiple access: channelization, multiple access protocols (Aloha, CSMA/CA, CSMA/CD). Local area networks (Ethernet, Fast Ethernet, Gigabit Ethernet, WiFi, VLANs), switches and their operation, scheduling policies. MAC and IP addresses. Network layer of the Internet: the TCP/IP protocol family, Internet addresses and subnetting, control protocols, routing algorithms (Bellman-Ford, Dijkstra), routing protocols (OSFP, BGP), and hierarchical routing, high speed packet forwarding. Protocols and services of the application and transport layers, error, flow and congestion control schemes. Web-based applications and Content Distribution Networks (CDNs). Introduction to wireless and mobile network technologies

Necessary Background

Students should have a basic understanding of computer systems.

Recommended Textbooks

- J. F. Kurose, K. W. Ross, “Computer Networking: A Top-Down Approach”, 8th edition, 2021
- A. S. Tanenbaum, N. Feamster, D. J. Wetherall, “Computer Networks”, 6th edition, Pearson, 2021.

Assessment Methods

The final grade is the weighted average of the midterm (25%), the final examination grade (60%) and the project grade (15%). The project involves using a traffic monitoring tool (Wireshark) to observe and analyze network traffic.

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

Code: 9090

Instructor: V. Kalogeraki

ECTS credits: 6

Communication with the Instructor: vana@aueb.gr

Level of difficulty

Advanced

Intended Audience

Mainly Computer Science students.

Course Objectives and Outcomes

After successfully completing the course, students will be able to:

- Master the foundations of distributed cloud architectures and large-scale data processing. The course covers the capabilities, limitations, and design challenges of these systems).
- Gain hands-on experience in building and deploying cloud-native big data applications.

Course Outline

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, Caching,

Pub/Subsystems, Apache systems and tools including Apache Hadoop, Yarn, Mesos, Kafka, Zookeeper, Redis and Pregel.

Necessary Background

Knowledge of Operating Systems and Computer Networks. Knowledge of a Programming language is required.

Recommended Textbooks

A collection of research papers is used.

Assessment Methods

The final grade is determined by a written final exam, the presentation of a research paper, and a programming assignment. However, a passing grade on the written final exam is required in order for the overall course grade to be considered passing.

Blockchains (Master's course)

Code: 9094

Instructor: S. Voulgaris

ECTS credits: 6

Level: Advanced

Communication with the Instructor: voulgaris@aueb.gr

Intended Audience

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

Course Objectives and Outcomes

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

Course Outline

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).

Necessary Background

Solid understanding of algorithms and data structures, plus experience with some programming language.

Recommended Textbooks

No textbook, just slides and papers.

Assessment methods

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

Reinforcement Learning

(Master's course, jointly taught to AUEB MSc students and Erasmus students)

Code: 9126

6 ECTS credits

Level of difficulty

Advanced

Instructor

S. Toumpis (toumpis@aueb.gr)

Intended Audience

Students of Computer Science and related fields

Course Objectives and Outcomes

After successfully completing the course, students will be able to:

- Describe the fundamental concepts of reinforcement learning.
- Describe a wide range of reinforcement learning techniques (architectures and algorithms).
- Design and implement reinforcement learning models for a variety of related problems.

  Evaluate the effectiveness and performance of algorithms and methodologies based on reinforcement learning.

Course Outline

Introduction to Reinforcement Learning. Dynamic programming. Finite Markov Decision Processes. Static-state problems with Multi-armed Bandits. Monte Carlo methods. Temporal Difference Learning. Basic Reinforcement Learning algorithms: Q-Learning and SARSA. Programming and learning with tabular methods. Policy evaluation and control with function approximation. Off-policy methods with approximation. Policy gradient methods. Advanced reinforcement learning techniques. Applications of reinforcement learning in computer science.

Necessary Background

The course requires a solid foundation in Probability Theory, gained by an undergraduate-level introductory course, basic knowledge of Calculus and Linear Algebra, and an overall maturity in mathematics gained by having completed a few undergraduate-level mathematics courses.

Recommended Textbooks

- Reinforcement Learning: An introduction, Richard S. Sutton and Andrew G. Barto, MIT Press, 2018.
- A Course in Reinforcement Learning, Dimitri Bertsekas, Athena Scientific, 2023.
- Deep Learning: Foundations and Concepts, Christopher M. Bishop, High Bishop, Springer, 2024.

Assessment methods

Biweekly homework programming sets and a 3-hour final written examination.

Natural Language Processing

(MSc course, jointly taught to AUEB MSc students and Erasmus students)

Code: 9127

6 ECTS credits

Level of difficulty

Advanced

Instructor

I. Androutsopoulos (ion@aueb.gr)

Intended Audience

Mainly Computer Science students.

Course Objectives and Outcomes

The course covers algorithms, models and systems that allow computers to "understand" and generate natural language text, with emphasis in deep learning methods for natural language processing (NLP) and large language models (LLMs). Time permitting, a brief introduction to deep learning for speech processing and multimodal LLMs is also provided.

After successfully completing the course, students will be able to:

- understand how important NLP algorithms, tools, and LLMs work,
- select and implement appropriate NLP algorithms for particular applications,
- evaluate the effectiveness and efficiency of NLP systems, including LLMs.

Course Outline

n-gram language models, entropy, cross-entropy, perplexity, context-aware spelling correction, beam-search decoding. Boolean and TF-IDF features. Information gain, SVD. k-NN, k-means. Linear and logistic regression, stochastic gradient descent. Precision, recall, F1, AUC. Multi-Layer Perceptrons (MLPs), backpropagation. Dropout, batch/layer normalization. Pre-training word embeddings, Word2Vec. Recurrent neural networks (RNNs),

GRUs/LSTMs, RNN language models, RNNs with self-attention, bidirectional, stacked, hierarchical RNNs, encoder-decoder RNNs. Text processing with Convolutional Neural Networks (CNNs), image-to-text with CNNs-RNNs. Transformer encoders, BERT. Encoder-decoder Transformers, BART, T5. Decoder-only Transformers, GPT-x. Prompting, supervised fine-tuning, RLHF, DPO. Parameter efficient training, LoRA. Retrieval augmented generation (RAG), LLMs with tools, agents, ReACT. Adding vision to LLMs, LLaVA, InstructBLIP. Data augmentation for NLP. Introduction to automatic speech recognition (ASR). Deep learning encoders of speech segments, wav2vec, HuBERT, encoder-decoder and encoder-only ASR models. Dialog system architectures, intent recognition and dialog tracking using neural models, dialog systems based on LLMs.

Necessary Background

Basic knowledge of calculus, linear algebra, probability theory. For the programming assignments, programming experience in Python is required.

Recommended Textbooks

There is no required textbook. Extensive notes in the form of slides are provided.

Deep Learning for Natural Language Processing: A Gentle Introduction, M. Surdeanu and M.A. Valenzuela-Escarcega. Cambridge University Press, 2024. Free draft available at: https://clulab.org/gentlenlp/text.html

Speech and Language Processing, Daniel Jurafsky and James H. Martin. Pearson Education, 2nd edition, 2009. Available at AUEB's library. See also the free draft of the 3rd edition (in preparation) at: https://web.stanford.edu/~jurafsky/slp3/

Neural Network Methods for Natural Language Processing, Yoav Goldberg. Morgan & Claypool Publishers, 2017, ISBN-13: 978-1627052986. Available at AUEB's library.

Assessment Methods

In each part of the course, study exercises are provided (solved and unsolved, some requiring programming), some of which are handed in (as assignments). The final grade is the average of the final examination grade (50%) and the grade of the study and programming exercises to be submitted (50%), provided that the final examination grade is at least 5/10. Otherwise, the final grade equals the final examination grade.

SPRING SEMESTER

Computer Architecture

Code: 9093

Instructor: S. Voulgaris

ECTS credits: 6

Communication with the Instructor: voulgaris@aueb.gr

Intended Audience

Computer science students with some background on computer hardware.

Course Objectives and Outcomes

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

Course Outline

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.

Necessary Background

Students should have an understanding of computer system organization and digital logic.

Recommended 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.

Assessment methods

Exercises during the semester and a written final exam.

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

Code: 9089

6 ECTS credits

Level of difficulty

Advanced

Instructor

I. Evangelou (iordanise@aueb.gr)

Intended audience

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

Course Objectives and Outcomes

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

Course Outline

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.

Necessary Background

- Elements of linear algebra and calculus
- Basic programming skills (any standard programming language)
- Suggested: Elementary computer graphics (introductory course, undergraduate)

Recommended 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, 3ηέκδοση, Addison Wesley, 2013.

Assessment Methods

Written examinations (70%), final assignment (30%).

Distributed Systems

(undergraduate course, taught to Erasmus students only)

Code: 9010

6ECTS credits

Level of difficulty

Intermediate

Instructor

V. Kalogeraki (vana@aueb.gr)

Intended Audience

Mainly computer science students

Course Objectives and Outcomes

Study the theory and practice of distributed systems. Focus on recent developments and state-of-the-art practical systems.

Course Outline

The purpose of this course is to integrate the theory and practice of distributed systems with focus on recent developments and state-of-the-art practical systems. The topics we will cover include middleware architectures, process management, replication, consistency and group communication protocols, peer-to-peer systems, real-time scheduling, logical clocks, synchronization, programming frameworks such as MapReduce, file systems, caching and mobility. We will discuss detailed case studies that illustrate the concepts for each major topic.

Necessary Background

Knowledge of a Programming language.

Recommended Textbooks

Distributed Systems, M. van Steen and A.S. Tanenbaum, 4 th Edition (2023).

Assessment Methods

The final grade is determined by a written final exam and a programming assignment. However, a passing grade on the written final exam is required in order for the overall course grade to be considered passing.

Special Topics in Artificial Intelligence

MSc course, jointly taught to AUEB MSc students and Erasmus students)

Code: 9125

6 ECTS credits

Level of difficulty

Advanced

Instructors

J. Pavlopoulos (ipavlopoulos@aueb.gr)

S. Toumpis (toumpis@aueb.gr)

Intended Audience

Mainly Computer Science students

Course Objectives and Outcomes

Upon successful completion of the course, students will have gained exposure to an area of emerging importance within the broader field of ML or AI and will be able to: present and defend a research paper in the field of ML/AI; search for and identify literature on research topics of emerging importance within the field of ML/AI.

Course Outline

A course with content focusing on specific areas of Machine Learning (ML) and Artificial Intelligence (AI). Topics are selected by the Steering Committee from fields where relevant workshops have recently been organized, provided there is an available instructor for the specific subject. Indicative topics include: Distributed and Federated Machine Learning; Continual Learning; Machine Learning methods for limited data (Few-shot Learning); Advanced topics in Multi-armed Bandits and Reinforcement Learning; Multi-modal Learning.

Necessary Background

There are no formal prerequisite courses. However, it is highly recommended that students have attended courses in ML and AI, such as Natural Language Processing (NLP), Reinforcement Learning, and Deep Learning.

Recommended Textbooks

Research papers in fields relevant to the students' individual projects/assignments.

Assessment Methods

Assessment will be based on the final presentation of the selected article and the accompanying analysis and/or code submitted by the students.

Deep Learning

MSc course, jointly taught to AUEB MSc students and Erasmus students

Code :9124

6 ECTS credits

Level: Advanced

Instructor: T. Stafylakis (tstafylakis@aueb.gr)

Intended Audience

Mainly Computer Science students

Course Objectives and Outcomes

The course will be a mix of theory and practice, covering the basic deep learning theory and providing examples of how to build deep neural networks in practice with PyTorch.

After successfully completing the course, students will be able to:

Understand the main architectures of Deep Learning,

Understand different learning paradigms, such as supervised, self-supervised and reinforcement learning.

Course Outline

Architectures: Convolutional Neural Networks, Diffusion models, Generative Adversarial Networks, Neural Speech Synthesis, Variational Autoencoders and beyond. Learning Algorithms & Introductions: Introduction to Deep Learning, Introduction to Reinforcement Learning and Deep Q-Learning, Self-supervised learning in speech technologies, Self-supervision in Computer Vision and beyond.

Necessary Background

Basic knowledge of calculus, linear algebra, probability theory. For the programming assignments, programming experience in Python is required.

Recommended Textbooks

Understanding Deep Learning, by Simon J. D. Prince (https://udlbook.github.io/udlbook/).

Assessment Methods

This is a practical course; students will be graded on their attendance (10%), participation (20%), and competency to develop neural networks for specific tasks (70%). The latter will be determined by a programming assignment.

Multimedia Technology

Code: 9098

Instructor: G. Xylomenos

ECTS credits: 6

Communication with the Instructor: xgeorge@aueb.gr

Level of difficulty

Intermediate

Instructor

George Xylomenos (xgeorge@aueb.gr)

Intended Audience

Computer Science students, students with an interest in media technologies

Course Objectives and Outcomes

Introduction to the technologies and applications of digital media and multimedia, including the perception, capture, compression and playback of digital media like audio and video. The course emphasizes multimedia communications and applications on the Internet.

After successfully completing the course, students will be able to:

- understand how humans perceive audio, images and video
- understand how digital media are captured and compressed
- understand how digital media applications operate over the Internet
- show concrete experience with the creation of multimedia applications

Course Outline

Multimedia applications and systems. Definition and attributes of various media types. Perception, capture and playback of sound, images and video. Elements of information theory. Media coding and compression techniques. Compression standards: JPEG, MPEG, H.26x, MP3 and AAC. Multimedia communications, multicasting, CDNs. Conferencing. Synchronization. Media

streaming, RTP, IPTV and MPEG-DASH. Quality of service in multimedia communications.

Necessary Background

Introductory-level computer networks, knowledge of basic probabilities, some programming experience (depending on project selection).

Recommended Textbooks

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

Assessment Methods

The final grade is the average of the final examination (60%) and the course project (40%), provided that the final examination grade is at least 5/10. Otherwise, the final grade equals the final examination grade. The course project can be any media-related development project (e.g., game created with Godot or Unity, audio synthesizer, visualizer, etc.)

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

Computational Statistics (MSc in Statistics course)

Code: 9007

Instructor: TBA

ECTS credits: 7,5

Level of course: Advanced

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: Advanced

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 program components

None

• Course contents

Primary aim of this course is the understanding and the application of statistical methods 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 of provoking their

attention and motivate them. Finally, the students are introduced to the basic principles of scientific report writing and storytelling 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: Advanced

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 likelihood, 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 approach).

• **Prerequisites and co-requisites**

Undergraduate probability and calculus of functions of multiple variables.

• **Recommended optional program 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: Advanced

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: Introductory

Instructor: TBA

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 to random experiments.

• **Prerequisites and co-requisites**

Knowledge of Calculus

• **Recommended optional program 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 parameters. 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

Time Series Analysis

Code: 9119

Level of course: Advanced

Number of credits allocated**:** **7 ECTS credits**

Instructor: TBA

Objectives of the course:

The aim of this course is to provide students with the learning of using appropriate time series models and techniques required for the analysis of time series data. After successfully completing the course, students will be able to:

- know the basic concepts of stationary processes
- have learned the ARMA stochastic time series models
- have learned about the time-varying ARCH/GARCH volatility models
- be able to apply the Box-Jenkins methodology in empirical applications
- be able to model and forecast time series data
- know how to implement time series analysis using R

Prerequisites and co-requisites

Knowledge of Probability and Estimation, Regression and Distributions.

Recommended optional programme components

None

Course contents

This course provides the theory and practice of time series analysis. It introduces the basic theory of stationary processes (characteristics of stationary and non-stationary time series and unit root testing), it describes and presents analytically stochastic time series models, ARMA models in particular, and the Box-Jenkins methodology for ARIMA models. The course introduces the class of conditional heteroscedastic models

(ARCH/GARCH) and presents practical time series forecasting techniques. Illustrative examples applying time series models and techniques to actual economic and financial data are presented using R package. The empirical analysis consists of (a) unit root testing to exchange rate series and financial series, e.g. stocks and indices, and (b) modeling and forecasting economic/financial time series.

Recommended or required reading

- Δημέλη Σ. (2003, 3η Έκδοση): Σύγχρονες Μέθοδοι Ανάλυσης Χρονολογικών Σειρών, Εκδόσεις ΚΡΙΤΙΚΗ, Αθήνα.
- Hamilton, James D. Time Series Analysis. Princeton, New Jersey: Princeton University Press, 1994.
- Enders, Walter. Applied Econometric Time Series. New York: Wiley, 2010.
- 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.
- Gujarati, Damodar N. Basic Econometrics. New York: McGraw-Hill, 2008.
- 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.
- Tsay, Ruey S. Analysis of Financial Time Series. New York: Wiley, 2010.
- Wooldridge, Jeffrey. Introductory Econometrics: A Modern Approach. South-Western College Publishing, 2009.
- Granger, C.W.J. and Paul Newbold. Forecasting Economic Time Series. San Diego, CA: Academic Press, 1986.
- Zivot, Eric.Wang, Jiahui, Modeling Financial Time Series with S-PLUS, Springer Science and Business Media Inc., 2006.
- Brockwell, P.J. and R.A. Davis (2002, 2nd Edition): Introduction to Time Series and Forecasting, Springer Verlag.

- Brockwell, P.J. and R.A. Davis (1991, 2nd Edition): Time Series: Theory and Methods, Springer Verlag.
- Cryer, J.D. and K.S. Chan (2008): Time Series Analysis with Applications in R, Springer-Verlag.

Planned learning activities and teaching methods

Teaching in Class

Assessment methods and criteria

Written examination at the end of the semester: 100%.

Stochastic Models in Finance (MSc in Statistics course)

Code: 9034

ECTS Credits: 3

Level of course: Advanced

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 program components

None

• Course contents

This course aims to introduce 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 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: Advanced

Instructor: TBA

• 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 program components

None

• Course contents

This module provides a broad introduction to 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 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 (regardless of the grades in the homework assignments) in order not to fail the course.

Statistical Quality Control (MSc in Statistics course)

Code: 9057

ECTS credits: 7

Level of course: Advanced

Instructor: TBA

• **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: Advanced

Instructor: TBA

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.

Statistics II: Inference and Regression

Code: 9068

ECTS credits: 6

Level of course: Intermediate

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 statistics, 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 linear model assumptions. Multiple linear models, 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

Advanced Methods in Survey Sampling (MSc in Statistics course)

Code: 9100

ECTS Credits: 3

Level of course: Advanced

Instructor: TBA

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: Advanced

Instructor: TBA

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
- considering 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: Advanced

Instructor: TBA

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: Advanced

Instructor: TBA

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 an 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: Advanced

Instructor: TBA

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 several 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: Advanced

Instructor: TBA

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, joints 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 flavors 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

Code: 9058

ECTS Credits: 7

Level of course: Introductory

Instructor: A. Livada

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 program 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: Class lectures 4h/w. Field exercises. Bibliography study and analysis. Conducting a study. Assignments.

Assessment methods and criteria

Written exam (50%). Project presentation and exercises/assignments (50%).

Probability Theory (MSc in Statistics course)

Code: 9112

ECTS Credits: 3

Level of course: Advanced

Instructor: TBA

Objectives of the course

At the end of the course the students will be familiar with the measure-theoretical 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, such 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: Advanced

Instructor: TBA

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.
-

Planned learning activities and teaching methods

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

Assessment methods and criteria

Final exam, Assignments.

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

Code 9105

Level of course: Advanced

3 ECTS credits

Instructor: **TBA**

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 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
(50%).

INDEPENDENT COURSES

FALL & SPRING SEMESTER

Greek Language

Code: 9029

ECTS credits: 6

Instructor: TBA

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.