

# ECONOMICS GH (ECON-GH)

## ECON-GH 5000 Math Camp (0 Credits)

*Typically offered Summer term*

This 25 lectures and 13 recitations course - which counts zero credits towards the MSc Economics - revises mathematical background for the Master of Science in Economics. Prerequisites are a knowledge of Calculus. Beginning with a review of univariate differential calculus and optimization, the discussion moves to the basics of linear algebra, multivariate differential calculus and tools related to optimization of functions. While this course is not a study of pure mathematics, several results will be presented with rigorous proofs.

**Grading:** Class does not print on the transcript

**Repeatable for additional credit:** No

## ECON-GH 5100 Microeconomics 1 (4 Credits)

*Typically offered Fall*

This course provides an introduction to microeconomic theory designed to meet the needs of students in an economics PhD program. The course provides a rigorous overview of the main topics of microeconomic analysis including consumer theory, producer theory, game theory, general equilibrium, and information economics. This 4 credit course (70 contact hours) counts towards the Master of Science in Economics. Students should be comfortable with multivariable calculus, linear algebra, and basic real analysis as covered in ECON-GH 5000 Math Camp. This course has to be taken after or concurrently with ECON-GH 5900 Mathematics.

**Grading:** Grad Abu Dhabi Graded

**Repeatable for additional credit:** No

- Bulletin Categories: Economics MSc: Required
- Crosslisted with: Economics MSc

## ECON-GH 5120 Microeconomics 2 (4 Credits)

*Typically offered Spring*

This course provides a PhD-level introduction to game theory and market design. Game theory is the study of strategic decision making. It is routinely used in economics, political science, and computer science in the theoretical analysis of decision making. The course covers the analysis of static and dynamic games of both complete and incomplete information. Game theory provides the theoretical foundation for the study of how institutions shape behavior which, in turn, determines economic, social, and political outcomes. It provides the conceptual tools necessary to undertake "economic engineering," i.e., to design institutions that generate desirable outcomes. The second part of the course concerns market design, focusing on the two most-widely studied types of applications: auction design and the design of "matching" markets (e.g., school choice, kidney exchange).

**Grading:** Grad Abu Dhabi Graded

**Repeatable for additional credit:** No

**Prerequisites:** ECON-GH 5100 and ECON-GH 5900.

- Bulletin Categories: Economics MSc: Electives
- Crosslisted with: Economics MSc

## ECON-GH 5200 Mathematical Statistics and Probability (4 Credits)

*Typically offered Fall*

The main goal of the course is to provide an introduction to probability theory and statistics with an emphasis on the concepts and tools that are necessary for econometrics, such as best linear prediction, conditional distributions and expectation functions, and large sample theory. The course aims at training students to apply but also question the validity of conventional statistical techniques. We study the problem of choosing estimators, including a comparison of various criteria for ranking estimators, and the classical approach to hypothesis testing and interval estimation. The course also offers a brief introduction to data analysis and statistical learning. This 4-credit course (70 contact hours) counts towards the Master of Science in Economics. Prerequisites are knowledge of the material covered in ECON-GH 5000 Math Camp. This course has to be taken after or concurrently with ECON-GH 5900 Mathematics.

**Grading:** Grad Abu Dhabi Graded

**Repeatable for additional credit:** No

- Bulletin Categories: Economics MSc: Required
- Crosslisted with: Economics MSc

## ECON-GH 5210 Econometrics (4 Credits)

*Typically offered Spring*

The goal of this course is to develop in detail the theoretical underpinnings of the linear regression model which forms the cornerstone of theoretical and applied econometric research. The course will also introduce advanced econometric methods for cross-sectional, panel and time series data, such as Maximum Likelihood and Generalized Method of Moments, as they apply to several linear and nonlinear econometric models.

**Grading:** Grad Abu Dhabi Graded

**Repeatable for additional credit:** No

**Prerequisites:** ECON-GH 5200 and ECON-GH 5900.

- Bulletin Categories: Economics MSc: Required
- Crosslisted with: Economics MSc

## ECON-GH 5220 Empirical Economics (4 Credits)

*Typically offered Spring*

The main purpose of the course is to equip students with the quantitative foundations for conducting empirical research in economics. Additionally, students will learn how to understand, interpret and effectively critique empirical economic analysis by exposing them to scientific papers that effectively use a variety of econometric tools. We will generally focus on understanding the different contexts and methods that allow us to obtain causal effects. Distinguishing which correlations between economic variables represent a causal relationship is crucial for policy analysis. Finally, students will gain experience in the process of conducting research by selecting a question of interest, sourcing the relevant data, selecting the appropriate econometric tools for analysis, and writing up and presenting the findings of their project to a research-oriented audience.

**Grading:** Grad Abu Dhabi Graded

**Repeatable for additional credit:** No

**Prerequisites:** ECON-GH 5200 and ECON-GH 5900.

- Bulletin Categories: Economics MSc: Required
- Crosslisted with: Economics MSc

**ECON-GH 5310 Behavioral Economics (4 Credits)***Typically offered Spring*

The aim of the course is to identify behavioral patterns that cannot be easily explained with standard economic models. This is done in a constructive manner. That means students will test the predictions of standard economic theories based on observational data from laboratory experiments, field experiments, and naturally occurring phenomena and learn about alternative theories that fare better in describing the behavioral patterns that they identify. Equipped with this knowledge, students will learn how to use behavioral theories to design public policy interventions and perfect business processes. The course is divided into four main themes: individual decision making, fairness and social norms, strategic interactions, and applications. In the first part, students study the rationality of preferences, decision under uncertainty, and intertemporal choice. The second part reviews departures from self-regarding maximizing behavior and presents various models of other-regarding behavior that apply to settings where social norms and peer comparisons matter. In the third part, students tackle behavior in situations where strategic reasoning is central.

**Grading:** Grad Abu Dhabi Graded**Repeatable for additional credit:** No

- Bulletin Categories: Economics MSc: Electives
- Crosslisted with: Economics MSc

**ECON-GH 5320 Applied Forecasting: From Linear Models to Data Mining and Deep Learning (4 Credits)***Typically offered Spring*

Embark on an exciting journey to master real-world forecasting projects. This course equips you with essential statistical and computational tools crucial for success in the field. You will explore both classical and modern forecasting methods. Engage with logistic regression and decision trees for classification tasks, such as credit risk assessment. Delve into linear and nonlinear prediction models like ARx and feedforward neural networks for analyzing high and low-frequency time series. We will focus on variable selection, estimation, and combination techniques. Learn how to evaluate forecasts from both statistical and user perspectives. Understand the critical role of hyperparameters, including autoregressive model orders and neural network configurations. Throughout the semester, you will apply your knowledge in a hands-on forecasting project. This practical experience will solidify your understanding and prepare you for real-world challenges. Join us to elevate your forecasting skills and make a significant impact in your field!

**Grading:** Grad Abu Dhabi Graded**Repeatable for additional credit:** No

- Bulletin Categories: Economics MSc: Electives
- Crosslisted with: Economics MSc

**ECON-GH 5410 Economics of International Development (4 Credits)***Typically offered Spring*

How can the economies of the world become richer? Fairer? More open to opportunity? We will investigate economic growth, poverty, inequality, and the sources of economic change. The course begins by reviewing the relationships between poverty, inequality, and economic growth. Attention then turns to the role of markets, with a focus on finance. Then we turn to interventions designed to improve education, address demographic change, reduce the burden of disease, and confront corruption.

**Grading:** Grad Abu Dhabi Graded**Repeatable for additional credit:** No

- Bulletin Categories: Economics MSc: Electives
- Crosslisted with: Economics MSc

**ECON-GH 5420 Institutions, Governance and International Development (4 Credits)***Typically offered Spring*

This course introduces students to the theory and practice of international development with a focus on the role of institutions and governance to achieve sustained increase in income and improvement in the standard of living of the population of developing countries, accompanied by structural changes in the economy, such as technological innovation, diversification of production, and improvements in human capital. The course will address the underlying economic theories motivating interventions and also the institutions, tools and processes of international economic development from a practitioner perspective. Particular attention will be paid to the MENA region and fragile and conflict affected states. Invited speakers by senior economists of international institutions such as the World Bank constitute an important component of the course.

**Grading:** Grad Abu Dhabi Graded**Repeatable for additional credit:** No

- Bulletin Categories: Economics MSc: Electives
- Crosslisted with: Economics MSc

**ECON-GH 5600 Macroeconomics (4 Credits)***Typically offered Fall*

This course serves as a graduate level introduction to some fundamental questions in macroeconomics. We first theoretically and empirically study determinants of economic growth before proceeding to some major determinants of goods and labor supply and demand. We discuss fiscal and monetary policy issues as well as economic growth applying the methods and techniques used for the analysis of dynamic optimization problems using functional equations: dynamic programming. This 4 credit course (70 contact hours) counts towards the Master of Science in Economics. Prerequisites are knowledge of multivariable calculus as covered in ECON-GH 5000 Math Camp.

**Grading:** Grad Abu Dhabi Graded**Repeatable for additional credit:** No

- Bulletin Categories: Economics MSc: Required
- Crosslisted with: Economics MSc

**ECON-GH 5620 Macroeconomics 2 (4 Credits)***Typically offered Spring*

Macroeconomics 2 presents an overview of macroeconomics at the Master's level. The main theories are introduced in as intuitive a way as possible, to pinpoint as rigorously as possible which ones withstand empirical scrutiny and why. This is not a theoretical course, but techniques are discussed that help think about labor, goods and financial markets in a unified manner, and that motivate key empirical questions. Special attention is being paid to data and what empirical research has taught us. The proposed structure leaves plenty of room for group discussions, particularly as regards more recent developments on both empirical and theoretical fronts. The course covers basic concepts of labor market equilibrium and labor market institutions, capital investment and technical progress: business cycles and volatility. Financial market frictions, the demand for goods, demand management and the Phillips curve debate will be addressed as well as the relevance of heterogeneity in macroeconomics. After extensive coverage of a closed economy the course moves to an internationally open economy: terms of trade, currency adjustment and capital flows.

**Grading:** Grad Abu Dhabi Graded**Repeatable for additional credit:** No**Prerequisites:** ECON-GH 5600.

- Bulletin Categories: Economics MSc: Electives
- Crosslisted with: Economics MSc

**ECON-GH 5900 Mathematics 1 (4 Credits)***Typically offered Fall*

This 4 credit course (70 contact hours) counts towards the Master of Science in Economics. This course follows the Math Camp that the students take prior to the beginning of the Master's program. It trains the student to think rigorously and systematically at a level of high abstraction. The course is designed to introduce advanced but standard mathematics that are both instructive and relevant for economic analysis. This Mathematics 1 course introduces the fundamental elements of Set Theory, Linear Algebra, Topology, Convex Analysis and Differential Calculus that are needed to understand in depth, and practice at a high level of sophistication, a main pillar of economic analysis: Optimization. Prerequisites: Knowledge of material as taught in Math Camp ECON-GH 5000.

**Grading:** Grad Abu Dhabi Graded**Repeatable for additional credit:** No

- Bulletin Categories: Economics MSc: Required
- Crosslisted with: Economics MSc

**ECON-GH 5920 Mathematics 2 (4 Credits)***Typically offered Spring*

The Mathematics 2 course continues Mathematics 1 by deepening abstract mathematical concepts and thinking in Analysis (drawing from Set Theory, Linear Algebra, Topology, Differential and Integral Calculus, Convex Analysis, Measure Theory and Differential Topology) in lecture format with extensive room for proofs in class as well as in recitations. This course trains the student to think rigorously and systematically at a level of high abstraction. It is designed to introduce advanced but standard mathematics that are both instructive in their own sake, and relevant for economic analysis. The Mathematics 2 course covers the mathematics of a main pillar of economic analysis: Equilibrium.

**Grading:** Grad Abu Dhabi Graded**Repeatable for additional credit:** No**Prerequisites:** ECON-GH 5900.

- Bulletin Categories: Economics MSc: Electives
- Crosslisted with: Economics MSc

**ECON-GH 5950 Introduction to Computer Programming (4 Credits)***Typically offered Spring*

We find that the exposure of many economists to programming languages tends to be limited to mastering statistical packages, such as Stata and EViews, just well enough in order to perform simple tasks like running a basic regression. These skills, however, do not scale up in a straightforward manner to handle complex projects. This course is designed to help address this challenge. It is aimed at Masters students who expect to do research in a field that requires modest to heavy use of computations. In other words, any field that either involves real-world data; or that does not generally lead to models with simple closed-form solutions. Students will be introduced to effective programming practices that will substantially reduce their time spent programming, make their programs more dependable, and their results reproducible without extra effort. The course draws extensively on some simple techniques that are the backbone of modern software development, which most economists are simply not aware of. It shows the usefulness of these techniques for a wide variety of economic and econometric applications by means of hands-on examples.

**Grading:** Grad Abu Dhabi Graded**Repeatable for additional credit:** No

- Bulletin Categories: Economics MSc: Electives
- Crosslisted with: Economics MSc

**ECON-GH 5960 Numerical Methods (4 Credits)***Typically offered Spring*

Numerical Methods covers basic methods of numerical analysis such as numerical optimization, the solution of linear and nonlinear equation systems, etc. Special attention will be given to numerical methods for dynamic optimization, which are essential for dynamic analysis in all fields of economics. The course will cover in detail the solution of dynamic stochastic equilibrium models, including heterogeneous agent models, as they are used in modern macroeconomics, both in academic work and in central banks. The coursework will be done in Matlab, the language most widely used in economic applications. Introductions will be given to Python, a scripting language used in all fields of computing, and to Julia, a new high-performance computing language. The focus of the course is on the practical implementation of these methods. At the end of the course, participants are supposed to be able to replicate the results of recent papers in quantitative economics. The grade of the course will be based on a series of exercises and a final computational project.

**Grading:** Grad Abu Dhabi Graded**Repeatable for additional credit:** No**Prerequisites:** ECON-GH 5600.

- Bulletin Categories: Economics MSc: Electives
- Crosslisted with: Economics MSc

**ECON-GH 5970 The Network Economy (4 Credits)***Typically offered Spring*

Our opportunities, our preferences, and our choices are shaped by our connections. The awareness that connections matter leads us to invest in them. And these investments give rise to networks of friendship, the World Wide Web, supply chains, research alliances, transport links, and many other networks which we see around us. These observations have inspired an exciting new research program which examines the origins and the implications of networks. The lectures in this course provide a rigorous introduction to this research. This 4-credit course (70 contact hours) counts towards the Master of Science in Economics.

**Grading:** Grad Abu Dhabi Graded**Repeatable for additional credit:** No

- Bulletin Categories: Economics MSc: Electives
- Crosslisted with: Economics MSc

**ECON-GH 5980 Topics in Financial Econometrics (4 Credits)***Typically offered Spring*

This course will introduce you to the Econometrics of Financial Markets. We will focus on properties of financial data, risk management and portfolio allocation. Both methodological and empirical aspects will be covered. At the end of the course, you will be familiar with modelling and estimating volatility models, assessing Value at Risk of a portfolio, choosing among different asset price models, implementing trading rules. The project requirement gives you an opportunity to learn how to formulate a question of interest, formalize it in a hypothesis to test, and interpret your findings. Also, the recitations will make you a competent user of the R package. The course will prepare you either for a PhD program in Economics and Finance, or for a profession in the financial sector.

**Grading:** Grad Abu Dhabi Graded**Repeatable for additional credit:** No

- Bulletin Categories: Economics MSc: Electives
- Crosslisted with: Economics MSc

**ECON-GH 6000 Final Project (4 Credits)***Typically offered Summer term*

The final project course is the culmination of our efforts during the master's degree. It is designed to scaffold the development of your final research project. It is a hands-on course designed to guide students on how to conduct economic research and prepare a research thesis or policy proposal. An important aspect of the course is to provide a forum to discuss project progress and provide each other with economic analysis feedback. The course has three parts. The first part is a practical guide for using statistical software such as STATA to master handling and visualizing data using standard statistical methods, and making inferences. This component will utilize labs and also covers topics on how to write a research thesis or policy report by formulating a research question and hypothesis, searching for related literature, preparing a literature review, citing literature, structuring a document, and presenting findings. The second part involves a replication exercise of a published economics/finance paper. The last part of the course requires students to extend on the replicated paper in a significant direction.

**Grading:** Grad Abu Dhabi Graded**Repeatable for additional credit:** No**Prerequisites:** Econometrics (ECON-GH 5210) or Empirical Economics (ECON-GH 5220).

- Bulletin Categories: Economics MSc: Required
- Crosslisted with: Economics MSc