



Econometrics and Operations Research (MSc)

Vrije Universiteit Amsterdam - School of Business and Economics - M Econometrics and Operations Research - 2017-2018

The Master's programme in Econometrics and Operations Research is an academic programme focusing on the development and application of quantitative methods for analysing economic issues in a broad sense. It is a successful preparation for a professional career in which mathematics, statistics and ICT are used in analysing and solving complex issues in general economics, and business and financial economics. Econometricians are also employed as experts in optimizing strategic and operational business processes like transport flows, stock management and operating systems. Econometricians can be found working at the central banks of Europe, at federal banks in the United States, at central government agencies and ministries, financial institutions, consultancy firms, airlines, the railways and other logistic companies, and in the majority of listed companies.

The components of the Master's programme correspond closely with the department's research interests, which means that many of the latest scientific developments in areas like financial econometrics, logistics and game theory find their way directly into the teaching programme. Students also benefit from having the opportunity to study in small groups and work closely with the academic staff.

The Master's programme in Econometrics and Operations Research is divided into the track Econometrics and Operations Research. Each track has a specific set of compulsory courses constituting the core programme of 42 EC (incl. the Master's Thesis). In addition to the core programme, 7 specializations distributed over the tracks offer the students the opportunity to fill in their 18 EC electives of the programme in a profiled way.

The Master Econometrics and Operations Research is a one year programme en consists of 60 EC. For talented and ambitious students the master's programme offers an extra opportunity to distinguish themselves with the MSc Honours Programme Operations Research. This Honours Programme allows master's students to broaden and deepen their knowledge on state-of-the-art operations research techniques. The MSc Econometrics and Operations Research is a one year full-time programme, is taught in English, comprises 60 EC, and consists of several specializations.

-General information

-Course schedule

-Track Econometrics

-Specialization Econometric Theory

-Specialization Financial Econometrics

-Specialization Marketing Data Science

-Specialization Quantitative Economics

-Track Operations Research

-Specialization Financial Engineering

-Specialization Operations Research Theory

-Specialization Supply Chain Management

-Academic and Examination Regulations (OER) SBE Master's degree programmes

-Regulations and Guidelines

-Academic year calendar

-Transitional arrangements due to curriculum changes

-VUnet > Services

Inhoudsopgave

Master Econometrics and Operations Research - Track Econometrics - Specialization Econometric Theory	1
Master EORM - Econometrics - Core courses	1
Master EORM - Econometrics Theory - Specialization courses	1
Master EORM - Econometrics Theory - Optional courses	1
Master Econometrics and Operations Research - Track Econometrics - Specialization Financial Econometrics	2
Master EORM - Econometrics - Core courses	2
Master EORM - Financial Econometrics - Specialization courses	3
Master EORM - Financial Econometrics - Optional courses	3
Master Econometrics and Operations Research - Track Econometrics - Specialization Markets Data Science	3
Master EORM - Econometrics - Core courses	4
Master EORM - Markets Data Science - Specialization courses	4
Master EORM - Markets Data Science - Optional courses	4
Master Econometrics and Operations Research - Track Econometrics - Specialization Quantitative Economics	5
Master EORM - Econometrics - Core courses	5
Master EORM - Quantitative Economics - Specialization courses	5
Master EORM - Quantitative Economics - Optional courses	6
Master Econometrics and Operations Research - Track Operations Research - Specialization Financial Engineering	6
Master EORM - Operations Research - Core courses	6
Master EORM - Financial Engineering - Specialization courses	7
Master EORM - Operations Research - Optional courses	7
Master EORM - OR - Optional courses from Computer Science	7
Master EORM - OR - Optional courses from Economics	8
Master EORM - OR - Optional courses from Mathematics	8
Master EORM - OR - Optional courses from Parallel and Distributed Systems	9
Master EORM - OR - Optional courses from STREAM	9
Master EORM - OR - Optional courses from EORM	9
Master EORM - OR - Optional courses from BA - TSCM	9
Master Econometrics and Operations Research - Track Operations Research - Specialization Operations Research Theory	10
Master EORM - Operations Research - Core courses	10
Master EORM - Operations Research Theory - Specialization courses	11
Master EORM - Operations Research - Optional courses	11
Master EORM - OR - Optional courses from Computer Science	11
Master EORM - OR - Optional courses from Economics	11
Master EORM - OR - Optional courses from Mathematics	12
Master EORM - OR - Optional courses from Parallel and Distributed Systems	12
Master EORM - OR - Optional courses from STREAM	12
Master EORM - OR - Optional courses from EORM	13
Master EORM - OR - Optional courses from BA - TSCM	13

Master Econometrics and Operations Research - Track Operations Research - Specialization Supply Chain Management	14
Master EORM - Operations Research - Core courses	14
Master EORM - Supply Chain Management - Specialization courses	14
Master EORM - Operations Research - Optional courses	15
Master EORM - OR - Optional courses from Computer Science	15
Master EORM - OR - Optional courses from Economics	15
Master EORM - OR - Optional courses from Mathematics	16
Master EORM - OR - Optional courses from Parallel and Distributed Systems	16
Master EORM - OR - Optional courses from STREEM	16
Master EORM - OR - Optional courses from EORM	17
Master EORM - OR - Optional courses from BA - TSCM	17
Master Econometrics and Operations Research - Open specialization	17
M Econometrics - No specialization - Case courses	18
M Econometrics - No specialization - Obligatory courses	18
Honours Programme Operations Research	19
Honours Programme Operations Research - Optional courses LNMB Utrecht	19
Honours Programme Operations Research - Obligatory course VU	19
Vak: Advanced Econometrics (Periode 1)	20
Vak: Advanced Macroeconomics (Periode 2)	21
Vak: Advanced Methods for Applied Economic Research (Periode 1)	22
Vak: Advanced Microeconomics (Periode 1)	23
Vak: Airline Business (Periode 4)	25
Vak: Applied Analysis: Financial Mathematics (Periode 1+2)	26
Vak: Applied Econometrics for Urban, Transport and Environmental Economics (Periode 1)	27
Vak: Applied Research Methods (Periode 4)	28
Vak: Asset Pricing (Periode 1)	30
Vak: Asymptotic Statistics (Periode 1+2)	31
Vak: Behavioral Operations Research (Periode 4)	32
Vak: Branding and Advertising (Periode 4)	33
Vak: Combinatorial Optimization (Periode 1)	34
Vak: Computational Finance (Periode 4)	35
Vak: Data Mining Techniques (Periode 5)	36
Vak: Decision Making in Supply Chains (Periode 2)	37
Vak: Derivatives (Periode 4)	38
Vak: Digital Marketing (Periode 2)	40
Vak: Distributed Algorithms (Periode 5)	41
Vak: Dynamic Econometrics (Periode 2)	42
Vak: Dynamische Systemen (Periode 1+2)	43
Vak: Econometrics Essays (Periode 3+4)	44
Vak: Econometrics for Quantitative Risk Management (Periode 1+2)	45
Vak: Economics of Climate Change (Periode 2)	46
Vak: Economics of the Welfare State (Periode 2)	49
Vak: Empirical Transport Economics (Periode 4)	50
Vak: Environmental Economics (Periode 4)	51

Vak: Evolutionary Computing (Periode 1)	53
Vak: Financial Econometrics Case Study (Periode 3)	54
Vak: Financial Markets and Institutions (Periode 2)	54
Vak: Functional Analysis (Periode 1+2)	56
Vak: Geographic Information Systems (Periode 2)	57
Vak: Geomarketing (Periode 4)	58
Vak: Globalization, Growth and Development (Periode 4)	59
Vak: Human Development (Periode 4)	61
Vak: Industrial Organization and Competition Policy (Periode 4)	62
Vak: Institutional Investments and Asset Liability Management (Periode 4)	63
Vak: Labour Economics (Periode 4)	65
Vak: Large Scale Data Engineering (Periode 1)	66
Vak: Macroeconomic Policy in the EU (Periode 2)	67
Vak: Marketing Data Case (Periode 3)	69
Vak: Marketing Strategy (Periode 1)	70
Vak: Mathematical Biology (Periode 1+2)	71
Vak: Measure Theoretical Probability (Periode 1+2)	73
Vak: Microeconomics and Methods (Periode 1)	74
Vak: Microeconomics for Development (Periode 2)	75
Vak: Microeconomics for Urban, Transport and Environmental Economics (Periode 1)	76
Vak: Network Analysis (Periode 2)	77
Vak: Operations Performance Benchmarking (Periode 5)	79
Vak: Operations Research Case (Periode 3)	80
Vak: Optimization under Uncertainty (Periode 2)	80
Vak: OR Research Seminar (Ac. Jaar (september))	81
Vak: Portfolio Theory (Periode 1+2)	82
Vak: Public Economics and Policy (Periode 1)	82
Vak: Quantitative Financial Risk Management (Periode 4)	83
Vak: Regional and Urban Economics (Periode 2)	84
Vak: Research Project Economics (Periode 3)	85
Vak: Stochastic Integration (Periode 4+5)	87
Vak: Stochastic Proces for Finance (Periode 1+2)	87
Vak: Stochastic Processes (Periode 4+5)	88
Vak: Stochastic Processes for Finance (Periode 1+2)	89
Vak: Supply Chain Execution (Periode 2)	90
Vak: Supply Chain Lab (Periode 4)	91
Vak: Supply Chain Management (Periode 1)	92
Vak: Thesis MSc EOR - Econometrics (Ac. Jaar (september))	94
Vak: Thesis MSc EOR - Operations Research (Ac. Jaar (september))	94
Vak: Time series (Periode 4+5)	96
Vak: Time Series Econometrics (Periode 4)	97
Vak: Transport Economics (Periode 2)	97
Vak: Transport Economics and Management (Periode 1)	98
Vak: Urban Economic Challenges and Policies (Periode 4)	100
Vak: Web Data Processing Systems (Periode 2)	101

Master Econometrics and Operations Research - Track Econometrics - Specialization Econometric Theory

In the master specialization Econometric Theory, you explore and master the active research field of econometrics. We offer an in-depth study into the foundations of econometric methods that will offer you the challenge to explore and master an active research field and will place you first in any academic or professional career. Econometrics connects to many academic disciplines including mathematics, statistics, economics, finance, and business studies. Each year we attract around 75 students from which 50% are international students. We offer a high-quality and challenging teaching program with excellent teachers. The job perspectives of Econometrics students are excellent in all times.

Opleidingsdelen:

- [Master EORM - Econometrics - Core courses](#)
- [Master EORM - Econometrics Theory - Specialization courses](#)
- [Master EORM - Econometrics Theory - Optional courses](#)

Master EORM - Econometrics - Core courses

Below the Econometrics core courses, that are compulsory for the specializations Econometric Theory, Financial Econometrics, Marketing Data Science and Quantitative Economics.

Vakken:

Naam	Periode	Credits	Code
Advanced Econometrics	Periode 1	6.0	E_EORM_AECTR
Dynamic Econometrics	Periode 2	6.0	E_EORM_DE
Thesis MSc EOR - Econometrics	Ac. Jaar (september)	18.0	E_EORM_THSTR
Time Series Econometrics	Periode 4	6.0	E_EORM_TSE

Master EORM - Econometrics Theory - Specialization courses

Below are the obligatory specializations courses.

Vakken:

Naam	Periode	Credits	Code
Asymptotic Statistics	Periode 1+2	8.0	X_400323
Econometrics Essays	Periode 3+4	6.0	E_EORM_ECE
Measure Theoretical Probability	Periode 1+2	8.0	X_400244

Master EORM - Econometrics Theory - Optional courses

Choose 1 from 3 courses.

Vakken:

Naam	Periode	Credits	Code
Functional Analysis	Periode 1+2	8.0	X_400328
Stochastic Processes	Periode 4+5	8.0	X_400339
Time series	Periode 4+5	8.0	X_400571

Master Econometrics and Operations Research - Track Econometrics - Specialization Financial Econometrics

The Financial Econometrics specialization is a hands-on study into econometric methods used on a daily basis in the financial industry that will let you become the quantitative financial specialist and that will place you at the forefront of a successful professional career.

Financial Econometrics connects different academic disciplines including mathematics, statistics, finance, and business studies, and is primarily concerned with the use of financial economic theory and statistical techniques to support financial decision and policy making through the analysis of financial and economic data sets. The econometric methods can be used to analyse financial risk, investment strategies, financial economic policy, monetary policy, high-frequency trading, capital markets, financial stability, and many other topics. A programme that will enhance your analytical skills, will invest in your quantitative insights, will learn you how to design and apply econometric methods in a finance context, how to analyse financial data, how to use statistical tools for financial questions of relevance, how to approach big data problems, how to interpret quantitative results, how to present the results of an econometric analysis, how to deduct conclusions and to make financial decisions from a quantitative analysis. Each year we attract around 75 students from which 50% are international students. We offer a high-quality and challenging teaching program with excellent teachers. The job perspectives of Financial Econometrics students are excellent in all times.

Opleidingsdelen:

- [Master EORM - Econometrics - Core courses](#)
- [Master EORM - Financial Econometrics - Specialization courses](#)
- [Master EORM - Financial Econometrics - Optional courses](#)

Master EORM - Econometrics - Core courses

Below the Econometrics core courses, that are compulsory for the specializations Econometric Theory, Financial Econometrics, Marketing Data Science and Quantitative Economics.

Vakken:

Naam	Periode	Credits	Code
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Advanced Econometrics	Periode 1	6.0	E_EORM_AECTR
Dynamic Econometrics	Periode 2	6.0	E_EORM_DE
Thesis MSc EOR - Econometrics	Ac. Jaar (september)	18.0	E_EORM_THSTR
Time Series Econometrics	Periode 4	6.0	E_EORM_TSE

Master EORM - Financial Econometrics - Specialization courses

Below are the obligatory specializations courses.

Vakken:

Naam	Periode	Credits	Code
Asset Pricing	Periode 1	6.0	E_FIN_AP
Derivatives	Periode 4	6.0	E_FIN_DER
Financial Econometrics Case Study	Periode 3	6.0	E_EORM_FECS

Master EORM - Financial Econometrics - Optional courses

Choose 1 from 4 courses.

Vakken:

Naam	Periode	Credits	Code
Financial Markets and Institutions	Periode 2	6.0	E_FIN_FMI
Institutional Investments and Asset Liability Management	Periode 4	6.0	E_FIN_IIALM
Quantitative Financial Risk Management	Periode 4	6.0	E_FIN_QFRM
Stochastic Proces for Finance	Periode 1+2	6.0	E_FIN_SPF

Master Econometrics and Operations Research - Track Econometrics - Specialization Markets Data Science

In the Marketing Data Science specialization you study econometrics and data science methods for the analysis of marketing data to facilitate better marketing strategies. The Marketing Data Science study let you become the quantitative marketing specialist and place you at the forefront of a successful professional career. We connect many academic disciplines including mathematics, statistics, economics, and marketing. This study is primarily concerned with the use of microeconomics, consumer behaviour and statistical techniques to analyse data sets with multiple hierarchies such as product, brand, location, distribution, etc. The econometric methods are used to analyse volume shares, advertising effects, sale strategies, consumer behaviour, brand loyalty schemes, TV and social media advertising, and many other topics. This study will enhance your analytical skills, will invest in your

quantitative insights, will learn you how to analyse marketing data, how to use statistical tools for market, advertising and product-life questions of relevance, how to approach big data problems, how to interpret quantitative results, how to present the results of an econometric analysis, how to deduct conclusions and to make marketing decisions from a quantitative analysis. Each year we attract around 75 students from which 50% are international students. We offer a high-quality and challenging teaching program with excellent teachers. The job perspectives of Marketing Data Science students are excellent in all times.

Opleidingsdelen:

- [Master EORM - Econometrics - Core courses](#)
- [Master EORM - Markets Data Science - Specialization courses](#)
- [Master EORM - Markets Data Science - Optional courses](#)

Master EORM - Econometrics - Core courses

Below the Econometrics core courses, that are compulsory for the specializations Econometric Theory, Financial Econometrics, Marketing Data Science and Quantitative Economics.

Vakken:

Naam	Periode	Credits	Code
Advanced Econometrics	Periode 1	6.0	E_EORM_AECTR
Dynamic Econometrics	Periode 2	6.0	E_EORM_DE
Thesis MSc EOR - Econometrics	Ac. Jaar (september)	18.0	E_EORM_THSTR
Time Series Econometrics	Periode 4	6.0	E_EORM_TSE

Master EORM - Markets Data Science - Specialization courses

Below are the obligatory specializations courses.

Vakken:

Naam	Periode	Credits	Code
Branding and Advertising	Periode 4	6.0	E_MKT_BA
Marketing Data Case	Periode 3	6.0	E_EORM_MDC
Marketing Strategy	Periode 1	6.0	E_MKT_MSTRAT

Master EORM - Markets Data Science - Optional courses

Choose 1 from 4 courses.

Vakken:

Naam	Periode	Credits	Code
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Data Mining Techniques	Periode 5	6.0	X_400108
Digital Marketing	Periode 2	6.0	E_MKT_DM
Geomarketing	Periode 4	6.0	E_MKT_GEOM
Large Scale Data Engineering	Periode 1	6.0	X_405116

Master Econometrics and Operations Research - Track Econometrics - Specialization Quantitative Economics

The Quantitative Economics specialization dives into the cross-roads of applied econometrics and economics and offers the student the challenge to explore the active research fields of microeconomics, macroeconomics and/or macro-finance. Quantitative Economics connects many academic disciplines including mathematics, statistics, economics, finance, and business studies, and is primarily concerned with using economic theory and statistical techniques to analyse economic data. This specialization offers you the chance to explore the intersection of economics and econometrics. This study will enhance your analytical skills, will invest in your quantitative insights, will introduce you to a scientific approach of analytical thinking and will generally broaden your quantitative horizons. It will teach you how to analyse and model economic data, how to carry out statistical hypothesis tests, how to investigate theoretical properties of estimators and predictors, how to design an empirical study, how to interpret quantitative results, how to present the results of an econometric analysis, how to deduct conclusions and policy advice from a quantitative analysis. Each year we attract around 75 students from which 50% are international students. We offer a high-quality and challenging teaching program with excellent teachers. The job perspectives of Quantitative Economics students are excellent in all times.

Opleidingsdelen:

- [Master EORM - Econometrics - Core courses](#)
- [Master EORM - Quantitative Economics - Specialization courses](#)
- [Master EORM - Quantitative Economics - Optional courses](#)

Master EORM - Econometrics - Core courses

Below the Econometrics core courses, that are compulsory for the specializations Econometric Theory, Financial Econometrics, Marketing Data Science and Quantitative Economics.

Vakken:

Naam	Periode	Credits	Code
Advanced Econometrics	Periode 1	6.0	E_EORM_AECTR
Dynamic Econometrics	Periode 2	6.0	E_EORM_DE
Thesis MSc EOR - Econometrics	Ac. Jaar (september)	18.0	E_EORM_THSTR
Time Series Econometrics	Periode 4	6.0	E_EORM_TSE

Master EORM - Quantitative Economics - Specialization courses

Below are the obligatory specializations courses.

Vakken:

Naam	Periode	Credits	Code
Advanced Macroeconomics	Periode 2	6.0	E_EC_AMAEC
Advanced Microeconomics	Periode 1	6.0	E_EC_AMIEC
Research Project Economics	Periode 3	6.0	E_EC_RPEC

Master EORM - Quantitative Economics - Optional courses

Choose 1 from 7 courses.

Vakken:

Naam	Periode	Credits	Code
Economics of Climate Change	Periode 2	6.0	E_STR_ECC
Financial Markets and Institutions	Periode 2	6.0	E_FIN_FMI
Globalization, Growth and Development	Periode 4	6.0	E_EC_GGD
Human Development	Periode 4	6.0	E_EC_HDEV
Industrial Organization and Competition Policy	Periode 4	6.0	E_EC_IOCP
Labour Economics	Periode 4	6.0	E_EC_LABELC
Transport Economics	Periode 2	6.0	E_STR_TREC

Master Econometrics and Operations Research - Track Operations Research - Specialization Financial Engineering

There is a growing interest in the financial world in instruments for financial engineering and computational finance. Next to the 4 core Operations Research courses, you take at least 2 courses from the Duisenberg Honours Programme Quantitative Risk Management.

Opleidingsdelen:

- [Master EORM - Operations Research - Core courses](#)
- [Master EORM - Financial Engineering - Specialization courses](#)
- [Master EORM - Operations Research - Optional courses](#)

Master EORM - Operations Research - Core courses

Below the Operations Research core courses, that are compulsory for the specializations Financial Engineering, Operations Research Theory, and

Supply Chain Management.

Vakken:

Naam	Periode	Credits	Code
Behavioral Operations Research	Periode 4	6.0	E_EORM_BOR
Combinatorial Optimization	Periode 1	6.0	E_EORM_COPT
Operations Research Case	Periode 3	6.0	E_EORM_ORC
Optimization under Uncertainty	Periode 2	6.0	E_EORM_OPTU
Thesis MSc EOR - Operations Research	Ac. Jaar (september)	18.0	E_EORM_THSOR

Master EORM - Financial Engineering - Specialization courses

Choose 2 from 5 specialization courses.

Vakken:

Naam	Periode	Credits	Code
Asset Pricing	Periode 1	6.0	E_FIN_AP
Derivatives	Periode 4	6.0	E_FIN_DER
Econometrics for Quantitative Risk Management	Periode 1+2	6.0	E_FIN_EQRM
Institutional Investments and Asset Liability Management	Periode 4	6.0	E_FIN_IIALM
Stochastic Proces for Finance	Periode 1+2	6.0	E_FIN_SPF

Master EORM - Operations Research - Optional courses

Choose 1 course from the list.

Opleidingsdelen:

- [Master EORM - OR - Optional courses from Computer Science](#)
- [Master EORM - OR - Optional courses from Economics](#)
- [Master EORM - OR - Optional courses from Mathematics](#)
- [Master EORM - OR - Optional courses from Parallel and Distributed Systems](#)
- [Master EORM - OR - Optional courses from STREAM](#)
- [Master EORM - OR - Optional courses from EORM](#)
- [Master EORM - OR - Optional courses from BA - TSCM](#)

Master EORM - OR - Optional courses from Computer Science

Vakken:

Naam	Periode	Credits	Code
Data Mining Techniques	Periode 5	6.0	X_400108
Evolutionary Computing	Periode 1	6.0	X_400111
Large Scale Data Engineering	Periode 1	6.0	X_405116
Web Data Processing Systems	Periode 2	6.0	XM_40020

Master EORM - OR - Optional courses from Economics

Vakken:

Naam	Periode	Credits	Code
Advanced Macroeconomics	Periode 2	6.0	E_EC_AMAEC
Advanced Methods for Applied Economic Research	Periode 1	6.0	E_EC_AMAER
Advanced Microeconomics	Periode 1	6.0	E_EC_AMIEC
Economics of the Welfare State	Periode 2	6.0	E_EC_EWS
Globalization, Growth and Development	Periode 4	6.0	E_EC_GGD
Industrial Organization and Competition Policy	Periode 4	6.0	E_EC_IOCP
Labour Economics	Periode 4	6.0	E_EC_LABEC
Macroeconomic Policy in the EU	Periode 2	6.0	E_EC_MPEU
Microeconomics and Methods	Periode 1	6.0	E_EC_MM
Microeconomics for Development	Periode 2	6.0	E_EC_MED
Public Economics and Policy	Periode 1	6.0	E_EC_PEP

Master EORM - OR - Optional courses from Mathematics

Vakken:

Naam	Periode	Credits	Code
Applied Analysis: Financial Mathematics	Periode 1+2	6.0	X_400076
Computational Finance	Periode 4	6.0	XMU_418045
Dynamische Systemen	Periode 1+2	6.0	X_400637
Mathematical Biology	Periode 1+2	8.0	X_400504
Measure Theoretical Probability	Periode 1+2	8.0	X_400244
Portfolio Theory	Periode 1+2	6.0	X_400535

Stochastic Integration	Periode 4+5	8.0	X_400470
Stochastic Processes for Finance	Periode 1+2	6.0	X_400352

Master EORM - OR - Optional courses from Parallel and Distributed Systems

Vakken:

Naam	Periode	Credits	Code
Distributed Algorithms	Periode 5	6.0	X_400211

Master EORM - OR - Optional courses from STREAM

Vakken:

Naam	Periode	Credits	Code
Applied Econometrics for Urban, Transport and Environmental Economics	Periode 1	6.0	E_STR_AEUTE
Economics of Climate Change	Periode 2	6.0	E_STR_ECC
Empirical Transport Economics	Periode 4	6.0	E_STR_ETE
Environmental Economics	Periode 4	6.0	E_STR_EEC
Geographic Information Systems	Periode 2	6.0	E_STR_GIS
Microeconomics for Urban, Transport and Environmental Economics	Periode 1	6.0	E_STR_MEUTE
Regional and Urban Economics	Periode 2	6.0	E_STR_RUE
Transport Economics	Periode 2	6.0	E_STR_TREC
Urban Economic Challenges and Policies	Periode 4	6.0	E_STR_UECP

Master EORM - OR - Optional courses from EORM

Vakken:

Naam	Periode	Credits	Code
Advanced Econometrics	Periode 1	6.0	E_EORM_AECTR
Dynamic Econometrics	Periode 2	6.0	E_EORM_DE
Time Series Econometrics	Periode 4	6.0	E_EORM_TSE

Master EORM - OR - Optional courses from BA - TSCM

Vakken:

Naam	Periode	Credits	Code
Airline Business	Periode 4	6.0	E_BA_AIRB
Applied Research Methods	Periode 4	3.0	E_BA_ARM
Decision Making in Supply Chains	Periode 2	6.0	E_BA_DMSC
Network Analysis	Periode 2	6.0	E_BA_NA
Operations Performance Benchmarking	Periode 5	6.0	E_BA_OPB
Supply Chain Execution	Periode 2	6.0	E_BA_SUCE
Supply Chain Lab	Periode 4	6.0	E_BA_SCL
Supply Chain Management	Periode 1	6.0	E_BA_SCM
Transport Economics and Management	Periode 1	6.0	E_BA_TEM

Master Econometrics and Operations Research - Track Operations Research - Specialization Operations Research Theory

With this track you deepen your knowledge and understanding of the research area and eventually, through the thesis, participate in front-line research in Operations Research. Next to the 4 core Operations Research courses, you select at least 2 6ects-courses from the program offered by the Dutch Network on the Mathematics of Operations Research (LNMB, Landelijk Netwerk Mathematische Besliskunde). The LNMB-courses are taught by the best researchers in Operations Research from all over the Netherlands in centrally located Utrecht.

Opleidingsdelen:

- [Master EORM - Operations Research - Core courses](#)
- [Master EORM - Operations Research Theory - Specialization courses](#)
- [Master EORM - Operations Research - Optional courses](#)

Master EORM - Operations Research - Core courses

Below the Operations Research core courses, that are compulsory for the specializations Financial Engineering, Operations Research Theory, and Supply Chain Management.

Vakken:

Naam	Periode	Credits	Code
Behavioral Operations Research	Periode 4	6.0	E_EORM_BOR
Combinatorial Optimization	Periode 1	6.0	E_EORM_COPT
Operations Research Case	Periode 3	6.0	E_EORM_ORC

Optimization under Uncertainty	Periode 2	6.0	E_EORM_OPTU
Thesis MSc EOR - Operations Research	Ac. Jaar (september)	18.0	E_EORM_THSOR

Master EORM - Operations Research Theory - Specialization courses

Choose 2 courses at LNMB, with a total of at least 12 EC. For more information about LNMB, see

<http://www.lnmb.nl/pages/courses/mastercourses>.

Choose courses from this list:

- Continuous Optimization (Period 1+2, 6.0 EC)
- Discrete Optimization (Period 1+2, 6.0 EC)
- Heuristic Methods in Operations Research (Period 1+2, 6.0 EC)
- Advanced Linear Programming (Period 4+5, 6.0 EC)
- Queueing Theory (Period 4+5, 6.0 EC)
- Scheduling (Period 4+5, 6.0 EC)

Master EORM - Operations Research - Optional courses

Choose 1 course from the list.

Opleidingsdelen:

- [Master EORM - OR - Optional courses from Computer Science](#)
- [Master EORM - OR - Optional courses from Economics](#)
- [Master EORM - OR - Optional courses from Mathematics](#)
- [Master EORM - OR - Optional courses from Parallel and Distributed Systems](#)
- [Master EORM - OR - Optional courses from STREEM](#)
- [Master EORM - OR - Optional courses from EORM](#)
- [Master EORM - OR - Optional courses from BA - TSCM](#)

Master EORM - OR - Optional courses from Computer Science

Vakken:

Naam	Periode	Credits	Code
Data Mining Techniques	Periode 5	6.0	X_400108
Evolutionary Computing	Periode 1	6.0	X_400111
Large Scale Data Engineering	Periode 1	6.0	X_405116
Web Data Processing Systems	Periode 2	6.0	XM_40020

Master EORM - OR - Optional courses from Economics

Vakken:

Naam	Periode	Credits	Code
Advanced Macroeconomics	Periode 2	6.0	E_EC_AMAEC
Advanced Methods for Applied Economic Research	Periode 1	6.0	E_EC_AMAER
Advanced Microeconomics	Periode 1	6.0	E_EC_AMIEC
Economics of the Welfare State	Periode 2	6.0	E_EC_EWS
Globalization, Growth and Development	Periode 4	6.0	E_EC_GGD
Industrial Organization and Competition Policy	Periode 4	6.0	E_EC_IOCP
Labour Economics	Periode 4	6.0	E_EC_LABEC
Macroeconomic Policy in the EU	Periode 2	6.0	E_EC_MPEU
Microeconomics and Methods	Periode 1	6.0	E_EC_MM
Microeconomics for Development	Periode 2	6.0	E_EC_MED
Public Economics and Policy	Periode 1	6.0	E_EC_PEP

Master EORM - OR - Optional courses from Mathematics

Vakken:

Naam	Periode	Credits	Code
Applied Analysis: Financial Mathematics	Periode 1+2	6.0	X_400076
Computational Finance	Periode 4	6.0	XMU_418045
Dynamische Systemen	Periode 1+2	6.0	X_400637
Mathematical Biology	Periode 1+2	8.0	X_400504
Measure Theoretical Probability	Periode 1+2	8.0	X_400244
Portfolio Theory	Periode 1+2	6.0	X_400535
Stochastic Integration	Periode 4+5	8.0	X_400470
Stochastic Processes for Finance	Periode 1+2	6.0	X_400352

Master EORM - OR - Optional courses from Parallel and Distributed Systems

Vakken:

Naam	Periode	Credits	Code
Distributed Algorithms	Periode 5	6.0	X_400211

Master EORM - OR - Optional courses from STREAM

Vakken:

Naam	Periode	Credits	Code
Applied Econometrics for Urban, Transport and Environmental Economics	Periode 1	6.0	E_STR_AEUTE
Economics of Climate Change	Periode 2	6.0	E_STR_ECC
Empirical Transport Economics	Periode 4	6.0	E_STR_ETE
Environmental Economics	Periode 4	6.0	E_STR_EEC
Geographic Information Systems	Periode 2	6.0	E_STR_GIS
Microeconomics for Urban, Transport and Environmental Economics	Periode 1	6.0	E_STR_MEUTE
Regional and Urban Economics	Periode 2	6.0	E_STR_RUE
Transport Economics	Periode 2	6.0	E_STR_TREC
Urban Economic Challenges and Policies	Periode 4	6.0	E_STR_UECP

Master EORM - OR - Optional courses from EORM

Vakken:

Naam	Periode	Credits	Code
Advanced Econometrics	Periode 1	6.0	E_EORM_AECTR
Dynamic Econometrics	Periode 2	6.0	E_EORM_DE
Time Series Econometrics	Periode 4	6.0	E_EORM_TSE

Master EORM - OR - Optional courses from BA - TSCM

Vakken:

Naam	Periode	Credits	Code
Airline Business	Periode 4	6.0	E_BA_AIRB
Applied Research Methods	Periode 4	3.0	E_BA_ARM
Decision Making in Supply Chains	Periode 2	6.0	E_BA_DMSC
Network Analysis	Periode 2	6.0	E_BA_NA

Operations Performance Benchmarking	Periode 5	6.0	E_BA_OPB
Supply Chain Execution	Periode 2	6.0	E_BA_SUCE
Supply Chain Lab	Periode 4	6.0	E_BA_SCL
Supply Chain Management	Periode 1	6.0	E_BA_SCM
Transport Economics and Management	Periode 1	6.0	E_BA_TEM

Master Econometrics and Operations Research - Track Operations Research - Specialization Supply Chain Management

Researchers and lecturers in Logistics and Supply Chain Management speak the language of optimization theory. The field continues providing Operations Research with new and challenging research questions and remains one of the major areas for the job market of our program's graduates. Next to the 4 core Operations Research courses, you take at least 2 courses from the Master Program Transportation and Supply Chain Management.

Opleidingsdelen:

- [Master EORM - Operations Research - Core courses](#)
- [Master EORM - Supply Chain Management - Specialization courses](#)
- [Master EORM - Operations Research - Optional courses](#)

Master EORM - Operations Research - Core courses

Below the Operations Research core courses, that are compulsory for the specializations Financial Engineering, Operations Research Theory, and Supply Chain Management.

Vakken:

Naam	Periode	Credits	Code
Behavioral Operations Research	Periode 4	6.0	E_EORM_BOR
Combinatorial Optimization	Periode 1	6.0	E_EORM_COPT
Operations Research Case	Periode 3	6.0	E_EORM_ORC
Optimization under Uncertainty	Periode 2	6.0	E_EORM_OPTU
Thesis MSc EOR - Operations Research	Ac. Jaar (september)	18.0	E_EORM_THSOR

Master EORM - Supply Chain Management - Specialization courses

Choose 2 from 4 specialization courses.

Vakken:

Naam	Periode	Credits	Code
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Geographic Information Systems	Periode 2	6.0	E_STR_GIS
Supply Chain Execution	Periode 2	6.0	E_BA_SUCE
Supply Chain Management	Periode 1	6.0	E_BA_SCM
Transport Economics and Management	Periode 1	6.0	E_BA_TEM

Master EORM - Operations Research - Optional courses

Choose 1 course from the list.

Opleidingsdelen:

- [Master EORM - OR - Optional courses from Computer Science](#)
- [Master EORM - OR - Optional courses from Economics](#)
- [Master EORM - OR - Optional courses from Mathematics](#)
- [Master EORM - OR - Optional courses from Parallel and Distributed Systems](#)
- [Master EORM - OR - Optional courses from STREEM](#)
- [Master EORM - OR - Optional courses from EORM](#)
- [Master EORM - OR - Optional courses from BA - TSCM](#)

Master EORM - OR - Optional courses from Computer Science

Vakken:

Naam	Periode	Credits	Code
Data Mining Techniques	Periode 5	6.0	X_400108
Evolutionary Computing	Periode 1	6.0	X_400111
Large Scale Data Engineering	Periode 1	6.0	X_405116
Web Data Processing Systems	Periode 2	6.0	XM_40020

Master EORM - OR - Optional courses from Economics

Vakken:

Naam	Periode	Credits	Code
Advanced Macroeconomics	Periode 2	6.0	E_EC_AMAEC
Advanced Methods for Applied Economic Research	Periode 1	6.0	E_EC_AMAER
Advanced Microeconomics	Periode 1	6.0	E_EC_AMIEC
Economics of the Welfare State	Periode 2	6.0	E_EC_EWS
Globalization, Growth and Development	Periode 4	6.0	E_EC_GGD

Industrial Organization and Competition Policy	Periode 4	6.0	E_EC_IOCP
Labour Economics	Periode 4	6.0	E_EC_LABELC
Macroeconomic Policy in the EU	Periode 2	6.0	E_EC_MPEU
Microeconomics and Methods	Periode 1	6.0	E_EC_MM
Microeconomics for Development	Periode 2	6.0	E_EC_MED
Public Economics and Policy	Periode 1	6.0	E_EC_PEP

Master EORM - OR - Optional courses from Mathematics

Vakken:

Naam	Periode	Credits	Code
Applied Analysis: Financial Mathematics	Periode 1+2	6.0	X_400076
Computational Finance	Periode 4	6.0	XMU_418045
Dynamische Systemen	Periode 1+2	6.0	X_400637
Mathematical Biology	Periode 1+2	8.0	X_400504
Measure Theoretical Probability	Periode 1+2	8.0	X_400244
Portfolio Theory	Periode 1+2	6.0	X_400535
Stochastic Integration	Periode 4+5	8.0	X_400470
Stochastic Processes for Finance	Periode 1+2	6.0	X_400352

Master EORM - OR - Optional courses from Parallel and Distributed Systems

Vakken:

Naam	Periode	Credits	Code
Distributed Algorithms	Periode 5	6.0	X_400211

Master EORM - OR - Optional courses from STREAM

Vakken:

Naam	Periode	Credits	Code
Applied Econometrics for Urban, Transport and Environmental Economics	Periode 1	6.0	E_STR_AEUTE

Economics of Climate Change	Periode 2	6.0	E_STR_ECC
Empirical Transport Economics	Periode 4	6.0	E_STR_ETE
Environmental Economics	Periode 4	6.0	E_STR_EEC
Geographic Information Systems	Periode 2	6.0	E_STR_GIS
Microeconomics for Urban, Transport and Environmental Economics	Periode 1	6.0	E_STR_MEUTE
Regional and Urban Economics	Periode 2	6.0	E_STR_RUE
Transport Economics	Periode 2	6.0	E_STR_TREC
Urban Economic Challenges and Policies	Periode 4	6.0	E_STR_UECP

Master EORM - OR - Optional courses from EORM

Vakken:

Naam	Periode	Credits	Code
Advanced Econometrics	Periode 1	6.0	E_EORM_AECTR
Dynamic Econometrics	Periode 2	6.0	E_EORM_DE
Time Series Econometrics	Periode 4	6.0	E_EORM_TSE

Master EORM - OR - Optional courses from BA - TSCM

Vakken:

Naam	Periode	Credits	Code
Airline Business	Periode 4	6.0	E_BA_AIRB
Applied Research Methods	Periode 4	3.0	E_BA_ARM
Decision Making in Supply Chains	Periode 2	6.0	E_BA_DMSC
Network Analysis	Periode 2	6.0	E_BA_NA
Operations Performance Benchmarking	Periode 5	6.0	E_BA_OPB
Supply Chain Execution	Periode 2	6.0	E_BA_SUCE
Supply Chain Lab	Periode 4	6.0	E_BA_SCL
Supply Chain Management	Periode 1	6.0	E_BA_SCM
Transport Economics and Management	Periode 1	6.0	E_BA_TEM

Master Econometrics and Operations Research - Open specialization

In case you opt for no specialization, choose courses from the two tracks. Note that the thesis can only be written on a topic from mathematical economics.

You have to choose 1 case course and three obligatory courses. Furthermore, concerning the electives: you are allowed to choose any elective offered within the programme Econometrics and Operations Research.

Opleidingsdelen:

- [M Econometrics - No specialization - Case courses](#)
- [M Econometrics - No specialization - Obligatory courses](#)

M Econometrics - No specialization - Case courses

Choose 1 of 3 case courses.

Vakken:

Naam	Periode	Credits	Code
Financial Econometrics Case Study	Periode 3	6.0	E_EORM_FECS
Marketing Data Case	Periode 3	6.0	E_EORM_MDC
Operations Research Case	Periode 3	6.0	E_EORM_ORC

M Econometrics - No specialization - Obligatory courses

Follow the obligatory courses from the specializations.

- choose EITHER Advanced Econometrics OR Combinational Optimization
- choose EITHER Dynamic Econometrics OR Optimization under Uncertainty
- choose EITHER Time Series Econometrics OR Behavioural Operations Research

Vakken:

Naam	Periode	Credits	Code
Advanced Econometrics	Periode 1	6.0	E_EORM_AECTR
Behavioral Operations Research	Periode 4	6.0	E_EORM_BOR
Combinatorial Optimization	Periode 1	6.0	E_EORM_COPT
Dynamic Econometrics	Periode 2	6.0	E_EORM_DE
Optimization under Uncertainty	Periode 2	6.0	E_EORM_OPTU
Thesis MSc EOR - Econometrics	Ac. Jaar (september)	18.0	E_EORM_THSTR
Thesis MSc EOR - Operations Research	Ac. Jaar (september)	18.0	E_EORM_THSOR
Time Series Econometrics	Periode 4	6.0	E_EORM_TSE

Honours Programme Operations Research

For talented and ambitious students the master's programme offers an extra opportunity to distinguish themselves with the MSc Honours Programme Operations Research. This Honours Programme allows master's students to broaden and deepen their knowledge on state-of-the-art operations research techniques.

The programme has a study load of 18 EC and consists of two master's courses from the program of the LNMB (6 EC per course) and the 'OR research seminar' (6 EC) organized by the OR-group of the department of Econometrics and Operations Research at VU University. The LNMB provides a great variety of high-level courses on deterministic and stochastic operations research. Students can choose LNMB master's courses according to their interest. The OR research seminar will run from September to April. Form and contents of the OR research seminar will depend on the students interests and ambitions. The aim of this seminar is to train students to write a PhD grant proposal enabling them to continue their studies as a PhD.

The honours programme is successfully completed if the student has finished the master's programme within one year and, in addition, has successfully finished all courses of the honours programme. The successful completion of the honours programme will be recorded in the Diploma Supplement.

Opleidingsdelen:

- [Honours Programme Operations Research - Optional courses LNMB Utrecht](#)
- [Honours Programme Operations Research - Obligatory course VU](#)

Honours Programme Operations Research - Optional courses LNMB Utrecht

Choose courses at LNMB, with a total of at least 12 EC. For more information about LNMB, see <http://www.lnmb.nl/pages/courses/mastercourses>.

Choose courses from this list:

- Introduction to Stochastic Processes (Period 1, 4.0 EC)
- Continuous Optimization (Period 1+2, 6.0 EC)
- Discrete Optimization (Period 1+2, 6.0 EC)
- Heuristic Methods in Operations Research (Period 1+2, 6.0 EC)
- Scheduling (Period 4+5, 6.0 EC)
- Advanced Linear Programming (Period 4+5, 6.0 EC)
- Queueing Theory (Period 4+5, 6.0 EC)

Honours Programme Operations Research - Obligatory course VU

Vakken:

Naam	Periode	Credits	Code
OR Research Seminar	Ac. Jaar (september)	6.0	E_EORM_ORRS

Advanced Econometrics

Vakcode	E_EORM_AECTR (64412001)
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. F. Blasques Albergaria Amaral
Examinator	dr. F. Blasques Albergaria Amaral
Docent(en)	dr. F. Blasques Albergaria Amaral
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	400

Doel vak

This course introduces students to advanced econometric theory and methods. Students will be guided through the frontier of econometric theory and be introduced to state-of-the-art econometric models and techniques.

By the end of this course, participants will:

- (1) have gained a profound and detailed understanding of advanced econometric theory and methods;
- (2) know how to design, estimate and analyze complex nonlinear dynamic models;
- (3) have solved advanced theoretical and practical econometric exercises;
- (4) understand the interplay between econometric techniques and modeling assumptions;
- (5) understand the proofs of asymptotic properties of important estimators and test statistics.

Inhoud vak

This course covers both theoretical and practical aspects of complex dynamic econometric models that are used in the industry, by central banks, governments, think tanks, and other research institutes.

The students will be introduced to stochastic theory that allows them to fully understand the dynamic properties of complex models featuring nonlinearities, time-varying parameters and latent variables. Important concepts include invertibility, stationarity, dependence, ergodicity and bounded moments

The students will also be introduced to advanced estimation theory that allows them to "bring" state-of-the-art models to the data and conduct inference on parameters under very general conditions. Important topics include the existence, measurability, consistency and asymptotic normality of extremum, M and Z estimators. We also cover advanced topics in nonlinear model selection and specification, estimation and inference under incorrect specification and metric selection.

From a practical perspective, the advanced methods and state-of-the-art models are used for forecasting and policy analysis in a wide number of applications ranging from finance to macroeconomics and data science.

Onderwijsvorm

Lectures and tutorials

Toetsvorm

Final exam and group assignment with Individual assessment.

Literatuur

Lecture notes on "Advanced Econometrics" by F. Blasques

Other sources:

Davidson J., "Econometric Theory", Blackwell Publishing, 2000.

van der Vaart A., "Asymptotic Statistics". Cambridge Series in Statistical and Probabilistic Mathematics. Cambridge University Press, 2000.

White H., "Estimation, Inference and Specication Analysis". Econometrics Society Monographs, 1996.

Lütkepohl H., "New Introduction to Multiple Time Series Analysis", Springer, 2005.

Hamilton J. D., "Time Series Analysis", Princeton University Press. 1994.

Davidson J., "Stochastic Limit Theory". Advanced Texts in Econometrics, Oxford University Press, 1994.

B. Potscher and I.R. Prucha, "Dynamic Nonlinear Econometric Models: Asymptotic Theory". Springer-Verlag, 1997.

R. Gallant and H. White, "A Unified Theory of Estimation and Inference for Nonlinear Dynamic Models", Basil Blackwell Ltd., Oxford, 1987.

Hansen, B E, Econometrics. Manuscript, University of Wisconsin.2009.
Current URL: www.ssc.wisc.edu/~bhansen/econometrics/

Aanbevolen voorkennis

This course presumes that students are familiar with basic probability and statistics.

The theory and practice behind the simple linear regression model should be well understood. Furthermore, the students should have been introduced to time-series analysis. In particular, the concept of stationarity and ARMA models should be familiar.

Advanced Macroeconomics

Vakcode	E_EC_AMAEC (60422010)
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	prof. dr. P.A. Gautier

Examinator	prof. dr. P.A. Gautier
Docent(en)	prof. dr. P.A. Gautier
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	400

Doel vak

The students will be able to actively read current literature and embark on their own research projects using the knowledge gained about the analytical, mathematical, and statistical tools of modern dynamic macroeconomics. The tools include dynamic optimization, Nash bargaining, and the basic building blocks of DSGE models. We will also discuss the current big issues like: (i) How can small shocks lead to a large crisis (ii) What explains the increase in inequality and is the analysis of Piketty correct?, (iii) What caused the great recession and the euro crisis?

Inhoud vak

This course provides coverage at an advanced level of the building blocks of macroeconomics. Models of economic growth will be built up from intertemporal optimization decisions of firms and households. Special attention is given to the distribution of income (i.e. the implications of modern growth theory for the theory of Piketty). Next, the course will present the basic tools of Real Business Cycle and New Keynesian models. We also consider modern theories of financial crises and pay a lot of attention to the recent financial and euro crisis. Then, we will consider equilibrium search models which form the core of macro labor. Finally, we discuss budget deficits and Ricardian equivalence plus new political economy models where the behavior of policy makers are part of the model.

Onderwijsvorm

lecture

Toetsvorm

written interim examination
plus problem sets.

Literatuur

Romer, David Advanced Macro Economics. 3rd edition, McGraw Hill.

Vereiste voorkennis

Knowledge of calculus and intermediary macro.

Aanbevolen voorkennis

Basic knowledge of calculus and undergraduate macro

Doelgroep

Msc students

Advanced Methods for Applied Economic Research

Vakcode	E_EC_AMAER (60422070)
Periode	Periode 1
Credits	6.0

Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. S. Dobbelaere
Examinator	dr. S. Dobbelaere
Docent(en)	dr. S. Dobbelaere, S. Sovago
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	400

Doel vak

After the course students are able to critically evaluate the quality of empirical research in economic applications. Furthermore, they are capable of performing empirical research themselves, for example, when writing their thesis. The latter implies that they can decide about the appropriate model, can deal with real-life data, are aware of the strength and weaknesses of the model and can estimate and interpret its parameters.

Inhoud vak

This course makes students familiar with various microeconomic methods. These methods are often used in economic research, both to test predictions from economic theory and to assess the effectiveness of economic policy. During the course attention is devoted both to the theory underlying the different techniques and the practical application. Theoretical knowledge is examined in the final exam, while the implementation of the different methods is requested in the weekly empirical exercises. In these empirical exercises the software package Stata is used. An important aspect of the course is that students learn how to interpret estimation results.

Onderwijsvorm

Lectures
Practical assignments

Toetsvorm

The practical homework assignments count for 20% of the final grade, the written exam for the other 80%. However, the assignments only count for the final grade if (i) the grade for the assignments is higher than the exam grade, and (ii) the exam grade exceeds 5.0. If any of these conditions is not met, the final grade equals the exam grade.

Literatuur

Stock, J.H. and M.W. Watson, Introduction to Econometrics. Pearson Education Inc., 3rd edition update, 2015

Vereiste voorkennis

Introductory course in econometrics at Bachelor level.

Aanbevolen voorkennis

Common used statistical tests and simple regression analysis.

Overige informatie

Students who are not familiar with the software package STATA are encouraged to attend the workshop "Introduction to Stata".

Advanced Microeconomics

Vakcode	E_EC_AMIEC ()
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	prof. dr. J.L. Moraga Gonzalez
Examinator	prof. dr. J.L. Moraga Gonzalez
Docent(en)	prof. dr. J.L. Moraga Gonzalez
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	400

Doel vak

This course prepares the theoretical groundwork for microeconomic policy courses elsewhere in the MSc Economics curriculum, highlighting traditional economic approaches, their normative foundations, and recent theories of information economics. Goal of the course is to make the student comfortable as a user of fundamental concepts of microeconomic theory at an advanced level.

By the end of the course the student will:

- be familiar with the main, unifying microeconomics principles and know how to analyze economic problems using the tools of microeconomics
- know the main concepts of consumer choice and firm behavior, and their relevance for equilibrium and welfare analysis
- be able to identify market failure and evaluate economic policy with regard to efficiency and equity
- be prepared to recognize situations of strategic interaction, as well as the methods to predict economic outcomes in those situations
- be familiar with expected utility theory for decision-making under uncertainty such as insurance
- know the limitations to economic policy
- know of possibilities and limitations to mechanism design in applied policy fields, such as auctions and matching.

Inhoud vak

This course equips the student with microeconomics tools needed for the subsequent policy courses. Policy applications in themselves are not subject of the current course, but rather their preparation.

The course focuses on modeling and requires substantial math skills (in particular calculus). Traditional topics (part I) include the theory of the firm, consumer choice and demand, partial and general equilibrium analysis and aspects of market failure. Part II covers risk and insurance under symmetric and asymmetric information, concepts of game theory, as well as the economics of information and incentives.

Using problem sets and exercises will increase and deepen the understanding of microeconomics modeling. This will help students touch upon a large number of microeconomic policy issues from a unified perspective.

Onderwijsvorm

lecture
tutorial

Toetsvorm

Written examination (75%), tutorial (problem sets, 25%) , if exam grade 5.0 or higher.

Literatuur

Snyder and Nicholson, Microeconomic Theory: Basic Principles and Extensions, 11th ed.

Vereiste voorkennis

Familiarity with Microeconomics at the level of Varian, H. R. Intermediate Microeconomics. 8th edition. W. W. Norton, 2010.
Familiarity with Mathematics at the level of Sydsaeter, Knut and Hammond, Essential Mathematics for Economic Analysis, Prentice Hall, 3rd ed., 2008

Aanbevolen voorkennis

All students (but specially those who think need to refresh their math skills) are strongly encouraged to attend the course "Math Refresher", starting end of August (details t.b.a.).
For more information about Math Refresher, see Canvas.

Airline Business

Vakcode	E_BA_AIRB (61452050)
Periode	Periode 4
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. A.J.H. Pels
Examinator	dr. A.J.H. Pels
Docent(en)	dr. A.J.H. Pels, dr. M.G. Lijesen
Lesmethode(n)	Hoorcollege, Werkcollege
Niveau	400

Doel vak

The aviation sector is a popular topic in the media. Airport noise, airport expansion, airport privatization, airline alliances, airline bankruptcies, new aircraft design etc. etc. frequently are the topic of heated debate. This course looks at recent developments in the airline industry from a scientific perspective. The deregulation of the aviation markets in 1978 (in the U. S.) and in the 1980s and 1990s (E. U.) led to some drastic changes in airline strategies and management styles. The origins and consequences of these changes are considered in this course.

Inhoud vak

Why did you pay more (or less) for your ticket than the person sitting next to you in the aircraft. Why do KLM and easyJet have different network types? How does competition from Emirates influence KLM and Schiphol? Why should we (or shouldn't we) open a secondary airport? By the end of this course, the student can answer such questions, and explain recent developments in the airline industry using basic economic knowledge on pricing, cost structures, and network design. Furthermore, the insights can be used to explain developments in other transportation sectors as well. Airline pricing, airline cost and network design are three important aspects that will be discussed

throughout the course. The lectures specifically deal with the following topics:

- Airline markets
- Airline pricing
- Airline output and market structure
- Airline cost
- Network design
- Network competition
- Network management
- Revenue management
- Aviation policy

Onderwijsvorm

lectures

students need to choose two (out of four) tutorials. The topics for the tutorials are based on current policy problems. Students need to review relevant literature and prepare short presentations on the topic. In a boardroom like meeting, students discuss their findings with other students to come to a final decision.

Toetsvorm

Paper, written examination

Literatuur

A selection of articles will be announced in the study guide; lecture slides.

Vereiste voorkennis

The course 'Transport Economics and Management' is highly recommended. Students that did not follow this course have to contact the coordinators in advance.

Applied Analysis: Financial Mathematics

Vakcode	X_400076 (400076)
Periode	Periode 1+2
Credits	6.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Coördinator	prof. dr. A.C.M. Ran
Examinator	prof. dr. A.C.M. Ran
Docent(en)	prof. dr. A.C.M. Ran
Lesmethode(n)	Hoorcollege
Niveau	400

Doel vak

The course aims to introduce the student to several aspects of the mathematical theory of option pricing.

Inhoud vak

This course gives an introduction to financial mathematics.

The following subjects will be treated:

- introduction in the theory of options;
- the binomial method;

- introduction to partial differential equations;
- the heat equation;
- the Black-Scholes formula and applications;
- introduction to numerical methods, approximating the price of an (American) option.

Onderwijsvorm

Lectures, exercises, discussion of exercises.

Toetsvorm

Homework exercises and final examination

Literatuur

The Mathematics of Financial Derivatives, A Student Introduction, by Paul Wilmott, Sam Howison, Jeff Dewynne. Cambridge University Press.

In addition, lecture notes will be made available for several topics which are not treated in the book.

Aanbevolen voorkennis

Calculus and Linear Algebra

Doelgroep

3W, mMath, mBA, 3Ect

Applied Econometrics for Urban, Transport and Environmental Economics

Vakcode	E_STR_AEUTE ()
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. H.R.A. Koster
Examinator	dr. H.R.A. Koster
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	400

Doel vak

The main objective of this course is to provide an overview of econometric research methods in spatial economics and to teach you how to apply these methods to real-world data.

Inhoud vak

Public policies need to be evaluated in order to understand their effectiveness and correct validation of economic theory can only be achieved with empirical research. The main objective of this course is to provide an overview of econometric research methods in spatial economics and to teach you how to apply these methods to real-world data. After following this course, you will:

- have an advanced understanding of the mathematical and statistical concepts underlying regression analysis;
- understand the importance of and difficulties in estimating causal effects as opposed to correlations in spatial economics problems;
- know how to appropriately interpret regression results of various estimators and know which one to apply in particular situations,

depending on (i) the nature of the data (cross-sectional / panel / qualitative data) and (ii) the task at hand (i.e., valuation of public policies, testing of economic theories or estimating parameters as derived from theory);

- understand and know how to apply techniques that are commonly in use in urban, regional, environmental and transport economics and policy: spatial econometrics; spatial interaction models, discrete choice models and quasi-experimental set-ups;
- be able to apply these methods independently to typical datasets in spatial economics and other domains (including labour economics and public economics) using the software package STATA.

Onderwijsvorm

Lectures (12) and tutorials (6)

Toetsvorm

Written examination (75 percent): some questions on the theoretical prerequisites but mainly interpretation of regression outputs and sketches of solution strategies for the estimation of particular parameters in well-defined situations.

Assignment (25 percent) in small groups: Assignments are to be handed in before the tutorials and discussed there. Some assignments relate to the derivation of theoretical propositions of the estimators and their properties, but the main focus is hands-on computer exercises applying the theoretical concepts to real-world data using the software package STATA and correct subsequent interpretation of the results.

Literatuur

Stock, J.H. and Watson, M.W. (2011). Introduction to econometrics, 3rd edition. Upper Saddle River, NJ: Pearson Education.

Train, K. (2009). Discrete choice methods with simulation. Cambridge: Cambridge University Press. Chapters 2 and 3.

Gibbons, S., & Overman, H. G. (2012). Mostly Pointless Spatial Econometrics? Journal of Regional Science, 52(2), 172-191.

Angrist, J.D., Pischke, J.-D. (2009). Mostly Harmless Econometrics: An Empiricists Companion. Princeton: Princeton University Press. Chapters 1, 2, 3.1, 4.1, 5.1, 6.1, 8.1 and 8.2.

Except for Stock and Watson, the accompanying literature is downloadable from Canvas.

Aanbevolen voorkennis

An active knowledge of mathematical tools and econometric techniques is required. Please apply for the the Math and STATA refresher otherwise.

Overige informatie

Students are strongly(!) advised to follow the Math Refresher and Introduction to STATA courses that are given from August 26 to 30, during the last week before the courses start officially

Applied Research Methods

Vakcode	E_BA_ARM ()
Periode	Periode 4
Credits	3.0

Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. T. de Graaff
Examinator	dr. T. de Graaff
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	400

Doel vak

In Applied Research Methods we present an overview of suitable research methods for a Master thesis in the area of Transport and Supply Chain Management. The main objective of this course is to give you a basic understanding of the relevance of specific research frameworks and how to properly apply them to specific research problems in TSCM. Moreover, with a specific focus on your thesis topic, a specific research method will be taught in small dedicated tutorial groups. After following this course, you can distinguish between several research frameworks that can be developed in TSCM, (e.g., case study research, a survey (focused on developing a questionnaire), valuation using experiments (how to estimate willingness to pay), choice analysis (e.g., logistic or multinomial regression), quantitative analytical research (using simulation experiments); you can reflect on the question whether a specific research framework is suitable for a particular research question; you can set up your research within one of the above mentioned research frameworks; you are able to apply the above mentioned research framework to a stylized research project; you are able to validate the results obtained; and you can report on the use of the above mentioned research frameworks.

Inhoud vak

The type of research that you perform determines the type of research framework that you will develop. There are basically two types of research: theory development and theory testing. Theory development is carried out when there is no body of theory available and hence no theories to start from. Testing theories is usually done in those situations where there are sufficient theories to base hypotheses on that can be tested. Do not confuse the question of choosing a particular research method with the discrimination between quantitative and qualitative research. The discrimination between qualitative and quantitative research only has limited relevance for the determination of the type of research framework. Ultimately, it is the research question that determines the type of approach and whether to use quantitative data or not.

Onderwijsvorm

Lectures and tutorials

Toetsvorm

Assignments (paper and presentation)

Literatuur

Papers and syllabus

Vereiste voorkennis

Business Research Methods

Aanbevolen voorkennis

It is preferable that students have a working knowledge of Excel and R.

Doelgroep

Students TSCM master

Asset Pricing

Vakcode	E_FIN_AP ()
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	prof. dr. R.C.J. Zwinkels
Examinator	prof. dr. R.C.J. Zwinkels
Docent(en)	prof. dr. R.C.J. Zwinkels
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	400

Doel vak

This course aims to deepen your knowledge in the field of asset pricing and investments.

After completion of the course, you should:

- Understand the determinants of equity returns.
- Understand and be able to apply optimal asset allocations for both individual and institutional investors.
- Acquire an academic and critical attitude towards competing theories in investment questions.
- Be comfortable with doing advanced analyses on large data sets in software such as Microsoft Excel.

Inhoud vak

Starting from basic (undergraduate) Investments knowledge, this course centers around the issues of asset pricing and investments. In the first week we revisit the well-known mean-variance framework and derive the standard CAPM. Starting from the second week, we carefully study the assumptions underlying the CAPM framework and ask ourselves what they imply for asset pricing. Examples include the assumption of mean-variance utility, rational expectations, and complete arbitrage. In the final week, we take a sidestep towards delegated asset management. Throughout the course, neoclassical and behavioral theories confronted with each other. The course builds on a combination of theory and empirics. Throughout the course, students will compete in an investment game in which they can directly apply their newly acquired knowledge and experience the real-life issues associated with investing.

Onderwijsvorm

Each of the six weeks of the course feature four hours of lectures and two hours of tutorials. The content of the tutorials varies. There will, for example, be guest lectures from finance practitioners, discussions of the assignments, and in-depth discussions of particular technical issues.

The focus of the assignments is to apply the theoretical knowledge from class to real world problems using actual stock market data in

Excel or other software. In addition to gaining a deeper understanding of the topics in the course, the assignments will train you in quantitative computer skills you will need later in their career and prepare you for similar assignments in other courses and your thesis.

Toetsvorm

Final grade = $0.75 \times (\text{written exam grade}) + 0.25 \times (\text{assignments grade})$.

To pass this course, you need a minimum final grade of 5.5 and a minimum grade of 5.0 on the written exam.

Literatuur

- Selected research articles.
- Lecture notes.

Vereiste voorkennis

You should be familiar with investments at the level of Bodie, Kane & Marcus, Investments. Undergraduate level knowledge of statistics and mathematics is also required (e.g., Berenson, Levine, Krehbiel: Basic Business Statistics; and Sydsaeter and Hammond (2006; Prentice Hall): Essential Mathematics for Economic Analysis, Sydsaeter, Hammond, Seierstad, and Strom (2005; Prentice Hall): Further mathematics for Economic Analysis (chapters 4 and 11)).

Aanbevolen voorkennis

You are expected to be very versatile in a relevant software package, such as Microsoft Excel (or any other similarly advance package) and use it to perform estimation and optimization. Core texts here are Benninga, Financial Modeling, or (more advanced) Jackson and Staunton, Advanced modeling in Finance using excel and VBA.

Overige informatie

This course can have an in-depth follow-up by choosing the investments learning line, consisting of an appropriate investments related Research Project in period 3 as well as related electives in period 4 (e.g., Institutional Investments and ALM, Macro and International Finance, Behavioral Finance, Quantitative Risk Management).

Asymptotic Statistics

Vakcode	X_400323 (400323)
Periode	Periode 1+2
Credits	8.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Niveau	500

Inhoud vak

This course is part of the joint national master programme in mathematics. For schedules, course locations and course descriptions see <https://elo.mastermath.nl>. Registration is required via <https://elo.mastermath.nl/login>

Doelgroep
mMath

Intekenprocedure

You have to register your participation in each Mastermath course via <https://elo.mastermath.nl/login>

Registration is mandatory and absolutely necessary for transferring your grades from Mastermath to the administration of your university.

Behavioral Operations Research

Vakcode	E_EORM_BOR ()
Periode	Periode 4
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	prof. dr. G. Schäfer
Examinator	prof. dr. G. Schäfer
Lesmethode(n)	Hoorcollege
Niveau	400

Doel vak

The course focusses on the modeling, analysis and optimization of complex decision making processes which involve human behavior (such as selfish, risk-averse, altruistic or malicious behavior). Building on game-theoretic foundations, you learn to model processes of complex decision making and to quantify the inefficiency caused by human behavior.

The main goal of the course is to equip you with algorithmic optimization techniques to master the challenging task of reducing the inefficiency of such processes. These techniques find their applications for example in Traffic Routing, Network Design, Cost Sharing, Resource Allocation and Auction Design.

Inhoud vak

- network routing and the price of anarchy
- Braess paradox and the network design problem
- computation and inefficiency of equilibria
- congestion games and cost sharing games
- smoothness framework and learning in games
- combinatorial auctions and the VCG mechanism
- sponsored search auctions

Onderwijsvorm

Lectures and tutorials. Exercises will be given each week and students are expected to present their solutions during the tutorials. In addition, students will have to work on and hand in three take-home assignments (which will be graded).

Toetsvorm

Final exam – Individual assessment
Assignments – Individual assessment

Literatuur

- N. Nisan, T. Roughgarden, E. Tardos, and V. V. Vazirani (Editors), Algorithmic Game Theory, Cambridge University Press, 2007.
- Y. Shoham and K. Leyton-Brown, Multiagent Systems, Cambridge University Press, 2009.
- Lecture Notes

Vereiste voorkennis

Students should have some background knowledge of combinatorial optimization; in particular, they should be familiar with fundamental optimization problems (shortest path, matching, flow, scheduling), algorithms and complexity (exact and approximation algorithms, P vs. NP), and linear and convex programming (duality, KKT conditions).

Branding and Advertising

Vakcode	E_MKT_BA ()
Periode	Periode 4
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	prof. dr. ir. P.W.J. Verlegh
Examinator	prof. dr. ir. P.W.J. Verlegh
Docent(en)	A.W. Eigenraam MSc
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	400

Doel vak

Upon completion of this course, students:

- Demonstrate a critical understanding of the concepts and theories used, as well as key topics covered, in the top academic journals on the role of brands for marketing and the value of brands for consumer decisions.
- Effectively apply branding theories both to understand real-life marketing problems and to design solutions to those problems.
- Communicate and collaborate effectively with an international cohort of classmates to design and produce case solutions or other presentations, provided in English, to both academic and professional audiences.

Inhoud vak

Branding is an important instrument in marketing. In this course we discuss brand management and branding strategies and study what makes brands successful. We also reflect on the roles of brands for consumers, and how these goals and resulting consumer behaviors interact with marketer's activities and objectives. The course aims to critically reflect on these practices from an academic point of view, supported by knowledge gathered by studying theory and concepts that are relevant to branding (in the form of reading assignments and in-class discussion), and to analyze branding issues with the use of literature and desk research (in the form of a case study and smaller assignments).

We will discuss literature related to brand strategy and brand management, brand communication, and brand-related consumer behavior, and will focus on topics like brand positioning (and repositioning),

brand equity, brand extension, brand communities, internal branding, and brand communication.

Onderwijsvorm

Lectures, workgroups

Toetsvorm

Written examination: 70%;

Assignment: 30%;

each to be completed with a minimum score of 5.0

Literatuur

Academic articles

Aanbevolen voorkennis

Marketing Strategy

Consumer marketing

Combinatorial Optimization

Vakcode	E_EORM_COPT ()
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. ir. R.A. Sitters
Examinator	dr. ir. R.A. Sitters
Docent(en)	dr. ir. R.A. Sitters
Lesmethode(n)	Hoorcollege, Werkcollege
Niveau	400

Doel vak

In this course you will learn how to develop efficient algorithms for solving fundamental optimization problems in operations research.

The objectives of the course are to:

- learn about fundamental optimization problems (Scheduling, vehicle routing, facility location, network design, ...)
- learn algorithms for solving these problems
- learn to prove performance guarantees (running time, approximation ratio)
- apply the theory by implementing some of these algorithms.
- construct and implement your own algorithms for optimization problems.

Inhoud vak

Some of the topics that will be covered in the course are:

- Scheduling problems, routing problems, facility location problems.
- (Integer) linear programming, dynamic programming, local search algorithm, randomized algorithms.
- Theoretical performance guarantees: approximation ratio, polynomial running time.
- Computational complexity theory and hardness of approximation.

Onderwijsvorm

Lectures (4hours) and tutorials (2hours).

Toetsvorm

The final grade is determined by a written exam (60%) and an assignment (40%).

In the assignment you will apply the theory and implement algorithms for optimization problems. We use Python for this.

Literatuur

The material to be covered in class is based on the following books.

Book [1] will be used the most and is freely available for download (you may consider buying it though).

The other books [2-4] will be used occasionally and give a good impression of the theory.

[1] D.P. Williamson and D.B. Shmoys, The Design of Approximation Algorithms, Cambridge University Press, 2011

[2] V. V. Vazirani, Approximation Algorithms, Springer, 1998

[3] C. H. Papadimitriou and K. Steiglitz, Combinatorial Optimization; Algorithms and Complexity, Prentice-Hall, 1982.

[4] Kleinberg and E. Tardos, Algorithm Design, Addison Wesley, 2005.

Vereiste voorkennis

Basic knowledge of graph theory and linear programming. Basic programming skills, preferably Python. If you have experience with other languages (java, R, Matlab, ...) then Python will be easy to learn.

Aanbevolen voorkennis

Basic knowledge on graph theory, linear programming, and combinatorial optimization is assumed. For example, the bachelor courses Operations Research 3 (SBE) and Combinatorische Optimalisatie (FEW) each provide sufficient pre-knowledge.

Doelgroep

Anyone with sufficient pre-knowledge and an interest in algorithms for optimization problems.

Overige informatie

See <http://personal.vu.nl/r.a.sitters/AdvancedAlgorithms/index.html> for the contents of last years course.

Computational Finance

Vakcode	XMU_418045 ()
Periode	Periode 4
Credits	6.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Lesmethode(n)	Hoorcollege
Niveau	400

Inhoud vak

<http://studiegids.uva.nl/xmlpages/page/2017-2018/zoek-vak/vak/32277>

Doelgroep

mSFM

Overige informatie

This course is offered at the UvA. For more information contact: FNWI Education Service Centre, Science Park 904, servicedesk-esc-science@uva.nl, +31 (0)20 525 7100.

Enrolment via <https://m.sis.uva.nl/vakaanmelden> is required.

Data Mining Techniques

Vakcode	X_400108 (400108)
Periode	Periode 5
Credits	6.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Coördinator	dr. M. Hoogendoorn
Examinator	dr. M. Hoogendoorn
Docent(en)	dr. M. Hoogendoorn
Lesmethode(n)	Hoorcollege
Niveau	500

Doel vak

The aim of the course is that students acquire data mining knowledge and skills that they can apply in a business environment. How the aims are to be achieved: Students will acquire knowledge and skills mainly through the following: an overview of the most common data mining algorithms and techniques (in lectures), a survey of typical and interesting data mining applications, and practical assignments to gain "hands on" experience. The application of skills in a business environment will be simulated through various assignments of the course.

Inhoud vak

The course will provide a survey of basic data mining techniques and their applications for solving real life problems. After a general introduction to Data Mining we will discuss some "classical" algorithms like Naive Bayes, Decision Trees, Association Rules, etc., and some recently discovered methods such as boosting, Support Vector Machines, and co-learning. A number of successful applications of data mining will also be discussed: marketing, fraud detection, text and Web mining, possibly bioinformatics. In addition to lectures, there will be an extensive practical part, where students will experiment with various data mining algorithms and data sets. The grade for the course will be based on these practical assignments (i.e., there will be no final examination).

Onderwijsvorm

Lectures (h) and compulsory practical work (pra). Lectures are planned to be interactive: there will be small questions, one-minute discussions, etc.

Toetsvorm

Practical assignments (i.e. there is no exam). There will be two assignments done in groups of three. There is a possibility to get a grade without doing these assignments: to do a real research project instead (which will most likely to involve more work, but it can also be more rewarding). For the regular assignments the first assignment counts

for 40% and the second for 60%. The grade of both assignments needs to be sufficient to pass the course.

Literatuur

Ian H. Witten, Eibe Frank, Mark A. Hall, Data Mining: Practical Machine Learning Tools and Techniques (Third Edition). Morgan Kaufmann, January 2011
ISBN 978-0-12-374856-0

Aanbevolen voorkennis

Kansrekening and Statistiek or Algemene Statistiek (knowledge of statistics and probabilities) or equivalent. Recommended: Machine Learning.

Doelgroep

mBA, mCS, mAI, mBio

Decision Making in Supply Chains

Vakcode	E_BA_DMSC (61442080)
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	prof. dr. W.E.H. Dullaert
Examinator	prof. dr. W.E.H. Dullaert
Docent(en)	prof. dr. W.E.H. Dullaert
Lesmethode(n)	Hoorcollege, Werkgroep, Practicum
Niveau	400

Doel vak

In today's highly competitive markets supply chain managers are challenged to design, plan and control logistics processes at company and supply chain level. Regardless of whether their supply chain is aiming for e.g. higher responsiveness, improved cost efficiency or supply chain vulnerability, the resulting decision problems tend to be complex and require quantitative analysis. Moreover, they often need to be addressed under time pressure without access to dedicated software tools.

This course wants to teach students how to use and build spreadsheet models to (i) analyze real-life company data, (ii) develop optimization and simulation models, (iii) report results and formulate recommendations to improve supply chain performance.

Inhoud vak

In this course you learn a variety of methods for analyzing, modelling and improving logistics processes in supply chains. To make sure that you can apply these skills in practice we will use widely available spreadsheet software (and add-ins) instead of dedicated software which is often unavailable in companies. Important topics that we are going to address are data processing, optimization and simulation analysis.

Students will be challenged to solve exercises and case studies by designing appropriate spreadsheet models.

Onderwijsvorm

Lectures and (computer) tutorials

Toetsvorm

Team assessment
Individual exam

Literatuur

- extensive handouts and additional course material to be distributed via Canvas
- handbook to be announced

Vereiste voorkennis

Students not following the MSc BA TSCM programme are kindly requested to contact the course coordinator prior to enrollment.

Derivatives

Vakcode	E_FIN_DER (60442060)
Periode	Periode 4
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. N.J. Seeger
Examinator	dr. N.J. Seeger
Docent(en)	dr. N.J. Seeger
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	400

Doel vak

The primary objective of this course is to provide students with an advanced introduction to derivative instruments. By the end of the course students should have a sound understanding of the pricing concepts, practical applicability, operational complexity, and risks of several linear and non-linear derivatives.

Inhoud vak

In today's financial world, the role of derivatives gets increasingly important. Banks and pension funds use derivatives to manage their balance sheet risk, corporate treasuries need derivatives for mitigation of international trade risk, insurance companies actively apply derivatives strategically in order to hedge long term interest rate exposures. Worldwide derivatives trading has exploded to unprecedented levels in the last decades. Therefore, a sound understanding of derivatives is indispensable for anyone pursuing a job in finance.

The course aims to help students in developing a general understanding of the fundamental principles related to derivative instruments. When we try to understand derivative instruments we will ask questions like:

1. How do derivative instruments work?
2. Is it possible to decompose derivatives in basic assets?
3. How to determine the fair value of derivative instruments?
4. What are the risks of using derivative instruments?

5. How are derivative instruments applied in practice and are there any relevant operational issues in the real world?

Hence, the course focuses on facilitating conceptual understanding of derivative instruments and of the methods that are needed to apply derivatives in different settings of finance applications; whether it is for trading purposes, structuring products, risk management, etc.

The field of derivatives is one of the most mathematically sophisticated in finance. Therefore, to understand derivatives it is inevitable to deal with mathematical methods. However, we want to emphasize that in the course mathematical methods are primarily used as tools to understand derivatives. We intend to serve a balanced mix of theory, intuition and practical aspects.

The course will treat the following subjects:

- Why derivatives?
- Forwards, futures and options
- Pricing concepts of derivative instruments
- Discrete and continuous time option pricing models
- Understanding Black-Scholes formula
- Beyond Black-Scholes (stochastic volatility and jumps)
- Hedging strategies
- Estimating model parameters
- Credit derivatives / Financial Crisis

Onderwijsvorm

The course spans a period of six weeks. There will be 12 lecture sessions of 2 x 45 minutes each (for dates and times see course schedule), in which the course material is presented. There will be two additional tutorial sessions in which solutions to programming problems related to derivatives topics will be discussed.

Toetsvorm

The final grade of the course is the grade of the written exam.

Literatuur

- Lecture slides
- John Hull: Options, Futures and other Derivatives, 8th Edition, 2011

Further References:

- Das, R.K. and S.R. Sundaram: Derivatives: Principles and Practice, McGRAW-Hill International Edition, 2010
- Jarrow, R. and A. Chatterjea: An Introduction to Derivative Securities, Financial Markets, and Risk Management, W. W. Norton & Company, 2013
- Baxter/Rennie: Financial Calculus, Cambridge, 1996. - Neftci: Principles of Financial Engineering, Elsevier, 2nd edition, 2008.
- Bingham/Kiesel: Risk-Neutral Valuation: Pricing and Hedging of Financial Derivatives, Springer, 2004.
- Björk, T.: Arbitrage Theory in Continuous Time, Oxford University Press, 2004.

Vereiste voorkennis

Students entering this course should be familiar with the basic corporate finance principles and techniques (e. g. Berk/DeMarzo, Corporate Finance. 2013) and investment management concepts (e. g. Bodie, Investments. 2010). In order to follow the course material right

from the start it is recommended to review the derivatives material that has been covered in the courses: Financiering 2.5 and Investments 3.4. For solving the assignments, programming experience with Excel/VBA is required. A very good introduction to Excel/VBA can be found on the homepage <http://xlvu.weebly.com>; provided by Dr. Arjen Siegmann.

Digital Marketing

Vakcode	E_MKT_DM ()
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	drs. E.F.J. Lancee
Examinator	drs. E.F.J. Lancee
Docent(en)	drs. E.F.J. Lancee
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	400

Doel vak

- Demonstrate a critical understanding of the concepts and theories used, as well as key topics covered, in the top academic journals on digital marketing and how such theories complement traditional theories.
- Effectively apply digital marketing theories both to understand real-life marketing problems and to design (multichannel) solutions to those problems.
- Communicate and collaborate effectively with an international cohort of classmates to design and produce case solutions or other presentations, provided in English, to both academic and professional audiences.

Inhoud vak

The Internet and digital media have transformed marketing and business since the first website went live in 1991. More than 20 years later over one billion people around the globe regularly use the web to find products, entertainment and soulmates. Consumer behavior and the way companies market to both consumers and businesses have changed dramatically. To succeed in the future, organizations will need marketers, strategists and agencies with up-to-date knowledge of how to apply digital media such as the web, e-mail and mobile. Digital marketing is an exciting area to be involved in, since it poses many new opportunities and challenges yearly, monthly and even daily. Therefore the following strategic topics from the digital marketing literature will be discussed:

- Theories about digital consumer behavior & psychology; (digital buying behavior, sharing behavior & social behavior)
- Theories about digital marketing strategy; (digital value creation, multichannel strategy, social media strategy)
- Theories about the digital marketing mix; (product, price, place)
- Theories about strategic digital and multichannel communication; (multichannel communication, social media (viral) communication, digital branding & digital advertising)
- Theories about digital relationship management; (personalization, participation, e-CRM, e-profiling, loyalty)

Onderwijsvorm

Lectures, workgroups

Toetsvorm

Written examination: 70%;

Assignment: 30%;

each to be completed with a minimum score of 5.0

Literatuur

Academic articles and additional materials as mentioned in the course manual

Aanbevolen voorkennis

Marketing strategy

Consumer marketing

Distributed Algorithms

Vakcode	X_400211 (400211)
Periode	Periode 5
Credits	6.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Coördinator	prof. dr. W.J. Fokkink
Examinator	prof. dr. W.J. Fokkink
Docent(en)	prof. dr. W.J. Fokkink
Lesmethode(n)	Hoorcollege, Werkcollege
Niveau	500

Doel vak

The main objective is to provide students with an algorithmic frame of mind for solving fundamental problems in distributed computing. They obtain insight into concurrency concepts, and are offered a bird's-eye view on a wide range of algorithms for basic and important challenges in distributed systems.

Characteristic of the course is that correctness arguments and complexity calculations of distributed algorithms are provided in an intuitive fashion and by means of examples and exercises.

Inhoud vak

The following topics are treated in the course: Logical clocks, snapshots, graph traversal, termination detection, garbage collection, deadlock detection, routing, election, minimal spanning trees, anonymous networks, fault tolerance, failure detection, synchronization, consensus, mutual exclusion, self-stabilization.

Onderwijsvorm

4 hours per week HC

4 hours per week WC

Toetsvorm

Written examen (plus a take-home exercise sheet that can provide up to 0.5 bonus point, if a passing mark for the written exam is achieved).

Literatuur

W.J. Fokkink. Distributed Algorithms: An Intuitive Approach. MIT Press, 2013.

Aanbevolen voorkennis

Datastructures & Algorithms

Doelgroep

mAI, mCS, mPDCS

Overige informatie

The homepage of the course is at <http://www.cs.vu.nl/~tcs/da/>

Dynamic Econometrics

Vakcode	E_EORM_DE ()
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. H. Karabiyik
Examinator	dr. H. Karabiyik
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	400

Doel vak

This course introduces students to advanced econometric theory and methods for analyzing linear multivariate non-stationary time-series and panel data.

By the end of this course, participants will:

- (1) have detailed knowledge of VAR, VECM and dynamic panel-data models.
- (2) understand the limit theory behind spurious regression and cointegration;
- (3) be familiar with advanced unit-root and cointegration tests;
- (4) understand the challenges in designing, estimating and analyzing linear econometric models for non-stationary time-series and panel data.

Inhoud vak

This course covers both theoretical and practical aspects of modeling multivariate non-stationary time-series and panel data, with special emphasis on unit-root processes and cointegration.

The students will be introduced to linear multivariate time-series models and linear panel data models used in econometrics. Important topics include marginalizing, conditioning, exogeneity, vector autoregressive (VAR) models, and vector error correction models (VECM).

Important limit results will be carefully derived providing the students with a deep understanding of the theory and practice behind a wide range of advanced unit roots test, spurious regression, cointegration, and dynamic panels.

Onderwijsvorm

Lectures and tutorials

Toetsvorm

Final exam and group assignment – Individual assessment

Literatuur

Lecture notes and other material provided by teacher.

Davidson (2000), "Econometric Theory". Wiley.

Hamilton (1994), "Time Series Analysis". Princeton University Press.

Aanbevolen voorkennis

This course presumes that students are familiar with basic probability and statistics. The theory and practice behind the simple linear regression model should be well understood. Furthermore, the students should have been introduced to time-series analysis. In particular, the concepts of stationarity and ARMA models should be familiar.

Dynamische Systemen

Vakcode	X_400637 ()
Periode	Periode 1+2
Credits	6.0
Voertaal	Nederlands
Faculteit	Faculteit der Exacte Wetenschappen
Coördinator	prof. dr. R.C.A.M. van der Vorst
Examinator	prof. dr. R.C.A.M. van der Vorst
Docent(en)	prof. dr. B.W. Rink
Lesmethode(n)	Hoorcollege, Werkcollege, Deeltoets extra zaalcapaciteit
Niveau	300

Doel vak

Aan het einde van deze cursus

1. kent de student de grafische en numerieke methoden voor het oplossen van eendimensionale niet-lineaire gewone differentiaalvergelijkingen;
2. kent de student de stelling voor existentie en eenduidigheid van oplossingen van gewone differentiaalvergelijkingen, en kan deze gebruiken;
3. kan de student meerdere bifurcaties met een of twee parameters herkennen, kwalificeren en berekenen;
4. kan de student stelsels van twee lineaire gewone differentiaalvergelijkingen oplossen en kwalificeren, en een faseplaatje voor deze vergelijkingen tekenen.
5. kan de student een faseplaatje van een eenvoudig stelsel niet-lineaire tweedimensionale ODEs tekenen, herkent hij/zij of zo'n ODE conservatief is, en kent hij/zij meerdere technieken om periodieke oplossingen van dergelijke ODEs te vinden (bijv. de stelling van Poincare-Bendixon, de slow-fast methode, en d.m.v. storingstheorie);
6. kan de student meerdere voorbeelden geven van problemen uit de wetenschap die met ODEs gemodelleerd worden.

Inhoud vak

Dit college is gewijd aan de theorie van niet-lineaire gewone differentiaalvergelijkingen. Aan de orde komen existentie en uniciteit van oplossingen, methoden voor het expliciet berekenen van oplossingen, de grafische methode voor eendimensionale vergelijkingen, bifurcaties, lineaire differentiaalvergelijkingen in twee dimensies, fasevlak analyse, limietcycli, storingstheorie, symmetrie en mechanische systemen. Aan de hand van concrete voorbeelden wordt geïllustreerd hoe men dergelijke problemen aanpakt.

Onderwijsvorm

De cursus bestaat uit een hoorcollege en een werkcollege per week.

Toetsvorm

Inleveropgaven en deeltentamens. De eerste inleveropgave telt voor 10% mee in het eindcijfer, het eerste deeltentamen voor 30%, de tweede inleveropgave voor 10% en het tweede deeltentamen voor 50%.

Literatuur

Steven Strogatz, "Nonlinear dynamics and chaos: with applications to physics, biology, chemistry and engineering", paperback edition, Westview Press, 1st ed, 2001. Daarnaast zullen op college soms aantekeningen worden verspreid.

Aanbevolen voorkennis

Eerstejaars cursussen Calculus en Analyse

Doelgroep

2W, 2W-B, CHW-doorstroom

Overige informatie

Actuele informatie over dit vak zal worden aangeboden op Canvas.

Econometrics Essays

Vakcode	E_EORM_ECE ()
Periode	Periode 3+4
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. F. Blasques Albergaria Amaral
Examinator	dr. F. Blasques Albergaria Amaral
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	400

Doel vak

To allow students to study an econometric research topic in detail. The work will be carried out independently by the student but with close supervision by expert teacher.

Inhoud vak

Students first study independently on a "capita selecta" of relevant and important econometric theoretical research topics. After a series of short seminars of econometric researchers from within the department and possibly from outside, a choice of a well defined research topic will be

made. The research work is focussed on econometric theory and methodology, and is carried out by the student individually. The work concentrates on studying, verifying and possibly extending the results. The students present their achievements in a short scientific report. The supervision is done by an expert in the department.

Onderwijsvorm

Two hours lectures (in the form of research seminars), four hours work groups where each student can discuss questions and report on the progress in research.

Toetsvorm

Assessment of the short scientific report.

Literatuur

Seminar presentations and references to relevant research papers, articles and books.

Doelgroep

MSc Econometrics students, it is compulsory for the specialisation Econometric Theory

Econometrics for Quantitative Risk Management

Vakcode	E_FIN_EQRM ()
Periode	Periode 1+2
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. C.S. Bos
Examinator	dr. C.S. Bos
Docent(en)	prof. dr. A. Lucas, dr. C.S. Bos
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	400

Doel vak

Upon successful completion, students should

- have a thorough understanding of econometric estimation methodology (extremum estimation, regression, maximum likelihood, GMM);
- understand the asymptotic statistical behavior of typical estimation methodologies and have the means to develop inference procedures to answer finance/econometric questions of interest;
- be aware of typical statistical complications in financial econometrics and how to deal with these (endogeneity, time series variation and model instability, unit roots and spurious regression, cointegration, heteroskedasticity, alternative standard errors);
- be able to implement econometric methods in computer code and run simulations to study the properties of estimation and inference procedures;
- download, process, and use real financial data, obtain results, and critically interpret the results obtained;
- be able to report the results clearly and concisely;
- be able to understand and critically evaluate financial econometric research as presented in the academic literature;

In this way students should be well prepared for the team research

project in Block 3, and for the academic thesis in Block 5/6.

Inhoud vak

This is a specialized course for the Duisenberg Honours Programme in Quantitative Risk Management and is not accessible to students outside this programme.

The course starts out with a series of models commonly applied in the financial econometrics literature and practice. These include linear and non-linear regression, maximum likelihood estimation, and GMM. We consider time series, cross-sectional, and panel data settings. The common ground in estimation and inference behind these models is investigated, leading towards the theory for a general statistical framework for extremum estimators and inference procedures in the second part of the course.

Students are required to implement some of the methods in case assignments using computer coding. We use Python as our standard programming language, but students are free to choose some other language if they prefer.

Onderwijsvorm

2h lectures, 2h tutorials, over two periods

Toetsvorm

Intermediate exam, final written exam, case work.

Literatuur

Tsay, R. S. (2010): Analysis of Financial Time Series, 3rd edition. John Wiley & Sons. <http://dx.doi.org/10.1002/9780470644560>

Hansen, B. E. (2016): Econometrics.

<http://www.ssc.wisc.edu/~bhansen/econometrics>

Vereiste voorkennis

Students should have a sound knowledge of Probability Theory and Mathematical Statistics, Linear Algebra and Calculus, as well as an introductory knowledge in Econometrics. They should also be familiar with basic bachelor level finance concepts. Students should also master a matrix-oriented programming language. During the course, Python is used (see e.g. https://www.kevinsheppard.com/Python_for_Econometrics). A bootcamp 'Principles in Programming in Econometrics' is organized for Python and/or Matlab in the last week of August, before the start of the course. Please register by signing up in Canvas for the bootcamp.

Indication of entry level:

Edwards, C. H. and D. E. Penney (2007). Calculus, with Early Transcendentals. New International ed of 7th Revised. Pearson.

Casella, G. and R. L. Berger (2008). Statistical Inference. International edition of 2nd revised. Cengage Learning, Inc.

Stock, J. H. and M. W. Watson (2011). Introduction to Econometrics.

3rd. UK: Pearson Education.

Bodie, Z., A. Kane, and A. Marcus (2013). Investments. 10th. McGraw-Hill Education.

Economics of Climate Change

Vakcode	E_STR_ECC ()
Periode	Periode 2

Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. S. Poelhekke
Examinator	dr. S. Poelhekke
Docent(en)	prof. dr. R.S.J. Tol, dr. S. Poelhekke
Lesmethode(n)	Hoorcollege
Niveau	400

Doel vak

This course focuses on climate change: one of the greatest challenges of our time. What can the science of economics teach us about its causes and potential solutions? What are the costs and benefits of climate change? Should we tax carbon, cap-and-trade emission rights, or subsidize solar and wind power? Why is it so difficult to sign environmental agreements such as 'Kyoto' and 'Paris' despite the high stakes? Does trade harm the environment? Will our industry move abroad if we take a leading role and 'go it alone'?

After having completed this course, you will know the answers to the above questions and be able to enter into the economic policy debate well informed.

Moreover, you will:

- have a deep understanding of the fundamental difficulties and complexities of environmental policy making in an international context;
- have gained insights in the economics of international agreements and international trade;
- are able to apply to theory to cases such as climate change, acidification and ozone depletion;
- have sharpened your economic analysis in the group discussions and improved your presentations skills.

Inhoud vak

The course consists of lecturers teaching the state- of- the- art, and students giving presentations on seminal papers in the literature.

The lectures cover the following topics (provisional scheme)

- Introduction: Externalities and environmental policy
- Economic impacts of climate change
- Climate change policy making: instruments and costs
- The economics of acidification and ozone depletion
- Trade the environment: pollution havens versus factor endowments
- International environmental agreements

The first eight lectures are on the economics of climate change and climate policy, and also on the problems of acidification and ozone depletion. The following subjects are analysed. What is climate change, and what are its causes and consequences? What are the economic impacts of climate change? What are the costs of emission reduction? How can emission reductions be achieved? What lessons do acidification and ozone policy hold for climate policy? What is optimal and equitable climate policy? How likely is this in reality? Are there effective and acceptable alternatives to optimal climate policy?

The last six classes are on the relationship between trade and the environment. Common wisdom is that trade is the source of many environmental problems. One of the main reasons for this is that governments are afraid that domestic environmental policies will reduce the home economy's international competitiveness and hence environmental policies are set too lax. In the first four lectures we analyze to what extent this fear is correct, both theoretically and empirically. We compare how the trade-off between international competitiveness and the environment depends on the type of pollutant (local pollutants such as PM10, or transboundary pollutants, such as SO₂) as well as on the size of the domestic economy. In lectures 5 and 6 we turn to the issue of international agreements. Writing down a protocol which requires countries to reduce their emissions of CO₂ or SO₂ is easy (see for example the Kyoto Protocol), but what are the incentives for countries to actually join the coalition? And what is the role of trade sanctions therein?

Toetsvorm

essay
presentations
take home exam

Literatuur

Books:

- Perman et al., Natural Resource and Environmental Economics, Addison Wesley, 4th edition, 2011.
- Richard Tol, Climate Economics: Economic Analysis of Climate, Climate Change and Climate Policy, Edward Elgar Publishing, 29 aug. 2014
- 208 pagina's
- Copeland and Taylor, Trade and the Environment, Princeton University Press, 2003

Articles (tbd):

- Nordhaus, William D & Yang, Zili, 1996. "A Regional Dynamic General-Equilibrium Model of Alternative Climate-Change Strategies," American Economic Review, vol. 86(4), pages 741-65.
- Hoel, Michael & Shapiro, Perry, 2003. "Population mobility and transboundary environmental problems," Journal of Public Economics, Elsevier, vol. 87(5-6), pages 1013-1024, May.
- Scott Barrett, Self-Enforcing International Environmental Agreements, Oxford Economic Papers, New Series, Vol. 46, Special Issue on Environmental Economics (Oct., 1994), pp. 878-894.
- Santiago J. Rubio & Alistair Ulph, 2006. "Self-enforcing international environmental agreements revisited," Oxford Economic Papers, Oxford University Press, vol. 58(2), pages 233-263, April.
- de Zeeuw, Aart, 2008. "Dynamic effects on the stability of international environmental agreements," Journal of Environmental Economics and Management, Elsevier, vol. 55(2), pages 163-174, March.
- Levinson, Arik. 2009. "Technology, International Trade, and Pollution from US Manufacturing." American Economic Review, 99(5): 2177-92.
- Wolfgang Keller and Arik Levinson, "Pollution Abatement Costs and Foreign Direct Investment Inflows to U.S. States", The Review of Economics and Statistics, 2002, vol. 84, issue 4, pages 691-703.
- Steven Poelhekke and Frederick van der Ploeg, "Green havens and pollution havens", The World Economy, forthcoming.

Vereiste voorkennis

Microeconomics.

Economics of the Welfare State

Vakcode	E_EC_EWS ()
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	prof. dr. P.W.C. Koning
Examinator	prof. dr. P.W.C. Koning
Lesmethode(n)	Hoorcollege
Niveau	400

Doel vak

By the end of this course, students will be able to assess the concepts of the welfare state from an economic perspective:

- Students are able to identify the key equity and efficiency arguments for the provision of various welfare state programs.
- Students understand the concepts of insurance theory and their implications for the provision of social insurance.
- Students can critically evaluate empirical applications about individual behavior in the context of the welfare state.
- Students are able to apply their knowledge on real life welfare state programs, of which they can evaluate, judge and communicate their pros and cons.

Inhoud vak

Governments implement welfare state programs to protect their citizens to social risks such as falling sick, becoming unemployed, ageing or the occurrence of health costs. These programs, that range from public benefits to the regulation of private insurance markets, may have a strong impact on the income, well-being and the behavior of individuals. Welfare state programs are typically justified by equity and public responsibility, but at the same time the growth of public expenditures force governments to make more efficient use of existing resources. This gives rise to a tension between equity and efficiency considerations.

This course provides an economic perspective on the design of equitable and efficient welfare state programs. The course starts with exploring the fundamental arguments for state intervention and the provision of social insurance, using concepts from insurance theory. Next, attention will be devoted to different welfare state interventions, including cash benefits (such as unemployment insurance, sick pay, disability insurance and pensions) and benefits in kind programs (e.g. health care). Throughout the course, these programs will be assessed along the line of equity and efficiency measures, using insights from the empirical literature on the effect of welfare state interventions on individual behavior and social outcomes.

Onderwijsvorm

Lectures, student presentations, as well as a paper assignment

Toetsvorm

Written interim examination and grade for presentations/papers

Literatuur

Barr, The Economics of the Welfare State, Oxford University Press, Edition 4 (or higher)

In addition, articles are mandatory as well. These are included in the Course Manual.

Empirical Transport Economics

Vakcode	E_STR_ETE ()
Periode	Periode 4
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	prof. dr. J.N. van Ommeren
Examinator	prof. dr. J.N. van Ommeren
Lesmethode(n)	Hoorcollege
Niveau	400

Doel vak

This course aims to familiarize students with applied empirical transport research and how to interpret recent applied work to evaluate important transport policies. The course consists of lectures, interesting home assignments and tutorials where assignments will be discussed. In the lectures, we explain recent developments in empirical strategies in transport research that are theoretically founded and which help you to examine transport policies from a welfare perspective. The lectures are based on a book and recently published articles. Active participation of the students is vital and class discussions will be an important part of all lectures. Home assignments induce you to engage in econometric analysis of (real) transport data, and to interpret the policy implications of data analysed. During the tutorials we will discuss the results.

After the course, you will be able to:

- Perform applied/empirical research in transport economics in a wide range of settings
- Critically evaluate research done by others
- Evaluate the effect of policies and understand the theoretical underpinning behind this

Inhoud vak

This course covers key topics in contemporary empirical transport research and policies. Key topics discussed (and applied in the assignments) include:

- applied discrete choice demand analysis (e.g. to estimate value of time)
- applied panel data analyses (e.g. to estimate variation in travel time as a function of congestion)
- applied instrumental variables approach (to estimate demand functions)

for inland shipping in order to determine the welfare effects of low water in the river Rhine)

- analysis of (car/airport) congestion, global warming and other externalities
- analyse several empirical studies of parking policy (e.g., cruising; taxation of employer parking)
- understand company car tax policy (within the OECD) and the effect on welfare
- competition and market power (of several types of transport companies)
- regulation and deregulation (of transport companies)
- transport investment and pricing
- improve your understanding of location decisions of households and the relationship with commuting
- competitive tendering in transport: for example, we discuss tendering policies that determine which companies will build or operate our (road) infrastructure and show recent evidence how competitive tendering of public transport reduces costs.

Onderwijsvorm

Lectures, tutorials and assignments.

Toetsvorm

Assignments 30%,

Written examination 70%

Written examination: at least a 5.0

Literatuur

- Train, K., 2009. Discrete Choice Methods with Simulation, 2nd edition.

Cambridge University Press, Cambridge. Freely downloadable from

<http://elsa.berkeley.edu/books/choice2.html>

- many empirical articles

Aanbevolen voorkennis

Transport Economics is recommended

Environmental Economics

Vakcode	E_STR_EEC (60442040)
Periode	Periode 4
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	prof. dr. C. Fischer
Examinator	prof. dr. C. Fischer
Docent(en)	dr. G.C. van der Meijden
Lesmethode(n)	Hoorcollege
Niveau	400

Doel vak

The course aims to teach students why natural resource management should not be left to the free market. After following this course, students are able to characterize several types of market failure and to explain how each of these causes environmental problems, such as overexploitation of natural resources and air pollution. Moreover, students will be able to explain which policy instruments can be used by

the government to tackle environmental problems that arise in a market economy. Students will also learn how to use stated and revealed preference methods to value the environment. Finally, students will be taught how renewable resources (such as forestry and fisheries), and non-renewable resources (such as fossil fuels) should optimally be exploited from a social welfare perspective and how the optimal exploitation differs from the exploitation in a market equilibrium. There is also a lecture on the economic impact of natural resources, and whether these are a curse or a blessing.

The course consists of lectures, homework assignments, tutorials, and presentation/discussion sessions. The lectures are aimed at developing a thorough understanding of key economic, environmental and ethical aspects of environmental problems, and of the link between theory, methods and empirical analysis. The goal of the homework assignments that will be discussed during the tutorials is to practice the use of modern economic methods to analyse and solve problems in the field of environmental economics. The presentation/discussion sessions are intended to improve the participants' economic reasoning and communication skills. In these sessions, students will present a journal article in class, and they are expected to participate in a group discussion afterwards.

After following this course, you:

- can explain why, and under which conditions, the free market does not result in an efficient outcome.
- are capable of showing how externalities can be 'internalized' by using market instruments, like Pigouvian taxes, quotas and tradable permits, etc.
- are able to advise environmental policy makers on which policy instruments to use under different circumstances in order to correct the market outcome
- use stated and revealed preference methods to attach a monetary value to environmental services
- can explain how non-renewable resources like fossil fuels, are exploited in a market economy and how the exploitation differs from the optimum
- can show how renewable resources, like fishery and forestry, are exploited in a market economy and how the exploitation differs from the social optimum
- are able to describe and explain the optimal climate policy in the global economy and to explain how sub-optimal climate policies can lead to a 'Green Paradox', in the sense that the problem of climate change is aggravated instead of diminished upon the introduction of those policies
- are able to describe the most important interactions between the economy and the environment, and their relationship with sustainable development.
- are able to explain why resource rich countries often suffer from low rates of economic growth, and what they can do to avoid this so-called Resource Curse.
- are able to work with simple mathematical models to analyse the effects of environmental policy and to determine the time profile of renewable and non-renewable resources, both in the optimum and in the market equilibrium
- have improved your presentation and discussion skills

Inhoud vak

The following topics will be dealt with in the course:

- interaction between the economy and the environment

- environmental policy: Pigouvian taxes, quotas, and tradable emission permits
- non-renewable resource use: scarcity and market structure
- renewable resource use: fishery and forestry
- non-renewable resource use and climate change
- climate policy and the 'Green Paradox'
- sustainable development
- welfare economics and market failures
- resource-rich economies and the 'Resource Curse'
- theory and methods for environmental valuation

The topics for the group discussions and student presentations can be chosen by the participants. They should be based on articles published in scientific journals.

Onderwijsvorm

Lectures, assignments, student presentations, and group discussions.

Toetsvorm

Written exam (60%), assignments (30%), and presentation/participation (10%). Passing the course is conditional on the exam grade being 5.0 or higher.

Literatuur

To be announced.

Aanbevolen voorkennis

Advanced microeconomics.

Evolutionary Computing

Vakcode	X_400111 (400111)
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Coördinator	J.V. Heinerman MSc
Examinator	J.V. Heinerman MSc
Docent(en)	prof. dr. A.E. Eiben, J.V. Heinerman MSc
Lesmethode(n)	Hoorcollege
Niveau	400

Doel vak

This course has a threefold objective: 1) To learn about computational methods based on Darwinian principles of evolution. 2) To illustrate the usage of such methods as problem solvers and as simulation tools. 3) To gain hands-on experience in performing computational experiments with evolutionary algorithms.

Inhoud vak

The course is treating various algorithms based on the Darwinian evolution theory. Driven by natural selection (survival of the fittest), an evolution process is being emulated and solutions for a given problem are being "bred". During this course all "dialects" within evolutionary computing are treated (genetic algorithms, evolution strategies, evolutionary programming, genetic programming). Applications in

optimisation, constraint handling, machine learning, and robotics are discussed. Specific subjects handled include: various genetic structures (representations), selection techniques, sexual and asexual variation operators, (self-)adaptivity. Special attention is paid to methodological aspects, such as algorithm design and tuning. If time permits, subjects in Artificial Life will be handled. Hands-on- experience is gained by a compulsory programming assignment.

Onderwijsvorm

Oral lectures and compulsory Java programming assignment (in teams of 3). Highly motivated students can replace the programming assignment by a special research track under the personal supervision of the lecturer(s). These research projects aim at publications.

Toetsvorm

Written exam and programming assignment (weighted average). To pass the course as a whole, you must pass both the exam and the programming assignment.

Literatuur

Eiben, A.E., Smith, J.E., Introduction to Evolutionary Computing. Springer, 2015, 2nd edition, ISBN 978-3-662-44873-1.

Vereiste voorkennis

Java programming skills are necessary to do the practical assignment.

Doelgroep

mBA, mAI, mCS, mPDCS

Financial Econometrics Case Study

Vakcode	E_EORM_FECS ()
Periode	Periode 3
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. L.F. Hoogerheide
Examinator	dr. L.F. Hoogerheide
Lesmethode(n)	Practicum
Niveau	400

Financial Markets and Institutions

Vakcode	E_FIN_FMI (60442080)
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	prof. dr. I.P.P. van Lelyveld
Examinator	prof. dr. I.P.P. van Lelyveld

Docent(en)	prof. dr. I.P.P. van Lelyveld
Lesmethode(n)	Hoorcollege
Niveau	400

Doel vak

The purpose of this course is to develop an understanding of the economics underlying financial intermediation, financial markets and banking, with a particular regard for current market developments and their consequences.

Inhoud vak

We start by very briefly discussing the traditional role of commercial banks in the financial system and how banks manage risks. Given that Finance track students this year will have studied most of this in the Bachelor course FMI, this coverage will be high over.

Given the depth of the Great Financial Crisis (2007-2009), there has been a flurry in new regulation. What are the objectives of these regulations, are these or will these be met. Since traditionally regulation has been focussed on solvency will dedicate a lecture on liquidity as well as this has proven to be quite a separate type of risk. In addition we will discuss macroprudential and systemic risk regulations.

The next two lectures cover the plumbing of the system and other large institutional participants. The former lecture will provide us some understanding of how risks in the system not only originate with the actions (i.e., trades) but also with the markets are set up. The latter will discuss how, next to (investment) banks, other large institutional investors are coming to the fore.

In the final part of the course we will turn to three distinct markets: the derivatives market, the interbank and the international banking market. How do these markets operate, particularly in the crisis, and how are they evolving.

Two guest lectures from practitioners will provide more colour: DNB President Klaas Knot will cover central bank policy complemented by a lecture from a practitioner.

Onderwijsvorm

The lectures will be complemented by a writing assignment (see below) All information regarding the timetable of the course can be found at <http://rooster.vu.nl>.

To facilitate the Writing Assignment a non-compulsory lecture on writing in English will be organised in the second week.

In the second week there will be an additional non-compulsory lecture to discuss question for those without a banking background (e.g. econometrics students).

Question should be raised on the web forum.

Toetsvorm

Final grade is based on a closed-book written final exam (80%) and the grade on an open-book essay to be written in groups of at most three students (20%). More details regarding the topics and the structure of the essay will be provided during the lectures and

tutorials. If no essay was submitted, it will be graded 0 (zero), counting as a 0 for the resit as well. In the case of a resit in later periods (i.e., in 2018 or later), the essay result will be disregarded and the resit grade will be based 100% on the examination. The exam questions will cover the topics and the exercises treated in the class. The lecture notes and solutions published on Canvas can be used as a faithful guide for the required material and level of difficulty.

Part of understanding is being able to present your findings. In many cases, getting the form right is just as important as the actual content. Findings can be presented in many ways. For example, as an academic article, a thesis, a Powerpoint or a column. In this writing assignment we will aim for a contribution to a policy oriented blog such as VoxEU (www.voxeu.org). See www.voxveu.org for last year's submissions.

Last year the topic was the future of banking. Closer to the course, we will set the topic for this year's assignment.

The assignment should be written in groups of at most three. Please use the appropriate sign up tool on Canvas. Further details will be given in the first lecture. Note that a non-compulsory lecture on writing in English will be planned in the first week.

The deadline for the assignment will be announced in the first lecture.

Literatuur

The material from the Bachelor course FMI will be assumed as starting level. For those wishing to brush up, please go over all of Chapters 8 through 12 from

- Mishkin, F., K. Matthews, and M. Giuliadori, The Economics of Money, Banking and Finance, European edition.

Several mandatory academic papers will be posted to Canvas

Lecture notes will be available on Canvas just before each class.

Solutions for all exercises will be available after lectures.

Other non-mandatory (but useful) materials such as academic papers, press articles or book titles will be posted on Canvas.

Vereiste voorkennis

Students should have followed a bachelor course in Money and Banking.

Functional Analysis

Vakcode	X_400328 (400328)
Periode	Periode 1+2
Credits	8.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Coördinator	prof. dr. B.W. Rink
Lesmethode(n)	Hoorcollege
Niveau	500

Inhoud vak

This course is part of the joint national master programme in mathematics.

For schedules, course locations and course descriptions see

Doelgroep

mMath

Intekenprocedure

You have to register your participation in each Mastermath course via

<https://elo.mastermath.nl/login/>

Registration is mandatory and absolutely necessary for transferring your grades from Mastermath to the administration of your university.

Geographic Information Systems

Vakcode	E_STR_GIS (60452030)
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. E. Koomen
Examinator	dr. E. Koomen
Docent(en)	dr. E. Koomen, dr. E. Simao Da Graca Dias
Lesmethode(n)	Hoorcollege, Computerpracticum
Niveau	400

Doel vak

For economists, the spatial-economic market model of Von Thünen (1780-1850) was a major breakthrough in their spatial thinking. During this course, we will see how this spatial thinking has evolved from Von Thünen's time to the world of today.

The aim of this course is to make students understand the importance of space and distance as key factors in applied research, in particular in the fields of regional, urban, transport and environmental economics. The students will be introduced into the theoretical and methodological issues of GIScience and GISystems and they will be trained in how GIS can assist and extend research.

At the end of the course students:

- can carry out a spatially explicit analysis in which they apply relevant theories and concepts as discussed during the lectures
- know how to use GIS software and tools in their analysis
- will be able to explain what GIS is and how it can be used in business processes, government policy planning and scientific analysis

Inhoud vak

This course introduces students to the role of location in (spatial) economics. It focuses on the informational value of location and on how to use the factor location when doing analysis.

The following list of core issues will be discussed during the lectures and practiced with during the tutorial/practical hours and the GIS assignment:

- introduction to GIS (data types and data storage)
- collecting spatial data
- setting up a spatial analysis
- spatial analysis methods

- visualisation of spatial data

Onderwijsvorm

The course consists of a combination of lectures in which the core concepts are explained and assignments in which the spatial concepts are applied in practice using GIS- software and spatial data. Active participation of the students is expected in all lectures and practical assignments.

Toetsvorm

Written interim examination: 50 percent

Assignments: 50 percent

(Each to be completed with a minimum score of 5.0)

Literatuur

Academic papers provided through the digital learning environment.

Doelgroep

This is an elective course in the STREEM programme that is also open to students from other Master programmes who have an interest in the analysis of spatial patterns and processes.

The course provides links with the STREEM core courses Regional and Urban Economics (period 2), Transport Economics and Environmental Economics (period 4), and with the course Advanced Methods (period 1) as it includes spatial data research performed in these domains during the lectures and using spatial data from these fields during the tutorials.

Geomarketing

Vakcode	E_MKT_GEOM (60442180)
Periode	Periode 4
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	prof. dr. J. Boter
Examinator	prof. dr. J. Boter
Docent(en)	prof. dr. J. Boter, dr. J.E.C. Dekkers
Lesmethode(n)	Hoorcollege, Practicum
Niveau	400

Doel vak

- Demonstrate a command of a range of GIS/spatial research skills and tools to analyze large quantities of secondary data with spatial aspects.
- Demonstrate a critical understanding of the concepts and theories used, as well as key topics covered, in the top academic journals on the spatial aspects of marketing concepts (e.g., spread of innovation, WOM) and consumer behavior (e.g., travel).
- Effectively using GIS tools and methods to carry out spatial analyses to understand real-life spatial problems and to design solutions to those problems.
- Communicate and collaborate effectively with an international cohort of classmates to design and produce case solutions or other presentations, provided in English, to both academic and professional audiences.

Inhoud vak

A number of key issues in (strategic) marketing have a strong spatial component, such as:

- Location: where should a bank or shop locate its outlets to maximize profits or customer satisfaction? Contrary to Price or Promotion, Place is difficult to be changed on a short notice. Selecting an appropriate location, therefore, is crucial and has long- run implications.
- Assortment planning or micromarketing: Different areas have different demographics. Ideally, assortments of outlets are adapted to suit such local differences. Insight into what type of consumers live where can be an important help maximizing sales for the limited available shelf space that an outlet has available.
- Direct marketing/CRM: Nowadays, transaction systems link sales data to customer data. Thus, companies know where their customers live. These addresses may convey important background information about the customer profile, since the area of residence can say a lot about income, type of household, spending behavior and interests. Such insights may help in selecting the right addresses for, for example, cross- selling.
- Consumer behavior phenomena: a number of consumer behavior phenomena develop along particular spatial patterns. For instance, innovations are not adopted everywhere at the same time often, adoption follows a particular pattern across a country. Such insight is vital for the successful launch of new products.
- International Market Assessment and Expansion: companies that want to successfully export new products need to be careful in selecting their best export opportunities. An interesting question in this global marketing- issue is what countries with attractive combinations of demographics and cultural characteristics are potential new market areas for new products.

In short, analysis of spatial (market) information is essential for many strategic and operational marketing decisions. Geographical Information Systems (GIS) are an important tool in carrying out such analyses. The following topics from both the marketing and spatial economics literature are discussed:

- Theories about spatial competition and location
- Theories about spatial patterns in consumer behavior
- 'Customer targeting' and geodemographics, determining (potential) market areas
- Location strategies for retail- and service companies
- Geographical Information Systems (GIS) and its use in market analysis, choice of location and strategic planning

Onderwijsvorm

Lectures and computer tutorials

Toetsvorm

Written examination: 70%

Assignment: 30%

each to be completed with a minimum score of 5.0

Literatuur

Academic articles and GIS instruction material

Globalization, Growth and Development

Vakcode	E_EC_GGD (60442050)
Periode	Periode 4
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	prof. dr. C.T.M. Elbers
Examinator	prof. dr. C.T.M. Elbers
Docent(en)	prof. dr. C.T.M. Elbers
Lesmethode(n)	Hoorcollege
Niveau	400

Doel vak

Aim of the course is to study aspects of globalization, growth and development that are fruitfully studied from the perspective of the economics discipline. After following the course the student will

- know the basic facts concerning the topics discussed in the course
- have a thorough understanding of these topics, in particular their economic dimension
- have learnt various empirical research techniques that can be applied within this field of economics
- be able to present and discuss current journal articles and book chapters on globalization

Inhoud vak

Globalization poses both challenges and offers opportunities to rich, emerging and poor countries. The course focuses on a number of themes that have been central in the academic and public discussion of recent trends in the world economy. Among them are:

- Relationship between growth, trade and poverty
- Globalization and inequality
- International migration
- International trade and capital flows
- Environmental and labour standards
- Institutions
- Trade shocks, resources and civil conflict
- Financial stability

More topics in globalization are introduced in the course in the form of student presentations. The course stresses the importance of empirical research and devotes significant time to the empirical strategies that have been used by researchers in studying globalization.

Onderwijsvorm

Lectures, Student Presentations and Discussions

Toetsvorm

Written exam at the end of the course

Literatuur

Selected articles

Vereiste voorkennis

Advanced Macroeconomics 4.2 and International Economics 3.2

Doelgroep

Students specialising in economics

Human Development

Vakcode	E_EC_HDEV (60442130)
Periode	Periode 4
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	prof. dr. M.P. Pradhan
Examinator	prof. dr. M.P. Pradhan
Lesmethode(n)	Hoorcollege
Niveau	400

Doel vak

An active study of the advanced literature of the human development aspects of development economics, the branch of economics that focusses on the specific economic problems of less developed nations. A thorough exercise in independently formulating and studying relevant research issues and analysing in a constructive and critical manner the problems of development economics in the human development context.

Inhoud vak

In the lectures, we study human development in developing countries using recent articles on this topic. We start off with two lectures on education, looking at how education systems are financed and organised, outcomes are measured, and where the challenges for future development lie. This also provides an entry point for discussing impact evaluation methods in more depth, and how they have been applied in the context of designing education policies for developing countries. We discuss both supply and demand side policies. We then move on to the study of social capital, and use as an entry point the participatory development type projects, which heavily rely on local social capital for implementation. The next week is on early childhood development, which has in recent years received more attention. We investigate the hypothesis that intervening before children enter primary education is maybe the most cost effective way to improve human development outcomes. This discussion provides an entry point to discuss modelling issues that arise when analysing human development during formative years. The last two lectures focus on health. We study inequality in health and access to health services, health systems and financing, and impact of innovative delivery models. PS. I may replace the lecture on social capital with a lecture on the role of the private sector this year.

The tutorials are used for student led discussions, where groups of students prepare a presentation and discussion on a particular research question related to the topic discussed during the lectures. Active participation in the tutorials is mandatory.

Onderwijsvorm

Lectures

Toetsvorm

Written examination, presentation and participation in classroom discussion, term paper.

Literatuur

Articles provided during the course.

Aanbevolen voorkennis

Proven knowledge of basic micro economics and basic applied econometrics

Overige informatie

Course taught at the UvA.

Industrial Organization and Competition Policy

Vakcode	E_EC_IOCP ()
Periode	Periode 4
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. E.I. Motchenkova
Examinator	dr. E.I. Motchenkova
Docent(en)	dr. E.I. Motchenkova
Lesmethode(n)	Hoorcollege
Niveau	400

Doel vak

This course is designed to give students an overview of the mainstream theory of Industrial Organization.

After following this course, students

- can define and recognize main types and determinants of market structure
- can name and explain the determinants of the actions taken by firms and are able to explain the relationships between firms' actions and market outcomes
- are able to apply mathematics, game theory, welfare analysis and micro-economic tools to analyze the problem of collusion, entry and exit decisions, vertical control, product differentiation, and adoption of new technologies issues
- can describe and analyze (both analytically and graphically) the main models used for analysis of strategic behavior of firms under asymmetric information
- are able to determine optimal firm and regulator behavior conditional on the type of market structure and nature of competition in the market and draw policy conclusions

Inhoud vak

Many markets of interest are dominated by only few firms. These firms not only choose their prices and outputs, but also the quality and design of their products, engage in advertising campaigns and make investments in R&D. They also decide on whether to enter or exit markets, whether to merge, vertically integrate, or to collude with rival firms. These choices have strong effects on the markets, in which firms operate, and may also have wider repercussions throughout the economy. This course presents an approach - based on strategic decision

making - for understanding the functioning of such markets. We also use this approach to clarify the role of the government in regulating economic activity.

This course is designed to give students an overview of the mainstream theory of Industrial Organization, to provide students with insights in the organization of markets, and to give an overview of the main analytical tools used for analysis of imperfectly competitive markets. The course is primarily theoretical. At the same time, a number of empirical and experimental results will be discussed.

Part 1 of the course concerns non-strategic industrial organization and consists of the theory of the firm, analysis of monopoly power, price discrimination and vertical integration. Part 2 studies strategic industrial organization. The topics are static oligopoly models, dynamic price competition, spatial competition and advertising, incumbent/entrant behavior, R&D and adoption of new technologies. Also substantial attention will be devoted to applications of the IO tools for analysis of Competition policy. There we will focus on European and US competition law, collusion, abuse of dominant position, and mergers.

Onderwijsvorm

Lectures
Workshops and assignments

Toetsvorm

written interim examination - 80% of the final grade
problem sets and workshop presentations – 20% of the final grade

Literatuur

Tirole, J. (1988), The Theory of Industrial Organization. MIT Press.
Motta, M. (2004), Competition Policy: Theory and Practice, Cambridge University Press.
Reader with articles provided on Black Board

Vereiste voorkennis

Microeconomics course

Aanbevolen voorkennis

Bachelor level courses in Industrial Organization

Institutional Investments and Asset Liability Management

Vakcode	E_FIN_IIALM ()
Periode	Periode 4
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. M. Boes
Examinator	dr. M. Boes
Docent(en)	dr. M. Boes
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	400

Doel vak

This course has a dual objective:

1. Students should achieve advanced knowledge of the investment process of institutional investors, like pension funds, and the concept of balance sheet management (ALM: Asset and Liability Management)
2. Students should acquire a thorough knowledge of the developments in fixed income space, in particular the recent advances in the pricing of fixed income derivatives like swaps and swaptions

After following this course, you:

- Have a thorough understanding of the theory of strategic dynamic asset allocation (SAA) and Asset Liability Management (ALM) and its implementation by institutional investors
- Have a thorough understanding of basic fixed income instruments such as (inflation) swaps and swaptions and their strategic use by institutional investors
- Have an overview of the practical implementation of ALM studies in the financial industry
- Have an up-to-date knowledge on the recent developments in the regulation of derivatives markets
- Have a sound understanding on how linear and non-linear derivatives are used by pension funds in their balance sheet management
- Have knowledge on how pension funds decide on the management of currency risk, benchmark choice, and mitigation measures for counterparty credit risk

Inhoud vak

Week 1: a broad introduction to pension funds. Specifically, we give an overview of the Dutch pension system, some basic definitions, and the regulatory framework. In addition to that, the investment problem of a pension fund is explained and subsequently linked to the investment decision problems that were treated in earlier courses. Also in week 1, we give an introduction to interest rate risk on the balance sheet of institutional investors.

Week 2 and 3: focus on fixed income derivatives: which instruments are available, how do they work, how to price, what are the risks and which tools are available to manage those risks? The approach taken won't be purely theoretical, we'll have a clear focus on the practical usage of fixed income derivatives.

Week 4 and 5: focus on strategic asset allocation for institutional investors. We give both an academic and an applied treatment of this problem. We won't solely focus on interest rate risk management but will also look at the practical consequences of strategic choices on equity investing and currency hedging.

Week 6: we'll organize a guest lecture in this final week and we'll also have the presentation session resulting from the second case.

In this course we work closely together with Ortec Finance. Consequence is that we'll be able to establish a strong link between academic theory and practical application.

Onderwijsvorm

Lectures (2 times 2 hours per week) and a weekly working class (2 hours)

Toetsvorm

- Written exam;
- Two cases;
- Cases count for 20% of final grade;
- Participation in the cases is mandatory: if students do not participate, they cannot pass for the course

Literatuur

- Hull: Options, Futures and Other Derivatives (8th Edition)
- Additional course material (e.g. academic papers) will be provided on Canvas

Overige informatie

This course brings students up to date with the recent developments in the field of fixed income derivatives and institutional investments. To do so efficiently, the course builds on earlier courses.

Labour Economics

Vakcode	E_EC_LABELC (60422030)
Periode	Periode 4
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. S. Dobbelaere
Examinator	dr. S. Dobbelaere
Docent(en)	dr. S. Dobbelaere
Lesmethode(n)	Hoorcollege
Niveau	400

Doel vak

This course is an introduction to labor economics with an emphasis on applied microeconomic theory and empirical analysis. The aim of the course is to acquaint students with traditional and contemporary topics in labor economics. The following course objectives are defined:

- Demonstrating a theoretical understanding of how labor markets operate (disciplinary knowledge).
- Understanding the recent developments of wage determination in imperfectly competitive labor markets (disciplinary knowledge & analytical and quantitative skills).
- Understanding how institutional forces and technological change shape labor market performance (disciplinary knowledge & analytical and quantitative skills).
- Being able to discuss critically existing empirical evidence (critical readership).
- Learning how to distinguish alternative theories empirically and how key parameters are obtained from data (disciplinary knowledge & analytical and quantitative skills).
- Performing own empirical analysis by means of a replication exercise (analytical and quantitative skills).
- Understanding the crucial role of better data and a better match between theory and empirics in finding pertinent answers to societal and

economic problems in contemporary labor markets (societal and contextual relevance).

Inhoud vak

The course covers a systematic development of theories of wage determination over the past decades. We focus on the two traditions of modelling wage determination in imperfectly competitive labor markets: ex post wage bargaining and ex ante wage posting. We study employment in a dynamic context, emphasizing the role of search frictions. We focus on the evolution of wage inequality and changes in the employment structure, taking into account the role of technological change, international competition and labor market institutions. These topics are politically and economically important and underscore a lot of modern labor economics.

Onderwijsvorm

Lectures and tutorials (in-class presentations of assignments).

Toetsvorm

Interim assessment: Case/paper individual, Case/paper group and Presentation. End of period: Open exam. Conditional on the exam grade exceeding 5.0, assignments count for 40% of the final grade and the exam for 60%. If the exam grade is lower than 5.0, the final grade is equal to the exam grade.

Literatuur

Selected main readings (papers) and chapters of the textbook "Cahuc P., Carcillo S. and A. Zylberberg. 2014. Labor Economics (2nd edition). MIT press".

Large Scale Data Engineering

Vakcode	X_405116 ()
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Coördinator	prof. dr. P.A. Boncz
Examinator	prof. dr. P.A. Boncz
Docent(en)	prof. dr. P.A. Boncz
Lesmethode(n)	Hoorcollege
Niveau	500

Doel vak

The goal of the course is to gain insight into and experience with algorithms and infrastructures for managing big data.

More information is found on <http://event.cwi.nl/lsde>

Inhoud vak

This course confronts the students with some data management tasks, where the challenge is that the mere size of this data causes naive solutions, and/or solutions that work only on a single machine, to stop being practical. Solving such tasks requires the computer scientist to have insight in the main factors that underlie algorithm performance

(data access patterns, hardware latency/bandwidth), as well as possess certain skills and experience in managing large-scale computing infrastructure.

Onderwijsvorm

There are two lectures per week, and the course requires significant practical work. The practicals are done outside lecture hours, at the discretion of the students who are supported remotely through Skype screen sharing.

Toetsvorm

In the first assignment the students can work either on their own laptops via a prepared VM, or in the cloud using an Amazon EC2 Micro Instance; and there is an online competition between practicum teams for the best result. The second assignment, using a Hadoop Cluster, are done on the SurfSARA Hadoop cluster (90 machines, 720 cores, 1.2PB storage). For this assignment, a report of 5-8 pages must be written. The students also need to read two scientific papers of choice, related to the second assignment, and present these in class. There is no written exam; the grade is based on the two assignments grades, the grade for the in-class presentation and attendance/participation.

Literatuur

scientific papers provided in the course

Vereiste voorkennis

Hadoop environments consist of Linux machines, so some basic ability in working with these comes in handy. Also, you must have some programming skills in C,C++ or Java.

Aanbevolen voorkennis

Programming proficiency in C/C++ or Java

Doelgroep

mCS, mPDCS

Macroeconomic Policy in the EU

Vakcode	E_EC_MPEU ()
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. B.A. Brugemann
Examinator	dr. B.A. Brugemann
Lesmethode(n)	Hoorcollege
Niveau	400

Doel vak

1. Students know key institutional aspects of monetary, fiscal, and financial policy in the EU.
2. Students know the main theories and empirical evidence concerning monetary, fiscal, and financial policy.
3. Students are able to integrate theoretical and empirical insights as well as institutional knowledge when assessing macroeconomic policies.

4. Students are able to independently identify any gaps in the knowledge they need to comprehensively assess a macroeconomic policy issue.
5. Students are able to implement a plan for comprehensively assessing a macroeconomic policy issue, working independently and in a team, and present their findings to policy makers.

Inhoud vak

The Eurozone Crisis is not over. Recovery is slow and average unemployment in the Euro area is still above 10%. Despite ongoing reforms, the financial sector remains fragile. Moreover, many countries face high deficits and large debt-to-GDP ratios. The crisis has exposed weaknesses in the construction of the Economic and Monetary Union of the European Union (EMU). It has also led to unprecedented policy responses. In addition, the EU is facing the consequences of Brexit referendum.

In this course you will study Macroeconomic Policy in the EU. You will work on identifying the key macroeconomic policy issues facing the EU and the Eurozone, and on determining which issue is currently the most important. You will identify the best available academic research on this most important issue, including empirical and theoretical research in economics, and potentially relevant research in fields outside of but related to economics. Taking into account this research as well as other relevant considerations, you will formulate concrete policy recommendations for addressing this issue.

As is clear from the preceding paragraph, the content of this course is largely endogenous. It depends on what you, as a group, decide is the macroeconomic policy issue that is currently most important for the EU and the Eurozone. It also depends on what you, as a group, identify as the best available academic research on this issue. The teachers of the course will provide you with guidance in making these decisions. As experts in macroeconomics, they will also be a resource that helps you with understanding challenging research papers in economics.

Onderwijsvorm

As discussed in the content section, the content of this course is not pre-determined by the teachers. Rather, it is determined by what you decide as a group. In the beginning of the course, the teachers will primarily moderate and guide the process of identifying the most important policy issue currently facing the EU and the Eurozone, and in finding the best available academic research on this issue. Thus there will be no traditional lecturing at the beginning of the course. In your class meetings, you will decide that certain tasks need to be carried out before the next class meeting. For example, it may be necessary to prepare short presentations of the arguments supporting the case that particular policy issues are the most important. You will decide on these tasks together with the teachers. These tasks then become homework assignments that may be graded. They can be individual or group assignments.

After the class meetings of the first two weeks, you will have identified a first set of high-quality research papers that are relevant for the most important policy issue you have identified. You will then do a first reading of these papers. Given your current level of training in economics, there are likely to be important aspects of the analysis that you would like to understand better before using the paper as a basis for policy advice. You will identify these aspects of the

analysis, formulating specific questions describing what you would like to understand better. At this stage, you can request that the teachers give lectures on this research that address your questions.

In the process of identifying high-quality academic research, the teachers will guide you to also include relevant empirical research papers. They will then design one (or potentially two, depending on the level of complexity of the papers) empirical assignments that ask you to replicate parts of the empirical analysis. This is intended to promote your understanding of the empirical research and give you an opportunity to apply elements of what you have learned in the course on advanced methods.

Throughout, we will adopt the perspective of a think tank that is focused on macroeconomic policy in Europe. In the first week (and possibly the beginning of the second week), we adopt the perspective of the board of directors of this think tank. Here the objective will be to set priorities for the work of the think tank, identifying the most important policy issue that the think tank should focus its resources on. We will then switch gears, adopting the perspective of policy consultants working for this think tank. As policy consultants, we need to identify high-quality academic research and obtain a sufficient level of understanding of this research to confidently provide policy recommendations. Your final task (in the last two weeks) will be to write a policy brief that is providing a concrete policy recommendation, supported by the academic research we have considered, and taking into account other considerations you find important. The policy brief will be a group assignment, and accounts for a substantial part of the final grade.

Toetsvorm

Open Exam, Case/paper Group (Policy Brief)

Literatuur

There is no textbook. The readings consist primarily of academic research articles and policy papers.

Vereiste voorkennis

Bachelor economics or another bachelor plus premaster.

Aanbevolen voorkennis

Good knowledge of macro- and microeconomics as well as methods of empirical analysis.

Marketing Data Case

Vakcode	E_EORM_MDC ()
Periode	Periode 3
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	prof. dr. S.J. Koopman
Examinator	prof. dr. S.J. Koopman
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	400

Doel vak

To advance in the empirical practice of Marketing Data Science using statistical and econometric methods with an emphasis on statistical learning and prediction.

Inhoud vak

A real-life quantitative marketing project is considered and carried out. All aspects of marketing data research will be considered. The main steps of a marketing data science project will be taken, including the formulation of marketing research questions, the data cycle process, the analysis, modelling, and forecasting of data, presentation of the empirical results, the evaluation and the formulation of answers to the questions. Particular attention is given to the data cycle process: retrieve data, clean data, aggregate data, visualisation, and evaluation. Besides the practices of marketing data science, also the interpretation of empirical results, how to value their relevance and how to translate these into practical solutions will be discussed.

Onderwijsvorm

Each week consist of two-hour lectures and four-hour working groups. All work will be carried in groups of 2-3 students. A report must be delivered.

Toetsvorm

Group assessment of the report.

Literatuur

A collection of papers and chapters from books.

Doelgroep

MSc Econometrics students, the Marketing Data Case is compulsory for the specialisation Marketing Data Science.

Overige informatie

The Marketing Data Case is for the MSc Econometrics and compulsory for the specialisation "Marketing Data Science"

Marketing Strategy

Vakcode	E_MKT_MSTRAT (60412060)
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. P. Ozturan
Examinator	dr. P. Ozturan
Docent(en)	dr. P. Ozturan
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	400

Doel vak

Marketing strategy focuses on how firms can identify opportunities for creating customer value and deliver this value effectively.

Understanding the drivers of superior customer need fulfillment and establishing sustainable competitive advantage in the marketplace are key issues in this process. The objective of this course is to give you insights into key topics within the field of marketing strategy, how effective strategic marketing decisions can be made and which effects they have for customers, firms, and other stakeholders.

By following this course, you will:

- Demonstrate a critical understanding of the concepts and theories used, as well as key topics covered, in the top academic journals on marketing strategy.
- Effectively apply marketing strategy theory both to understand real-life marketing strategy problems and to design solutions to those problems.
- Communicate and collaborate effectively with an international cohort of classmates to design and produce case solutions or other presentations, provided in English, to both academic and professional audiences.

Inhoud vak

We will go beyond marketing tactics for a single product or service offering. Our focus will be on the strategic-level management of a firm's marketing resources and capabilities in order to build a sustainable competitive advantage. We will explore how to create value equity, brand equity and relationship equity to generate the greatest financial return for the firm. As such, topics such as market orientation, innovation, branding, customer loyalty, and customer lifetime value will be discussed extensively. We will do so based on state-of-the-art knowledge on these areas as well as a large business cases problem, and examples from business practice.

Onderwijsvorm

Lectures, workgroups

Toetsvorm

Written examination: 70%;

Assignment: 30%;

each to be completed with a minimum score of 5.0

Literatuur

Academic articles

Mathematical Biology

Vakcode	X_400504 ()
Periode	Periode 1+2
Credits	8.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Coördinator	dr. R. Planque
Examinator	dr. R. Planque
Docent(en)	dr. R. Planque
Lesmethode(n)	Hoorcollege
Niveau	400

Doel vak

After completion of the course, the student is able to

1. read and understand the research literature about (deterministic) models of biological phenomena
2. participate actively in projects that aim to model biological phenomena
3. derive mathematical equations from bookkeeping considerations
4. interpret mathematical results in the biological context that motivated the analysis; more precisely the point is that mathematical statements are translated into a relation between phenomena and the underlying mechanisms
5. use formal arguments (based on differences in the time- or spatial scale of various mechanisms) to simplify equations in a meaningful way
6. apply various analytical techniques to study phase portraits of planar ODEs representing ecological systems
7. derive and analyse linear diffusion equations and their solutions
8. apply bifurcation theory to study systems of nonlinear reaction-diffusion equations

Inhoud vak

1. Exploiting time scale differences : the quasi-steady-state-approximation
 - Michaelis Menten enzyme kinetics
 - Holling's functional response
 - excitable media: Fitzhugh-Nagumo

2. Phase plane analysis

Essentially an assignment : students work in couples through a series of exercises about prey-predator interaction. In a lecture we explain some key notions, such as linearized stability and Poincare-Bendixon.

3. Diffusion (mainly linear theory; partly in the form of assignments)

- various derivations of the diffusion equation
- the fundamental solution, superposition
- transport by diffusion: what distance in how much time?
- separation of variables, eigenfunctions/modes
- the asymptotic speed of propagation

4. Reaction-Diffusion (nonlinearity)

- travelling waves
- scalar equations do NOT generate stable patterns (in convex domains)
- Turing instability
- bifurcation theory
- transition layers (excitable systems)?

5. Age/size structured populations, cell cycle models

6. Chemotaxis

7. Branching processes, links to epidemiology

8. Adaptive Dynamics

9. Master equations and additional topics, as time permits.

Onderwijsvorm

-- lectures (notes are in preparation and should be ready by the time the course is given) which explain and illustrate the methods while referring to other sources for detailed accounts of the underlying mathematical theory
-- assignments which provide training in modelling and in the use of the methods. Students work on assignments, using both pen and paper and computer tools (MatLab).

Toetsvorm

Grades are to a large extent based on the handed in written texts and on oral presentations. Grading is based on 5 homework assignments and the final project. The average grade of the 5 home assignments will contribute 40% to the final grade. The written work on the paper will contribute another 40% and the remaining 20% will come from the oral presentation.

Literatuur

Lecture notes will be provided by the instructors. See also the course website for the latest details:

<http://www.few.vu.nl/~rplanque/Onderwijs/MathBio/>

Aanbevolen voorkennis

Basic knowledge about linear algebra, analysis, ODE, stochastic processes. (The key point, however, is the attitude: students should be willing to quickly fill in gaps in background knowledge.)

Doelgroep

MSc Mathematics

Intekenprocedure

You have to register your participation in each Mastermath course via <https://elo.mastermath.nl/login>.

Registration is mandatory and absolutely necessary for transferring your grades from Mastermath to the administration of your university.

Overige informatie

This course is part of the joint national master programme in mathematics. For schedules, course locations and course descriptions see <https://elo.mastermath.nl>. Registration required via <https://elo.mastermath.nl/login>.

Measure Theoretical Probability

Vakcode	X_400244 (400244)
Periode	Periode 1+2
Credits	8.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Lesmethode(n)	Hoorcollege
Niveau	400

Inhoud vak

This course is part of the joint national master programme in mathematics.
For schedules, course locations and course descriptions see

<http://www.mastermath.nl>.

Registration required via <http://www.mastermath.nl>.

Doelgroep

mMath, mSFM

Intekenprocedure

You have to register your participation in each Mastermath course via <http://www.mastermath.nl/registration/>

Registration is mandatory and absolutely necessary for transferring your grades from Mastermath to the administration of your university.

Microeconomics and Methods

Vakcode	E_EC_MM ()
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. E.I. Motchenkova
Examinator	dr. E.I. Motchenkova
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	400

Doel vak

This course offers the main theoretical concepts in consumer choice, firm behavior and analysis of imperfectly competitive markets. It also makes students familiar with various microeconomic methods. These methods are often used in economic research, both to test predictions from economic theory and to assess the effectiveness of economic policy.

Specific learning outcomes upon completion of this curricular item are

- being able to understand the relevance of economics for modern societies
- acquiring knowledge in the decisions to be taken by individual consumers and producers to maximize utility and profit
- gaining insight into the determination of the equilibrium outcomes in different market structures
- analyzing firm behavior in monopolistic and oligopolistic markets
- being able to evaluate public economic policy including competition law aimed at correcting market failures in imperfectly competitive markets
- understanding the impact of various forms of asymmetric information on economic transactions
- learning about the tools that governments might use for addressing market failures
- being familiar with the basic econometric techniques
- being able to critically evaluate empirical research in economic applications
- being able to make decisions about the appropriate statistical model
- being capable of performing empirical research using the software package STATA

Inhoud vak

This course focuses on fundamental microeconomic theory and methods for applied economic research.

The course discusses the main theoretical concepts and policy applications in microeconomics. Applying economic tools of analysis helps students to gain an understanding of how decisions are being made at the micro level by firms, consumers and government. Microeconomics also helps evaluating observed outcomes and the consequences of policy choices. In particular, we cover consumer and producer behavior, game theory, market structures (perfect competition, monopoly, oligopoly) and market imperfections. The role of policy will be discussed throughout.

Correct validation of economic theory can only be achieved with empirical research and public policies need to be evaluated in order to understand their effectiveness. Therefore, this course also provides an overview of econometric research methods in economics and students learn how to apply these methods to real-world data. Attention is devoted both to the theory underlying the different techniques and the practical application. An important aspect of the course is that students learn how to interpret estimation results.

Onderwijsvorm

Lectures and seminars

Toetsvorm

Written final exam (80%) and written group assignments (20%)

Literatuur

Onderstal, A.M., 2014. Economics of organizations and markets. Pearson Benelux (ISBN 9789043030410)

Stock, JH. and MW. Watson. 2015. Introduction to Econometrics. Updated 3rd global edition. Pearson Education (ISBN 10: 1-292-07131-1)

Vereiste voorkennis

Students are strongly advised to follow Math Refresher and Introductory STATA course in the last week of August.

Microeconomics for Development

Vakcode	E_EC_MED (60422090)
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	prof. dr. M.P. Pradhan
Examinator	prof. dr. M.P. Pradhan
Docent(en)	prof. dr. C.T.M. Elbers, prof. dr. R.H. Oostendorp, prof. dr. M.P. Pradhan, prof. dr. P.F. Lanjouw
Lesmethode(n)	Hoorcollege
Niveau	400

Doel vak

In this course we apply microeconomics to topics in development economics. The aim is not to be complete, but to select a number of well-studied topics, stressing their empirical foundation as well as the

role of policy. Students should be able to:

- demonstrate knowledge and understanding of microeconomic principles underlying economic development

- have a good understanding of empirical strategies to identify microeconomic foundations of development

- demonstrate an ability to derive policy implications from microeconomic development analysis

Inhoud vak

The concepts and measurement of poverty and inequality will be extensively discussed as well as methods for evaluating the impact of policy. The impact of market imperfections, particularly for handling risk, on firm and household behaviour will be covered, including a discussion of consumption smoothing, risk-sharing, diversification and microfinance strategies. The principal-agent relationship between donors and recipients of foreign aid will be illustrated with a discussion of elite capture and the measurement and costs of corruption. During the course, extensive use will be made of empirical evidence.

Onderwijsvorm

lecture

Toetsvorm

written examination, assignments

Literatuur

Selected articles to be announced.

Aanbevolen voorkennis

- Advanced Microeconomics (code E_EC_AMIEC)

- Advanced Methods for Applied Economic Research (code E_EC_AMAER)

Microeconomics for Urban, Transport and Environmental Economics

Vakcode	E_STR_MEUTE ()
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. A.J.H. Pels
Examinator	dr. A.J.H. Pels
Docent(en)	dr. A.J.H. Pels, prof. dr. E.T. Verhoef, prof. dr. J.L. Moraga Gonzalez, dr. C.L. Behrens
Lesmethode(n)	Hoorcollege, Werkcollege
Niveau	400

Doel vak

The aim of this course is to equip the student with the microeconomic toolbox that is required to be able to structure and analyze economic and policy questions in the fields of urban, regional, transport and environmental economics from the economic viewpoint. These tools are

indispensable to successfully follow the remainder of the program.

By the end of the course the student will:

- be familiar with the main microeconomics principles, and know how to analyze microeconomic problems using mathematical tools
- be familiar with the theory of spatial competition
- be familiar with the theory of cost functions for network sectors
- know the main concepts of consumer choice and firm behavior, and their relevance for economic and welfare analysis
- be able to evaluate economic policy with regard to efficiency, and know of the limitations to economic policy
- know possibilities and limitations in applied policy fields, such as welfare analysis, regulation of industry, cost benefit analysis, and policy coordination and competition

Inhoud vak

The first three weeks the lectures coincide with the lectures of Advanced Microeconomics, code E_EC_AMIEC. We refer to the description of that course for more information.

The last three weeks differ between the two courses. This course (Microeconomics for Urban Transport and Environmental Economics) will deal with topics that are of special interest in urban, regional, environmental and transport economics and policy.

The following topics are addressed:

- Applied welfare analysis
- Cost Benefit Analysis
- Cost functions: economies of scale, scope, density and networks
- Market structures in network sectors
- Product and price differentiation (including spatial competition)
- Market failures and public policy
- Government failures: Policy coordination and competition

Onderwijsvorm

There will be two lectures each week in which the emphasis is on the teacher's explanation of the essential material. Active participation of the students is, however, expected in all lectures: class discussions and making small exercises to better comprehend the material will be part of all lectures. The tutorials will be devoted to discussion of problem sets and exercises, where active participation of students is again required.

Toetsvorm

take- home interim examination and written interim examination

Vereiste voorkennis

Participants are expected to have a basic understanding of microeconomic theory (bachelor level, e. g. Varian's Intermediate Microeconomics).

Aanbevolen voorkennis

Students wishing to refresh their math skills are encouraged to attend the course "Math Refresher".

For more information about Math Refresher, see Canvas.

Network Analysis

Vakcode	E_BA_NA (61422100)
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. T. de Graaff
Examinator	dr. T. de Graaff
Docent(en)	dr. T. de Graaff
Lesmethode(n)	Hoorcollege, Werkcollege
Niveau	400

Doel vak

Firms and consumers typically operate in various types of networks. These can be both physical networks (such as transport and communication networks) and non-physical networks (such as information networks). The main objective of this course is to give you a basic understanding of economic network theory, which enables you to identify the relevance and consequences of networks for firms as well as for consumers.

After following this course, you:

- have a basic understanding of the fundamental economic principles underlying applied network theory;
- understand the role and behavior of various agents (government, consumers and firms) within network sectors;
- are able to understand the economic impacts that various forms of networks (i.e., transport networks, consumer networks, information networks, clustering of firms) have on the nature, size and behavior of firms;
- are able to determine optimal firm and consumer behavior conditional on the nature of the network;
- and have used applied network theory with (stylized) cases studies, in order to determine optimal firm or consumer behavior in combination with the nature of the network.

Inhoud vak

The economic principles behind networks and their consequences for both firms and consumers form the backbone of this course. The lectures specifically deal with the following topics:

- basic applied network theory;
- government interventions in network sectors;
- clustering and spill-over effects between firms;
- network sectors (e.g. telecom, transportation, energy);
- information and communication goods;
- switching costs and lock-in effects;
- network externalities.

In the working groups we will make use of the software package R, as it is capable of optimizing, analysing and plotting network structures (amongst many other things). A basic understanding of R is recommended but not necessary, as tutorials will be provided and working groups typically constitute of in-class hands-on assignments as well.

Onderwijsvorm

Lectures and working groups concentrate on the application of network theory on stylized case studies.

Toetsvorm

Written interim examination (75%) and assignments (25%)

Literatuur

- Syllabus
- Selected papers

Vereiste voorkennis

Transport Economics and Management (or knowledge of microeconomics at a bachelor level)

Operations Performance Benchmarking

Vakcode	E_BA_OPB ()
Periode	Periode 5
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. G. Maroti
Examinator	dr. G. Maroti
Docent(en)	dr. G. Maroti
Lesmethode(n)	Hoorcollege
Niveau	400

Doel vak

With this course we aim to furnish students with knowledge on assessing and benchmarking operations performance in practice. Upon finishing this course students are able to:

- Identify and understand state-of-the-art methods for benchmarking and evaluating operations performance.
- Decide on the use of appropriate static and/or dynamic performance assessment methods dependent on situational criteria.
- Apply theory on performance benchmarking and assessment on a real-life situation and draw managerial conclusions.
- Understand the role and importance of behavioral factors in managing performance.

Inhoud vak

Performance assessment and benchmarking is a topic that has received considerable attention in both practice and academia across a wide variety of disciplines. This course is aimed at students who wish to broaden their understanding of methods related to evaluating and benchmarking performance, with a specific emphasis on Operations Management. The course will focus on academic methods relevant to benchmarking of operations performance in business practice. This includes the wider area of disciplines necessary to organize the primary processes within and between companies. As such, the course is of value to students an interest in topics including but not limited to quality management, logistics, behavioral aspects of operations management, resources management and operations strategy. The course is therefore also accessible to students without prior knowledge of TSCM.

Onderwijsvorm

Lectures and tutorials.

Toetsvorm

A combination of group assignments and a written exam

Literatuur

Extensive handouts and additional course materials to be distributed via Canvas; supporting chapters from a handbook (to be determined).

Overige informatie

Students who are not enrolled in the full time or online MSc BA programme with specialization in TSCM are kindly requested to contact the course coordinator prior to enrollment.

Operations Research Case

Vakcode	E_EORM_ORC ()
Periode	Periode 3
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	prof. dr. G.T. Timmer
Examinator	prof. dr. G.T. Timmer
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	400

Doel vak

Practicing methods of operational research using real- life case studies.

Inhoud vak

Students learn solving real-life problems allocating costs or benefits of joint projects. The training concerns the formulation of the problem in a manageable quantitative model, to evaluate the theoretical properties of available solutions and their computational complexity, to select appropriate and computational tractable solutions, to develop a software tool for solving the problem, to carry out the required calculations and to report the results in an essay. Participants work on a real-life case in small groups of 2 or 3 students.

Standard lectures will guide the student through the computational aspects of statistical estimation, simulation and optimisation methods. To gain further insights in the practical detail, computer programs for the implementation of some computer-intensive methods will be developed.

Onderwijsvorm

Lecture and Working Group

Toetsvorm

Essay

Optimization under Uncertainty

Vakcode	E_EORM_OPTU ()
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Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	prof. dr. B.F. Heidergott
Examinator	prof. dr. B.F. Heidergott
Lesmethode(n)	Hoorcollege, Werkcollege
Niveau	400

Doel vak

Students learn to carry out a simulation-based optimization and report on their findings.

Inhoud vak

This is course on advanced simulation techniques. The methodological part of the course focusses on the theory of recursive learning and optimization algorithms known as stochastic approximation.

Onderwijsvorm

Combined lectures and tutorials

Toetsvorm

Final exam – Individual assessment

Individual assignment - Individual assessment

Literatuur

Handout of monograph “Gradient based Stochastic Optimization”, F. Vázquez-Abad and B. Heidergott, 2017.

Vereiste voorkennis

Analysis, basic probability theory, stochastic processes, basic programming

Doelgroep

The course is suitable to be taken in an exchange program

Overige informatie

In presence of uncertainty, gradients typically fail to be available in analytical form and optimization has to resort to simulation-based algorithms. Unbiased gradient estimators are a main ingredient in simulation-based optimization methods. The focus of this course is on unbiased gradient estimators and their application in stochastic simulation-based optimization and learning algorithms. Next to classical stochastic gradient methods, this course also covers a range of related topics such as model and parameter insecurity, robust optimization and sample average approximation. Applications will stem from a wide range of domains from Financial Engineering over Inventory Management to Waiting Time Minimization.

OR Research Seminar

Vakcode	E_EORM_ORRS ()
Periode	Ac. Jaar (september)
Credits	6.0

Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	prof. dr. B.F. Heidergott
Niveau	400

Portfolio Theory

Vakcode	X_400535 (400535)
Periode	Periode 1+2
Credits	6.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Niveau	500

Inhoud vak

<http://studiegids.uva.nl/xmlpages/page/2017-2018/zoek-vak/vak/34857>

Doelgroep

mSFM, mMath

Overige informatie

This course is offered at the UvA. For more information contact: FNWI Education Service Centre, Science Park 904, servicedesk-esc-science@uva.nl, +31 (0)20 525 7100.

Enrolment via <https://m.sis.uva.nl/vakaanmelden> is required.

Public Economics and Policy

Vakcode	E_EC_PEP ()
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	prof. dr. E.T. Verhoef
Examinator	prof. dr. E.T. Verhoef
Docent(en)	prof. dr. H.L.F. de Groot
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	400

Doel vak

The aim of the course is to prepare the conceptual groundwork for policy analyses and expositions later in the Public Policy program. Students will learn the central concepts and theories from the field of Public Economics and will learn how to apply these in policy analysis and advice. The course will seek to strike an optimal balance between on the one hand mastering the analytical and technical skills required to be able to understand and apply micro and welfare economic theory for policy analysis and advice, and, on the other, the ability to apply these skills in analyzing and assessing concrete contemporary policy issues. This aim is strived for by the course's set-up, in which

lectures will be used for in-depth discussion and explanation of theory, and tutorials are designed to learn to apply this to concrete policies.

Inhoud vak

The course will address topics such as taxation of households and firms, tax incidence, public debt, distributional effects of taxation and public expenditure, theories of the state, efficiency and welfare, optimal taxation and Ramsey pricing, market failure, externalities, and non-local and local public goods, and local public goods. The twelve lectures will follow closely the material covered in the textbook, and will seek to not only make the technical treatment and theoretical concepts accessible, but also to draw the links with contemporary policy challenges.

Onderwijsvorm

The course consists of twelve lectures and six tutorial sessions, and ends with a written exam. The exact schedule will be announced shortly via Canvas.

Toetsvorm

The grading will be based on

- Tutorial scores (25%)
- Written exam (75%)

Literatuur

Atkinson, A.B. and J.E. Stiglitz (2015). Lectures in Public Economics, 2nd edition. Princeton University Press, Princeton and Oxford.

Vereiste voorkennis

Material covered in the first three weeks of Period 1, in the course Microeconomics and Methods.

Aanbevolen voorkennis

Intermediate microeconomics, for example at the level of Varian's text on Intermediate Economics (Hal R. Varian: Intermediate Microeconomics: A modern Approach. 6th edition or later. New York: W.W. Norton), and, where less formal training has been acquired, a working knowledge of calculus.

Doelgroep

Students in the Public Policy program.

Quantitative Financial Risk Management

Vakcode	E_FIN_QFRM (60422110)
Periode	Periode 4
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. S.A. Borovkova
Examinator	dr. S.A. Borovkova
Docent(en)	dr. S.A. Borovkova, dr. A. van Haastrecht
Lesmethode(n)	Hoorcollege, Werkcollege
Niveau	400

Doel vak

Deep understanding and ability to implement modern quantitative risk measurement and management techniques, in the areas of market, operational and liquidity risk.

Inhoud vak

The lecturers are Dr. S. Borovkova, an expert on derivatives and quantitative risk management. We will focus on financial risks facing corporations and financial institutions, such as market, liquidity and operational risks (note that credit risk is handled in a separate course Credit, Complexity and Systemic Risk). The course will encompass both theoretical and applied aspects of risk management. This course will give you a solid fundamental for measurement and management of financial risks, knowledge of newest quantitative methods and the ability to apply your knowledge in corporate environment. The lectures are complemented by practical assignments designed to maximally match actual risk management applications in banking environment. For this course you need a strong quantitative focus and affiliation with statistics and probability as well as (some) affiliation with finance, or an intention to learn necessary concepts and vocabulary.

Onderwijsvorm

Lectures (4 hours per week) and practice sessions (2 hours a week)

Toetsvorm

2 practical assignments and written exam

Literatuur

Embrechts, Frey and McNeal "Quantitative Risk Management"

Aanbevolen voorkennis

Introductory statistics and probability, implementation skills (Matlab, R, Python or any other computer package)

Regional and Urban Economics

Vakcode	E_STR_RUE (60442140)
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	prof. dr. H.L.F. de Groot
Examinator	prof. dr. H.L.F. de Groot
Docent(en)	prof. dr. H.L.F. de Groot, prof. dr. J. Rouwendal
Lesmethode(n)	Hoorcollege
Niveau	400

Doel vak

The aim of this course is to provide students with an advanced introduction in the field of regional and urban economics. Students learn the theoretical and empirical methods applied in the field, and

get a good understanding of the fundamental questions that are addressed in the field and the current state of affairs in the literature. They are trained to critically read and properly understand contributions in the leading journals in the field. At a more specific level, after having taken this course, students have a good understanding of the New Economic Geography Model, are familiar with the theoretical foundations of agglomeration economies and their empirical relevance, understand the theoretical foundations of and can apply spatial interaction modelling, are familiar with regional growth theories, understand the function of regional labour and housing markets, and have a good understanding of the determinants of urban structures.

Inhoud vak

This course covers advanced topics in theoretical and empirical research on regional and urban economics. Key issues are location and potential reasons for clustering of economic activity, spatial interaction (migration, trade, FDI and commuting), patterns of regional economic convergence and divergence, the role of geographic factors in explaining regional economic growth performance, the impact of (spatial) externalities of knowledge production, urban size and growth, urban land use, housing markets and the functioning of regional labour markets. The topics are addressed from a theoretical as well as an empirical perspective.

Onderwijsvorm

Lectures and Tutorials

Toetsvorm

Written exam (70 percent; individual assessment) and Assignments (30 percent; group assessment). A minimum grade of 5.0 for the exam is required.

Literatuur

- Brakman, S., J.H. Garretsen and C. van Marrewijk (2009): *The New Introduction to Geographical Economics*, Cambridge University Press, Cambridge.
- Ciccone, A. and R.E. Hall (1996): 'Productivity and the Density of Economic Activity', *American Economic Review*, 86, pp. 54-70.
- Gallup, J.L., J.D. Sachs and A.D. Mellinger (1999): 'Geography and Economic Development', *International Regional Science Review*, 22, pp. 179-232.
- Glaeser, E.L. and M.E. Kahn (2003): 'Sprawl and Urban Growth', in: J.V. Henderson and J.-F. Thisse (eds), *Handbook of Urban and Regional Economics*, Volume 4, Chapter 56, Elsevier, Amsterdam.
- Glaeser, E.L., H.D. Kallal, J.A. Scheinkman and A. Shleifer (1992): 'Growth in Cities', *Journal of Political Economy*, 100, pp. 1126-1151.
- Krugman, P. (1991): 'History and Industry Location: The Case of the US Manufacturing Belt', *American Economic Review*, 81, pp. 80-83.

Research Project Economics

Vakcode	E_EC_RPEC (60432020)
Periode	Periode 3
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics

Coördinator	dr. S. Hochguertel
Examinator	dr. S. Hochguertel
Lesmethode(n)	Werkgroep
Niveau	400

Doel vak

During this period, the student writes and presents an academic paper based on a literature review, under supervision from a School member.

The goal is to strengthen some essential practical skills that characterize a good economist, namely the ability to master a certain field of literature and to identify the relative contributions of different articles to this field, as well as to identify remaining blind spots, and the ability to present this knowledge in a structured way, both as a written report and in the form of an oral presentation.

Specific learning outcomes upon completion of this curricular item:

- Students are able to identify relevant economic issues, to formulate appropriate research questions, and to proceed to a plan for implementation to answer their question
- Students have developed a feel for what makes a good and useful model and in what context to use it. They have acquired a critical attitude towards scientific literature.
- Students have developed a critical attitude to relevance and shortcomings of empirical data compared to theoretical requirements, and have become aware of limitations in insights that can be gained from theoretical reasoning alone when addressing real- life issues
- Students are able to work independently, and are able to present their findings to both expert and non-expert academic audiences

Inhoud vak

During this research project, students are asked to review a coherent set of around 10 scientific papers, of which around four core contributions. Core contributions are preferably (recently) published in leading economics journals and of high technical or substantive content.

The process requires to reflect on those contributions, to put them into perspective, and to write a critical evaluation. The review presents the essence of the papers studied, discusses the relatively strong and weak aspects of the different papers, and where relevant compares and confronts the different insights from different approaches, identifying issues for possible further analysis. The project closes with a presentation to fellow students and School.

Domain: any area of economics, preferably where sufficient School expertise for supervision is available.

Onderwijsvorm

Individual supervision by School member.

Toetsvorm

Paper and presentation in public (single grade); subcriteria apply.

Literatuur

n.a.

Vereiste voorkennis

None.

Aanbevolen voorkennis

Advanced Microeconomics; Advanced Methods for Applied Economic Research; Advanced Macroeconomics

Doelgroep

Program participants MSc Economics

Stochastic Integration

Vakcode	X_400470 (400470)
Periode	Periode 4+5
Credits	8.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Niveau	400

Inhoud vak

<http://studiegids.uva.nl/xmlpages/page/2017-2018/zoek-vak/vak/31653>

Doelgroep

mMath, mSFM

Overige informatie

This course is offered at the UvA. For more information contact: FNWI Education Service Centre, Science Park 904, servicedesk-esc-science@uva.nl, +31 (0)20 525 7100.

Enrolment via <https://m.sis.uva.nl/vakaanmelden> is required.

Stochastic Proces for Finance

Vakcode	E_FIN_SPF ()
Periode	Periode 1+2
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. S.A. Borovkova
Examinator	dr. S.A. Borovkova
Lesmethode(n)	Hoorcollege, Werkcollege
Niveau	400

Doel vak

The goal of this course is to provide a deep understanding of the theory of stochastic processes and change of measure, for derivatives valuation, simulation and other quantitative finance applications. Another goal is to develop practical (implementation) skills to apply the knowledge in a working environment.

Inhoud vak

This course is an introduction in stochastic processes and their application in finance. The purpose is to introduce fundamental concepts underlying arbitrage theory and martingale approach with the emphasis on practical applications in derivative pricing. The course starts with such notions as stochastic process, the flow of information, filtration, martingale, self-financing portfolio, arbitrage, replication/hedging, complete markets, Brownian motion, Itô calculus, Feynman-Kac theorem, change of measure and Girsanov theorem. These concepts will be used to study European and American options, Forward contracts, Exotic options, zero coupon and swap pricing, and will be extended to interest rate models to price interest rate derivatives. The lecturers are Prof. Artem Tsvetkov, head of quant team of ING, and Dr Svetlana Borovkova, an expert on derivatives and quantitative risk management. Two guest lecturers from finance industry will also participate in the course.

Onderwijsvorm

Lectures (2 hours per week) and practical sessions (2 hours a week)

Toetsvorm

Written midterm test, written exam and three computer assignments

Literatuur

Main: Björk, Arbitrage theory in continuous time [1].
 Additional: S. Shreve, Stochastic calculus for finance [2, 3]
 Scientific articles: Dupire [4], Heston [5], SABR [6],
 Longstaff-Schwartz [7].
 Software: Matlab is used for computer practical and assignments.

Vereiste voorkennis

Introductory probability theory, Analysis

Doelgroep

Quantitative Risk management MSc honours students, Finance and Stochastics MSc students, Business Analytics MSc students interested in quant finance

Stochastic Processes

Vakcode	X_400339 (400339)
Periode	Periode 4+5
Credits	8.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Coördinator	prof. dr. B.W. Rink
Examinator	prof. dr. B.W. Rink
Lesmethode(n)	Hoorcollege
Niveau	400

Inhoud vak

This course is part of the joint national master programme in Mathematics.

For schedules, course locations and course descriptions see <https://elo.mastermath.nl/>

Doelgroep

mMath

Intekenprocedure

You have to register your participation in each Mastermath course via <https://elo.mastermath.nl/login/>

Registration is mandatory and absolutely necessary for transferring your grades from Mastermath to the administration of your university.

Stochastic Processes for Finance

Vakcode	X_400352 (400352)
Periode	Periode 1+2
Credits	6.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Coördinator	dr. E.N. Belitser
Examinator	dr. E.N. Belitser
Docent(en)	prof. dr. J. van den Berg
Lesmethode(n)	Hoorcollege
Niveau	400

Doel vak

Learn basics of stochastic processes in continuous time, including the concepts of martingales and stochastic integration; apply these concepts to price options on stocks and interest rates by the no-arbitrage principle.

Inhoud vak

Financial institutions trade in risk, and it is therefore essential to measure and control such risks. Financial instruments such as options, swaps, forwards, etc. play an important role in risk management, and to handle them one needs to be able to price them. This course gives an introduction to the mathematical tools and theory behind risk management.

A "stochastic process" is a collection of random variables, indexed by a set T . In financial applications the elements of T model time, and T is the set of natural numbers (discrete time), or an interval in the positive real line (continuous time). "Martingales" are processes whose increments over an interval in the future have zero expectation given knowledge of the past history of the process. They play an important role in financial calculus, because the price of an option (on a stock or an interest rate) can be expressed as an expectation under a so-called martingale measure. In this course we develop this theory in discrete and continuous time. Most models for financial processes in continuous time are based on a special Gaussian process, called Brownian motion. We discuss some properties of this process and introduce "stochastic integrals" with Brownian motion as the integrator. Financial

processes can next be modeled as solutions to "stochastic differential equations". After developing these mathematical tools we turn to finance by applying the concepts and results to the pricing of derivative instruments. Foremost, we develop the theory of no-arbitrage pricing of derivatives, which are basic tools for risk management.

Onderwijsvorm

Lectures and discussion of exercises

Toetsvorm

Assignments and written examination.

Literatuur

Lecture notes

Additional literature:

Shreve, "Stochastic Calculus for Finance I: The Binomial Asset Pricing Model", Springer;

Shreve, "Stochastic Calculus for Finance II: Continuous-time models", Springer.

Vereiste voorkennis

Probability (X_400622) and Analysis 1 (X_400005), or their equivalents.

Aanbevolen voorkennis

Measure Theory.

Doelgroep

mBA, mBA-D, mMath, mSFM, master Econometrics.

Overige informatie

A significant part of the course is used to introduce mathematical subjects and techniques like Brownian motion, stochastic integration and Ito calculus. In view of this, the course is NOT meant for students who already followed the master course "Stochastic Integration" or "Stochastic differential equations". On the other hand, after completing this course, students may be motivated to follow other courses (like the two mentioned above) where stochastic calculus is treated in a deeper and more rigorous way.

Supply Chain Execution

Vakcode	E_BA_SUCE ()
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. J. de Vries
Examinator	dr. J. de Vries
Docent(en)	dr. J. de Vries
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	400

Doel vak

Supply Chain Execution focuses on different aspects of warehouse operation and design. The objectives of this course are:

- o To understand the material flow in a warehouse,
- o To realize the warehouse equipments, the layout of a warehouse, order picking, automation, and
- o To learn how to measure the performance of a warehouse.

At the end of this course, the students should be able to critically evaluate the warehouse issues, support the identified issues by data analysis, propose improvement projects (design and operational) and present and defend their work.

Inhoud vak

The content of this course should:

- make you conversant in the language of warehousing and material handling,
- enhance your critical thinking, in the areas of warehousing and supply chain management,
- provide you with both quantitative and qualitative tools to identify, analyze and manage warehouse operations and logistics issues,
- build your confidence in the areas of warehousing by developing your verbal skills to voice,
- explain and support your conceptual thinking.

Toetsvorm

Written exam (Multiple choice & open questions)

Supply Chain Lab

Vakcode	E_BA_SCL ()
Periode	Periode 4
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. R. Roberti
Examinator	dr. R. Roberti
Lesmethode(n)	Hoorcollege, Werkcollege
Niveau	400

Doel vak

Designing and redesigning transport and distribution networks is a major strategic challenge for contemporary supply chain managers, involving large datasets, different stakeholders, conflicting objectives and a wide variety of side constraints. The same holds for planning transport flows and managing scarce resources effectively within these networks. Experience has shown that industry optimization projects can lead to significant cost savings, improved service and sustainability when managed appropriately.

This course therefore aims at exploring complex decision problems arising in real-life transport and distribution management at strategic, tactical and operational levels. Solution approaches and tools will be

introduced to students for better management. In that respect, the course extends the scope of the Decision Making in Supply Chains course and builds upon the key methods and skills acquired there.

Upon successfully completing this course, students should be able to:

- analyze real-life industry problems and formulate managerial recommendations
- formulate optimization models using algebraic modelling language
- apply network optimization and integer programming techniques
- solve integer and network optimization problems using dedicated software
- identify the capabilities and limitations of optimization models in distribution logistics

Inhoud vak

Transport and distribution management often consists of interrelated decisions involving network design, production planning and scheduling, product storage and warehousing, transport and distribution. This course introduces students to these specific decision problems, and also equips them with tools and methods to solve these problems.

Network optimization, integer programming techniques and heuristics are powerful tools for improving transport and distribution decision processes. As they are being used more often in the industry, the course wants to offer students key insights and sufficient training to be able to participate in development and implementation projects in their professional career. To this end, dedicated software packages are introduced for modeling and solving distribution problems. This course extends the scope of the Decision Making in Supply Chains course to more complex optimization problems arising in real-life transport and distribution planning. Solution approaches are illustrated by means of a selection of topics, e.g. transportation planning, facility location, network design, vehicle routing and scheduling, manpower planning, and rostering.

The teaching and learning are largely based on "learning by doing" with a number of cases in different industrial applications. A mixture of lectures, tutorials, assignments and case studies offers students the best possible support to master sufficient skills to tackle real-life cases in distribution logistics.

Toetsvorm

Based on an individual computer-based exam and a course group project.

Literatuur

Anderson, D.R., Sweeney, D.J., Williams, T.A. and M. Wisniewski (2014). An introduction to management science – quantitative approaches to decision making. 2nd edition. ISBN 978-1-4080-8840-1. The book is available in the VU bookshop.

In addition to the handbook, extensive handouts will be made available the evening before each lecture day. The exercises and cases for the tutorials will also be announced via Canvas.

Supply Chain Management

Vakcode	E_BA_SCM ()
Periode	Periode 1
Credits	6.0
Voertaal	Engels

Faculteit	School of Business and Economics
Coördinator	dr. E. Spiliotopoulou
Examinator	dr. E. Spiliotopoulou
Lesmethode(n)	Hoorcollege, Werkcollege
Niveau	400

Doel vak

During the Master TSCM courses, the context will be expanded to encompass multiple companies. The central theme is cooperation between shippers, customers and logistics service providers. The objective of this course is to introduce students to the topic of demand & supply chain management and to discuss relevant concepts to matching supply and demand in these chains. More specifically, upon completion of this course you will be able to:

- Analyse the strategy, structure and planning of a supply chain in a fact-based and structured manner;
- Develop recommendations for improving the strategy, structure and planning of a supply chain.

Inhoud vak

After an introduction to the concepts of SCM, we will discuss the design and implementation of SCM concepts taking into account the flow of information, money and materials across the supply chain. Amongst other issues, the following questions will be dealt with in this course:

- What is the interaction among general business strategy and logistics strategy? What is the effect of logistics trends on managing the value chain?
- How can you manage inventories to minimize costs without compromising your customer service level?
- What are the different forecasting techniques and how to choose a forecasting method?
- How can supply chains be supported by supply contracts and what is the value of information in a supply chain?
- What concepts exist to match supply and demand in value chains? How to plan inbound, internal and outbound logistics in an integrated way?
- What is the role of strategic alliances in supply chain management? (both in sourcing and distribution)

Onderwijsvorm

Hearing lectures and tutorials

In small groups, the students will work on an assignment for a specific supply chain. Separate assignment meetings will be scheduled. Additional relevant theory and literature has to be searched for by the groups.

Toetsvorm

Written exam and assignments

Literatuur

Simchi-Levi, D., Kaminsky, P., Simchi-Levi, E. (2008). Designing and Managing the Supply Chain: Concepts, Strategies and Case Studies (3rd ed). Irwin: McGraw-Hill.

Additional material (via Canvas)

Vereiste voorkennis

All non-TSCM Master students (including all exchange students) are required to contact the course coordinator before enrolling; permission from the course coordinator is obligatory prior to participating in this

course.

Aanbevolen voorkennis

The contents of Chopra & Meindl (Supply Chain Management: strategy, planning and operation)

Thesis MSc EOR - Econometrics

Vakcode	E_EORM_THSTR ()
Periode	Ac. Jaar (september)
Credits	18.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	prof. dr. S.J. Koopman
Examinator	prof. dr. S.J. Koopman
Niveau	500

Doel vak

To let the student carry out a scientific or professional study on a topic in which econometrics plays the key role. It provides the student the opportunity to show its talents and abilities in econometrics.

Inhoud vak

Writing a MSc Thesis in Econometrics

Doelgroep

MSc Econometrics students

Thesis MSc EOR - Operations Research

Vakcode	E_EORM_THSOR ()
Periode	Ac. Jaar (september)
Credits	18.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. A.A.N. Ridder
Examinator	dr. A.A.N. Ridder
Niveau	500

Doel vak

The thesis is the final stage of the MSc program in Operations Research (OR) in which the student demonstrates her/his abilities to conduct independent academic research on a specific topic in the field of OR.

The goals are (1) to practice the art of conducting independently academic research; and (2) to record the results of this work in an academic paper.

As part of goal (1) the student needs to formulate the research question, to find the appropriate literature, to develop a mathematical model of the problem, to collect data for validating and or estimating the model, to analyse the model using acquired skills and techniques, to implement and verify scientific computer programs, and finally to come

up with solutions that could be based on analytical, numerical, or empirical methods.

As part of (2) the student needs to be able to write a professional paper that describes clearly the research questions, the research design, the contribution of the work, the used methodology, and the conclusions.

Inhoud vak

The thesis research is supervised by a School member. The research starts at the beginning of the second Semester of the master program by proposing a research topic and supervisor. It might also be possible to choose a research topic that is suggested by a School member. These matters are dealt with during a meeting with the thesis coordinator. In some cases it is possible to write the thesis based on an internship. This is assessed by the coordinator and by the supervisor.

When you know your thesis topic and thesis supervisor, you immediately inform these to the thesis coordinator dr. A.A.N. Ridder (a.a.n.ridder@vu.nl) and the secretary of the department mrs Hedda Werkman (secretariaateconometrie.feweb@vu.nl). Also, after you have registered for this course, check whether you are user of the Canvas site of the thesis Operations Research. This site contains important information on the thesis procedures, and the thesis editing style.

Every month a seminar (the so-called thesis seminar) is arranged for all faculty and for all students who are engaged in producing a thesis. At the beginning of his/her thesis research, the student gives an introductory talk of about five minutes in which (s)he briefly accounts the thesis statement and problem. Students whose theses have been approved by the thesis supervisor give a final presentation lasting at most half an hour. For each thesis presentation one student acts as designated discussant. All students engaged in a thesis receive a monthly invitation to the seminars, and are expected to attend these seminars.

Since you need to give the co-reader and the opponent enough time to read your thesis, you submit the final version at least ten days before the presentation. However, for theses that will be presented after 10 August, you have to submit before 1 August! Submitting means that your thesis should be final and ready to upload to the thesis database of the university library. In case you do not meet the deadline of 1 August and you decide to continue working for submission and presentation in the next academic year, the grade will be capped at 6.0. You may apply for an exemption of the grade cap when there are good reasons for the delay. Send an email to the thesis coordinator dr. A.A.N. Ridder (a.a.n.ridder@vu.nl) accompanied by an endorsement of your supervisor.

The following aspects are part of the assessment criteria and shall receive due consideration.

- Research question: formulate clearly an original research problem (maybe with subproblems).
- Positioning in literature: review relevant studies.

- Research design: address the methodological issues, the data collection and the application of theory.

- Description and analysis of results: show understanding of the research question and present a readable derivation of the complex

analysis.

- Conclusion and discussion: succeed putting the findings in a wide context.
- Editorial quality: compile a sound academic paper, typeset in LaTeX.
- Degree of independence: show your own work and do not always wait for input of your supervisor.
- Oral presentation: present the main findings of your thesis in a structured and timely manner that is easy to follow; answer questions well and clear.

Onderwijsvorm

Individual supervision by a School member.

Toetsvorm

Written thesis and oral presentation.

Literatuur

Academic papers.

Vereiste voorkennis

At least two core courses should be passed

Doelgroep

All students in the MSc Operations Research program

Intekenprocedure

Participants should enroll in the Canvas page, and sign up via email (see above).

Time series

Vakcode	X_400571 (400571)
Periode	Periode 4+5
Credits	8.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Coördinator	prof. dr. B.W. Rink
Lesmethode(n)	Hoorcollege
Niveau	500

Inhoud vak

This course is part of the Joint National Master Programme in Mathematics.

For schedules, course locations and course descriptions see <https://elo.mastermath.nl>.

Doelgroep

mMath

Intekenprocedure

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Time Series Econometrics

Vakcode	E_EORM_TSE (64432000)
Periode	Periode 4
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	prof. dr. S.J. Koopman
Examinator	prof. dr. S.J. Koopman
Lesmethode(n)	Hoorcollege
Niveau	400

Doel vak

To gain insights in economic and financial time series modelling with a focus on theory, methods and computations.

Inhoud vak

This course focuses on theory, methodology and computational methods for a general class of time series state space models

The econometric methodology is explored in detail for a number of selected topics in the time series analysis of economic and financial data.

In particular, dynamic model properties, model formulations, likelihood evaluations, signal extraction and Monte Carlo simulation methods are studied.

Theory and methods are developed in detail: derivations are studied which all start from basic principles in statistics and econometrics.

Various computer programs need to be developed for the implementation of the methods.

Onderwijsvorm

lectures
tutorials

Toetsvorm

written exam
written assignments

Literatuur

Selection of literature:

- Brockwell, P.J. & R.A. Davis, Time Series: Theory and Methods. Second Edition, Springer-Verlag, 1991.
- Durbin, J. & S.J. Koopman, Time Series Analysis by State Space Methods. Second Edition, Oxford University Press, 2012.
- Selected papers.

Transport Economics

Vakcode	E_STR_TREC (60432050)
Periode	Periode 2
Credits	6.0

Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. A.J.H. Pels
Examinator	dr. A.J.H. Pels
Docent(en)	dr. A.J.H. Pels, dr. V.A.C. van den Berg
Lesmethode(n)	Hoorcollege, Werkcollege
Niveau	400

Doel vak

The aim of this course is to provide students with an advanced knowledge of contemporary transport economics, considering both intra-city transport (e.g. congested road traffic, urban transit) and inter-city transport (notably aviation). Students

- learn theoretical and empirical methods applied in the field of transport economics and in related fields, such as transport planning.
- get a good understanding of the fundamental policy questions that are addressed in the field, and the methods with which these are addressed.
- learn the current state of affairs in the literature.

are trained to critically read and properly understand contributions in the leading journals in the field.

Inhoud vak

This course covers advanced topics in theoretical and empirical research on urban transport economics. Key issues are value of time and reliability; cost

functions and scale economies for various modes; congestion analysis in static and dynamic formulations; network equilibrium and optimum for deterministic and stochastic network models; first-best and second-best pricing in static and dynamic networks; investment analysis under first-best and second-best pricing; industrial organization aspects of intra-city (e.g. roads and transit) and inter-city (e.g. airports and airlines) transport; public transport and maritime topics. The topics are addressed from a theoretical as well as an empirical perspective.

Toetsvorm

written interim examination: 70 percent

assignments: 30 percent (paper review tutorial 10 percent, network optimization tutorial 10 percent, methods tutorial 10 percent)

Literatuur

- Small, K.A. and E.T. Verhoef, The Economics of Urban Transportation. Routledge, 2007.

- Additional literature for more specialized topics will be announced at the start of the course.

Aanbevolen voorkennis

Microeconomics for urban, transport and environment economics or a similar course

Transport Economics and Management

Vakcode	E_BA_TEM (61422300)
Periode	Periode 1

Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	dr. A.J.H. Pels
Examinator	dr. A.J.H. Pels
Docent(en)	dr. A.J.H. Pels, dr. V.A.C. van den Berg
Lesmethode(n)	Hoorcollege, Werkcollege
Niveau	400

Doel vak

The transport sector is very important for the Netherlands and the Benelux. In a relatively small area, we find the ports of Rotterdam, Antwerp and Amsterdam. In the same area we have the Amsterdam Airport Schiphol and Brussels Zaventem as main airports. These important international nodes are connected to the hinterland (Germany, France) by an extensive road and rail system and inland waterways. These nodes, and the access and regress modes provide an important contribution to the economy. How is the transport sector organized? What are the strategies, and how do we set prices?

Inhoud vak

In this course, we discuss the economic foundations of pricing and network strategies in transport sectors, and the implications for transport policy. In the first part of the course we discuss the microeconomic theory of market structures, pricing, externalities and regulation, with a strong focus on transport markets. Which market structures can we use to describe transport sectors? How does this influence price setting for passenger and freight transport? How do we deal with environmental effects? We also discuss the costs of operating transport networks. How can we describe the cost of operating, for example, a rail network or a shipping company? Using regression analysis we illustrate how cost and demand functions can be estimated, and used in policy making.

In the second part of the course several transport markets will be discussed, applying the theories and techniques discussed in the first part. We discuss the maritime transport market, road transport, and also the rail market. In addition, the students will have to do an assignment using basic econometric techniques.

Onderwijsvorm

There will be two lectures each week in which the emphasis is on the teacher's explanation of the essential material. Active participation of the students is, however, expected in all lectures. The tutorials focus on empirical applications of some concepts discussed during the lectures (cost functions, ship size).

Furthermore, during the tutorials we practice with the materials from the lectures.

Toetsvorm

tutorials 25 percent, written interim examination 75 percent

Literatuur

- Mallard & G., S. Glaister, Transport Economics Theory, Application and Policy. Palgrave Macmillan, New York, 2008.

- Lecture slides will be distributed via Canvas.

Vereiste voorkennis

We expect students followed a bachelor course in (micro) economics and statistics.

Aanbevolen voorkennis

We expect students followed a bachelor course in (micro) economics and statistics. If you followed these courses no further preparation is necessary.

The following book gives an indication of the expected entry level:

'Stuart Cole (2005), Applied Transport Economics: Policy, management and decision making, Third edition, Kogan Page Ltd'.

Urban Economic Challenges and Policies

Vakcode	E_STR_UECP ()
Periode	Periode 4
Credits	6.0
Voertaal	Engels
Faculteit	School of Business and Economics
Coördinator	prof. dr. J. Rouwendal
Examinator	prof. dr. J. Rouwendal
Lesmethode(n)	Hoorcollege
Niveau	400

Doel vak

The aim of this course is to introduce the students to applications of urban economics to policy-relevant issues. After taking this course, students should be able to judge the strengths and weaknesses of using various economic tools and methods in concrete policy situations.

Inhoud vak

In the course a number of relevant urban economics issues are analyzed using state-of-the art methods of urban economic analysis. The list is partly determined in a brainstorm session in which students are asked to suggest relevant topics. Subjects discussed include the current state-of-the art practice of hedonic price method for the valuation of non-market goods, the application of residential sorting models to urban policy questions, the study of social interactions (segregation, gentrification) in an urban context, clustering of firms within cities and the spatial structure of contemporary cities. Attention is paid to welfare economic issues (needed for policy evaluation), and econometric methods (needed for appropriate analysis of causal relationships). Guest lectures provide a bridge between academic and policy-induced research. Towards the end of the course students write a short essay in which they propose appropriate policy measures to deal with a relevant urban economic issue.

Onderwijsvorm

Lectures, guest lectures and tutorials

Toetsvorm

Written exam (70%) and 3 assignments (3×10%)

Literatuur

Scientific papers and lecture notes

Aanbevolen voorkennis

Urban and Regional Economics.

Web Data Processing Systems

Vakcode	XM_40020 ()
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Coördinator	J. Urbani
Examinator	J. Urbani
Docent(en)	J. Urbani
Lesmethode(n)	Hoorcollege
Niveau	400

Doel vak

After taking this course, you will be able to:

- Understand the fundamentals of the most important problems that modern Web companies face daily;
- Process large amounts of Web data efficiently using state-of-the-art tools that are currently used in the Web industry;
- Extract useful insights from raw data available on the Web;
- Adapt or reuse techniques used on the Web to other fields (e.g. Data Mining, Artificial Intelligence) where similar problems might occur.

Inhoud vak

The Web constitutes the largest repository of knowledge that is available to mankind, and its impact on modern society is unprecedented at many levels. Many Web companies are valued with billion dollar quotations and are now central to our modern life.

The key players in the Web industry must face numerous challenges that are concerned with the size, distribution, heterogeneity, and the uncontrolled nature of the Web. Systems to process Web data require the application of a combination of techniques spanning databases, distributed systems, data mining, and artificial intelligence.

The goal of this course is to introduce the student to the most advanced systems and techniques which deal with Web data. Important classes of problems concern:

- the storage and retrieval of Web data (How can we store and retrieve information from large social networks, graphs, or large volumes of text?)
- efficient entity disambiguation (What is a particular web page talking about?)
- large-scale knowledge extraction (What sort of knowledge can we extract from web documents -- e.g. Wikipedia?)
- effective link prediction (Is there a connection between two users/events/concepts?)

- expressive ontological inference (Can current knowledge lead to more implicit knowledge?)
- trust (Can we trust the content on a certain blog post?)

This course will describe techniques to perform these tasks with a particular emphasis on scalability, which is a crucial aspect in this domain. In order to better understand the challenges and effectiveness of current solutions, the student will be called to implement practical assignments on realistic Web data. These assignments will be part of the final evaluation of the course.

Onderwijsvorm

The course takes the form of lectures and practical assignments.

Toetsvorm

A combination of exams and group homework assessments.

Literatuur

A mixture of scientific publications and other material available on the Web.

Doelgroep

XM_CS