

Handbook of requirements for the M.Sc. study programme Econometrics

November 14, 2022

POSSIBLE REQUIREMENTS IN CASE OF CONDITIONAL ADMISSION:			
NAME	No.	Lectures/courses	Credit Points
MACROECONOMICS	ME Req1	Reading Course Macroeconomics	7,5
MICROECONOMICS	ME Req2	Reading Course Microeconomics	7,5
ADVANCED MATHEMATICS	ME Req3	Advanced Engineering Mathematics	7
PROBABILITY	ME Req4	Reading Course Probability	5
INFERENCE	ME Req5	Reading Course Inference	5
LINEAR MODELS	ME Req6	Reading Course Linear Models	5
MINOR INTRODUCTORY CASE STUDIES	ME Req7	Minor Introductory Case Studies	5

Module: Macroeconomics				Module ME Req1	
M.Sc. Program: Econometrics (requirements in case of conditional admission)					
Frequency Each semester	Duration 1 semester	Semester beginning of programme	Credit Points 7,5	Time 225 h	
1	Structure of the module				
	No.	Courses	Type	Credit Points	Credit Hours
	1	Reading Course Macroeconomics	reading course	7,5	-
2	Language of instruction English				
3	Contents of the module The module covers essential dynamic macroeconomic models that are required as a background for more advanced theories covered in specialized master level courses. The contents follow chapters 2 – 5 and 8 of the textbook by Michael Wickens, Macroeconomic Theory. A dynamic general equilibrium approach, 2 nd ed., Princeton University Press (2011).				
4	Competences Students acquire knowledge of core models and methods of dynamic macroeconomics. They become familiar with intertemporal optimization and its uses in the construction of baseline models of real and monetary business cycle fluctuations and long-run growth.				
5	Examinations Oral exam based on the book chapters				
6	Type of Examinations				
	covering the entire module		Relating to individual courses		
7	Requirements -none-				
8	Status of the Module Possible requirement in case of conditional admission to the M.Sc. Econometrics				
9	Module Coordinator Prof. Dr. Ludger Linnemann		Responsible Department TU Dortmund University, Department of Business and Economics		

Module: Microeconomics				Module ME Req2		
M.Sc. Program: Econometrics (requirements in case of conditional admission)						
Frequency Each semester		Duration 1 semester	Semester beginning of programme	Credit Points 7,5	Time 225 h	
1 Structure of the module						
	No.	Courses		Type	Credit Points	Credit Hours
	1	Reading Course Microeconomics		reading course	7,5	-
2 Language of instruction English						
3 Contents of the module The module covers the essential microeconomic model of rational choices in a general equilibrium. The topics of this course form the theoretical foundation for the contents of more advanced master level courses. The contents follow chapters 1 – 10 and 13 of the textbook by Hal R. Varian, Microeconomic Analysis. 3 rd ed., W.W. Norton (2010).						
4 Competences Students acquire knowledge of core models of decision theory for firms and consumers and solve problems of constraint optimization. They learn how to conduct comparative statics and gain knowledge of efficiency and welfare of a competitive equilibrium.						
5 Examinations Oral exam based on the book chapters						
6 Type of Examinations						
covering the entire module			Relating to individual courses			
7 Requirements -none-						
8 Status of the Module Possible requirement in case of conditional admission to the M.Sc. Econometrics						
9 Module Coordinator Prof. Dr. Lukas Buchheim			Responsible Department TU Dortmund University, Department of Business and Economics			

Module: Advanced Mathematics					Module ME Req3
M.Sc. study programme: Econometrics (requirements in case of conditional admission)					
Frequency Winter semester, annual	Duration 1 semester	Semester beginning of programme	Credit Points 7	Time 210 h	
1	Structure of the module				
	No.	Lecture/Course	Type	Credit Points	Credit Hours
	1	Advanced Engineering Mathematics	L + T	7	3 + 2
2	Language English				
3	Content <ul style="list-style-type: none"> • Linear Algebra: Vector spaces, matrices and equation systems, linear maps, Jordan-, LU-, QR-, and singular value decomposition, numerical aspects. • Differential Equation: Linear systems, differential equations with constant coefficients. • Laplace-Transform: Definition, convolution and application to differential equations. • Differential Calculus with several variables: Derivatives, inverse and implicit functions, Taylor expansion and extreme values. • Stability of Differential Equations: Theorems of Ljapunov and Poincaré-Ljapunov. • Variational Calculus. Literature: <ul style="list-style-type: none"> • Bajpai, Avinash C. , Mathematics for engineers and scientists • Meyer, R.M., Essential mathematics for applied fields • Lancaster, P., Tismenetsky, M., The theory of matrices • Lang, S., Linear algebra • Slides 				
4	Competences The course gives an introduction to fundamental mathematical techniques used in almost every course. Attention is given to the underlying mathematical structure.				
5	Examination Written exam (2 hours).				
6	Types of Examinations				
	<input checked="" type="checkbox"/> covering the entire module		<input type="checkbox"/> Relating to individual courses		
7	Requirements - none -				
8	Status of the Module Possible requirement in case of conditional admission to the M. Sc. Econometrics				
9	Module Coordinator Chairman of board of examiners		Responsible Department Mathematics		

Module: Probability				Module ME Req4		
M.Sc. study programme: Econometrics (requirements in case of conditional admission)						
Frequency every semester		Duration 1 semester	Semester beginning of programme	Credit Points 5	Time 150 h	
1 Structure of the module						
	No.	Lecture/Course		Type	Credit Points	Credit Hours
	1	Reading Course Probability		reading course	5	
2 Language English						
3 Content						
<ul style="list-style-type: none"> • Concepts of probability, distributions, conditional probability and independence, Bayes' rule, sequences of events. • Sampling, Binomial distribution, Normal approximation, Poisson distribution. • Random variables, expectation and variance. • Probability densities, Exponential and Gamma distributions, substitutions, cumulative distribution functions. • Joint distributions, Uniform and Normal distributions. • Dependence, conditional distributions, covariance and correlation. 						
Literature: Jim Pitman: Probability. Springer 1993: Chapters 1, 2.1, 2.2, 2.5, 3.1-3.5, 4.1, 4.2, 4.4, 4.5, 5.1-5.3, 6.						
4 Competences Students gain a deep understanding of probability. They independently integrate statistical problems in the context of probability theory and solve them using appropriate methods. Students apply mathematical proof techniques.						
5 Examination Examination based on the book chapters.						
6 Requirements Types of Examinations						
covering the entire module			Relating to individual courses			
7 Requirements - none -						
8 Status of the Module Possible requirement in case of conditional admission to the M. Sc. Econometrics						
9 Module Coordinator Chairman of board of examiners			Responsible Department Statistics			

Module: Inference				Module ME Req5		
M.Sc. study programme: Econometrics (requirements in case of conditional admission)						
Frequency every semester		Duration 1 semester	Semester beginning of programme	Credit Points 5	Time 150 h	
1 Structure of the module						
	No.	Lecture/Course		Type	Credit Points	Credit Hours
	1	Reading Course Inference		reading course	5	
2 Language English						
3 Content						
<ul style="list-style-type: none"> • Parametric point estimation: method of moments and maximum likelihood; consistency; sufficiency; error, bias and loss; completeness; Rao-Cramer-bound; invariance; Bayesian estimation. • Parametric interval estimation: confidence intervals, especially for Normal distribution parameters, finding methods, Bayesian estimation. • Tests of hypotheses: simple and composite hypotheses, loss function, (uniformly) most powerful tests, unbiased tests, tests for (multivariate) Normal distribution parameters, Chi-square tests, relation to confidence intervals. 						
Literature: Alexander M. Mood, Franklin A. Graybill, Duane C. Boes: Introduction to the Theory of Statistics. McGraw-Hill 1974: Chapters VII, VIII, IX.1-IX.6.						
4 Competences Students calculate point and interval estimators and carry out significance tests. They prove basic properties of estimators and tests. Students apply the methods to real data.						
5 Examination Examination based on the book chapters.						
6 Types of Examinations						
	covering the entire module		Relating to individual courses			
7 Requirements - none -						
8 Status of the Module Possible requirement in case of conditional admission to the M. Sc. Econometrics						
9 Module Coordinator Chairman of board of examiners				Responsible Department Statistics		

Module: Linear Models					Module ME Req6
M.Sc. study programme: Econometrics (requirements in case of conditional admission)					
Frequency every semester	Duration 1 semester	Semester beginning of programme	Credit Points 5	Time 150 h	
1	Structure of the module				
	No.	Lecture/Course	Type	Credit Points	Credit Hours
	1	Reading Course Linear Models	reading course	5	-
2	Language English				
3	Content <ul style="list-style-type: none"> • Introduction to regression models: real data examples, simple and multiple linear models, binary response models. • Linear model components: parameters, covariates, residuals, assumptions. • Parameter estimation: coefficients and error variance. • Hypothesis tests and confidence intervals: F-Tests, confidence regions, prediction intervals. • Model choice: variable selection, prediction evaluation, criteria. Literature: Thomas Kneib, Stefan Lang, Ludwig Fahrmeir, Brian D. Marx: Regression: Models, Methods and Applications. Springer 2015: Chapters 1, 2.1-2.3, 3.				
4	Competences Students calculate point and interval estimators and carry out significance tests in the context of the linear model. They have knowledge on model selection. Students apply the methods to real data.				
5	Examination Examination based on the book chapters.				
6	Types of Examinations <input checked="" type="checkbox"/> covering the entire module <input type="checkbox"/> Relating to individual courses				
7	Requirements - none -				
8	Status of the Module Possible requirement in case of conditional admission to the M. Sc. Econometrics				
9	Module Coordinator Chairman of board of examiners		Responsible Department Statistics		

Module: Minor Introductory Case Studies					Module ME Req7
M.Sc. study programme: Econometrics (requirements in case of conditional admission)					
Frequency every semester	Duration 1 semester	Semester beginning of programme	Credit Points 5	Time 150 h	
1	Structure of the module				
	No.	Lecture/Course	Type	Credit Points	Credit Hours
	1	Minor Introductory Case Studies (parts of the course "Fallstudien I" of the module BD 17 of the Bachelor programme Data Science)	P	5	4 (for 3/7 of the sem.)
2	Language English, enclosed in a German course				
3	Content The aim of the course is to familiarise students with the independent evaluation of statistical data sets. In addition to the provision of a catalogue of basic standard procedures for data evaluation, a central learning objective is the appropriate presentation of the methodological approach and the evaluation results in verbal and written form. In order to achieve these learning goals, students have to work in small groups (three to four members) on projects for a total of 3 method complexes. The time frame for each project is one to two weeks, depending on the level of difficulty. The intermediate and final results of the statistical evaluation are presented alternately by the groups. After completion of each project, each student must write a short, written report in which the results achieved in the group and the methodology used are presented in an appropriate manner. Data Science Master students work on the first 3 of 7 projects.				
4	Competences Students work independently according to scientific criteria and report orally and in writing on their work. Students apply statistical methods to real data sets, modify the methods if necessary and work out methods unknown to them. They derive solutions to problems and reflect on them. They work together in groups. They prepare and give presentations, explaining statistical methods and communicating results. They discuss their own and other methods, results and reports with others. They complete the projects within a short, given time.				
5	Examination Written reports and oral presentations.				
6	Types of Examinations				
	covering the entire module		Relating to individual courses		
7	Requirements - none -				
8	Status of the Module Possible requirement in case of conditional admission to the M. Sc. Econometrics				
9	Module Coordinator Chairman of board of examiners		Responsible Department Statistics		