POSSIBLE REQUIREMENTS IN CASE OF CONDITIONAL ADMISSION:

<table>
<thead>
<tr>
<th>NAME</th>
<th>No.</th>
<th>Lectures/courses</th>
<th>Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>MACROECONOMICS</td>
<td>ME Req1</td>
<td>Reading Course Macroeconomics</td>
<td>7,5</td>
</tr>
<tr>
<td>MICROECONOMICS</td>
<td>ME Req2</td>
<td>Reading Course Microeconomics</td>
<td>7,5</td>
</tr>
<tr>
<td>ADVANCED MATHEMATICS</td>
<td>ME Req3</td>
<td>Advanced Engineering Mathematics</td>
<td>7</td>
</tr>
<tr>
<td>PROBABILITY</td>
<td>ME Req4</td>
<td>Reading Course Probability</td>
<td>5</td>
</tr>
<tr>
<td>INFERENCE</td>
<td>ME Req5</td>
<td>Reading Course Inference</td>
<td>5</td>
</tr>
<tr>
<td>LINEAR MODELS</td>
<td>ME Req6</td>
<td>Reading Course Linear Models</td>
<td>5</td>
</tr>
<tr>
<td>MINOR INTRODUCTORY CASE STUDIES</td>
<td>ME Req7</td>
<td>Minor Introductory Case Studies</td>
<td>5</td>
</tr>
</tbody>
</table>
# Module: Macroeconomics

## M.Sc. Program: Econometrics (requirements in case of conditional admission)

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Duration</th>
<th>Semester beginning of programme</th>
<th>Credit Points</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Each semester</td>
<td>1 semester</td>
<td>beginning of programme</td>
<td>7.5</td>
<td>225 h</td>
</tr>
</tbody>
</table>

## Structure of the module

<table>
<thead>
<tr>
<th>No.</th>
<th>Courses</th>
<th>Type</th>
<th>Credit Points</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reading Course Macroeconomics</td>
<td>reading course</td>
<td>7.5</td>
<td>-</td>
</tr>
</tbody>
</table>

## Language of instruction

English

## 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, 2nd ed., Princeton University Press (2011).

## 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.

## Examinations

Oral exam based on the book chapters

## Type of Examinations

- covering the entire module
- Relating to individual courses

## Requirements

- none-

## Status of the Module

Possible requirement in case of conditional admission to the M.Sc. Econometrics

## Module Coordinator

Prof. Dr. Ludger Linnemann

## Responsible Department

TU Dortmund University, Department of Business and Economics
<table>
<thead>
<tr>
<th>Module: Microeconomics</th>
<th>Module ME Req2</th>
</tr>
</thead>
</table>

**M.Sc. Program:** Econometrics (requirements in case of conditional admission)

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Duration</th>
<th>Semester beginning of programme</th>
<th>Credit Points</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Each semester</td>
<td>1 semester</td>
<td>programme</td>
<td>7,5</td>
<td>225 h</td>
</tr>
</tbody>
</table>

1. **Structure of the module**
   - **No.**
   - **Courses:** Reading Course Microeconomics
   - **Type:** reading course
   - **Credit Points:** 7,5
   - **Credit Hours:** -

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. 3rd 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
### Advanced Mathematics

#### M.Sc. study programme: Econometrics (requirements in case of conditional admission)

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Duration</th>
<th>Semester</th>
<th>Credit Points</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter semester, annual</td>
<td>1 semester</td>
<td>beginning of programme</td>
<td>7</td>
<td>210 h</td>
</tr>
</tbody>
</table>

#### Structure of the module

<table>
<thead>
<tr>
<th>No.</th>
<th>Lecture/Course</th>
<th>Type</th>
<th>Credit Points</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Advanced Engineering Mathematics</td>
<td>L + T</td>
<td>7</td>
<td>3 + 2</td>
</tr>
</tbody>
</table>

#### Language

- English

#### Content

- 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.
- Variational Calculus.

**Literature:**

- 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

#### Competences

The course gives an introduction to fundamental mathematical techniques used in almost every course. Attention is given to the underlying mathematical structure.

#### Examination

- Written exam (2 hours).

#### Types of Examinations

- [ ] covering the entire module
- [ ] Relating to individual courses

#### Requirements

- none -

#### Status of the Module

Possible requirement in case of conditional admission to the M. Sc. Econometrics

#### Module Coordinator

- Chairman of board of examiners

#### Responsible Department

- Mathematics
## Module: Probability

### Module ME Req4

<table>
<thead>
<tr>
<th>M.Sc. study programme: Econometrics (requirements in case of conditional admission)</th>
</tr>
</thead>
</table>

### Frequency
- every semester

### Duration
- 1 semester

### Semester
- beginning of programme

### Credit Points
- 5

### Time
- 150 h

### Structure of the module

<table>
<thead>
<tr>
<th>No.</th>
<th>Lecture/Course</th>
<th>Type</th>
<th>Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reading Course Probability</td>
<td>reading course</td>
<td>5</td>
</tr>
</tbody>
</table>

### Language
- English

### Content
- 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.

### 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.

### Examination
Examination based on the book chapters.

### Types of Examinations
- covering the entire module
- Relating to individual courses

### Requirements
- none -

### Status of the Module
Possible requirement in case of conditional admission to the M. Sc. Econometrics

### Module Coordinator
Chairman of board of examiners

### Responsible Department
Statistics
<table>
<thead>
<tr>
<th><strong>Module:</strong> Inference</th>
<th><strong>Module ME Req5</strong></th>
</tr>
</thead>
</table>

**M.Sc. study programme:** Econometrics (requirements in case of conditional admission)

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Duration</th>
<th>Semester</th>
<th>Credit Points</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>every semester</td>
<td>1 semester</td>
<td>beginning of programme</td>
<td>5</td>
<td>150 h</td>
</tr>
</tbody>
</table>

1. **Structure of the module**

<table>
<thead>
<tr>
<th>No.</th>
<th>Lecture/Course</th>
<th>Type</th>
<th>Credit Points</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reading Course Inference</td>
<td>reading course</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

2. **Language**

English

3. **Content**

- 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:**

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

<table>
<thead>
<tr>
<th>No.</th>
<th>Lecture/Course</th>
<th>Type</th>
<th>Credit Points</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reading Course Linear Models</td>
<td>reading course</td>
<td>5</td>
<td>-</td>
</tr>
</tbody>
</table>

### Language

- English

### Content

- 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:**


### 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.

### Examination

Examination based on the book chapters.

### Types of Examinations

- [ ] covering the entire module
- [ ] Relating to individual courses

### Requirements

- none -

### Status of the Module

Possible requirement in case of conditional admission to the M. Sc. Econometrics

### Module Coordinator

Chairman of board of examiners

### Responsible Department

Statistics
<table>
<thead>
<tr>
<th>Module:</th>
<th>Minor Introductory Case Studies</th>
<th>Module ME Req7</th>
</tr>
</thead>
</table>

**M.Sc. study programme:** Econometrics (requirements in case of conditional admission)

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Duration</th>
<th>Semester</th>
<th>Credit Points</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>every semester</td>
<td>1 semester</td>
<td>beginning of programme</td>
<td>5</td>
<td>150 h</td>
</tr>
</tbody>
</table>

1 **Structure of the module**

<table>
<thead>
<tr>
<th>No.</th>
<th>Lecture/Course</th>
<th>Type</th>
<th>Credit Points</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minor Introductory Case Studies (parts of the course “Fallstudien I” of the module BD 17 of the Bachelor programme Data Science)</td>
<td>P</td>
<td>5</td>
<td>4 (for 3/7 of the sem.)</td>
</tr>
</tbody>
</table>

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