<table>
<thead>
<tr>
<th>Module</th>
<th>Econo-Physics: Fundamentals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code</td>
<td>71162</td>
</tr>
<tr>
<td>Instruction language</td>
<td>German or English</td>
</tr>
<tr>
<td>ECTS credits</td>
<td>6</td>
</tr>
<tr>
<td>Attendance time</td>
<td>5 hours per week</td>
</tr>
<tr>
<td>Duration</td>
<td>1 semester</td>
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<tr>
<td>Cycle</td>
<td>Irregularly</td>
</tr>
<tr>
<td>Coordinator</td>
<td>Dean of Physics Studies</td>
</tr>
<tr>
<td>Instructors</td>
<td>PD Dr. Jürgen Stockburger</td>
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</tbody>
</table>
| Allocation to study programmes | Physik M.Sc., elective module, 1st or 2nd semester  
Wirtschaftsphysik M.Sc., elective module, 1st - 3rd semester |
| Formal prerequisites | None |
| Recommended prerequisites | Basic knowledge of probability theory |
| Learning objectives | Students who have successfully completed this module, have learned the theoretical foundations of the original application of physical concepts in interdisciplinary fields, particularly economic disciplines. |
| Syllabus | In this module, the following specialist topics will be covered:  
Advanced Probability Theory  
- moments, cumulants, generating  
- Multidimensional distributions  
- Modular, shape-stable distributions  
Time series and correlations  
- Hierarchical characterization of correlations  
- Portfolio Theory  
- Non-linear and non-stationary modeling of time series  
- Scaling behavior and fat-tailed distributions  
Stochastic Processes  
- Markov processes  
- Martingale  
- Stochastic in physical context  
- Brownian motion, Ito-processes  
Market pricing models for options and other derivatives  
- Black-Scholes theory  
- Risk-neutral valuation, martingale  
- Binomial Model  
- Levy-financial models  
Limitations of modeling |
| Literature |
| Teaching and | Lecture (3 hours per week) |
### learning methods

Exercise (2 hours per week)

### Workload

- 45 hours lecture (attendance time)
- 30 hours exercise (attendance time)
- 105 hours self-study and exam preparation

Total: 180 hours

### Assessment

Written or oral examination. A prerequisite for the participation in the examination is an ungraded course achievement. Form and scope of the examination and of the course achievement are determined and notified by the instructor at the beginning of the course.

### Examination

- 11991 Econo-Physics: Fundamentals (prerequisite)
- 11990 Econo-Physics: Fundamentals

### Grading procedure

The module mark is the examination mark.

### Basis for

Modules *Econo-Physics: Nonequilibrium Statistics* and *Econo-Physics: Numerical Simulation Methods*