Module Catalogue
for the Subject
Mathematics
as a Bachelor’s with 1 major
with the degree "Bachelor of Science"
(180 ECTS credits)

Examination regulations version: 2008
Responsible: Institute of Mathematics
Contents

The subject is divided into 6
Content and Objectives of the Programme 7
Abbreviations used, Conventions, Notes, In accordance with 8
Compulsory Courses 9
  Propaedeutics of Mathematics 10
  Introduction to Geometry 11
  Number Theory and Algebra 13
  Numerical Mathematics 1 15
  Analysis 16
  Linear Algebra 18
  Stochastics 1 20
  Ordinary Differential Equations and Complex Analysis 21
  Advanced Analysis 23
Compulsory Electives 24
  Mathematics 1 25
  Numerical Mathematics 2 26
  Stochastics 2 27
  Mathematics 2 28
  Introduction to Discrete Mathematics 29
  Introduction to Functional Analysis 30
  Operations Research 31
  Non-Linear Dynamics 32
  Mathematics 3 33
  Reading Course Numerical Mathematics 34
  Reading Course Stochastics 35
  Reading Course Discrete Mathematics 36
  Reading Course Functional Analysis 37
  Reading Course Operations Research 38
  Reading Course Dynamical Systems 39
  Reading Course Optimisation 40
  Mathematics 4 41
  Seminar in Analysis 42
  Seminar in Linear Algebra 43
  Seminar in Algebra 44
  Seminar in Geometry 45
  Seminar in Number Theory 46
  Seminar in Ordinary Differential Equations 47
  Seminar in Complex Analysis 48
  Seminar in Numerical Mathematics 49
  Seminar in Stochastics 50
  Seminar in Functional Analysis 51
  Seminar in Operation Research 52
  Seminar in Discrete Mathematics 53
Application-oriented Subject 54
  Application-oriented Subject Biology 55
  Application-oriented Subject Biology Compulsory Courses 56
    Genetics, Neurobiology, Behaviour 57
    Structure and Function of Cells 59
  Application-oriented Subject Biology Compulsory Electives 60
    Bioinformatics 61
    Ecology of plants and animals 62
<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bioinformatics for advanced students</td>
<td>63</td>
</tr>
<tr>
<td>Ecology of Animals for advanced students</td>
<td>64</td>
</tr>
<tr>
<td>Biophysics - Basic course</td>
<td>65</td>
</tr>
<tr>
<td>Special Bioinformatics I</td>
<td>66</td>
</tr>
<tr>
<td>Neurobiology I</td>
<td>67</td>
</tr>
<tr>
<td>Ecology of populations</td>
<td>68</td>
</tr>
<tr>
<td>Molecular modelling - From DNA to protein</td>
<td>69</td>
</tr>
<tr>
<td>Specific Bioinformatics II</td>
<td>70</td>
</tr>
<tr>
<td>Evolution - Basics and Principles (Lecture and Practice)</td>
<td>71</td>
</tr>
<tr>
<td>The Animal Kingdom</td>
<td>72</td>
</tr>
<tr>
<td>The Plant Kingdom</td>
<td>73</td>
</tr>
<tr>
<td>Genetics</td>
<td>74</td>
</tr>
<tr>
<td><strong>Application-oriented Subject Chemistry</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Application-oriented Subject Chemistry Compulsory Courses</strong></td>
<td></td>
</tr>
<tr>
<td>Organic Chemistry 1</td>
<td>77</td>
</tr>
<tr>
<td>Principles of quantum mechanics and spectroscopy</td>
<td>78</td>
</tr>
<tr>
<td>Introduction to Physics for Students of Non-physics-related Minor Subjects</td>
<td>79</td>
</tr>
<tr>
<td>General Chemistry for Mathematics Majors</td>
<td>80</td>
</tr>
<tr>
<td><strong>Application-oriented Subject Chemistry Compulsory Electives</strong></td>
<td></td>
</tr>
<tr>
<td>Organic Chemistry 2</td>
<td>82</td>
</tr>
<tr>
<td>Physical and Theoretical Chemistry 3: Symmetry and Quantum Chemistry</td>
<td>83</td>
</tr>
<tr>
<td>Theoretical Models in Chemistry</td>
<td>84</td>
</tr>
<tr>
<td><strong>Application-oriented Subject Geography</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Application-oriented Subject Geography Compulsory Electives 1</strong></td>
<td></td>
</tr>
<tr>
<td>General Human Geography</td>
<td>87</td>
</tr>
<tr>
<td>General Physical Geography</td>
<td>88</td>
</tr>
<tr>
<td><strong>Application-oriented Subject Geography Compulsory Electives 2</strong></td>
<td></td>
</tr>
<tr>
<td>Cartography and Geoinformation</td>
<td>90</td>
</tr>
<tr>
<td>Remote Sensing</td>
<td>91</td>
</tr>
<tr>
<td><strong>Application-oriented Subject Geography Compulsory Electives 3</strong></td>
<td></td>
</tr>
<tr>
<td>Special Problems of Physical Geography</td>
<td>93</td>
</tr>
<tr>
<td>Applied Physical Geography</td>
<td>94</td>
</tr>
<tr>
<td>Data Acquisition and Processing in Physical Geography</td>
<td>95</td>
</tr>
<tr>
<td>Working Methods: Solid Earth System</td>
<td>96</td>
</tr>
<tr>
<td>Working Methods of Physical Geography</td>
<td>97</td>
</tr>
<tr>
<td>Special Issues of Human Geography</td>
<td>98</td>
</tr>
<tr>
<td>Applied Human Geography</td>
<td>99</td>
</tr>
<tr>
<td>Theories and Methodology in Human Geography</td>
<td>100</td>
</tr>
<tr>
<td>Quantitative and Qualitative Regional Analysis</td>
<td>101</td>
</tr>
<tr>
<td>Methods of Planning in Human Geography</td>
<td>102</td>
</tr>
<tr>
<td><strong>Application-oriented Subject Computer Science</strong></td>
<td></td>
</tr>
<tr>
<td>**Application-oriented Subject Computer Science Compulsory Electives</td>
<td></td>
</tr>
<tr>
<td>Information transmission</td>
<td>105</td>
</tr>
<tr>
<td>Digital computer systems</td>
<td>106</td>
</tr>
<tr>
<td>Theoretical informatics</td>
<td>107</td>
</tr>
<tr>
<td>Algorithm and data structures</td>
<td>108</td>
</tr>
<tr>
<td>Automation and control technology</td>
<td>109</td>
</tr>
<tr>
<td>Data bases</td>
<td>110</td>
</tr>
<tr>
<td>Graphtheoretical concepts and algorithms</td>
<td>111</td>
</tr>
<tr>
<td>Theory of complexity</td>
<td>112</td>
</tr>
<tr>
<td>Logic for informatics</td>
<td>113</td>
</tr>
<tr>
<td>Object oriented programming</td>
<td>114</td>
</tr>
<tr>
<td>Practical course in programming</td>
<td>115</td>
</tr>
<tr>
<td>Computer architecture</td>
<td>116</td>
</tr>
</tbody>
</table>
Computer networks and communication systems  |  117
Software technology  |  118
Practical course in software  |  119
Knowledge management systems and data mining  |  120

**Application-oriented Subject Philosophy**  |  121

**Application-oriented Subject Philosophy Compulsory Courses**  |  122
- Principles of Philosophy  |  123
- Philosophy and the sciences  |  124

**Application-oriented Subject Philosophy Compulsory Electives**  |  125
- Theoretical philosophy  |  126
- Practical Philosophy  |  127
- History of philosophy  |  128
- Issue of research in philosophy  |  129
- Text analysis: Ancient Philosophy  |  130
- Text Analysis: Medieval Philosophy  |  131
- Text analysis: modern philosophy  |  132
- Text analysis: contemporary philosophy  |  133
- Basic disciplines of theoretical philosophy: metaphysics and epistemology  |  134
- Specific disciplines of theoretical philosophy  |  135
- Basic disciplines of practical philosophy: ethics and theory of action  |  136
- Specific disciplines of practical philosophy  |  137
- Problems of Older Philosophy: Ancient/Medieval  |  138
- Problems of Modern/Contemporary Philosophy  |  139
- Problems of Theoretical Philosophy  |  140
- Problems of Practical Philosophy  |  141

**Application-oriented Subject Physics**  |  142

**Application-oriented Subject Physics Compulsory Courses**  |  143
- Introduction to Physics Part 1 for students of Physics Related Minor Subjects  |  144
- Introduction to Physics Part 2 for students of Physics Related Minor Subjects  |  145
- Measurements and Data Analysis  |  146

**Application-oriented Subject Physics Compulsory Electives 1**  |  147
- Physics Laboratory Course for students of Physics Related Minor Subjects  |  148
- Practical Course  |  149

**Application-oriented Subject Physics Compulsory Electives 2**  |  150
- Experimental Physics 3 (Optics, Quantum Phenomena, Introduction Atomic Physics)  |  151
- Experimental Physics 4 (Introduction to Solid State Physics)  |  152
- Theoretical Physics 1 (Theoretical Mechanics)  |  153
- Theoretical Physics 2 (Theoretical Electrostatics and Electrodynamics)  |  154
- Theoretical Physics 3 (Theoretical Quantum Mechanics)  |  155
- Theoretical Physics 4 (Theoretical Thermodynamics and Statistics)  |  156

**Application-oriented Subject Business Management and Economics**  |  157

**Application-oriented Subject Business Management and Economics Compulsory Courses**  |  158
- Managerial Accounting  |  159
- Financial Accounting  |  160
- Introduction to Business Administration  |  161
- Introduction to Economics  |  162
- Macroeconomics 1  |  163
- Microeconomics 1  |  165

**Application-oriented Subject Business Management and Economics Compulsory Electives**  |  166
- Introduction to Market-Oriented Management  |  167
- Supply, Production and Operations Management. An Introduction  |  169
- Investment and Finance. An Introduction  |  170
<table>
<thead>
<tr>
<th>Course</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macroeconomics 2</td>
<td>171</td>
</tr>
<tr>
<td>Microeconomics 2</td>
<td>172</td>
</tr>
<tr>
<td>Introduction to Economic Policy</td>
<td>173</td>
</tr>
<tr>
<td><strong>Thesis</strong></td>
<td></td>
</tr>
<tr>
<td>Thesis Mathematics (Bachelor Thesis)</td>
<td>175</td>
</tr>
<tr>
<td><strong>Subject-specific Key Skills</strong></td>
<td></td>
</tr>
<tr>
<td>Computational Mathematics, advanced</td>
<td>178</td>
</tr>
<tr>
<td>Programming course for students of Mathematics and other subjects, simple</td>
<td>179</td>
</tr>
<tr>
<td>Preparatory Course Mathematics</td>
<td>180</td>
</tr>
<tr>
<td>Programming course for students of Mathematics and other subjects</td>
<td>181</td>
</tr>
<tr>
<td>Computeroriented Mathematics</td>
<td>182</td>
</tr>
<tr>
<td>Defense of Bachelor Thesis in Mathematics</td>
<td>183</td>
</tr>
</tbody>
</table>
### The subject is divided into

<table>
<thead>
<tr>
<th>section / sub-section</th>
<th>ECTS credits</th>
<th>starting page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compulsory Courses</td>
<td>91</td>
<td>9</td>
</tr>
<tr>
<td>Compulsory Electives</td>
<td>59</td>
<td>24</td>
</tr>
<tr>
<td>Mathematics 1</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>Mathematics 2</td>
<td>10</td>
<td>28</td>
</tr>
<tr>
<td>Mathematics 3</td>
<td>4</td>
<td>33</td>
</tr>
<tr>
<td>Mathematics 4</td>
<td>5</td>
<td>41</td>
</tr>
<tr>
<td>Application-oriented Subject</td>
<td>35</td>
<td>54</td>
</tr>
<tr>
<td>Application-oriented Subject Biology</td>
<td>35</td>
<td>55</td>
</tr>
<tr>
<td>Application-oriented Subject Biology Compulsory Courses</td>
<td>10</td>
<td>56</td>
</tr>
<tr>
<td>Application-oriented Subject Biology Compulsory Electives</td>
<td>25</td>
<td>60</td>
</tr>
<tr>
<td>Application-oriented Subject Chemistry</td>
<td>35</td>
<td>75</td>
</tr>
<tr>
<td>Application-oriented Subject Chemistry Compulsory Courses</td>
<td>26</td>
<td>76</td>
</tr>
<tr>
<td>Application-oriented Subject Chemistry Compulsory Electives</td>
<td>9</td>
<td>81</td>
</tr>
<tr>
<td>Application-oriented Subject Geography</td>
<td>35</td>
<td>85</td>
</tr>
<tr>
<td>Application-oriented Subject Geography Compulsory Electives 1</td>
<td>15</td>
<td>86</td>
</tr>
<tr>
<td>Application-oriented Subject Geography Compulsory Electives 2</td>
<td>10</td>
<td>89</td>
</tr>
<tr>
<td>Application-oriented Subject Geography Compulsory Electives 3</td>
<td>10</td>
<td>92</td>
</tr>
<tr>
<td>Application-oriented Subject Computer Science</td>
<td>35</td>
<td>103</td>
</tr>
<tr>
<td>Application-oriented Subject Computer Science Compulsory Electives</td>
<td>35</td>
<td>104</td>
</tr>
<tr>
<td>Application-oriented Subject Philosophy</td>
<td>35</td>
<td>121</td>
</tr>
<tr>
<td>Application-oriented Subject Philosophy Compulsory Courses</td>
<td>20</td>
<td>122</td>
</tr>
<tr>
<td>Application-oriented Subject Philosophy Compulsory Electives 1</td>
<td>15</td>
<td>125</td>
</tr>
<tr>
<td>Application-oriented Subject Physics</td>
<td>min. 35</td>
<td>142</td>
</tr>
<tr>
<td>Application-oriented Subject Physics Compulsory Courses</td>
<td>16</td>
<td>143</td>
</tr>
<tr>
<td>Application-oriented Subject Physics Compulsory Electives 1</td>
<td>3-4</td>
<td>147</td>
</tr>
<tr>
<td>Application-oriented Subject Physics Compulsory Electives 2</td>
<td>16</td>
<td>150</td>
</tr>
<tr>
<td>Application-oriented Subject Business Management and Economics</td>
<td>35</td>
<td>157</td>
</tr>
<tr>
<td>Application-oriented Subject Business Management and Economics Compulsory Courses</td>
<td>30</td>
<td>158</td>
</tr>
<tr>
<td>Application-oriented Subject Business Management and Economics Compulsory Electives</td>
<td>5</td>
<td>166</td>
</tr>
<tr>
<td>Thesis</td>
<td>10</td>
<td>175</td>
</tr>
<tr>
<td>Subject-specific Key Skills</td>
<td>10</td>
<td>177</td>
</tr>
</tbody>
</table>
Content and Objectives of the Programme

The mathematics Bachelor programme is offered by the Department of Mathematics, with a total of (currently: SS 2010) nine chairs. At the end of this course of study, the student should be familiar with the main branches of Mathematics, taught methods of mathematical reasoning and working as well as analytical thinking, abstract concepts and the ability to recognise and construct complex structures and interconnections. Through the course these skills, which the students acquires provides the basic knowledge required for a consecutive Bachelor-Masters degree. Moreover, they can later familiarise themselves with the many areas of society, in which mathematical methods can be applied to or be of use. This is supported through the study of an integrated elective application-oriented subject (biology, chemistry, geography, computer science, philosophy, physics or economics), in which the choice of the student is trusted to utilise the basic thoughts and technical skills of the subject, where there is an application of mathematical methods. In the mathematics Bachelor study, the main emphasis is put on basic mathematical knowledge, method knowledge and the development of the mental constructs which are typical for mathematics. The acquisition of special topics in different secondary branches of mathematics is subordinate. For the Bachelor thesis the student should work on a thematic and temporally closely limited frame in order to carry out a mathematical task, using well-known procedures and scientific criteria under guidance but, to a large extent, independently. The exam enables the acquisition of a comparable, international degree in the field of mathematics and provides the framework of a consecutive Bachelor-Masters degree as an initial professional qualification, which can be used as a means for entry into the working world or as preparation for further Masters study. The exam should ascertain whether the candidate overlooks the context of the basics in mathematics and possesses the ability to use the related scientific methods, with regards to mathematics and the selected elective application-oriented subjects.
Abbreviations used

Course types: E = field trip, K = colloquium, O = conversatorium, P = placement/lab course, R = project, S = seminar, T = tutorial, Ü = exercise, V = lecture

Term: SS = summer semester, WS = winter semester

Methods of grading: NUM = numerical grade, B/NB = (not) successfully completed

Regulations: (L)ASPO = general academic and examination regulations (for teaching-degree programmes), FSB = subject-specific provisions, SFB = list of modules

Other: A = thesis, LV = course(s), PL = assessment(s), TN = participants, VL = prerequisite(s)

Conventions

Unless otherwise stated, courses and assessments will be held in German, assessments will be offered every semester and modules are not creditable for bonus.

Notes

Should there be the option to choose between several methods of assessment, the lecturer will agree with the module coordinator on the method of assessment to be used in the current semester by two weeks after the start of the course at the latest and will communicate this in the customary manner.

Should the module comprise more than one graded assessment, all assessments will be equally weighted, unless otherwise stated below.

Should the assessment comprise several individual assessments, successful completion of the module will require successful completion of all individual assessments.

In accordance with

the general regulations governing the degree subject described in this module catalogue:

ASPO2007

associated official publications (FSB (subject-specific provisions)/SFB (list of modules)):

9-Dec-2008 (2008-32)

15-Mar-2010 (2010-11)

This module handbook seeks to render, as accurately as possible, the data that is of statutory relevance according to the examination regulations of the degree subject. However, only the FSB (subject-specific provisions) and SFB (list of modules) in their officially published versions shall be legally binding. In the case of doubt, the provisions on, in particular, module assessments specified in the FSB/SFB shall prevail.
Compulsory Courses

(91 ECTS credits)
<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propaedeutics of Mathematics</td>
<td>10-M-PPM-082-m01</td>
</tr>
</tbody>
</table>

**Module coordinator**

Dean of Studies Mathematik (Mathematics)

**Module offered by**

Institute of Mathematics

<table>
<thead>
<tr>
<th>ECTS</th>
<th>Method of grading</th>
<th>Only after succ. compl. of module(s)</th>
</tr>
</thead>
<tbody>
<tr>
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<td>(not) successfully completed</td>
<td>--</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Duration</th>
<th>Module level</th>
<th>Other prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 semester</td>
<td>undergraduate</td>
<td>Admission prerequisite to assessment: regular attendance of courses (as specified at the beginning of the course).</td>
</tr>
</tbody>
</table>

**Contents**

Fundamental proof methods and questions in mathematics, insight into examples of abstract concepts of mathematics, e.g. by reference to its historical development, approach to axiomatic and deduction.

**Intended learning outcomes**

The student is acquainted with the basic proof methods and techniques in mathematics. He/She is able to perform easy mathematical arguments independently and present them adequately and reasonably in written and oral form.

**Courses**

<table>
<thead>
<tr>
<th>V + Ü (no information on SWS (weekly contact hours) and course language available)</th>
</tr>
</thead>
</table>

**Method of assessment**

| project assignments (type and expenditure of time to be specified by the lecturer at the beginning of the course) |
| Assessment offered: once a year, winter semester |
| Language of assessment: German, English if agreed upon with the examiner |

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I**

(examination regulations for teaching-degree programmes)
Module title | Abbreviation
---|---
Introduction to Geometry | 10-M-GEO-082-m01

Module coordinator | Module offered by
Dean of Studies Mathematik (Mathematics) | Institute of Mathematics

<table>
<thead>
<tr>
<th>ECTS</th>
<th>Method of grading</th>
<th>Only after succ. compl. of module(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>numerical grade</td>
<td>--</td>
</tr>
</tbody>
</table>

Duration | Module level | Other prerequisites
1 semester | undergraduate | By way of exception, additional prerequisites are listed in the section on assessments.

Contents

Introduction to topics in geometry: axiomatic introduction of projective spaces, coordinates, fundamental theorems, relations to linear algebra and algebra, curves and hypersurfaces in Euclidean spaces, curvature.

Intended learning outcomes

The student is acquainted with the fundamental concepts and methods of geometry.

Courses (type, number of weekly contact hours, language — if other than German)

This module has 2 components; information on courses listed separately for each component.

- 10-M-GEO-1-082: V + Ü (no information on language and number of weekly contact hours available)
- 10-M-GEO-2-082: V + Ü (no information on language and number of weekly contact hours available)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

This module has the following 2 assessment components. To pass the module as a whole students must pass one of the two assessment components.

**Assessment component to module component 10-M-GEO-1-082: Einführung in die Projektive Geometrie**

- 8 ECTS credits, method of grading: numerical grade
- written examination (approx. 90 minutes); if announced by the lecturer, the written examination can be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups (groups of 2, approx. 30 minutes)
- Language of assessment: English, German if agreed upon with the examiner
- Other prerequisites: Admission prerequisite to assessment: successful completion of approx. 50% of exercises. Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.

**Assessment component to module component 10-M-GEO-2-082: Einführung in die Differentialgeometrie**

- 8 ECTS credits, method of grading: numerical grade
- written examination (approx. 90 minutes); if announced by the lecturer, the written examination can be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups (groups of 2, approx. 30 minutes)
- Language of assessment: English, German if agreed upon with the examiner
- Other prerequisites: Admission prerequisite to assessment: successful completion of approx. 50% of exercises. Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.
<table>
<thead>
<tr>
<th>Allocation of places</th>
<th>--</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additional information</td>
<td>--</td>
</tr>
<tr>
<td><strong>Referred to in LPO I</strong> (examination regulations for teaching-degree programmes)</td>
<td>§ 73 (1) 4. Mathematik Geometrie</td>
</tr>
</tbody>
</table>
# Module Catalogue for the Subject
## Mathematics
### Bachelor's with 1 major, 180 ECTS credits

<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number Theory and Algebra</td>
<td>10-M-ZAL-082-m01</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Module coordinator</th>
<th>Module offered by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dean of Studies Mathematik (Mathematics)</td>
<td>Institute of Mathematics</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ECTS</th>
<th>Method of grading</th>
<th>Only after succ. compl. of module(s)</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Duration</th>
<th>Module level</th>
<th>Other prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 semester</td>
<td>undergraduate</td>
<td>By way of exception, additional prerequisites are listed in the section on assessments.</td>
</tr>
</tbody>
</table>

## Contents
Introduction to number theory, algebra and their interrelations: basic algebraic structures (groups, rings, fields); discussion of properties of integers and rational numbers (as well as algebraic extensions) with regard to their algebraic structure (residue class rings and finite fields).

## Intended learning outcomes
The student is acquainted with the fundamental concepts and methods of number theory and algebra. He/she is able to interrelate these concepts and realises the advantages of thinking across the borders of different branches in mathematics.

## Courses
This module comprises 3 module components. Information on courses will be listed separately for each module component.

- **10-M-ZAL-1-082:** V + Ü (no information on SWS (weekly contact hours) and course language available)
- **10-M-ZAL-2-082:** V + Ü (no information on SWS (weekly contact hours) and course language available)
- **10-M-ZAL-P-082:** M (no information on SWS (weekly contact hours) and course language available)

## Method of assessment
Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

### Assessment in module component 10-M-ZAL-1-082: Introduction to Number Theory
- **4 ECTS,** Method of grading: (not) successfully completed
- written examination (approx. 90 minutes); if announced by the lecturer, the written examination can be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups (groups of 2, approx. 30 minutes)
- Language of assessment: German, English if agreed upon with the examiner
- Other prerequisites: Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.

### Assessment in module component 10-M-ZAL-2-082: Introduction to Algebra
- **7 ECTS,** Method of grading: (not) successfully completed
- written examination (approx. 90 minutes); if announced by the lecturer, the written examination can be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups (groups of 2, approx. 30 minutes)
- Language of assessment: German, English if agreed upon with the examiner
- Other prerequisites: Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for
the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.

**Assessment in module component 10-M-ZAL-P-082:** Examination in Number Theory and Algebra
- 2 ECTS, Method of grading: numerical grade
- oral examination of one candidate each (approx. 30 minutes)
- Language of assessment: German, English if agreed upon with the examiner
- Only after successful completion of module components: Successful completion of module component 10-M-ZAL-1 or module component 10-M-ZAL-2 is a prerequisite for participation in module component 10-M-ZAL-P.

### Allocation of places

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### Additional information

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### Referred to in LPO I (examination regulations for teaching-degree programmes)

§ 73 (1) 2. Mathematik Lineare Algebra, Algebra und Elemente der Zahlentheorie
<table>
<thead>
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<td>Dean of Studies Mathematik (Mathematics)</td>
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</tr>
</tbody>
</table>

**Contents**

Solution of systems of linear equations and curve fitting problems, nonlinear equations and systems of equations, interpolation with polynomials, splines and trigonometric functions, numerical integration.

**Intended learning outcomes**

The student is acquainted with the fundamental concepts and methods in numerical mathematics, applies them to practical problems and knows about their typical fields of application.

**Courses** (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 90 minutes); if announced by the lecturer, the written examination can be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups (groups of 2, approx. 30 minutes)

Language of assessment: German, English if agreed upon with the examiner

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 73 (1) 5. Mathematik Angewandte Mathematik
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<td>Analysis</td>
<td>10-M-ANA-082-m01</td>
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<td>By way of exception, additional prerequisites are listed in the section on assessments.</td>
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</table>

**Contents**

Real numbers and completeness, basic topological notions, convergence and divergence of sequences and series, power series, Taylor series, fundamental calculus in one and several variables (including inverse and implicit function theorem); fundamental integral calculus in one variable (Riemann integral and improper integrals).

**Intended learning outcomes**

The student knows and masters the essential methods and notions of analysis. He/She is able to perform easy mathematical arguments and present them adequately in written and oral form. He/She is acquainted with the central proof methods and concepts in analysis, their analytic background and geometric interpretation.

**Courses** (type, number of weekly contact hours, language — if other than German)

This module comprises 3 module components. Information on courses will be listed separately for each module component.

- 10-M-ANA-1-082: V + Ü (no information on SWS (weekly contact hours) and course language available)
- 10-M-ANA-2-082: V + Ü (no information on SWS (weekly contact hours) and course language available)
- 10-M-ANA-P-082: M (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

**Assessment in module component 10-M-ANA-1-082: Analysis 1 Analysis 1**

- 8 ECTS, Method of grading: (not) successfully completed
- a) written examination (approx. 90 minutes; usually chosen) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes)
- Language of assessment: German, English if agreed upon with the examiner
- Other prerequisites: Modules 10-M-VKM and 10-M-PPM are recommended.

**Assessment in module component 10-M-ANA-2-082: Analysis 2 Analysis 2**

- 7 ECTS, Method of grading: (not) successfully completed
- a) written examination (approx. 90 minutes; usually chosen) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes)
- Language of assessment: German, English if agreed upon with the examiner
- Other prerequisites: Modules 10-M-VKM and 10-M-PPM are recommended; in addition, module component 10-M-ANA-1 is recommended for module component 10-M-ANA-2.

**Assessment in module component 10-M-ANA-P-082: Examination in Analysis**

- 2 ECTS, Method of grading: numerical grade
- oral examination of one candidate each (approx. 30 minutes)
- Language of assessment: German, English if agreed upon with the examiner
- Only after successful completion of module components: Successful completion of any one of the module components 10-M-ANA-1, 10-M-ANL-1, 10-M-ANA-2, 10-M-ANL-2 is a prerequisite for participation in module component 10-M-ANA-P.
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<td>§ 73 (1) 1. Mathematik Analysis</td>
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</table>
Module title | Abbreviation
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Linear Algebra | 10-M-LNA-082-m01

Module coordinator | Module offered by
Dean of Studies Mathematik (Mathematics) | Institute of Mathematics

ECTS | Method of grading | Only after succ. compl. of module(s)
--- | --- | ---
14 | numerical grade | --

Duration | Module level | Other prerequisites
--- | --- | ---
2 semester | undergraduate | By way of exception, additional prerequisites are listed in the section on assessments.

Contents

Sets, relations and maps; notions of groups, rings and fields (in particular, polynomial rings); vector spaces (subspaces, quotient spaces, linear independency, basis, dimension); linear maps (isomorphism theorem, image, kernel, rank); matrix calculus; systems of linear equations, determinants, eigenvalues, eigenvectors and eigenspaces, diagonalisability (including characteristic polynomial, minimal polynomial), normal forms, bilinear forms; Euclidean and unitary vector spaces (orthonormal bases, isometries, principal axis transformation).

Intended learning outcomes

The student knows and masters the basic notions and essential methods of linear algebra. He/She is able to perform easy mathematical arguments independently, and can present them adequately in written and oral form. He/She is able to apply the central proof methods and concepts of linear algebra and knows about their algebraic and geometric background.

Courses

This module comprises 3 module components. Information on courses will be listed separately for each module component.

- 10-M-LNA-1-082: V + Ü (no information on SWS (weekly contact hours) and course language available)
- 10-M-LNA-2-082: V + Ü (no information on SWS (weekly contact hours) and course language available)
- 10-M-LNA-P-082: M (no information on SWS (weekly contact hours) and course language available)

Method of assessment

Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

Assessment in module component 10-M-LNA-1-082: Linear Algebra 1 Linear Algebra 1

- 7 ECTS, Method of grading: (not) successfully completed
- written examination (approx. 90 minutes); if announced by the lecturer, the written examination can be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups (groups of 2, approx. 30 minutes)
- Language of assessment: German, English if agreed upon with the examiner
- Other prerequisites: Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.

Assessment in module component 10-M-LNA-2-082: Linear Algebra 2 Linear Algebra 2

- 5 ECTS, Method of grading: (not) successfully completed
- written examination (approx. 90 minutes); if announced by the lecturer, the written examination can be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups (groups of 2, approx. 30 minutes)
- Language of assessment: German, English if agreed upon with the examiner
• Other prerequisites: Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.

**Assessment in module component 10-M-LNA-P-082:** Examination in Linear Algebra

• 2 ECTS, Method of grading: numerical grade
• oral examination of one candidate each (approx. 30 minutes)
• Language of assessment: German, English if agreed upon with the examiner
• Only after successful completion of module components: Successful completion of module component 10-M-LNA-1 or module component 10-M-LNA-2 is a prerequisite for participation in module component 10-M-LNA-P.

### Allocation of places

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### Additional information

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### Referred to in LPO I (examination regulations for teaching-degree programmes)

§ 73 (1) 2. Mathematik Lineare Algebra, Algebra und Elemente der Zahlentheorie
<table>
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<td>Stochastics 1</td>
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</tbody>
</table>

**Contents**

Combinatorics, Laplace models, selected discrete distributions, elementary measure and integration theory, continuous distributions: normal distribution, random variable, distribution function, product measures and stochastic independence, elementary conditional probability, characteristics of distributions: expected value and variance, limit theorems: law of large numbers, central limit theorem.

**Intended learning outcomes**

The student is acquainted with fundamental concepts and methods in stochastics, applies these methods to practical problems and knows about the typical fields of application.

**Courses**

V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

written examination (approx. 90 minutes); if announced by the lecturer, the written examination can be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups (groups of 2, approx. 30 minutes)

Language of assessment: German, English if agreed upon with the examiner

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

§ 73 (1) 3. Mathematik Stochastik
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<tr>
<td>Ordinary Differential Equations and Complex Analysis</td>
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<td>13</td>
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<td>By way of exception, additional prerequisites are listed in the section on assessments.</td>
</tr>
</tbody>
</table>

### Contents

Existence and uniqueness theorems on solutions of ordinary differential equations, solution theorems on systems of linear differential equations, introduction to the problem of systems of nonlinear differential equations, basic notions in the qualitative theory of ordinary differential equations, basic properties of holomorphic functions, meromorphic functions and conformal maps, basic proof methods in differential equations and complex analysis, applications in computer science, physics, engineering science and other fields of mathematics.

### Intended learning outcomes

The student is acquainted with the fundamental concepts and methods of the theory of ordinary differential equations and holomorphic functions. He/she is able to interconnect these concepts and realises the advantages of thinking across the borders of different branches in mathematics.

### Courses

This module comprises 3 module components. Information on courses will be listed separately for each module component.

- 10-M-DFT-1-082: V + Ü (no information on SWS (weekly contact hours) and course language available)
- 10-M-DFT-2-082: V + Ü (no information on SWS (weekly contact hours) and course language available)
- 10-M-DFT-P-082: M (no information on SWS (weekly contact hours) and course language available)

### Method of assessment

Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

#### Assessment in module component 10-M-DFT-1-082: Ordinary Differential Equations

- 4 ECTS, Method of grading: (not) successfully completed
- Written examination (approx. 90 minutes); if announced by the lecturer, the written examination can be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups (groups of 2, approx. 30 minutes)
- Language of assessment: German, English if agreed upon with the examiner
- Other prerequisites: Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.

#### Assessment in module component 10-M-DFT-2-082: Introduction to Complex Analysis

- 7 ECTS, Method of grading: (not) successfully completed
- Written examination (approx. 90 minutes); if announced by the lecturer, the written examination can be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups (groups of 2, approx. 30 minutes)
- Language of assessment: German, English if agreed upon with the examiner
- Other prerequisites: Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.

**Assessment in module component 10-M-DFT-P-082:** Examination in Ordinary Differential Equations and Complex Analysis
- 2 ECTS, Method of grading: numerical grade
- oral examination of one candidate each (approx. 30 minutes)
- Language of assessment: German, English if agreed upon with the examiner
- Only after successful completion of module components: Successful completion of module component 10-M-DFT-1 or module component 10-M-DFT-2 is a prerequisite for participation in module component 10-M-DFT-P.

### Allocation of places
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### Additional information
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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 73 (1) 1. Mathematik Analysis
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**Module coordinator**

Dean of Studies Mathematik (Mathematics)

**Module offered by**

Institute of Mathematics

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**Duration**

1 semester

**Module level**

undergraduate

**Other prerequisites**

Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.

**Contents**

Lebesgue integral in several variables, including theorems on convergence and Fubini's theorem, $L^p$-spaces and elementary Fourier theory in $L^2$, Gauss's theorem.

**Intended learning outcomes**

The student is acquainted with advanced topics in analysis. Taking the example of the Lebesgue integral, he or she is able to understand the construction of a complex mathematical concept.

**Courses** (type, number of weekly contact hours, language — if other than German)

Ü + V (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 90 minutes); if announced by the lecturer, the written examination can be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups (groups of 2, approx. 30 minutes)

Language of assessment: German, English if agreed upon with the examiner

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 73 (1) 1. Mathematik Analysis
Compulsory Electives

(59 ECTS credits)
Mathematics 1
(5 ECTS credits)
Module title: Numerical Mathematics 2
Abbreviation: 10-M-NM2-082-m01

Module coordinator: Dean of Studies Mathematik (Mathematics)
Module offered by: Institute of Mathematics

ECTS: 5
Method of grading: numerical grade
Only after succ. compl. of module(s): --

Duration: 1 semester
Module level: undergraduate
Other prerequisites: Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.

Contents
Solution methods and applications for eigenvalue problems, linear programming, initial value problems for ordinary differential equations, boundary value problems.

Intended learning outcomes
The student is able to draw a distinction between the different concepts of numerical mathematics and knows about their advantages and limitations concerning the possibilities of application in different fields of natural and engineering sciences and economics.

Courses (type, number of weekly contact hours, language — if other than German)
V + Ü (no information on SWS (weekly contact hours) and course language available)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
written examination (approx. 90 minutes); if announced by the lecturer, the written examination can be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups (groups of 2, approx. 30 minutes)
Language of assessment: German, English if agreed upon with the examiner

Allocation of places
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Additional information
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§ 73 (1) 5. Mathematik Angewandte Mathematik
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</tr>
</tbody>
</table>

**Contents**

Elements of data analysis, statistics of data in normal and other distributions, elements of multivariate statistics.

**Intended learning outcomes**

The student is acquainted with fundamental concepts and methods in statistics, applies these methods to practical problems and knows about the typical fields of application.

**Courses** (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 90 minutes); if announced by the lecturer, the written examination can be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups (groups of 2, approx. 30 minutes)

Language of assessment: German, English if agreed upon with the examiner

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 73 (1) 3. Mathematik Stochastik
Mathematics 2
(10 ECTS credits)
### Module title

**Introduction to Discrete Mathematics**

### Abbreviation

10-M-EDM-072-m01

### Module coordinator

Dean of Studies Mathematik (Mathematics)

### Module offered by

Institute of Mathematics

### ECTS

5

### Method of grading

Numerical grade

### Only after succ. compl. of module(s)

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### Duration

1 semester

### Module level

Undergraduate

### Other prerequisites

Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.

### Contents

Techniques from combinatorics, introduction to graph theory (including applications), cryptographic methods, error-correcting codes.

### Intended learning outcomes

The student is acquainted with the fundamental concepts and results in discrete mathematics, masters the relevant proof techniques, is able to apply methods from number theory and algebra to discrete mathematics and realises the scope of applications of discrete structures.

### Courses

(V + Ü (no information on SWS (weekly contact hours) and course language available)

### Method of assessment

Written examination (approx. 90 minutes); if announced by the lecturer, the written examination can be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups (groups of 2, approx. 30 minutes)

Language of assessment: German, English if agreed upon with the examiner

### Allocation of places

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### Additional information

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### Referred to in LPO 1

(Examination regulations for teaching-degree programmes)

§ 73 (1) 2. Mathematik Lineare Algebra, Algebra und Elemente der Zahlentheorie
<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>Introduction to Functional Analysis</td>
<td>10-M-FAN-072-m01</td>
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</tbody>
</table>

**Contents**

Banach spaces and Hilbert spaces, bounded operators, principles of functional analysis.

**Intended learning outcomes**

The student knows the fundamental concepts and methods of functional analysis as well as the pertinent proof methods, is able to apply methods from linear algebra and analysis to functional analysis, and realises the broad applicability of the theory to other branches of mathematics.

**Courses** (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 90 minutes); if announced by the lecturer, the written examination can be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups (groups of 2, approx. 30 minutes)

Language of assessment: German, English if agreed upon with the examiner

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 73 (1) 1. Mathematik Analysis
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<td>Operations Research</td>
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</tbody>
</table>

**Contents**

Linear programming, duality theory, transport problems, integral linear programming, graph theoretic problems.

**Intended learning outcomes**

The student is acquainted with the fundamental methods in operations research, as required as a central tool for solving many practical problems especially in economics. He/She is able to apply these methods to practical problems, both theoretically and numerically.

**Courses** (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 90 minutes); if announced by the lecturer, the written examination can be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups (groups of 2, approx. 30 minutes)

Language of assessment: German, English if agreed upon with the examiner

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 73 (1) 5. Mathematik Angewandte Mathematik
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</table>

**Contents**

Basic notions in stability theory, Lyapunov theory; stable manifolds, periodic solutions including Poincare-Bendixson, chaotic dynamics; applications in physics and biology (e.g. Hamiltonian systems, Volterra-Lotka).

**Intended learning outcomes**

The student is acquainted with the fundamental concepts and results in non-linear dynamics and their proof methods. He/She is able to apply these methods to simple situations, e.g. in physics or biology.

**Courses**

- V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

- written examination (approx. 90 minutes); if announced by the lecturer, the written examination can be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups (groups of 2, approx. 30 minutes)
- Language of assessment: German, English if agreed upon with the examiner

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 73 (1) 1. Mathematik Analysis
Mathematics 3
(4 ECTS credits)
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<td>Reading Course Numerical Mathematics</td>
<td>10-M-RCN-082-m01</td>
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<tbody>
<tr>
<td>1 semester</td>
<td>undergraduate</td>
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**Contents**

Advanced topics in numerical mathematics.

**Intended learning outcomes**

The student is able to work independently on a given scientific topic. He or she can tackle a simple mathematical text and can use standard literature.

**Courses**

(type, number of weekly contact hours, language — if other than German)

A (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) talk (approx. 30 minutes) or b) written elaboration (approx. 5 to 10 pages)

** Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

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<table>
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<th>Module title</th>
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<td>Reading Course Stochastics</td>
<td>10-M-RCS-082-m01</td>
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**Module coordinator**
Dean of Studies Mathematik (Mathematics)

**Module offered by**
Institute of Mathematics

**ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** |
--- | --- | --- |
4 | numerical grade | -- |

**Duration** | **Module level** | **Other prerequisites** |
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1 semester | undergraduate | -- |

**Contents**
Advanced topics in stochastics.

**Intended learning outcomes**
The student is able to work independently on a given scientific topic. He or she can tackle a simple mathematical text and can use standard literature.

**Courses** (type, number of weekly contact hours, language — if other than German)
A (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
a) talk (approx. 30 minutes) or b) written elaboration (approx. 5 to 10 pages)

**Allocation of places**
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**Additional information**
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**Referred to in LPO I** (examination regulations for teaching-degree programmes)
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<table>
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<th>Module title</th>
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<td>Reading Course Discrete Mathematics</td>
<td>10-M-RCD-082-m01</td>
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<td>1 semester</td>
<td>undergraduate</td>
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</table>

**Contents**
Basics in discrete mathematics.

**Intended learning outcomes**
The student is able to work independently on a given scientific topic. He or she can tackle a simple mathematical text and can use standard literature.

**Courses** (type, number of weekly contact hours, language — if other than German)
A (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
a) talk (approx. 30 minutes) or b) written elaboration (approx. 5 to 10 pages)

**Allocation of places**
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**Additional information**
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**Referred to in LPO I** (examination regulations for teaching-degree programmes)
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<td>Reading Course Functional Analysis</td>
<td>10-M-RCF-o82-m01</td>
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**Module coordinator**
Dean of Studies Mathematik (Mathematics)

**Module offered by**
Institute of Mathematics

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**Duration**
1 semester

**Module level**
undergraduate

**Other prerequisites**
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**Contents**
Basics in functional analysis.

**Intended learning outcomes**
The student is able to work independently on a given scientific topic. He or she can tackle a simple mathematical text and can use standard literature.

**Courses**
A (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**
(a) talk (approx. 30 minutes) or (b) written elaboration (approx. 5 to 10 pages)

**Allocation of places**
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**Additional information**
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<table>
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<th>Module title</th>
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<td>Reading Course Operations Research</td>
<td>10-M-RCO-082-m01</td>
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<td>1 semester</td>
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**Contents**

Basics in operations research.

**Intended learning outcomes**

The student is able to work independently on a given scientific topic. He or she can tackle a simple mathematical text and can use standard literature.

**Courses** (type, number of weekly contact hours, language — if other than German)

A (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) talk (approx. 30 minutes) or b) written elaboration (approx. 5 to 10 pages)

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Contents**
Basics in dynamical systems and nonlinear dynamics.

**Intended learning outcomes**
The student is able to work independently on a given scientific topic. He or she can tackle a simple mathematical text and can use standard literature.

**Courses**
A (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**
A) talk (approx. 30 minutes) or B) written elaboration (approx. 5 to 10 pages)

**Allocation of places**
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**Additional information**
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**Referred to in LPO I**
(examination regulations for teaching-degree programmes)

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<table>
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<td>Reading Course Optimisation</td>
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### Contents
Basics in optimization.

### Intended learning outcomes
The student is able to work independently on a given scientific topic. He or she can tackle a simple mathematical text and can use standard literature.

### Courses
(type, number of weekly contact hours, language — if other than German)
A (no information on SWS (weekly contact hours) and course language available)

### Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
a) talk (approx. 30 minutes) or b) written elaboration (approx. 5 to 10 pages)

### Allocation of places
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### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)
--
Mathematics 4
(5 ECTS credits)
Module title: Seminar in Analysis
Abbreviation: 10-M-BSA-072-m01

Module coordinator: Dean of Studies Mathematik (Mathematics)
Module offered by: Institute of Mathematics

ECTS: 5
Method of grading: numerical grade
Only after succ. compl. of module(s): --

Duration: 1 semester
Module level: undergraduate
Other prerequisites: --

Contents:
A selected topic in analysis.

Intended learning outcomes:
The student gains first experience with independent scientific work. He/She masters elaboration and structuring of a given topic using selected literature, and prepares a talk on the subject. He/She is able to participate actively in a scientific discussion.

Courses:
(type, number of weekly contact hours, language — if other than German)
S (no information on SWS (weekly contact hours) and course language available)

Method of assessment:
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
talk (approx. 60 minutes)
Assessment offered: in the semester in which the course is offered
Language of assessment: German, English if agreed upon with the examiner

Allocation of places:
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Additional information:
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Referred to in LPO I (examination regulations for teaching-degree programmes)
§ 73 (1) 1. Mathematik Analysis
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<tr>
<td>Seminar in Linear Algebra</td>
<td>10-M-BSL-072-m01</td>
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**Module coordinator**

Dean of Studies Mathematik (Mathematics)

**Module offered by**

Institute of Mathematics

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**Duration**

1 semester

**Module level**

undergraduate

**Other prerequisites**

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**Contents**

A selected topic in linear algebra.

**Intended learning outcomes**

The student gains first experience with independent scientific work. He/She masters elaboration and structuring of a given topic using selected literature, and prepares a talk on the subject. He/She is able to participate actively in a scientific discussion.

**Courses**

(type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Talk (approx. 60 minutes)

Assessment offered: in the semester in which the course is offered

Language of assessment: German, English if agreed upon with the examiner

**Allocation of places**

--

**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

§ 73 (1) 2. Mathematik Lineare Algebra, Algebra und Elemente der Zahlentheorie
Module title | Abbreviation
---|---
Seminar in Algebra | 10-M-BSE-072-m01

Module coordinator | Module offered by
Dean of Studies Mathematik (Mathematics) | Institute of Mathematics

ECTS | Method of grading | Only after succ. compl. of module(s)
---|---|---
5 | numerical grade | --

Duration | Module level | Other prerequisites
1 semester | undergraduate | --

Contents
A selected topic in algebra.

Intended learning outcomes
The student gains first experience with independent scientific work. He/She masters elaboration and structuring of a given topic using selected literature, and prepares a talk on the subject. He/She is able to participate actively in a scientific discussion.

Courses (type, number of weekly contact hours, language — if other than German)
S (no information on SWS (weekly contact hours) and course language available)

Method of assessment (type, scope, language — if other than German, examination offered — If not every semester, information on whether module is creditable for bonus)
talk (approx. 60 minutes)
Assessment offered: in the semester in which the course is offered
Language of assessment: German, English if agreed upon with the examiner

Allocation of places
--

Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
§ 73 (1) 2. Mathematik Lineare Algebra, Algebra und Elemente der Zahlentheorie
<table>
<thead>
<tr>
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<th>Abbreviation</th>
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<tbody>
<tr>
<td>Seminar in Geometry</td>
<td>10-M-BSG-072-m01</td>
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<tbody>
<tr>
<td>1 semester</td>
<td>undergraduate</td>
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</table>

**Contents**

A selected topic in geometry or differential geometry.

**Intended learning outcomes**

The student gains first experience with independent scientific work. He/She masters elaboration and structuring of a given topic using selected literature, and prepares a talk on the subject. He/She is able to participate actively in a scientific discussion.

**Courses**

(type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Talk (approx. 60 minutes)

Assessment offered: in the semester in which the course is offered

Language of assessment: German, English if agreed upon with the examiner

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

§ 73 (1) 4. Mathematik Geometrie
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<td>Seminar in Number Theory</td>
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**Contents**

A selected topic in number theory.

**Intended learning outcomes**

The student gains first experience with independent scientific work. He/She masters elaboration and structuring of a given topic using selected literature, and prepares a talk on the subject. He/She is able to participate actively in a scientific discussion.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Talk (approx. 60 minutes)

Assessment offered: in the semester in which the course is offered

Language of assessment: German, English if agreed upon with the examiner

**Allocation of places**

--

**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 73 (1) 2. Mathematik Lineare Algebra, Algebra und Elemente der Zahlentheorie
Module title: Seminar in Ordinary Differential Equations

Abbreviation: 10-M-BSW-072-m01

Module coordinator: Dean of Studies Mathematik (Mathematics)

Module offered by: Institute of Mathematics

ECTS: 5

Method of grading: numerical grade

Only after succ. compl. of module(s): --

Duration: 1 semester

Module level: undergraduate

Other prerequisites: --

Contents:
A selected topic in the theory of ordinary differential equations.

Intended learning outcomes:
The student gains first experience with independent scientific work. He/She masters elaboration and structuring of a given topic using selected literature, and prepares a talk on the subject. He/She is able to participate actively in a scientific discussion.

Courses:
S (no information on SWS (weekly contact hours) and course language available)

Method of assessment:
Talk (approx. 60 minutes)

Assessment offered: in the semester in which the course is offered

Language of assessment: German, English if agreed upon with the examiner

Allocation of places:
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Additional information:
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Referred to in LPO I (examination regulations for teaching-degree programmes):
§ 73 (1) 1. Mathematik Analysis
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<td>Seminar in Complex Analysis</td>
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### Contents

A selected topic in complex analysis.

### Intended learning outcomes

The student gains first experience with independent scientific work. He/She masters elaboration and structuring of a given topic using selected literature, and prepares a talk on the subject. He/She is able to participate actively in a scientific discussion.

### Courses

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Assessment offered: in the semester in which the course is offered
Language of assessment: German, English if agreed upon with the examiner

### Allocation of places

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### Additional information

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### Referred to in LPO I (examination regulations for teaching-degree programmes)

§ 73 (1) 1. Mathematik Analysis
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Contents

A selected topic in numerical mathematics.

Intended learning outcomes

The student gains first experience with independent scientific work. He/She masters elaboration and structuring of a given topic using selected literature, and prepares a talk on the subject. He/She is able to participate actively in a scientific discussion.

Courses (type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

Method of assessment (type, scope, language — if other than German, examination offered — If not every semester, information on whether module is creditable for bonus)

talk (approx. 60 minutes)
Assessment offered: in the semester in which the course is offered
Language of assessment: German, English if agreed upon with the examiner

Allocation of places

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Additional information

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Referred to in LPO I (examination regulations for teaching-degree programmes)

§ 73 (1) 5. Mathematik Angewandte Mathematik
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**Contents**

A selected topic in stochastics.

**Intended learning outcomes**

The student gains first experience with independent scientific work. He/She masters elaboration and structuring of a given topic using selected literature, and prepares a talk on the subject. He/She is able to participate actively in a scientific discussion.

**Courses**

(type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Talk (approx. 60 minutes)

Assessment offered: in the semester in which the course is offered

Language of assessment: German, English if agreed upon with the examiner

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

§ 73 (1) 3. Mathematik Stochastik
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<td>Seminar in Functional Analysis</td>
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</table>

**Contents**

A selected topic in functional analysis.

**Intended learning outcomes**

The student gains first experience with independent scientific work. He/She masters elaboration and structuring of a given topic using selected literature, and prepares a talk on the subject. He/She is able to participate actively in a scientific discussion.

**Courses**

(type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

talk (approx. 60 minutes)

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<td>Seminar in Operation Research</td>
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**Contents**

A selected topic in operations research.

**Intended learning outcomes**

The student gains first experience with independent scientific work. He/She masters elaboration and structuring of a given topic using selected literature, and prepares a talk on the subject. He/She is able to participate actively in a scientific discussion.

**Courses**

(type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

(type, scope, language — if other than German, examination offered — If not every semester, information on whether module is creditable for bonus)

talk (approx. 60 minutes)

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

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**Contents**

A selected topic in discrete mathematics.

**Intended learning outcomes**

The student gains first experience with independent scientific work. He/She masters elaboration and structuring of a given topic using selected literature, and prepares a talk on the subject. He/She is able to participate actively in a scientific discussion.

**Courses**

(type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

(type, scope, language — if other than German, examination offered — If not every semester, information on whether module is creditable for bonus)

talk (approx. 60 minutes)

**Allocation of places**

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**Additional information**

--

**Referred to in LPO I**
(examination regulations for teaching-degree programmes)

--
Application-oriented Subject
(35 ECTS credits)
Application-oriented Subject Biology
(35 ECTS credits)
Application-oriented Subject Biology Compulsory Courses
(10 ECTS credits)
Module title
Genetics, Neurobiology, Behaviour

Module coordinator
Dean of Studies Biologie (Biology)

Module offered by
Faculty of Biology

ECTS
6

Method of grading
numerical grade

Duration
1 semester

Module level
undergraduate

Other prerequisites
By way of exception, additional prerequisites are listed in the section on assessments.

Contents
Fundamental principles of genetics, neurobiology and behavioural biology.

Intended learning outcomes
[Version 1: Students will understand that there are molecular, cellular and system biological mechanisms and processes involved in animal behaviour and will be able to relate animal behaviour to the molecular and formal bases of inheritance.] [Version 2: Students will understand that there are molecular, cellular and system biological mechanisms and processes involved in animal behaviour and will be able to relate animal behaviour to the molecular and formal bases of inheritance.]

Courses
This module comprises 3 module components. Information on courses will be listed separately for each module component.

• 07-2A2GNV-1G-072: V + Ü (no information on SWS (weekly contact hours) and course language available)
• 07-2A2GNV-2N-072: V + Ü (no information on SWS (weekly contact hours) and course language available)
• 07-2A2GNV-3V-072: V + Ü (no information on SWS (weekly contact hours) and course language available)

Method of assessment
Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

Assessment in module component 07-2A2GNV-1G-072: Basic Genetics
• 2 ECTS, Method of grading: numerical grade
• written examination (approx. 30 minutes)
• Other prerequisites: Admission prerequisite to assessment: regular attendance of exercises and successful completion of the respective exercises as specified at the beginning of the course.

Assessment in module component 07-2A2GNV-2N-072: Basic Neurobiology
• 2 ECTS, Method of grading: numerical grade
• written examination (approx. 30 minutes)
• Other prerequisites: Admission prerequisite to assessment: regular attendance of exercises and successful completion of the respective exercises as specified at the beginning of the course.

Assessment in module component 07-2A2GNV-3V-072: Behavioural Biology
• 2 ECTS, Method of grading: numerical grade
• written examination (approx. 30 minutes, word problems and/or multiple choice questions)
• Other prerequisites: Admission prerequisite to assessment: regular attendance of exercises and successful completion of the respective exercises as specified at the beginning of the course.

Allocation of places
Only as part of "spezielles Studienangebot": 10 places.

Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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<td>Structure and Function of Cells</td>
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<td>Faculty of Biology</td>
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**Contents**

[Version 1: This module will discuss the cell, the smallest unit of life, starting with its macroscopic structure before moving on to its microscopic structure. It will point out differences and similarities between prokaryotic cells (bacteria, archaeobacteria) and eukaryotic cells (animals, plants).] [Version 2: The first part of the module will acquaint students with the elementary building blocks of life as well as biological categories. Building on this knowledge, the course will then discuss the cell, the smallest unit of life, starting with its macroscopic structure before moving on to its microscopic structure. It will point out differences and similarities between prokaryotic cells (bacteria, archaeobacteria) and eukaryotic cells (animals, plants).]

**Intended learning outcomes**

Knowledge of the structures of prokaryotic and eukaryotic cells and their (biological) macromolecules. Knowledge of the specific characteristics of the intracellular and extracellular structures of prokaryotes as well as animal and plant cells. Familiarity with the components and functioning of microscopes.

**Courses** (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (60 minutes)

**Allocation of places**

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**Additional information**

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**Referred to in LPO** (examination regulations for teaching-degree programmes)

--
Application-oriented Subject Biology Compulsory Electives
(25 ECTS credits)

In the area of mandatory electives, two of the following three modules must be completed: 07-1A1E, 07-1A1T, 07-1A1P. To achieve the required total of 25 ECTS credits in the area of mandatory electives, students may choose as many of the remaining modules as they wish. When taking up their studies, students are highly recommended to consult with the course advisory service Biology that will help them make an appropriate choice of modules.
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### Contents

Fundamental principles of bioinformatics.

### Intended learning outcomes

Students are proficient in methods for the analysis of DNA and protein databases.

### Courses (type, number of weekly contact hours, language — if other than German)

This module comprises 2 module components. Information on courses will be listed separately for each module component.

- 07-3A3Bl-1B-072: V (no information on SWS (weekly contact hours) and course language available)
- 07-3A3Bl-2B-072: S (no information on SWS (weekly contact hours) and course language available)

### Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

**Assessment in module component 07-3A3Bl-1B-072: Bioinformatics (Lecture)**

- 1 ECTS, Method of grading: numerical grade
- written examination (approx. 20 minutes)

**Assessment in module component 07-3A3Bl-2B-072: Bioinformatics (Seminar)**

- 1 ECTS, Method of grading: (not) successfully completed
- term paper (approx. 5 to 10 pages)

### Allocation of places

Only as part of Biochemistry Master's: 5 places. Places will be allocated by lot.

### Additional information

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
### Module title
Ecology of plants and animals

### Abbreviation
07-3A3OE-072-m01

### Module coordinator
Dean of Studies Biologie (Biology)

### Module offered by
Faculty of Biology

### ECTS
6

### Method of grading
numerical grade

### Only after succ. compl. of module(s)
--

### Duration
1 semester

### Module level
undergraduate

### Other prerequisites
--

### Contents
This module will provide students with an overview of the interactions of plants and animals with their abiotic and biotic environments. The module will focus on the functional adaptation to environmental conditions as well as on the structure and dynamics of populations and ecosystems. Students will be introduced to fundamental model concepts of ecology, will become familiar with examples of research findings and will acquire the fundamental knowledge necessary to develop an understanding of current ecological problems.

### Intended learning outcomes
Students are familiar with the fundamental principles of research in the field of ecology and with the most important abiotic and biotic factors that influence the distribution and frequency of occurrence of organisms in their environment. In addition, they understand the scientific relevance ecology has to the assessment of environmental issues.

### Courses
This module comprises 2 module components. Information on courses will be listed separately for each module component.

- **07-3A3OE-1T-072: V + Ü** (no information on SWS (weekly contact hours) and course language available)

- **07-3A3OE-2P-072: V + Ü** (no information on SWS (weekly contact hours) and course language available)

### Method of assessment
Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

**Assessment in module component 07-3A3OE-1T-072: Ecology of Animals (Lecture and Practice)**
- 3 ECTS, Method of grading: numerical grade
- written examination (45 minutes)

**Assessment in module component 07-3A3OE-2P-072: Ecology of Plant (Lecture and Practice)**
- 3 ECTS, Method of grading: numerical grade
- written examination (60 minutes)

### Allocation of places
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### Additional information
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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tr>
<td>Bioinformatics for advanced students</td>
<td>07-4BFMZ4-092-m01</td>
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<td>holder of the Chair of Bioinformatics</td>
<td>Faculty of Biology</td>
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<tr>
<td>1 semester</td>
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</table>

**Contents**

The module will introduce students to the practice of bioinformatics and will cover the following topics: sequence analysis, structure analysis, genome analysis, cellular and metabolic networks as well as gene regulation.

**Intended learning outcomes**

Students are able to use appropriate bioinformatic algorithms to address simple problems as well as to interpret their results.

**Courses** (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

log (approx. 10 to 20 pages)

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<thead>
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<td>Ecology of Animals for advanced students</td>
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<tbody>
<tr>
<td>holder of the Chair of Zoology III</td>
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<tr>
<td>1 semester</td>
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</table>

### Contents

Selected topics in autecology and synecology; experimental design, data collection and analysis in animal ecology.

### Intended learning outcomes

Students have acquired an advanced knowledge in the area of animal ecology. They are able to design simple ecological lab and field experiments as well as to interpret and present their findings.

### Courses

(V + Ü (no information on SWS (weekly contact hours) and course language available)

### Method of assessment

written examination (60 minutes)

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)
<table>
<thead>
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<td>Biophysics - Basic course</td>
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<tbody>
<tr>
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<tr>
<td>1 semester</td>
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</table>

**Contents**

In this module, students will acquire the general fundamentals of plant membrane transport and the biophysical methods with which it can be characterised. For this purpose, students will be introduced to modern methods of molecular biology and imaging as well as data collection and analysis.

**Intended learning outcomes**

Students understand basic membrane transport processes and are able to use experimental methods in experiments with intact plants, isolated plant cells as well as animal expression systems.

**Courses**

V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

written examination (60 minutes)

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<table>
<thead>
<tr>
<th>Module title</th>
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<td>Special Bioinformatics I</td>
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</table>

**Contents**

Fundamental principles of the tree of life, fundamental principles of phylogenetics (methods and markers), fundamental principles of evolutionary biology (concepts), sequence analysis, RNA structure prediction, phylogenetic reconstruction.

**Intended learning outcomes**

Students are able to use software and databases for sequence analysis, RNA structure prediction and phylogenetic reconstruction.

**Courses**

(V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

log (approx. 10 to 20 pages)

**Allocation of places**

--

**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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### Module Catalogue for the Subject Mathematics

**Bachelor's with 1 major, 180 ECTS credits**

<table>
<thead>
<tr>
<th>Module title</th>
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<tr>
<td>Neurobiology I</td>
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<tbody>
<tr>
<td>holder of the Chair of Neurobiology and Genetics</td>
<td>Faculty of Biology</td>
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</table>

#### Contents

Neurobiology and methods in neurobiology, using Drosophila as a neurogenetic model system.

#### Intended learning outcomes

Students have acquired an advanced knowledge of the neurobiology of a model organism and are able to apply the relevant methods in neurobiology.

#### Courses

(P no information on SWS (weekly contact hours) and course language available)

#### Method of assessment

(log (approx. 10 to 20 pages))

#### Allocation of places

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#### Additional information

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#### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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<table>
<thead>
<tr>
<th>Module title</th>
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<tr>
<td>Ecology of populations</td>
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**Module coordinator**
holder of the Chair of Zoology III

**Module offered by**
Faculty of Biology

<table>
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**Duration**
1 semester

**Module level**
undergraduate

**Other prerequisites**
--

**Contents**
More in-depth discussion of the structure and dynamics of human and animal populations; regulation of population density; management.

**Intended learning outcomes**
Students are able to interpret the structure and dynamics of populations and metapopulations on the basis of model concepts in population ecology and to apply more advanced methods of quantitative analysis to these.

**Courses**
This module comprises 2 module components. Information on courses will be listed separately for each module component.

- 07-4S1NVO5-1PO-092: V + Ü (no information on SWS (weekly contact hours) and course language available)
- 07-4S1NVO5-2PO-092: S (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**
Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

**Assessment in module component 07-4S1NVO5-1PO-092:** Basic Ecology of Populations (Lecture, Practice)
- 4 ECTS, Method of grading: numerical grade
- written examination (45 minutes)

**Assessment in module component 07-4S1NVO5-2PO-092:** Ecology of Populations (Seminar)
- 1 ECTS, Method of grading: (not) successfully completed
- presentation (approx. 20 to 30 minutes)

**Allocation of places**
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**Additional information**
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**Referred to in LPO I**
(examination regulations for teaching-degree programmes)

<table>
<thead>
<tr>
<th>Module title</th>
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<tr>
<td>Molecular modelling - From DNA to protein</td>
<td>07-4S1PS1-092-m01</td>
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<tr>
<td>1 semester</td>
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</table>

**Contents**

This module will equip students with advanced knowledge on the structure and function of nucleic acids and proteins as well as on the search for and analysis and modelling of plant macromolecules using databases and specific software.

**Intended learning outcomes**

Students have acquired a specialist knowledge of the structure-function relationships of macromolecules and are able to work with relevant databases and software.

**Courses**

V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

computerised practical examination (4 hours)

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
**Module title**  
Specific Bioinformatics II

**Abbreviation**  
07-5S2MZ3-092-m01

**Module coordinator**  
holder of the Chair of Bioinformatics

**Module offered by**  
Faculty of Biology

<table>
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</table>

**Duration**  
1 semester

**Module level**  
undergraduate

**Other prerequisites**  
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**Contents**
The module will cover two topics from the area of bioinformatics to be selected from the following list: - sequence analysis, phylogenetics and evolution - gene expression profiling - protein structure analysis - programming for bioinformatics - network analysis

**Intended learning outcomes**
Students have acquired knowledge about general strategies and methods of bioinformatics. They are able to independently perform scientific laboratory work.

**Courses**
(type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 60 minutes) or b) log (approx. 10 to 20 pages) or c) oral examination of one candidate each (approx. 30 minutes) or d) oral examination in groups (groups of up to 3 candidates, approx. 60 minutes) or e) presentation (approx. 20 to 30 minutes)

**Allocation of places**
--

**Additional information**
--

**Referred to in LPO I**
(examination regulations for teaching-degree programmes)

--
Module title: Evolution - Basics and Principles (Lecture and Practice)  
Abbreviation: 07-1A1E-072-m01

Module coordinator: holder of the Chair of Zoology II
Module offered by: Faculty of Biology

ECTS: 1  
Method of grading: numerical grade
Only after succ. compl. of module(s): --

Duration: 1 semester  
Module level: undergraduate  
Other prerequisites: --

Contents
This module will address one of the central issues of biology: evolution. Fundamental mechanisms and hypotheses will be discussed and students will be introduced to major phylogenetic reconstruction methods.

Intended learning outcomes
Ability to recognise evolution as the driving force behind the phylogeny of species. Familiarity with the concepts of phylogenetic relationships between plants/animals.

Courses (type, number of weekly contact hours, language — if other than German)
Ü (no information on SWS (weekly contact hours) and course language available)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
written examination (30 minutes)

Allocation of places
--

Additional information
--

Referred to in LPO I (examination regulations for teaching-degree programmes)
--
## Module Catalogue for the Subject
### Mathematics

### Bachelor’s with 1 major, 180 ECTS credits

<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tr>
<td>The Animal Kingdom</td>
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<tbody>
<tr>
<td>holder of the Professorship of Zoology at the Department of Electronmicroscopy</td>
<td>Faculty of Biology</td>
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<th>Duration</th>
<th>Module level</th>
<th>Other prerequisites</th>
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<tbody>
<tr>
<td>1 semester</td>
<td>undergraduate</td>
<td>Admission prerequisite to assessment: regular attendance of and participation in exercises as well as successful completion of the respective exercises as specified at the beginning of the course.</td>
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</table>

### Contents

Using the example of animals, students will be introduced to the phylogenetic diversity of eukaryotes. At the level of groups in the animal kingdom, students will acquire the fundamental knowledge necessary to understand the forms and functions of animal organisms, with morphology and cytology being discussed in an evolutionary and ecological context.

### Intended learning outcomes

Familiarity with the concepts of phylogenetic relationships between animals. Familiarity with the distinguishing characteristics and major representatives of groups in the animal kingdom. Ability to select those animal organisms that are most suitable for particular scientific issues. Familiarity with the components and functioning of microscopes. Fundamental skills in the interpretation of macroscopic and histologic preparations by light microscopy. Fundamental preparation skills.

### Courses

<table>
<thead>
<tr>
<th>(type, number of weekly contact hours, language — if other than German)</th>
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<th>(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)</th>
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<tr>
<td>written examination</td>
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### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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Module title | Abbreviation
---|---
The Plant Kingdom | 07-1A1P-072-m01

<table>
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<td>holder of the Chair of Plant Physiology and Biophysics</td>
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<th>Other prerequisites</th>
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<tbody>
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<td>1 semester</td>
<td>undergraduate</td>
<td>Admission prerequisite to assessment: regular attendance of exercises as well as successful completion of the respective exercises.</td>
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</table>

**Contents**

Using the example of plants, students will be introduced to the phylogenetic diversity of eukaryotes. At the level of groups in the plant kingdom, students will acquire the fundamental knowledge necessary to understand the forms and functions of plant organisms, with morphology and cytology being discussed in an evolutionary and ecological context.

**Intended learning outcomes**

Familiarity with the concepts of phylogenetic relationships between plants. Familiarity with the distinguishing characteristics and major representatives of groups in the plant kingdom. Ability to select those plant organisms that are most suitable for particular scientific issues. Familiarity with the components and functioning of microscopes. Fundamental skills in the interpretation of macroscopic and histologic preparations by light microscopy. Fundamental preparation skills.

**Courses** (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 minutes)

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
### Module Catalogue for the Subject Mathematics

**Bachelor's with 1 major, 180 ECTS credits**

<table>
<thead>
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<td>Faculty of Biology</td>
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<table>
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<th>Duration</th>
<th>Module level</th>
<th>Other prerequisites</th>
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<tbody>
<tr>
<td>1 semester</td>
<td>undergraduate</td>
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</table>

### Contents

Molecular and classical genetics.

### Intended learning outcomes

Students are familiar with the mechanisms of inheritance that are essential for developing an understanding of biology as a whole.

### Courses

V + S (no information on SWS (weekly contact hours) and course language available)

### Method of assessment

written examination (30 minutes)

### Allocation of places

--

### Additional information

--

### Referred to in LPO I

(examination regulations for teaching-degree programmes)

--
Application-oriented Subject Chemistry
(35 ECTS credits)
Application-oriented Subject Chemistry Compulsory Courses
(26 ECTS credits)
### Module Catalogue for the Subject Mathematics

**Bachelor's with 1 major, 180 ECTS credits**

<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic Chemistry 1</td>
<td>08-OC1-072-m01</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Module coordinator</th>
<th>Module offered by</th>
</tr>
</thead>
<tbody>
<tr>
<td>holder of the Professorship of Organic Chemistry</td>
<td>Institute of Organic Chemistry</td>
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<th>ECTS</th>
<th>Method of grading</th>
<th>Only after succ. compl. of module(s)</th>
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<tr>
<td>5</td>
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<table>
<thead>
<tr>
<th>Duration</th>
<th>Module level</th>
<th>Other prerequisites</th>
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<tbody>
<tr>
<td>1 semester</td>
<td>undergraduate</td>
<td>Registration for assessment: Yes, as specified.</td>
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</tbody>
</table>

### Contents

German contents available but not translated yet.

Das Modul bietet einen Überblick über die elementaren Grundkenntnisse der organischen Chemie. Dazu wird die Bindungssituation am Kohlenstoff betrachtet und in die Nomenklatur einfacher und mäßig komplexer organischer Verbindungen eingeführt. Es werden Grundlagen der Stereochemie, Substitutions-, Additions- und Eliminierungsreaktionen sowie der Syntheseplanung vermittelt.

### Intended learning outcomes

German intended learning outcomes available but not translated yet.


### Courses

(type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (90 minutes)

### Allocation of places

--

### Additional information

--

### Referred to in LPO I

(examination regulations for teaching-degree programmes)

--
### Module title

**Principles of quantum mechanics and spectroscopy**

### Abbreviation

08-PC1-072-m01

### Module coordinator

Lecturer of lecture "Grundlagen der Quantenmechanik and Spektroskopie" (Principles of Quantum Mechanics and Spectroscopy)

### Module offered by

Institute of Physical and Theoretical Chemistry

### ECTS

8

### Method of grading

Numerical grade --

### Only after succ. compl. of module(s)

--

### Duration

1 semester

### Module level

Undergraduate

### Other prerequisites

--

### Contents

German contents available but not translated yet.


### Intended learning outcomes

German intended learning outcomes available but not translated yet.

Die Studierenden sind in der Lage, grundlegende Modelle der Quantenmechanik zu erklären und bei Molekülen anzuwenden. Er/Sie kann unterschiedliche spektroskopische Methoden darstellen. Die Studierenden können die mathematischen Grundlagen der elementaren der Quantenmechanik anwenden.

### Courses

- V + Ü + V + Ü (no information on SWS (weekly contact hours) and course language available)

### Method of assessment

- a) 1 to 3 written examinations (1 written examination: 90 minutes; 2 written examinations: 60 or 90 minutes each; 3 written examinations: 60 minutes each) or b) oral examination in groups (groups of 2, approx. 30 minutes)

### Allocation of places

--

### Additional information

--

### Referred to in LPO I (examination regulations for teaching-degree programmes)

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<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
<th>ECTS</th>
<th>Method of grading</th>
<th>Duration</th>
<th>Module level</th>
<th>Other prerequisites</th>
<th>Contents</th>
<th>Intended learning outcomes</th>
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<tbody>
<tr>
<td>Introduction to Physics for Students of Non-physics-related Minor Subjects</td>
<td>11-EFNF-072-m01</td>
<td>7</td>
<td>numerical grade</td>
<td>2 semester</td>
<td>undergraduate</td>
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<td>Mechanics, vibration theory, thermodynamics, optics, science of electricity, Atomic and Nuclear Physics.</td>
<td>The students have knowledge of the principles of Physics.</td>
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<tr>
<td>Managing Director of the Institute of Applied Physics</td>
<td>Faculty of Physics and Astronomy</td>
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<td>written examination (approx. 120 minutes)</td>
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<td>Only as part of pool of general key skills (ASQ): 10 places. Places will be allocated by lot.</td>
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</table>
### Module title
General Chemistry for Mathematics Majors

### Abbreviation
08-CM1-072-m01

### Module coordinator
Lecturer of lecture "Experimentalchemie" (Experimental Chemistry)

### Module offered by
Institute of Inorganic Chemistry

### ECTS
6

### Method of grading
Numerical grade

### Only after succ. compl. of module(s)
--

### Duration
1 semester

### Module level
Undergraduate

### Other prerequisites
--

### Contents
German contents available but not translated yet.


### Intended learning outcomes
German intended learning outcomes available but not translated yet.


### Courses
No information on SWS (weekly contact hours) and course language available

V

### Method of assessment
Written examination (approx. 60 minutes)

### Allocation of places
--

### Additional information
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### Referred to in LPO I
Examination regulations for teaching-degree programmes
Application-oriented Subject Chemistry Compulsory Electives
(9 ECTS credits)
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<td>Institute of Organic Chemistry</td>
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### Contents

German contents available but not translated yet.


### Intended learning outcomes

German intended learning outcomes available but not translated yet.


### Courses

<table>
<thead>
<tr>
<th>Courses</th>
<th>(type, number of weekly contact hours, language — if other than German)</th>
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### Method of assessment

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<th>Language — if other than German</th>
<th>Examination offered — if not every semester, information on whether module is creditable for bonus</th>
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<td>a) 1 to 3 written examinations</td>
<td>1 written examination: 90 minutes; 2 written examinations: 60 or 90 minutes each; 3 written examinations: 60 minutes each</td>
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<tr>
<td>b) oral examination in groups</td>
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### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

--
### Module title

Physical and Theoretical Chemistry 3: Symmetry and Quantum Chemistry

### Abbreviation

08-PC3-082-m01

### Module coordinator

Lecturer of lecture "Quantenchemie"

### Module offered by

Institute of Physical and Theoretical Chemistry

### ECTS

6

### Method of grading

Numerical grade

### Only after succ. compl. of module(s)

--

### Duration

1 semester

### Module level

Undergraduate

### Other prerequisites

Registration for assessment: Yes, as specified.

### Contents

This module deals with basics of quantum chemistry and symmetry in chemistry.

### Intended learning outcomes

German intended learning outcomes available but not translated yet.

Der/Die Studierende verfügt über Kenntnisse der Quantenchemie und der Symmetrie in der Chemie und kann diese gezielt anwenden.

### Courses

(V + Ü + V + Ü) (no information on SWS (weekly contact hours) and course language available)

### Method of assessment

Written examination (90 minutes)

### Allocation of places

--

### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<td>Theoretical Models in Chemistry</td>
<td>08-TC-082-m01</td>
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<table>
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<tr>
<td>lecturer of lecture &quot;Quantenchemie&quot;</td>
<td>Institute of Physical and Theoretical Chemistry</td>
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<tr>
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<th>Other prerequisites</th>
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</thead>
<tbody>
<tr>
<td>1 semester</td>
<td>undergraduate</td>
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</tr>
</tbody>
</table>

**Contents**

German contents available but not translated yet.


**Intended learning outcomes**

German intended learning outcomes available but not translated yet.

Die Studierenden sind in der Lage, mit Hilfe grundlegender Konzepte und Modelle angeregte Zustände von Molekülen zu beschreiben.

**Courses**

(type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) 1 to 3 written examinations (1 written examination: 90 minutes; 2 written examinations: 60 or 90 minutes each; 3 written examinations: 60 minutes each) or b) oral examination in groups (groups of 2, approx. 30 minutes)

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

--
Application-oriented Subject Geography
(35 ECTS credits)
Application-oriented Subject Geography Compulsory Electives 1
(15 ECTS credits)
<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>General Human Geography</td>
<td>09-HG1-082-m01</td>
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</table>

**Module coordinator**
holder of the Chair of Economic Geography

**Module offered by**
Institute of Geography and Geology

<table>
<thead>
<tr>
<th>ECTS</th>
<th>Method of grading</th>
<th>Only after succ. compl. of module(s)</th>
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<tbody>
<tr>
<td>15</td>
<td>numerical grade</td>
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</tr>
</tbody>
</table>

**Duration**
1 semester

**Module level**
undergraduate

**Other prerequisites**
--

## Contents
Introduction to basic ideas and particular sub-areas of "Human Geography".

### Intended learning outcomes
Students possess the following skills: basics and definitions to Human Geography, research institutions and technical conception to Human Geography. This includes Urban Geography, Geography of Rural Settlements, Economic Geography, Social Geography, Population Geography and Civilisation Geographical Research.

### Courses
This module comprises 3 module components. Information on courses will be listed separately for each module component.

- 09-HG1-1-082: V + T (no information on SWS (weekly contact hours) and course language available)
- 09-HG1-2-082: V + T (no information on SWS (weekly contact hours) and course language available)
- 09-HG1-3-082: V + T (no information on SWS (weekly contact hours) and course language available)

### Method of assessment
Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

**Assessment in module component 09-HG1-1-082**: Introduction to the Geography of Cities, Towns and Villages

- 5 ECTS, Method of grading: numerical grade
- written examination (approx. 45 minutes)

**Assessment in module component 09-HG1-2-082**: Introduction to Economic Geography

- 5 ECTS, Method of grading: numerical grade
- written examination (approx. 45 minutes)

**Assessment in module component 09-HG1-3-082**: Introduction to Social and Population Geography

- 5 ECTS, Method of grading: numerical grade
- written examination (approx. 45 minutes)

### Allocation of places
--

### Additional information
--

### Referred to in LPO I (examination regulations for teaching-degree programmes)

§ 47 (1) 1. Geographie Humangeographie
§ 66 (1) 1. Geographie Humangeographie
## Module Catalogue for the Subject
### Mathematics
Bachelor's with 1 major, 180 ECTS credits

<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>General Physical Geography</td>
<td>09-PG1-082-m01</td>
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<th>Module coordinator</th>
<th>Module offered by</th>
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</thead>
<tbody>
<tr>
<td>holder of the Chair of Physical Geography</td>
<td>Institute of Geography and Geology</td>
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<tr>
<th>Duration</th>
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<th>Other prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 semester</td>
<td>undergraduate</td>
<td>--</td>
</tr>
</tbody>
</table>

### Contents
Introduction to "Physical Geography": basics of exogenous dynamics, endogenous dynamics and climatology.

### Intended learning outcomes
Students possess the following skills: Basics of the system Earth, i.e. understanding of dominating processes on the Earth’s surface that are driven by the geofactors rocks, relief, climate, soil, water, flora and fauna. These are decisive for the understanding of the structure, function and dynamics of the natural environment of its anthropogenic transformation (i.e. the environment, designed by humans through land use, settlements, traffic route etc.).

### Courses
This module comprises 3 module components. Information on courses will be listed separately for each module component.

- 09-PG1-1-082: V + T (no information on SWS (weekly contact hours) and course language available)
- 09-PG1-2-082: V + T (no information on SWS (weekly contact hours) and course language available)
- 09-PG1-3-082: V + T (no information on SWS (weekly contact hours) and course language available)

### Method of assessment
Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

#### Assessment in module component 09-PG1-1-082: General Physical Geography 3 (Earth System: Exogenic Dynamics) General Physical Geography 3 (Earth System: Exogenic Dynamics)
- 5 ECTS, Method of grading: numerical grade
- written examination (45 minutes)

#### Assessment in module component 09-PG1-2-082: General Physical Geography 2 (Earth System: Climate System) General Physical Geography 2 (Earth System: Climate System)
- 5 ECTS, Method of grading: numerical grade
- written examination (approx. 45 minutes)

#### Assessment in module component 09-PG1-3-082: General Physical Geography 3 (Earth System: Endogenic Dynamics) General Physical Geography 3 (Earth System: Endogenic Dynamics)
- 5 ECTS, Method of grading: numerical grade
- written examination (approx. 45 minutes)

### Allocation of places
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### Additional information
--

### Referred to in LPO I (examination regulations for teaching-degree programmes)
§ 47 (1) 1. Geographie Physiogeographie
§ 66 (1) 1. Geographie Physiogeographie
Application-oriented Subject Geography Compulsory Electives 2
(10 ECTS credits)
## Module title
Cartography and Geoinformation

## Abbreviation
09-KART-082-m01

### Module coordinator
holder of the Professorship of Cultural Geography

### Module offered by
Institute of Geography and Geology

### ECTS
10

### Method of grading
numerical grade

### Duration
1 semester

### Other prerequisites
undergraduate

## Contents
Introduction to "Cartography and to the Collection and Processing of Geodata", introduction to "Geographic Information Systems" (GIS).

## Intended learning outcomes
Students possess the following skills: basics of Cartography and the use of geodata, acquisition of abilities concerning the dealing with geodata and Geographical Information Systems (GIS).

## Courses
This module comprises 2 module components. Information on courses will be listed separately for each module component.

- **09-KART-1-082**: V + T (no information on SWS (weekly contact hours) and course language available)
- **09-KART-2-082**: S (no information on SWS (weekly contact hours) and course language available)

## Method of assessment
Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

**Assessment in module component 09-KART-1-082**: Cartography and Geodata Cartography and Geodata

- 5 ECTS, Method of grading: numerical grade
- written examination (approx. 75 minutes) and practice work (approx. 30 hours for creating approx. 3 maps or diagrams); weighted 1:1

**Assessment in module component 09-KART-2-082**: Geographical Information Systems (GIS)

- 5 ECTS, Method of grading: numerical grade
- practice work (approx. 5 pieces of practice work to be completed in approx. 30 hours)

## Allocation of places
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## Additional information
--

## Referred to in LPO I (examination regulations for teaching-degree programmes)
§ 66 (1) 2. Geographie Methoden der Geographie
Module title: Remote Sensing  
Abbreviation: 09-FERN-082-m01

Module coordinator: holder of the Chair of Remote Sensing
Module offered by: Institute of Geography and Geology

ECTS: 10  
Method of grading: numerical grade  
Duration: 1 semester  
Module level: undergraduate  
Other prerequisites: --

Contents:
Introduction to "Geographical Remote Sensing", applications of "Remote Sensing" to Geography.

Intended learning outcomes:
Students possess the following skills: Theoretical basics of systems, remote sensing, skills of current geographical fields of application of cross-disciplinary Methodology, Remote Sensing against the background of different sensor and platform specifications.

Courses:
This module comprises 2 module components. Information on courses will be listed separately for each module component.
- 09-FERN-1-082: V + T (no information on SWS (weekly contact hours) and course language available)
- 09-FERN-2-082: V + T (no information on SWS (weekly contact hours) and course language available)

Method of assessment:
Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

Assessment in module component 09-FERN-1-082: Introduction to Geographical Remote Sensing
- 5 ECTS, Method of grading: numerical grade
- written examination (approx. 45 minutes)

Assessment in module component 09-FERN-2-082: Applications of Remote Sensing in Geography
- 5 ECTS, Method of grading: numerical grade
- written examination (45 minutes)

Allocation of places:
--

Additional information:
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Referred to in LPO I (examination regulations for teaching-degree programmes)
§ 66 (1) 2. Geographie Methoden der Geographie
Application-oriented Subject Geography Compulsory Electives 3
(10 ECTS credits)
Special Problems of Physical Geography

Module coordinator: holder of the Chair of Physical Geography
Module offered by: Institute of Geography and Geology

ECTS: 10
Method of grading: numerical grade
Duration: 1 semester
Module level: undergraduate

Contents
This module covers synthesis and networking of physical-geographical factors in the light of different methodical approaches and particularly on the basis of the human impact: geomorphology, climate, soil, hydro geography, global change and past global change incl. geo and ecosystem research and ecosystem prediction as well as the cycle of materials on Earth's surface.

Intended learning outcomes
Students are acquainted with the synthesis and interconnectedness of skills that have already been acquired concerning the processes on Earth's surface, which are dominating the landscape on Earth's surface and are driven by the geological factors rock, relief, climate, soil, water, flora and fauna. These processes determine structure, function and dynamics of the natural environment and its anthropogenic transformation (the environment that has been shaped from humans by land utilisation, settlements, transport routes etc.). Through the quantitative acquisition of current process structures, Physical Geography is not only able to derive predictions for the capability and capacity of geological systems, but also to predict changes in future by analysing the development and change of geographical territories in the past. These important planning decision-making bases concerning the management as well as the sustainable use and development, are given weight to the task of Physical Geography in the practical area.

Courses
This module comprises 2 module components. Information on courses will be listed separately for each module component.
- 09-PG2-1-082: V (no information on SWS (weekly contact hours) and course language available)
- 09-PG2-2-082: S (no information on SWS (weekly contact hours) and course language available)

Method of assessment
Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

Assessment in module component 09-PG2-1-082: Special Problems of Physical Geography 1 (Earth System: Man and Environment)
- 5 ECTS, Method of grading: numerical grade
- written examination (approx. 45 minutes)

Assessment in module component 09-PG2-2-082: Special Problems of Physical Geography 2 (Earth System: Man and Environment)
- 5 ECTS, Method of grading: numerical grade
- presentation (approx. 30 minutes) with written elaboration (approx. 20 pages), weighted 1:1

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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<table>
<thead>
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<td>Institute of Geography and Geology</td>
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</thead>
<tbody>
<tr>
<td>1 semester</td>
<td>undergraduate</td>
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</table>

**Contents**

Students will choose a topic of "Physical Geography" and attend a project seminar: data collection, data analysis and presentation of explored issues.

**Intended learning outcomes**

Students know how to use their skills, which they have already acquired in the area basics and methods, in order to implement them practically. Based on a specific issue, which is partly integrated in a current research project, process steps of geographical research and method will be undergone. Students are acquainted with the data collection in the field or the modelling at the computer, the application of statistical processes, the cartographic visualisation and presentation in form of lectures, posters, films, Internet or reports. They also possess the ability to work independently.

**Courses** (type, number of weekly contact hours, language — if other than German)

This module comprises 2 module components. Information on courses will be listed separately for each module component.

- 09-PG3-1-082: S (no information on SWS (weekly contact hours) and course language available)
- 09-PG3-2-082: S (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

**Assessment in module component 09-PG3-1-082**: Project Seminar: Establishing Current Status and Data Acquisition

- 5 ECTS, Method of grading: numerical grade
- presentation (30 minutes) with written elaboration (20 pages), weighted 1:1

**Assessment in module component 09-PG3-2-082**: Project Seminar: Data Evaluation, Data Visualisation and Presentation

- 5 ECTS, Method of grading: numerical grade
- project report (20 pages)

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tr>
<td>Data Acquisition and Processing in Physical Geography</td>
<td>09-MT1-082-m01</td>
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<tr>
<td>holder of the Chair of Physical Geography</td>
<td>Institute of Geography and Geology</td>
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<tr>
<td>1 semester</td>
<td>undergraduate</td>
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</table>

### Contents
Consolidation of methodical knowledge concerning the collection and processing of data sets, which will be added in "Physical Geography" as a typical example in order to understand the natural environment; Advanced students can attend alternative seminars, in which applications from the areas ground climatology, climate modelling, geophysical methods, soil science of fields, remote sensing and GIS (geographic information system) will be offered optionally.

### Intended learning outcomes
Students possess in-depth knowledge of the area Basic Course, Methodology, Cartography, Statistics and EDP which will be acquired through a specific task. Thus, each form of data collection in the field or the modelling at the computer with different stages of data processing in the lab or at the computer will be linked together in order to teach the practical dealing with geophysical measurement methods as well as the dealing with different software applications.

### Courses
(S (no information on SWS (weekly contact hours) and course language available)

### Method of assessment
Presentation (approx. 15 minutes) with written elaboration (15 pages), weighted 1:1

### Allocation of places
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### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)
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Module title | Abbreviation
---|---
Working Methods: Solid Earth System | 09-MT3-082-m01

Module coordinator | Module offered by
holder of the Chair of Geodynamics and Geomaterials Research | Institute of Geography and Geology

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<td>numerical grade</td>
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</table>

Duration | Module level | Other prerequisites
1 semester | undergraduate | -- |

Contents
Basic observations on geological materials that can already be made in the field and which can lead to a first interpretation of geological processes, which took place, as well as the creation of value of geomaterials. Students will be provided with distinctive features and characteristics of the most important rock-forming and economically relevant minerals by means of chosen visuals. Subsequently, the classification of the most important sedimentary, igneous and metamorphic rock types will be elucidated and practised on the basis of their in the hand-piece identifiable mineral existence and structure. In the following modular section, the understanding of two-dimensional display of three-dimensional display of geological phenomena like the geographical distribution of different rock types or tectonic structures will be developed in form of geological maps and sections as well as simple structural-geological diagrams.

Intended learning outcomes
Students are able to identify the most important mineral types and as far as possible, to outline and interpret the rock samples without analytical tools. Moreover, they are able to interpret geological maps correctly and to show geological field observations in map form, profiles and suitable diagrams.

Courses
This module comprises 2 module components. Information on courses will be listed separately for each module component.

- 09-MT3-1-082: S (no information on SWS (weekly contact hours) and course language available)
- 09-MT3-2-082: Ü (no information on SWS (weekly contact hours) and course language available)

Method of assessment
Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

Assessment in module component 09-MT3-1-082: Mineral and Rock Identification
- 5 ECTS, Method of grading: numerical grade
- written or oral examination of one candidate each (30 minutes each)

Assessment in module component 09-MT3-2-082: Geological Maps and Structures
- 5 ECTS, Method of grading: numerical grade
- written or oral examination of one candidate each (approx. 30 minutes each) or term paper (approx. 20 pages)

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
§ 66 (1) 2. Geographie Methoden der Geographie
### Module Catalogue for the Subject
**Mathematics**

**Bachelor's with 1 major, 180 ECTS credits**

<table>
<thead>
<tr>
<th>Module title</th>
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<td>Working Methods of Physical Geography</td>
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<tr>
<td>1 semester</td>
<td>undergraduate</td>
<td>By way of exception, additional prerequisites are listed in the section on assessments.</td>
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</table>

## Contents

Field course: basic principles of physical-geographical field, mapping and measuring method (geomorphology, soil geography, vegetation geography, hydro geography, climatology); 10 days of fieldwork. Practical exercise: data preparation, analysis and interpretation; Synthesis of partial results, visualisation and presentation of data with the help of the GIS discussion and the production of a final report.

### Intended learning outcomes

Students possess the fundamental physical-geographical mapping, measurement and lab methods. They have skills of the difficulties of field, measurement and lab works and possess an overview of analysis and interpretation possibilities of the acquired field and lab data. They possess the visualisation and presentation of geodata and have the ability of networked considerations and of discussing the results scientifically.

## Courses

This module comprises 2 module components. Information on courses will be listed separately for each module component.

- **09-MT5-1-o82:** P (no information on SWS (weekly contact hours) and course language available)
- **09-MT5-2-o82:** S (no information on SWS (weekly contact hours) and course language available)

### Method of assessment

Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

#### Assessment in module component 09-MT5-1-o82: Introduction to physiogeographical Fieldwork Skills, Field Mapping and Measuring

- 5 ECTS, Method of grading: numerical grade
- placement report / fieldwork report / report on practical training / report on practical course / project report / report on technical course (approx. 15 pages)
- Other prerequisites: A basic knowledge of inorganic chemistry and physics is recommended.

#### Assessment in module component 09-MT5-2-o82: Data management, -analysis and -interpretation

- 5 ECTS, Method of grading: numerical grade
- presentation of project (approx. 30 minutes) and written elaboration (approx. 20 pages); weighted 1:1
- Other prerequisites: A basic knowledge of inorganic chemistry and physics is recommended.

## Allocation of places

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## Additional information

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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### Module title
Special Issues of Human Geography

#### Abbreviation
09-HG2-082-m01

<table>
<thead>
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<th>Module offered by</th>
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<td>holder of the Professorship of Social Geography</td>
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### Contents
This module deals with and consolidates chosen issues of "Theoretical and Applied Human Geography" from two different sub-areas of "Human Geography".

### Intended learning outcomes
Students possess subject-specific theories and have solid knowledge of two sub-areas of Human Geography and their application-oriented implementation. They are able to issue a seminar paper on the basis of independent literary work as well as present the seminar papers in a presentation, which will be held freely.

### Courses
This module comprises 2 module components. Information on courses will be listed separately for each module component.
- 09-HG2-1-082: S (no information on SWS (weekly contact hours) and course language available)
- 09-HG2-2-082: S (no information on SWS (weekly contact hours) and course language available)

### Method of assessment
Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

**Assessment in module component 09-HG2-1-082:** Special Issues of Human Geography 1
- 5 ECTS, Method of grading: numerical grade
- presentation (approx. 30 minutes) with written elaboration (approx. 20 pages), weighted 1:1

**Assessment in module component 09-HG2-2-082:** Special Issues of Human Geography 2
- 5 ECTS, Method of grading: numerical grade
- presentation (approx. 30 minutes) with written elaboration (approx. 20 pages), weighted 1:1

### Allocation of places
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### Additional information
--

### Referred to in LPO I (examination regulations for teaching-degree programmes)
--
### Applied Human Geography

**Module title**
Applied Human Geography

**Abbreviation**
09-HG3-082-m01

**Module coordinator**
holder of the Professorship of Social Geography

**Module offered by**
Institute of Geography and Geology

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**Contents**
Students will choose a topic of "Human Geography" and attend a project seminar: data collection, data analysis and presentation of explored issues.

**Intended learning outcomes**
Students possess the following skills:
- Application of the already acquired technical and methodological basics of practice-oriented issues of geographical planning and development using empirical research methods;
- Elaboration of action-oriented solutions;
- Presentation of results;
- Knowledge concerning the use of empirical survey and analysis methodology, project work, team spirit, results-oriented methods, acquisition of communicative technique skills.

**Courses**
This module comprises 2 module components. Information on courses will be listed separately for each module component.

| 09-HG3-1-082: S | (no information on SWS (weekly contact hours) and course language available) |
| 09-HG3-2-082: S | (no information on SWS (weekly contact hours) and course language available) |

**Method of assessment**
Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

**Assessment in module component 09-HG3-1-082:**
- Project-oriented Seminar 1 for Applied Human Geography
  - 5 ECTS, Method of grading: numerical grade
  - Presentation (approx. 30 minutes) with written elaboration (approx. 20 pages), weighted 1:1

**Assessment in module component 09-HG3-2-082:**
- Project-oriented Seminar 2 for Applied Human Geography
  - 5 ECTS, Method of grading: numerical grade
  - Presentation (approx. 30 minutes) with written elaboration (approx. 20 pages), weighted 1:1

**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<thead>
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<td>Theories and Methodology in Human Geography</td>
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<td>holder of the Professorship of Cultural Geography</td>
<td>Institute of Geography and Geology</td>
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**Contents**

This course will introduce students to general theory of science and geographical specific theory, discussion of different perspectives of research and methodologies, basics of empirical study in analytical and prescriptive sciences.

**Intended learning outcomes**

Students possess knowledge of theoretical and methodological basics. Students are acquainted with empirical research methods as well as models and modelling to Human Geography.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (45 minutes) and presentation (approx. 20 minutes), weighted 1:1

**Allocation of places**

--

**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 66 (1) 2. Geographie Methoden der Geographie
### Module title
Quantitative and Qualitative Regional Analysis

### Abbreviation
09-MT4-082-m01

### Module coordinator
holder of the Professorship of Social Geography

### Module offered by
Institute of Geography and Geology

### ECTS
10

### Method of grading
numerical grade

### Only after succ. compl. of module(s)
09-MT2 as well as one module component of modules 09-KART and 09-STAT each

### Duration
1 semester

### Module level
undergraduate

### Other prerequisites
--

## Contents
This module includes processes of quantitative regional research, multivariate statistical processes, processes of geographical modelling and simulation. Processes of qualitative social and regional research. Presentation and discussion of methods, criticism of methods. Application of methods based on typical examples.

## Intended learning outcomes
Students possess the following skills: The students' process-related skills will be applied to regional and analytical methods as well as the skills concerning the assessment and evaluation of the processes application and efficiency.

### Courses
This module comprises 2 module components. Information on courses will be listed separately for each module component.

- 09-MT4-1-082: S (no information on SWS (weekly contact hours) and course language available)
- 09-MT4-2-082: S (no information on SWS (weekly contact hours) and course language available)

### Method of assessment
Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

#### Assessment in module component 09-MT4-1-082: Quantitative Regional Analysis
- 5 ECTS, Method of grading: numerical grade
- presentation (30 minutes) with written elaboration (approx. 20 pages), weighted 1:1

#### Assessment in module component 09-MT4-2-082: Qualitative Regional Analysis
- 5 ECTS, Method of grading: numerical grade
- presentation (30 minutes) with written elaboration (approx. 20 pages), weighted 1:1

### Allocation of places
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### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)

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<td>Methods of Planning in Human Geography</td>
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<td>1 semester</td>
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**Contents**

Application of empirical research methods on practice-oriented issues on geographical planning and development, development of action-oriented problem solving, presentation of the results.

**Intended learning outcomes**

Students possess the following skills: Application of empirical survey and analysis methodology concerning regional development planning and regional or spatial development, project work, the ability to work in a team, result-oriented methods, communicative techniques.

**Courses**

This module comprises 2 module components. Information on courses will be listed separately for each module component.

- 09-MT6-1-o82: S (no information on SWS (weekly contact hours) and course language available)
- 09-MT6-2-o82: S (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

**Assessment in module component 09-MT6-1-o82:** Methods of Planning in Human Geography 1

- 5 ECTS, Method of grading: numerical grade
- a) presentation (approx. 25 minutes) with written elaboration (approx. 12 pages), weighted 1:1 or b) term paper (approx. 20 pages) or c) several small assessments (total length/expenditure of time comparable to a) and/or b), weighted 1:1

**Assessment in module component 09-MT6-2-o82:** Methods of Planning in Human Geography 2

- 5 ECTS, Method of grading: numerical grade
- a) presentation (approx. 25 minutes) with written elaboration (approx. 12 pages), weighted 1:1 or b) term paper (approx. 20 pages) or c) several small assessments (total length/expenditure of time comparable to a) and/or b), weighted 1:1

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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Application-oriented Subject Computer Science
(35 ECTS credits)
Application-oriented Subject Computer Science Compulsory Electives
(35 ECTS credits)
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<td>Information transmission</td>
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</table>

**Contents**

Introduction to probability calculus, coding theory, coding for fault detection and fault correction, information theory, spectrum and Fourier transform, modulation technique, structure of digital transmission systems, introduction to the structure of computer networks, communication protocols.

**Intended learning outcomes**

The students possess a technical, theoretical and practical knowledge of the structure of systems for information transmission, a knowledge that is necessary to understand these systems.

**Courses**

(type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (80 minutes) or oral examination (one candidate each: 20 minutes, groups of 2: 30 minutes, groups of 3: 40 minutes)

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

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<table>
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<td>Digital computer systems</td>
<td>10-I-RAL-072-m01</td>
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**Module coordinator**

holder of the Chair of Computer Science V

**Module offered by**

Institute of Computer Science

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**Duration**

1 semester

**Module level**

undergraduate

**Other prerequisites**

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**Contents**

Introduction to digital technologies, Boolean algebras, combinatorial circuits, synchronous and asynchronous circuits, hardware description languages, structure of a simple processor, machine programming, memory hierarchy.

**Intended learning outcomes**

The students possess a knowledge of the fundamentals of digital technologies up to the design and programming of easy microprocessors as well as knowledge for the application of hardware description languages for the design of digital systems.

**Courses**

(V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

written examination (80 minutes) or oral examination (one candidate each: 20 minutes, groups of 2: 30 minutes, groups of 3: 40 minutes)

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

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<td>Dean of Studies Informatik (Computer Science)</td>
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**Contents**

Computability, decidability, countability, complexity of calculations, Boolean functions and circuits, finite automata and regular sets, generative grammars, context-free languages, context-sensitive languages.

**Intended learning outcomes**

The students possess fundamental and applicable knowledge in the area of computability, decidability, countability, complexity of calculations, Boolean functions and circuits, finite automata and regular sets, generative grammars, context free languages, context sensitive languages.

**Courses**

(V + Ü) (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

written examination (80 minutes) or oral examination (one candidate each: 20 minutes, groups of 2: 30 minutes, groups of 3: 40 minutes)

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

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<td>Algorithm and data structures</td>
<td>10-I-ADS-072-m01</td>
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**Contents**

Design and analysis of algorithms, recursion vs. iteration, sort and search methods, data structures, abstract data types, lists, trees, graphs, basic graph algorithms, programming in Java.

**Intended learning outcomes**

[Version 1: The students are able to independently design algorithms as well as to precisely describe and analyse them. They are able to apply recursion in algorithms and data structures. The students are familiar with the three basic programming paradigms and are able to apply them in practical programs.] [Version 2: The students are able to independently design algorithms as well as to precisely describe and analyse them. The students are familiar with the basic paradigms of the design of algorithms and are able to apply them in practical programs. The students are able to estimate the run-time behaviour of algorithms and to prove their correctness.]

**Courses** (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (80 minutes) or oral examination (one candidate each: 20 minutes, groups of 2: 30 minutes, groups of 3: 40 minutes)

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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Module title | Abbreviation
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Automation and control technology | 10-I-AR-072-m01

Module coordinator | Module offered by
--- | ---
holder of the Chair of Computer Science VII | Institute of Computer Science

ECTS | Method of grading | Only after succ. compl. of module(s)
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8 | numerical grade | --

Duration | Module level | Other prerequisites
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1 semester | undergraduate | --

Contents
Overview of control and automation systems, fundamental principles of control technology, Laplace transformation, transfer function, plant, controller types, basic feedback loop, fundamental principles of control engineering, automata, structure of Petri nets, Petri nets for automisation, machine-related structure of processing computation machines, communication between process computers and periphery devices, software for automation systems, process synchronisation, process communication, real-time operating systems, real-time planning.

Intended learning outcomes
The students master the fundamentals of automation and control.

Courses (type, number of weekly contact hours, language — if other than German)
V + Ü (no information on SWS (weekly contact hours) and course language available)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
written examination (80 minutes)

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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Module title | Abbreviation
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Data bases | 10-I-DB-072-m01

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Contents

Relational algebra and complex SQL statements; database planning and normal forms; xml data modelling; transaction management.

Intended learning outcomes

The students possess a knowledge about database modelling and queries in SQL, transactions as well as easy data modelling in XML.

Courses (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (50 minutes) or oral examination (one candidate each: 15 minutes, groups of 2: 20 minutes, groups of 3: 25 minutes)

Allocation of places

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Additional information

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Referred to in LPO 1 (examination regulations for teaching-degree programmes)

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**Contents**

[Version 1: Paths, cycles and components, colouring and matching, transitive hull and irreducible kernel, trees, forests and matroids, depth first search, breadth first search, shortest paths, flows and streams, matchings, network design and routing, planar graphs, graph transformations] [Version 2: On the one hand, we handle typical graph problems: we solve round trip problems, calculate maximal flows, find matchings and colourings, work with planar graphs and find out how the ranking algorithm of Google works. On the other hand, we become familiar with new concepts, using the examples of graph problems, for example how we model problems as linear programs or how we show that they are fixed parameter computable.]

**Intended learning outcomes**

[Version 1: The students master the following topics: the most important graph theoretical concepts and algorithms: paths, cycles and components, colourings and matching, transitive hull and irreducible kernel, trees, forests, matroids, depth first search, breadth first search, shortest path, flows and streams, matchings, network design and routing, planar graphs, graph transformations.] [Version 2: The students are able to model typical problems of computer science as graph problems. In addition, the participants are able to decide which tool from the lecture helps solve a given graph problem algorithmically. In this course, students learn in detail how to estimate the run time of given graph algorithms.]

**Courses** (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (80 minutes) or oral examination (one candidate each: 20 minutes, groups of 2: 30 minutes, groups of 3: 40 minutes)

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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Module title | Abbreviation
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Theory of complexity | 10-I-KT-072-m01

Module coordinator | Module offered by
holder of the Chair of Computer Science IV | Institute of Computer Science

ECTS | Method of grading | Only after succ. compl. of module(s)
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8 | numerical grade | --

Duration | Module level | Other prerequisites
---|---|---
1 semester | undergraduate | --

Contents
Complexity measurements and classes, general relationships between space and time classes, memory consumption versus computation time, determinism versus indeterminism, hierarchical theorems, translation methods, P-NP problem, completeness problems, Turing reduction, interactive proof systems.

Intended learning outcomes
[Version 1: The students possess a fundamental and applicable knowledge in the areas of complexity measurements and classes, general relationships between space and time classes, memory consumption versus computation time, determinism versus indeterminism, hierarchical theorems, translation methods, P-NP problem, completeness problems, Turing reduction, interactive proof systems.] [Version 2: The students possess a fundamental and applicable knowledge in the areas of complexity measurements and classes, memory consumption versus computation time, determinism versus indeterminism, hierarchical theorems, translation methods, P-NP problem, completeness problems, lower bounds, Boolean hierarchy, polynomial time hierarchy, complexity of parallel algorithms and complexity of probabilistic algorithms.]

Courses (type, number of weekly contact hours, language — if other than German)
V + Ü (no information on SWS (weekly contact hours) and course language available)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
written examination (80 minutes) or oral examination (one candidate each: 20 minutes, groups of 2: 30 minutes, groups of 3: 40 minutes)

Allocation of places
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Additional information
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**Contents**

Syntax and semantics of propositional logic, equivalence and normal forms, Horn formulas, SAT, resolution, infinite formula sets, syntax and semantics of predicate logic.

**Intended learning outcomes**

The students are proficient in the following areas: syntax and semantics of propositional logic, equivalence and normal forms, Horn formulas, SAT, resolution, infinite formula sets, syntax and semantics of predicate logic.

**Courses**

V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

written examination (50 minutes) or oral examination (one candidate each: 15 minutes, groups of 2: 20 minutes, groups of 3: 25 minutes)

**Allocation of places**

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**Additional information**

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**Contents**

Polymorphism, generic programming, meta programming, web programming, templates, document management.

**Intended learning outcomes**

The students are proficient in the different paradigms of object-oriented programming and have experience in their practical use.

**Courses** (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (50 minutes) or oral examination (one candidate each: 15 minutes, groups of 2: 20 minutes, groups of 3: 25 minutes)

**Allocation of places**

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**Additional information**

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**Contents**

The programming language Java. Independent creation of small to middle-sized, high-quality Java programs.

**Intended learning outcomes**

The students are able to independently develop small to middle-sized, high-quality Java programs.

**Courses**

(type, number of weekly contact hours, language — if other than German)

P (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

completion of programming exercises (expenditure of time as specified) and final examination: written examination (60 to 90 minutes) or oral examination (one candidate each: 10 to 15 minutes, groups of 2: 20 minutes, groups of 3: 30 minutes)

**Allocation of places**

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**Additional information**

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## Contents

Instruction set architectures, command processing through pipelining, statical and dynamic instruction scheduling, caches, vector processors, multi-core processors.

## Intended learning outcomes

The students master the most important techniques to design fast computers as well as their interaction with compilers and operating systems.

## Courses

V + Ü (no information on SWS (weekly contact hours) and course language available)

## Method of assessment

- written examination (80 minutes) or oral examination (one candidate each: 20 minutes, groups of 2: 30 minutes, groups of 3: 40 minutes)

## Allocation of places

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## Additional information

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## Referred to in LPO I

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## Contents


## Intended learning outcomes

The students possess an intricate knowledge of the structure of computer networks and communication systems as well as fundamental principles to rate these systems.

## Courses

(V + Ü (no information on SWS (weekly contact hours) and course language available)

## Method of assessment

written examination (80 minutes) or oral examination (one candidate each: 20 minutes, groups of 2: 30 minutes, groups of 3: 40 minutes)

## Allocation of places

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## Additional information

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## Referred to in LPO I

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**Contents**

Object-oriented software development with UML, development of graphical user interfaces, foundations of databases and object-relational mapping, foundations of web programming (HTML, XML), software development processes, unified process, agile software development, project management, quality assurance.

**Intended learning outcomes**

The students possess a fundamental theoretical and practical knowledge on the design and development of software systems, in particular for the web.

**Courses** (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (80 minutes) or oral examination (one candidate each: 20 minutes, groups of 2: 30 minutes, groups of 3: 40 minutes)

**Allocation of places**

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**Additional information**

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**Contents**

Completion of a project assignment in groups, problem analysis, creation of requirements specifications, specification of solution components (e.g. UML) and milestones, user manual, programming documentation, presentation and delivery of the runnable software product in a colloquium.

**Intended learning outcomes**

The students possess the practical skills for the design, development and execution of a software project in small teams.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Periodic presentations on project progress with regard to detailing problem specifications, the corresponding solution components (software) and the documentation of these; if project is completed in groups, proof of contributions made by the individual student required; software and project documentation as specified in assignment, final presentation (10 to 15 minutes per group)

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Contents**

[Version 1: Foundations in the following areas: process and product-oriented knowledge management systems, basic knowledge representation and inference (rules, objects, constraints, probabilistic, non-monotonous, temporal closures), problem classes and solution methods (diagnostic, construction, simulation), knowledge acquisition and process models, data mining (data warehouse and OLAP, data preprocessing, data visualisation), learning algorithms with data mining (learning of decidability trees, rules, subgroups, clusters), semantic web.]

[Version 2: Foundations in the following areas: process and product-oriented knowledge management systems, basic knowledge representation and inference (rules, objects, constraints, probabilistic, non-monotonous, temporal closure), solution methods (diagnostic, construction), knowledge acquisition and process models, semantic web.]

**Intended learning outcomes**

The students possess the theoretical and practical knowledge necessary to understand and develop knowledge management systems and data mining systems including knowledge formalisation. The students also have acquired experience in a small project.

**Courses** (type, number of weekly contact hours, language — if other than German)

V + Ü + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (80 minutes) or oral examination (one candidate each: 20 minutes, groups of 2: 30 minutes, groups of 3: 40 minutes)

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
Application-oriented Subject Philosophy
(35 ECTS credits)
Application-oriented Subject Philosophy Compulsory Courses
(20 ECTS credits)
### Module Catalogue for the Subject
#### Mathematics

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### Contents

Introduction to the systems and the history of philosophy; introduction to academic writing and research in philosophy; introduction to formal logic; insight into a period in the history of philosophy.

### Intended learning outcomes

Intended learning outcomes: Content-related outcomes: - insight into basic problems and positions in philosophy - knowledge of, and ability to apply, methods in philosophy and ability to follow the rules of scholarly work - mastery of the fundamentals of formal logic - insight into a period in the history of philosophy Formal outcomes (skills to be tested in assessments): - ability to apply the principles of logic to argumentation - ability to apply general principles of argumentation such as transparency, consistency, discursivity, completeness, and generalisability - ability to present philosophical issues in a structured and linguistically and rhetorically appropriate way

### Courses

This module comprises 3 module components. Information on courses will be listed separately for each module component.

- 06-B-P1-1-072: Ü (no information on SWS (weekly contact hours) and course language available)
- 06-B-P1-2-072: Ü (no information on SWS (weekly contact hours) and course language available)
- 06-B-P1-3-072: Ü + Ü (no information on SWS (weekly contact hours) and course language available)

### Method of assessment

Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

**Assessment in module component 06-B-P1-1-072: Introduction to academic working techniques**
- 2 ECTS, Method of grading: (not) successfully completed
- 2 to 3 written assessments (approx. 1 page each) and/or oral assessments (approx. 5 minutes each)

**Assessment in module component 06-B-P1-2-072: Formal Logic**
- 3 ECTS, Method of grading: (not) successfully completed
- written examination (90 minutes)

**Assessment in module component 06-B-P1-3-072: Principles of Philosophy: historical epochs, main works, authors**
- 5 ECTS, Method of grading: numerical grade
- oral examination (approx. 25 minutes)

### Allocation of places

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### Additional information

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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Module title | Abbreviation
--- | ---
Philosophy and the sciences | 06-B-P2-072-m01

Module coordinator | Module offered by
holder of the Chair of Theoretical Philosophy | Institute of Philosophy

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Contents

Introduction to the theory of intellectual disciplines; philosophical bases of the humanities and the social sciences; philosophical bases of the natural sciences and engineering.

Intended learning outcomes

Intended learning outcomes: Content-related outcomes: - insight into the relationship of philosophy to individual intellectual disciplines - ability to reflect on the historical and intellectual origins of our knowledge culture - ability to organise topics into overarching historical, social, and political schemata - insight into the scope and limits of various intellectual disciplines - knowledge of, and ability to criticise, basic assumptions in systems of thought, culture, and knowledge Formal outcomes (skills to be tested in assessments): - ability to analyse philosophical texts and issues - ability to organise concepts and philosophical positions into overarching intellectual schemata - ability to present philosophical positions in a structured and linguistically appropriate manner

Courses (type, number of weekly contact hours, language — if other than German)

This module comprises 2 module components. Information on courses will be listed separately for each module component.

- 06-B-P2-1-072: S (no information on SWS (weekly contact hours) and course language available)
- 06-B-P2-2-072: S (no information on SWS (weekly contact hours) and course language available)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

Assessment in module component 06-B-P2-1-072: Philosophical principles of arts and humanities
- 5 ECTS, Method of grading: numerical grade
- written examination (approx. 120 minutes)

Assessment in module component 06-B-P2-2-072: Philosophical principles of natural sciences and technology
- 5 ECTS, Method of grading: numerical grade
- written examination (approx. 120 minutes)

Allocation of places

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Additional information

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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Application-oriented Subject Philosophy Compulsory Electives
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### Contents

Introduction to theoretical philosophy, using basic problems and paradigmatic texts.

### Intended learning outcomes

Intended learning outcomes: Content-related outcomes: - an overview of basic problems and positions in theoretical philosophy - an overview of systems and disciplines in theoretical philosophy - ability to use and distinguish between different methods in theoretical philosophy - familiarity with, and ability to evaluate, methods of argumentation and justification within theoretical philosophy - ability to reflect on the factors involved in the process of theoretical opinion formation Formal outcomes (skills to be tested in the assessment): - ability to analyse philosophical texts and issues - ability to organise concepts and philosophical positions into overarching intellectual schemata - ability to present philosophical positions in a structured and linguistically appropriate manner

### Courses

(\(\bar{U} + \bar{U} + S + S\) (no information on SWS (weekly contact hours) and course language available))

### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 180 minutes)

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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**Contents**

Introduction to practical philosophy, using basic problems and paradigmatic texts.

**Intended learning outcomes**

Content-related outcomes:
- an overview of basic problems and positions in practical philosophy
- an overview of systems and disciplines in practical philosophy
- ability to use and distinguish between different methods in practical philosophy
- knowledge of, and ability to evaluate, methods of argumentation and justification within practical philosophy
- ability to reflect on the factors involved in the process of moral opinion formation

Formal outcomes (skills to be tested in the assessment):
- ability to analyse philosophical texts and issues
- ability to organise concepts and philosophical positions into overarching intellectual schemata
- ability to present philosophical positions in a structured and linguistically appropriate manner

**Courses**

( type, number of weekly contact hours, language — if other than German)

Ü + Ü + S + S (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 180 minutes)

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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### Contents

Introduction to the history of philosophy, using basic problems and paradigmatic texts.

### Intended learning outcomes

Content-related outcomes:
- an overview of basic problems and positions in the history of philosophy
- ability to use and distinguish between different methods of historiography
- familiarity with, understanding of, and ability to evaluate methods and questions of scholarly inquiry with respect to the history of philosophy

Formal outcomes (skills to be tested in the assessment):
- ability to analyse philosophical texts and issues
- ability to organise concepts and philosophical positions into overarching intellectual schemata
- ability to present philosophical positions in a structured and linguistically appropriate manner

### Courses

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### Method of assessment

( type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 180 minutes)

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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**Module coordinator**

holder of the Chair of the History of Philosophy

**Module offered by**

Institute of Philosophy

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**Duration**

1 semester

**Module level**

undergraduate

**Other prerequisites**

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**Contents**

Selected research issues in philosophy.

**Intended learning outcomes**

Intended learning outcomes: Content-related outcomes: - knowledge and understanding of scholarly inquiry in philosophy Formal outcomes (skills to be tested in the assessment): - ability to analyse philosophical texts and issues - ability to follow the rules of scholarly work - ability to independently develop and present philosophical issues

**Courses**

V + S + S (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

term paper (approx. 12 pages)

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

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**Module title** | **Abbreviation**
---|---
Text analysis: Ancient Philosophy | 06-B-W1-072-m01

**Module coordinator**
holder of the Chair of the History of Philosophy

**Module offered by**
Institute of Philosophy

**ECTS** | **Method of grading** | **Only after succ. compl. of module(s)**
---|---|---
5 | numerical grade | --

**Duration** | **Module level** | **Other prerequisites**
---|---|---
1 semester | undergraduate | --

**Contents**
Ancient philosophical texts.

**Intended learning outcomes**

Content-related outcomes:
- ability to analyse texts of ancient philosophy while taking into account the historical and intellectual context of their origin
- knowledge of, and ability to criticise, basic assumptions in ancient systems of thought, culture, and knowledge

Formal outcomes (skills to be tested in the assessment):
- ability to analyse philosophical texts and issues
- ability to follow the rules of scholarly work (when writing a term paper)
- ability to organise historical concepts and philosophical positions into overarching intellectual schemata
- ability to independently develop and present philosophical issues

**Courses** (type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

term paper (approx. 12 pages)

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Module coordinator**
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**Duration**
1 semester

**Module level**
undergraduate

**Other prerequisites**
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**Contents**
Medieval philosophical texts.

**Intended learning outcomes**
Intended learning outcomes: Content-related outcomes: - ability to analyse texts of medieval philosophy while taking into account the historical and intellectual context of their origin - knowledge of, and ability to criticise, basic assumptions in pre-modern systems of thought, culture, and knowledge Formal outcomes (skills to be tested in the assessment): - ability to analyse philosophical texts and issues - ability to follow the rules of scholarly work - ability to independently develop and present philosophical issues

**Courses**
S (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**
term paper (approx. 12 pages)

**Allocation of places**
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**Additional information**
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### Contents

Modern philosophical texts.

### Intended learning outcomes

- Content-related outcomes: - ability to analyse texts of modern philosophy - knowledge of, and ability to criticise, basic assumptions of systems of thought, culture, and knowledge of modernity
- Formal outcomes (skills to be tested in the assessment): - ability to analyse philosophical texts and issues - ability to follow the rules of scholarly work - ability to independently develop philosophical issues and to present them in a linguistically appropriate manner

### Courses

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### Additional information

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**Duration**
1 semester

**Module level**
undergraduate

**Other prerequisites**
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**Contents**
Contemporary philosophical texts.

**Intended learning outcomes**
Intended learning outcomes: Content-related outcomes: - ability to analyse texts of contemporary philosophy - knowledge of, and ability to criticise, basic assumptions of systems of thought, culture, and knowledge of the contemporary world Formal outcomes (skills to be tested in the assessment): - ability to analyse philosophical texts and issues - ability to follow the rules of scholarly work - ability to independently develop philosophical issues and to present them in a linguistically appropriate manner

**Courses**
S (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**
term paper (approx. 12 pages)

**Allocation of places**
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**Additional information**
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**Referred to in LPO I** (examination regulations for teaching-degree programmes)
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**Contents**

Problems in and theoretical models of basic disciplines of theoretical philosophy.

**Intended learning outcomes**

Intended learning outcomes: Content-related outcomes: - insight into the fundamental disciplines of theoretical philosophy Formal outcomes (skills to be tested in the assessment): - ability to analyse philosophical texts and issues - ability to follow the rules of scholarly work - ability to independently develop philosophical issues and to present them in a linguistically appropriate manner

**Courses** (type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

term paper (approx. 12 pages)

**Allocation of places**

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**Additional information**

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**Contents**

Problems in and theoretical models of special disciplines of theoretical philosophy.

**Intended learning outcomes**

Intended learning outcomes: Content-related outcomes: - insight into special disciplines of theoretical philosophy Formal outcomes (skills to be tested in the assessment): - ability to analyse philosophical texts and issues - ability to follow the rules of scholarly work - ability to independently develop philosophical issues and to present them in a linguistically appropriate manner

**Courses** (type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

term paper (approx. 12 pages)

**Allocation of places**

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**Additional information**

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<thead>
<tr>
<th>Module coordinator</th>
<th>Module offered by</th>
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<tbody>
<tr>
<td>holder of the Chair of Practical Philosophy</td>
<td>Institute of Philosophy</td>
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<tbody>
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<td>1 semester</td>
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</table>

**Contents**

Problems in and theoretical models of basic disciplines of practical philosophy.

**Intended learning outcomes**

Intended learning outcomes: Content-related outcomes: - insight into the fundamental disciplines of practical philosophy
Formal outcomes (skills to be tested in the assessment): - ability to analyse philosophical texts and issues - ability to follow the rules of scholarly work - ability to independently develop philosophical issues and to present them in a linguistically appropriate manner

**Courses** (type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

term paper (approx. 12 pages)

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
Module title: Specific disciplines of practical philosophy

Abbreviation: 06-B-W8-072-m01

Module coordinator: holder of the Chair of Practical Philosophy

Module offered by: Institute of Philosophy

ECTS: 5

Method of grading: numerical grade

Only after succ. compl. of module(s): --

Duration: 1 semester

Module level: undergraduate

Other prerequisites: --

Contents:
Problems in and theoretical models of special disciplines of practical philosophy.

Intended learning outcomes:
Intended learning outcomes: Content-related outcomes: - insight into special disciplines of practical philosophy
Formal outcomes (skills to be tested in the assessment): - ability to analyse philosophical texts and issues - ability to follow the rules of scholarly work - ability to independently develop philosophical issues and to present them in a linguistically appropriate manner

Courses:
S (no information on SWS (weekly contact hours) and course language available)

Method of assessment:
term paper (approx. 12 pages)

Allocation of places:
--

Additional information:
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
### Module title
Problems of Older Philosophy: Ancient/Medieval

### Abbreviation
06-B-W9-072-m01

### Module coordinator
holder of the Chair of the History of Philosophy

### Module offered by
Institute of Philosophy

### ECTS
5

### Method of grading
numerical grade

### Only after succ. compl. of module(s)
--

### Duration
1 semester

### Module level
undergraduate

### Other prerequisites
--

### Contents
Problems in ancient and medieval philosophy.

### Intended learning outcomes
Intended learning outcomes: Content-related outcomes: - ability to analyse philosophical problems of older philosophy (ancient/medieval) - in-depth knowledge of the history of philosophical concepts, arguments, and theories
Formal outcomes (skills to be tested in the assessment): - ability to apply the principles of logic to argumentation - ability to apply general principles of argumentation such as transparency, consistency, discursivity, completeness, and generalisability - ability to present philosophical issues in a structured and linguistically and rhetorically appropriate way

### Courses
S (no information on SWS (weekly contact hours) and course language available)

### Method of assessment
oral examination (approx. 25 minutes)

### Allocation of places
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### Additional information
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### Referred to in LPO I
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<table>
<thead>
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<td>Problems of Modern/Contemporary Philosophy</td>
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**Contents**
Problems in early modern and contemporary philosophy.

**Intended learning outcomes**
Intended learning outcomes: Content-related outcomes: - ability to analyse philosophical problems of modern philosophy (early modern to contemporary) - in-depth knowledge of the history of philosophical concepts, arguments, and theories Formal outcomes (skills to be tested in the assessment): - ability to apply the principles of logic to argumentation - ability to apply general principles of argumentation such as transparency, consistency, discursivity, completeness, and generalisability - ability to present philosophical issues in a structured and linguistically and rhetorically appropriate way

**Courses**
(type, number of weekly contact hours, language — if other than German)
S (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
oral examination (approx. 25 minutes)

**Allocation of places**
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**Additional information**
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**Referred to in LPO 1**
(examination regulations for teaching-degree programmes)
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<td>Problems of Theoretical Philosophy</td>
<td>06-B-W11-072-m01</td>
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**Contents**
Problems in theoretical philosophy.

**Intended learning outcomes**
Intended learning outcomes: Content-related outcomes: - advanced knowledge of problems in theoretical philosophy. Formal outcomes (skills to be tested in the assessment): - ability to apply the principles of logic to argumentation - ability to apply general principles of argumentation such as transparency, consistency, discursivity, completeness, and generalisability - ability to present philosophical issues in a structured and linguistically and rhetorically appropriate way.

**Courses**
(No information on SWS (weekly contact hours) and course language available)
S

**Method of assessment**
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
oral examination (approx. 25 minutes)

**Allocation of places**
--

**Additional information**
--

**Referred to in LPO I**
(examination regulations for teaching-degree programmes)
--
### Module title
Problems of Practical Philosophy

### Abbreviation
06-B-W12-072-m01

### Module coordinator
holder of the Chair of Practical Philosophy

### Module offered by
Institute of Philosophy

### ECTS
5

### Method of grading
numerical grade

### Only after succ. compl. of module(s)
--

### Duration
1 semester

### Module level
undergraduate

### Other prerequisites
--

### Contents
Problems in practical philosophy.

### Intended learning outcomes
Intended learning outcomes: Content-related outcomes: - advanced knowledge of problems in practical philosophy Formal outcomes (skills to be tested in the assessment): - ability to apply the principles of logic to argumentation - ability to apply general principles of argumentation such as transparency, consistency, discursivity, completeness, and generalisability - ability to present philosophical issues in a structured and linguistically and rhetorically appropriate way

### Courses
S (no information on SWS (weekly contact hours) and course language available)

### Method of assessment
oral examination (approx. 25 minutes)

### Allocation of places
--

### Additional information
--

### Referred to in LPO I
(examination regulations for teaching-degree programmes)
--
Application-oriented Subject Physics
(min. 35 ECTS credits)
Application-oriented Subject Physics Compulsory Courses
(16 ECTS credits)

If consent is obtained from the examination committee, modules 11-ENNF1 and 11-ENNF2 (7 ECTS credits each) may be replaced with modules 11-E1 and 11-E2 (8 ECTS credits each).
<table>
<thead>
<tr>
<th>Module title</th>
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<tr>
<td>Introduction to Physics Part 1 for students of Physics Related Minor Subjects</td>
<td>11-ENNF1-062-m01</td>
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**Module coordinator**
Managing Director of the Institute of Applied Physics  
**Module offered by**  
Faculty of Physics and Astronomy

**ECTS**  
7  
**Method of grading**  
Numerical grade  
**Duration**  
1 semester  
**Module level**  
Undergraduate  
**Other prerequisites**  
--

**Contents**
Mechanics, vibration theory, thermodynamics.

**Intended learning outcomes**
The students have basic knowledge of physics for engineering students.

**Courses**
V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**
written examination (approx. 120 minutes)

**Allocation of places**
Only as part of pool of general key skills (ASQ): 20 places. Places will be allocated by lot.

**Additional information**
--

**Referred to in LPO I**
(examination regulations for teaching-degree programmes)
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<table>
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<td>Introduction to Physics Part 2 for students of Physics Related Minor Subjects</td>
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**Contents**

Science of electricity, magnetism, optics, Atomic Physics.

**Intended learning outcomes**

The students have basic knowledge of physics for engineering students.

**Courses**

V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 120 minutes)

**Allocation of places**

Only as part of pool of general key skills (ASQ): 20 places. Places will be allocated by lot.

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<table>
<thead>
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<td>Measurements and Data Analysis</td>
<td>11-PFR-072-m01</td>
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**Module coordinator**

Managing Director of the Institute of Applied Physics

**Module offered by**

Faculty of Physics and Astronomy

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</table>

**Duration**

1 semester

**Module level**

undergraduate

**Other prerequisites**

--

**Contents**

Types of error, error approximation and propagation, graphs, linear regression, average values and standard deviation, distribution functions, significance tests, writing of lab reports and publications.

**Intended learning outcomes**

In this module, the students acquire subject-specific transferable skills. They have knowledge of practical experimental work, error propagation and the principles of statistics.

**Courses**

V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

written examination (approx. 120 minutes)

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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Application-oriented Subject Physics Compulsory Electives 1
(3-4 ECTS credits)
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<td>Physics Laboratory Course for students of Physics Related Minor Subjects</td>
<td>11-PNNF-062-m01</td>
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<td>1 semester</td>
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</table>

**Contents**

Mechanics, vibration theory, thermodynamics, optics, X-rays, nuclear magnetic resonance, Atomic and Nuclear Physics.

**Intended learning outcomes**

The students know the principles of Physics.

**Courses**

P (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

(a) oral test (approx. 15 minutes) during experiment and (b) ungraded written examination (approx. 90 minutes)

**Allocation of places**

Only as part of pool of general key skills (ASQ): 15 places. Places will be allocated by lot.

**Additional information**

--

**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

--
### Module Catalogue for the Subject Mathematics
**Bachelor's with 1 major, 180 ECTS credits**

<table>
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<th>Module title</th>
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<td><strong>Practical Course</strong></td>
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<tbody>
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<td>1 semester</td>
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<td>Module 11-PFR recommended.</td>
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</table>

**Contents**

Physical laws of mechanics, thermodynamics, optics, science of electricity, vibration and waves, Atomic and Nuclear Physics and wave optics. Basic measuring methods using computers and storage oscilloscopes.

**Intended learning outcomes**

The students have knowledge and skills of physical measuring instruments and experimental techniques. They are able to independently plan and conduct experiments in cooperation with others, and to document the results in a measurement protocol.

**Courses** (type, number of weekly contact hours, language — if other than German)

- Beispiele aus Mechanik, Wärmelehre und Elektrik (Examples from Mechanics, Thermodynamics and Electricity, BAM): P (2 weekly contact hours)
- Klassische Physik (Classical Physics, KLP): P (2 weekly contact hours)
- Elektrizitätslehre und Schaltungen (Electricity and Circuits, ELS): P (2 weekly contact hours)
- Wellenoptik (Physical Optics, WOP): P (2 weekly contact hours)
- Atom- und Kernphysik (Atomic and Nuclear Physics, AKP): P (2 weekly contact hours)
- Computer und Messtechnik (Computers and Measurement Technology, CMT): P (2 weekly contact hours)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

This module has the following assessment components

1. Lab course in part 1: a) Preparing, performing and evaluating the experiments will be considered successfully completed if a Testat (exam) is passed. b) Talk (with discussion) to test the students' understanding of the physics-related contents of the course (approx. 30 minutes).
2. Lab course in part 2: a) Preparing, performing and evaluating the experiments will be considered successfully completed if a Testat (exam) is passed. b) Talk (with discussion) to test the students' understanding of the physics-related contents of the course (approx. 30 minutes).

Students must register for assessment components 1 and 2 online (registration deadline to be announced). Students will be offered one opportunity to retake element a) and/or element b). To pass an assessment component, they must pass both elements a) and b).

To pass this module, students must successfully complete two out of the six courses.

Students must attend BAM, KLP or ELS courses prior to attending WOP, AKP or CMT courses.

To pass this module, students must pass both assessment component 1 and assessment component 2.

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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Application-oriented Subject Physics Compulsory Electives 2
(16 ECTS credits)
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<td>Experimental Physics 3 (Optics, Quantum Phenomena, Introduction Atomic Physics)</td>
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</table>

### Contents

Physical laws of optics, quantum phenomena, introduction to Atomic Physics.

### Intended learning outcomes

The students have knowledge of the basic contexts and principles of optics, quantum phenomena and Atomic Physics.

### Courses

V + Ü (no information on SWS (weekly contact hours) and course language available)

### Method of assessment

written examination (approx. 120 minutes)

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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<table>
<thead>
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<td>Experimental Physics 4 (Introduction to Solid State Physics)</td>
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### Contents

Physical laws of solids: Bonding and structure, lattice dynamics, thermal properties, principles of electronic properties (free electron gas).

### Intended learning outcomes

The students have knowledge of the basic contexts and principles of solids: Bonding and structure, lattice dynamics, thermal properties, principles of electronic properties (free electron gas).

### Courses

V + Ü (no information on SWS (weekly contact hours) and course language available)

### Method of assessment

written examination (approx. 120 minutes)

### Allocation of places

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### Additional information

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<tr>
<td>Managing Director of the Institute of Theoretical Physics and Astrophysics</td>
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**Contents**
Newtonian mechanics, Lagrangian mechanics, Hamiltonian equation of motion, conservation laws.

**Intended learning outcomes**
The students have knowledge of the principles of classical theoretical mechanics and the required calculation methods.

**Courses**
V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**
written examination (approx. 120 minutes)

**Allocation of places**
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**Additional information**
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<td>Theoretical Physics 2 (Theoretical Electrostatics and Electrodynamics)</td>
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### Contents

Electrostatics, magnetostatics, Maxwell equations, covariant formulation, electrodynamics and matter.

### Intended learning outcomes

The students have knowledge of the principles of classical electrodynamics and the required calculation methods.

### Courses

V + Ü (no information on SWS (weekly contact hours) and course language available)

### Method of assessment

written examination (approx. 120 minutes)

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)
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<thead>
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<td>11-T3-072-m01</td>
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<td>Faculty of Physics and Astronomy</td>
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**Contents**

Limits of classical physics, Schrödinger equation, mathematical foundations of quantum mechanics, harmonic oscillator, angular momentum and spin, hydrogen atom, many-particle systems.

**Intended learning outcomes**

The students have knowledge of the principles of quantum mechanics and the required calculation methods.

**Courses** (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 120 minutes)

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Contents**
Principles of thermodynamics, fundamental theorems, thermodynamic potentials, principles of statistical mechanics.

**Intended learning outcomes**
The students have knowledge of the principles of thermodynamics and statistical mechanics and the required calculation methods.

**Courses** (type, number of weekly contact hours, language — if other than German)
V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
written examination (approx. 120 minutes)

**Allocation of places**
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**Additional information**
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**Referred to in LPO I** (examination regulations for teaching-degree programmes)
--
Application-oriented Subject Business Management and Economics
(35 ECTS credits)
Application-oriented Subject Business Management and Economics

Compulsory Courses

(30 ECTS credits)
Module title | Abbreviation
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Managerial Accounting | 12-IntUR-G-072-m01

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Contents

Content:
This course offers an introduction to aims and methods of managerial accounting (cost accounting).

Outline of syllabus:
1. Managerial accounting and financial accounting
2. Managerial accounting: basic terms
3. Different types of costs
4. Cost centre accounting based on total costs
5. Job costing based on total costs
6. Cost centre accounting and job costing based on direct/variable costs
7. Budgeting and cost-variance analysis
8. Cost-volume-profit analysis
9. Cost information and operating decisions

Reading:
Friedl/Hofmann/Pedell: Kostenrechnung. Eine entscheidungsorientierte Einführung.
(most recent editions)

Intended learning outcomes

After completing the course "Management Accounting and Control", the students will be able to
(i) set out the responsibilities of the company's internal accounting and control;
(ii) define the central concepts of internal enterprise computing restriction and control and assign case studies
the terms;
(iii) apply the basic methods of internal corporate accounting and control on a full and cost base to idealized ca-
se studies of medium difficulty that calculate relevant costs and benefits and take on this basis a reasoned deci-
sion.

Courses (type, number of weekly contact hours, language — if other than German)
V + Ü (no information on SWS (weekly contact hours) and course language available)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether
module is creditable for bonus)
written examination (approx. 60 minutes)

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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Module title | Abbreviation
---|---
Financial Accounting | 12-ExtUR-G-072-m01

Module coordinator | Module offered by
holder of the Chair of Business Taxation | Faculty of Business Management and Economics

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Contents

This course offers an introduction to the fundamentals of financial accounting, including the technique of double-entry book-keeping as well as the fundamentals of recognition, valuation and presentation of assets, liabilities and equity according to German commercial law.

Intended learning outcomes

Students acquire a basic understanding of the fundamentals of financial accounting. They are able to arrange, reproduce and apply this knowledge, i.e. they are able to solve simple accounting problems.

Courses

V + Ü (no information on SWS (weekly contact hours) and course language available)

Method of assessment

written examination (approx. 60 minutes)

Allocation of places

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Additional information

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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## Module title

**Introduction to Business Administration**

### Abbreviation

12-EBWL-G-072-m01

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### Contents

This course will introduce students to relevant subject areas of business administration. Students will acquire an overview of the different perspectives and main points of view from which a theoretical examination of business enterprise may take place. The course will focus on what companies or other organisations are, how they behave and in what form they are organised. For this purpose, a study will be made of the economic subject's decision-making behaviour.

Reading list to be provided during lecture.

### Intended learning outcomes

The aim of the lectures is to familiarise the students with the basic problem issues and perspectives within the field of business administration.

### Courses

| V + Ü (no information on SWS (weekly contact hours) and course language available) |

written examination (approx. 60 minutes)

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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### Contents

The course deals with the following topics:

1. Economics shows how markets function
2. The division of labour is the basis of our wealth
3. The market in action
4. Monopolies and cartels endanger market economies
5. The labour market and the role of unions
6. The government's role in a social market economy
7. Governmental redistribution guarantees the social balance in a market economy
8. Environmental policy and the government’s allocation function
9. Objectives and agents in the macro economy
10. How do aggregate supply and demand come into equilibrium?
11. The role of fiscal policy
12. How does a central bank stabilise aggregate demand by setting interest rates?

### Intended learning outcomes

By completing this course, students receive a fundamental understanding of economics. Students are able to grasp microeconomic as well as macroeconomic subjects and to analyze them in theoretical models.

### Courses

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### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)
Module title: Macroeconomics 1
Abbreviation: 12-Mak1-G-072-m01

Module coordinator: holder of the Chair of International Macroeconomics
Module offered by: Faculty of Business Management and Economics

ECTS: 5
Method of grading: numerical grade
Duration: 1 semester
Module level: undergraduate
Other prerequisites: --

Contents

Description:
This module covers basic macroeconomic relationships, the declaration of employment, production, interest, current and capital account, nominal and real exchange rate, prices and inflation - in the long run (with flexible wages and prices) and in the short term (with fixed wages and prices). The course will familiarise students with concepts which are of central importance in a globalised environment (e. g. interest rate arbitrage, foreign exchange risk, purchasing power parity). The explanations will be applied to current issues (e. g. current account balances in the global economy; questions related to the European monetary union and the global financial crisis).

Outline of syllabus:
1. Macroeconomic issues and characteristics
   - Issues of macroeconomics
   - The measurement of economic activity
2. Long-term relationships
   - The classic long-term model of the closed economy
   - Money and Inflation
   - The classic long-term model of a small open economy
3. Short and medium-term relationships
   - Fluctuations of economic activity: an introduction
   - The IS-LM model of a closed economy
   - The IS-LM model of an open economy
   - Unemployment
   - Aggregate supply and Phillips curve
   - Conclusion and outlook

Reading:
The latest editions of the following textbooks:
N. Gregory Mankiw: Macroeconomics [students are recommended to read the original English edition; they may also read the German translation]
Olivier Blanchard and David H. Johnson, Macroeconomics Prentice Hall; [a German-language edition of the book by Oliver Blanchard and Gerhard Illing is available from Pearson Studium].
Michael Burda and Charles Wyplosz: Macroeconomics. A European text.
To illustrate the lecture, case studies in particular will be developed in which more current sources are used.

Intended learning outcomes
This expertise enables the students to penetrate economically-intuitively and analytically macroeconomic interactions and problems in the course of advancing globalization and to deal with these arguments. Students learn to interpret on a scientific basis the impact of macroeconomic developments in individual economic actors (businesses, households, the state).

Courses
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### Module title

Microeconomics 1

### Abbreviation

12-Mik1-G-072-m01

### Module coordinator

holder of the Chair of Economics, Information and Contract Economics

### Module offered by

Faculty of Business Management and Economics

### ECTS

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### Contents

The lecture covers the following topics

Theory of the household:

1. Utility maximisation under constraints
2. Comparative statics
3. Income and substitution effects
4. Labour supply
5. Intertemporal consumption / savings decisions

Theory of the firm:

6. Production functions (technology)
7. Profit maximisation
8. Long run versus short run cost minimisation
9. Supply of goods

### Intended learning outcomes

Students are systematically trained in microeconomic methods relevant in household and firm theory. Accordingly, they will know how to solve optimization problems under constraints. These scientific methods will serve as useful in many fields of specialization in economics and business administration. In particular, students know analytically how to analyze the impact of changes in the economic environment, e.g., wages, interest rates, income on individual decision making.

### Courses

(type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

### Method of assessment

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written examination (approx. 60 minutes)

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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Application-oriented Subject Business Management and Economics
Compulsory Electives
(5 ECTS credits)
Module title | Abbreviation
---|---
Introduction to Market-Oriented Management | 12-Mark-G-072-m01

Module coordinator
holder of the Chair of Business Management and Marketing

Module offered by
Faculty of Business Management and Economics

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Duration | Module level | Other prerequisites
1 semester | undergraduate | --

Contents

Description
In this module, students will acquire the theoretical foundations of market-oriented management.

Content:
With the stakeholder approach as a starting point, the basic design of market-oriented management will be explained and exemplified in the 5 classical steps: situation analysis, objectives, strategies, tools and controlling. The course will focus not only on the behavioural approaches of consumer behaviour but also on industrial purchasing behaviour. A case study introducing students to the fundamental principles of market research based on a conjoint analysis will provide students with deeper insights into the topic.

Outline of syllabus:
1. Marketing, entrepreneurship and business management
2. Explanations of consumer behaviour
3. Fundamentals of market research
4. Strategic marketing; marketing tools
5. Corporate social responsibility versus creating shared value

Reading:

Intended learning outcomes

The students have a basic understanding of business management and are able to classify the knowledge systematically. In addition, they can use the acquired knowledge solve and identify the conventional problem fields of business management.

Courses
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Module title: Supply, Production and Operations Management. An Introduction

Abbreviation: 12-BPL-G-072-m01

Module coordinator: holder of the Chair of Business Management and Industrial Management

Module offered by: Faculty of Business Management and Economics

ECTS: 5

Method of grading: Only after succ. compl. of module(s)

Duration: 1 semester

Module level: undergraduate

Contents:
This course will provide students with an overview of fundamental processes in procurement, production and logistics and the related corporate functions as well as a model-based introduction to related planning procedures.

Intended learning outcomes:
The students will be able to describe and discuss the objectives and major processes in the domains of corporate procurement, production and logistics as well as their interdependencies. Furthermore, they are capable of developing and applying basic planning models in these fields.

Courses:
V + Ü (no information on SWS (weekly contact hours) and course language available)

Method of assessment:
written examination (approx. 60 minutes)

Allocation of places:
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Additional information:
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### Contents

**Content:**
This course offers an introduction to principles of financial mathematics, several methods of capital budgeting and principles of financial economics.

**Outline of syllabus:**
1. Principles of financial mathematics
2. Fundamental concepts
3. Problems of investment and finance in one commodity world under certainty
4. Problems of investment and finance in one commodity world under uncertainty
5. Problems of investment and finance in many commodities world under uncertainty
6. Capital market and corporate financing in Germany

### Intended learning outcomes

After completing the course "Principles of Investments and Finance", the students will be able
(i) to understand the fundamentals in financial mathematics and solve several problems, e.g. via the PV approach;
(ii) to address the central problems in intertemporal allocation given different capital market scenarios;
(iii) to budget and calculate the optimal useful life given static and dynamic investment approaches under the consideration of several other investment opportunities and the capital market scenario, especially the influence of taxes.

### Courses

**V + Ü** (no information on SWS (weekly contact hours) and course language available)

### Method of assessment

Written examination (approx. 60 minutes)

### Allocation of places

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### Additional information

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### Referred to in LPO I

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**Contents**

Description:
The lecture provides an introduction to long run or dynamic issues of macroeconomic theory and policy.

Contents:
1. Phillips curve and dynamic model
2. Growth theory and policy
3. Microeconomic foundations of macroeconomics
4. Macroeconomic policy

Lecture notes to be provided by Chair.

**Intended learning outcomes**

After completing the course "Makroökonomie 2" students are familiar with the most important concepts of growth theory, they know the microeconomic foundations of modern macroeconomic theory and understand the intertemporal budget constraint of the government. Therefore they are able to discuss the growth and distributional consequences of policy reforms by applying simple economic models.

**Courses**

(type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 minutes)

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

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<table>
<thead>
<tr>
<th><strong>Module title</strong></th>
<th><strong>Abbreviation</strong></th>
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<tbody>
<tr>
<td>Microeconomics 2</td>
<td>12-Mik2-G-072-m01</td>
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<tr>
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<tr>
<td>holder of the Chair of Industrial Economics</td>
<td>Faculty of Business Management and Economics</td>
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</thead>
<tbody>
<tr>
<td>1 semester</td>
<td>undergraduate</td>
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</tbody>
</table>

**Contents**

Outline of syllabus:
1. Cost minimisation
2. Profit maximisation and the supply function
3. Short-run market equilibrium
4. Long-run market equilibrium
5. Government interventions
6. Monopoly
7. Pricing strategies with market power
8. Introduction to game theory
9. Strategic interaction and oligopoly

**Intended learning outcomes**

The aim of the course is to understand how markets work. We will investigate the behavior of a company in different market structures; namely perfectly competitive markets, monopoly markets and all forms in between, the so-called oligopoly markets. Ultimately, we are interested in whether the market results from a social point of view is desirable. Using our models, we will also try to analyze the consequences of different government interventions. The knowledge that students gain in this course will be in their future course of studies of benefits to them. In almost all business and economics lectures markets play a role. It also discussed in detail how economic actors make their decisions. Students will thus learn the important building blocks of economic thought. This knowledge will also be useful in the workplace and even in their private lives.

**Courses (type, number of weekly contact hours, language — if other than German)**

V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)**

written examination (approx. 60 minutes)

**Allocation of places**

--

**Additional information**

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**Referred to in LPO I (examination regulations for teaching-degree programmes)**

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<table>
<thead>
<tr>
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<td>Introduction to Economic Policy</td>
<td>12-WiPo-G-072-m01</td>
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<td>holder of the Chair of Economic Order and Social Policy</td>
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<tbody>
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<td>undergraduate</td>
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</table>

**Contents**

**Description:**

The course consists of six chapters. The first chapter illustrates what economists have in mind when referring to the term "economic policy" and discusses its objectives, means and institutions. The following chapters deal with the objectives that are set out in the German "Gesetz zur Förderung der Stabilität und des Wachstums der Wirtschaft" ("Law for Promoting Stability and Growth of the Economy") of 1967. Each chapter uses current macroeconomic data to evaluate the degree to which the particular objective is achieved, discusses the reasons of possible problems and demonstrates actions the government may take to cure the problems.

**Outline of syllabus:**

1. Introduction
   - What is "Economic Policy"?
   - Objectives of economic policy
   - Instruments of economic policy
   - Institutions of economic policy
2. Full employment
   - Empirics: The status quo of the labour market
   - Reasons for unemployment
   - Cure for labour market problems
3. Price level stability
   - Empirics: Inflation, deflation or price stability?
   - Reasons for inflation and deflation
   - Cure for price instability
   - The contradicting relationship between full employment and stable prices
4. Business cycles and economic growth
   - Empirics: current situation of the world economy and long-term economic growth
   - Reasons for cyclical fluctuations and determinants of economic growth
   - Cure for macroeconomic instabilities and means to facilitate economic growth
5. Balance in foreign trade
   - Empirics: balances of payments of Germany, Europe and the World
   - Reasons for macroeconomic imbalances
   - Cure for instabilities in foreign trade
6. Income distribution
   - Empirics: the distribution of incomes and its historical development
   - Reasons for an increase in income inequality
   - Cure for inequality and redistribution

**Intended learning outcomes**

The students gain a basic understanding of the role of the state in national and international economies. Based on a number of macroeconomic models (AS/AD, IS/LM, phillips curve, labor market equilibria, Solow model, Beveridge curve, etc.), students study the ability of the state to influence national and global economies. Students learn to assess in which situations such influence can be welfare-enhancing and under which circumstances governmental interventions may be harmful. After successful completion of the course, students are able to analyze concrete economic situations and to develop policy options of the state. In addition, students have learned to
assess the situation of a country on the basis of empirical macroeconomic data and to explain the particular problems based on different models.

<table>
<thead>
<tr>
<th>Courses</th>
<th>(type, number of weekly contact hours, language — if other than German)</th>
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<tr>
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<th>(type, scope, language — if other than German, examination offered — If not every semester, information on whether module is creditable for bonus)</th>
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<tbody>
<tr>
<td>written examination</td>
<td>(approx. 60 minutes)</td>
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| Allocation of places | --                                                                                       |

| Additional information | --                                                                                      |

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Thesis

(10 ECTS credits)
<table>
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<tr>
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<tr>
<td>Thesis Mathematics (Bachelor Thesis)</td>
<td>10-M-BAM-072-m01</td>
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<td>Dean of Studies Mathematik (Mathematics)</td>
<td>Institute of Mathematics</td>
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<tbody>
<tr>
<td>1 semester</td>
<td>undergraduate</td>
<td>Registration for assessment: as specified.</td>
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</tbody>
</table>

**Contents**

Independently researching and writing on a topic in mathematics selected in consultation with the supervisor.

**Intended learning outcomes**

The student is able to work independently on a given mathematical topic and apply the skills and methods obtained during his/her studies in the bachelor programme. He/She can write down the result of his/her work in a suitable form.

**Courses** (type, number of weekly contact hours, language — if other than German)

no courses assigned

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written thesis

Language of assessment: German, English if agreed upon with the examiner

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
Subject-specific Key Skills

(10 ECTS credits)
### Module title
Computational Mathematics, advanced

### Abbreviation
10-M-COMg-082-m01

### Module coordinator
Dean of Studies Mathematik (Mathematics)

### Module offered by
Institute of Mathematics

### ECTS
4

### Method of grading
Only after succ. compl. of module(s)

### Duration
1 semester

### Module level
undergraduate

### Other prerequisites
Admission prerequisite to assessment: regular attendance of exercises (attendance monitored, a maximum of one incident of unexcused absence).

### Contents
Introduction to modern mathematical software for symbolic computation (e.g. Mathematica or Maple) and numerical computation (e.g. Matlab) to supplement the basic modules in analysis and linear algebra (10-M-ANA, 10-M-ANL and 10-M-LNA). Computer-based solution of problems in linear algebra, geometry, analysis, in particular differential and integral calculus; visualisation of functions.

### Intended learning outcomes
The student learns the use of advanced modern mathematical software packages, and is able to assess their fields of application to solve mathematical problems.

### Courses
Ü + V (no information on SWS (weekly contact hours) and course language available)

### Method of assessment
project in the form of programming exercises (type and expenditure of time to be specified by the lecturer at the beginning of the course)
Assessment offered: once a year, summer semester
Language of assessment: German, English if agreed upon with the examiner

### Allocation of places
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### Additional information
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### Referred to in LPO I
( examination regulations for teaching-degree programmes)
§ 73 (1) 5. Mathematik Angewandte Mathematik
<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>Programming course for students of Mathematics and other subjects, simple</td>
<td>10-M-PRGk-o82-m01</td>
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<table>
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<th>Other prerequisites</th>
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<tbody>
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<td>1 semester</td>
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<td>Admission prerequisite to assessment: regular attendance (attendance monitored, a maximum of one incident of unexcused absence).</td>
</tr>
</tbody>
</table>

**Contents**

Basics of a modern programming language (e.g. C or Fortran) taking into account the particular needs in mathematics.

**Intended learning outcomes**

The student is able to work independently on small programming exercises and standard programming problems in mathematics.

**Courses**

(type, number of weekly contact hours, language — if other than German)

P (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Project in the form of programming exercises (type and expenditure of time to be specified by the lecturer at the beginning of the course)

Language of assessment: German, English if agreed upon with the examiner

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

§ 73 (1) 5. Mathematik Angewandte Mathematik
<table>
<thead>
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<tbody>
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<table>
<thead>
<tr>
<th>Duration</th>
<th>Module level</th>
<th>Other prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 semester</td>
<td>undergraduate</td>
<td>Admission prerequisite to assessment: regular attendance of courses (as specified at the beginning of the course).</td>
</tr>
</tbody>
</table>

**Contents**

Introduction to the basic techniques in mathematics; approach to sets, propositions, propositional logic.

**Intended learning outcomes**

The student gets acquainted with the basic working techniques which are prerequisites for the further courses in the Bachelor's degree study programme.

**Courses** (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

project assignments (type and expenditure of time to be specified by the lecturer at the beginning of the course)
Assessment offered: once a year, winter semester
Language of assessment: German, English if agreed upon with the examiner

**Allocation of places**

- -

**Additional information**

- -

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

- -
Module title: Programming course for students of Mathematics and other subjects
Abbreviation: 10-M-PRG-082-m01

Module coordinator: Dean of Studies Mathematik (Mathematics)
Module offered by: Institute of Mathematics

ECTS: 3
Method of grading: Only after succ. compl. of module(s)
Duration: 1 semester
Module level: undergraduate
Other prerequisites: Admission prerequisite to assessment: regular attendance (attendance monitored, a maximum of one incident of unexcused absence).

Contents:
Basics of a modern programming language (e.g. C or Fortran) taking into account the particular needs in mathematics.

Intended learning outcomes:
The student is able to work independently on small programming exercises and standard programming problems in mathematics.

Courses:
P (no information on SWS (weekly contact hours) and course language available)

Method of assessment:
Project in the form of programming exercises (as specified at the beginning of the course)
Language of assessment: German, English if agreed upon with the examiner

Allocation of places:
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Additional information:
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Referred to in LPO I (examination regulations for teaching-degree programmes)
§ 73 (1) 5. Mathematik Angewandte Mathematik
Module title | Abbreviation
---|---
Computer-oriented Mathematics | 10-M-COM-082-m01

Module coordinator | Module offered by
---|---
Dean of Studies Mathematik (Mathematics) | Institute of Mathematics

ECTS | Method of grading | Only after succ. compl. of module(s)
---|---|---
3 | (not) successfully completed | --

Duration | Module level | Other prerequisites
---|---|---
1 semester | undergraduate | Admission prerequisite to assessment: regular attendance of exercises (attendance monitored, a maximum of one incident of unexcused absence).

**Contents**

Introduction to modern mathematical software for symbolic computation (e.g., Mathematica or Maple) and numerical computation (e.g., Matlab) to supplement the basic modules in analysis and linear algebra (10-M-ANA or 10-M-ANL) and 10-M-LNA). Computer-based solution of problems in linear algebra, geometry, analysis, in particular differential and integral calculus; visualisation of functions.

**Intended learning outcomes**

The student learns the use of advanced modern mathematical software packages, and is able to assess their fields of application to solve mathematical problems.

**Courses** (type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

project in the form of programming exercises (as specified at the beginning of the course)

Assessment offered: once a year, summer semester

Language of assessment: German, English if agreed upon with the examiner

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 73 (1) 5. Mathematik Angewandte Mathematik
<table>
<thead>
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<th>Module title</th>
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<td>Defense of Bachelor Thesis in Mathematics</td>
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**Module coordinator**
Dean of Studies Mathematik (Mathematics)

**Module offered by**
Institute of Mathematics

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<td>3</td>
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</table>

**Duration**
1 semester

**Module level**
undergraduate

**Other prerequisites**
--

**Contents**
The student prepares a scientific talk on the topic and results of his/her Bachelor's thesis and answers questions on his/her talk.

**Intended learning outcomes**
The student is able to prepare a presentation of his/her own scientific work. He/She is able to give a short and concise talk on his/her own scientific work, participate in a scientific debate and question the scientific activities of others.

**Courses**
(type, number of weekly contact hours, language — if other than German)
A (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
talk (approx. 15 minutes) with subsequent discussion (approx. 15 minutes)

**Allocation of places**
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**Additional information**
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**Referred to in LPO I**
(examination regulations for teaching-degree programmes)
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