

# Module Scheme MA Mathematik 2016

Main types of courses: VO ...lecture course, PS ... introductory seminar, SE ... seminar

## 1. Area of Specialisation

### 1.1. Arithmetics, Algebra and Discrete Mathematics 51 ECTS

#### 1.1.1. Core Modules

Code	Name	Type	SSt	ECTS
<b>MALG</b>	<b>Group Theory</b>			<b>7</b>
Compulsory	VO Group Theory	VO	3	5
Compulsory	PS Group Theory	PS	1	2

<b>MALZ</b>	<b>Algebraic Number Theory</b>			<b>6</b>
Compulsory	VO Algebraic Number Theory	VO	4	6

<b>MALK</b>	<b>Combinatorics</b>			<b>9</b>
Compulsory	VO Combinatorics	VO	4	6
Compulsory	PS Combinatorics	PS	2	3

<b>MALS</b>	<b>Seminars: Arithmetics, Algebra and Discrete Mathematics</b>			<b>8</b>
Compulsory	Seminar (Arithmetic or Algebra or Discrete Mathematics)	SE	2	4
Compulsory	Seminar (Arithmetic or Algebra or Discrete Mathematics)	SE	2	4

#### 1.1.2. Electives

<b>MALV</b>	<b>Electives in Arithmetics, Algebra and Discrete Mathematics</b>			<b>21</b>
Compulsory	For this module, students have to obtain 21 ECTS credits by completing Topics courses allocated to the area of specialization „Arithmetics, Algebra and Discrete Mathematics“, maximum of 4 ECTS credits thereof in the form of seminars. Courses of this module called “Topics courses”.	VO/ SE/ PS/ KO/ etc.		

## 1.2. Analysis 51 ECTS

### 1.2.1. Core Modules

<b>MANF</b>	<b>Advanced Functional Analysis</b>			<b>10</b>
Compulsory	Advanced Functional Analysis	VO	4	7
Compulsory	Real Analysis	VO	2	3

<b>MANK</b>	<b>Advanced Complex Analysis</b>			<b>5</b>
Compulsory	Advanced Complex Analysis	VO	3	5

<b>MANS</b>	<b>Seminars: Analysis</b>			<b>10</b>
Compulsory	Seminar (functional analysis/ harmonic analysis/ complex analysis/ ordinary differential equations/ partial differential equations)	SE	2	4
Compulsory	Seminar (functional analysis/ harmonic analysis/ complex analysis/ ordinary differential equations/ partial differential equations)	SE	2	4
Compulsory	Proseminar (connected to a Topics VO "Advanced Functional Analysis"/ Advanced Complex Analysis"/ "Advanced Partial Differential Equations"/ "Dynamical Systems and Nonlinear Differential Equations")	PS	1	2

<b>MANP</b>	<b>Advanced Partial Differential Equations</b>			<b>5</b>
Option A	Advanced Partial Differential Equations	VO	3	5
<b>MANO</b>	<b>Dynamical Systems and Nonlinear Differential Equations</b>			<b>5</b>
Option B	Dynamical Systems and Nonlinear Differential Equations	VO	3	5

### 1.2.2. Electives

<b>MANV</b>	<b>Electives in Analysis</b>			<b>21</b>
Compulsory	For this module, students have to obtain 21 ECTS credits by completing Topics courses allocated to the area of specialization „Analysis“, maximum of 4 ECTS credits thereof in the form of seminars. Courses of this module called "Topics courses".	VO/ SE/ PS/ KO/ etc.		

### 1.3. Applied Mathematics and Scientific Computing 51 ECTS

#### 1.3.1. Core Modules

<b>MAMN</b>	<b>Numerical Analysis</b>			<b>10</b>
Compulsory	Advanced Numerical Analysis	VO	4	7
Compulsory	PS Advanced Numerical Analysis	PS	2	3

<b>MAMA</b>	<b>Applied Analysis</b>			<b>6</b>
Compulsory	Applied Analysis	VO	4	6

<b>MAMO</b>	<b>Optimisation</b>			<b>6</b>
Compulsory	Nonlinear Optimisation	VO	4	6

<b>MAMS</b>	<b>Seminars: Applied Mathematics and Scientific Computing</b>			<b>8</b>
Compulsory	Seminar (applied mathematics/ differential equations/ image and signal processing/ mathematical modelling/ numerical analysis/optimisation)	SE	2	4
Compulsory	Seminar (applied mathematics/ differential equations/ image and signal processing/ mathematical modelling/ numerical analysis/optimisation)	SE	2	4

### 1.3.2. Electives

<b>MAMV</b>	<b>Electives in Applied Mathematics and Scientific Computing</b>			<b>21</b>
Compulsory	For this module, students have to obtain 21 ECTS credits by completing topics courses allocated to the area of specialization „Applied Mathematics and Scientific Computing“, maximum of 4 ECTS credits thereof in the form of seminars. Courses of this module called “Topics courses”.	VO/ SE/ PS/ KO/ etc.		

### 1.4. Biomathematics 51 ECTS

#### 1.4.1. Core Modules

<b>MBIP</b>	<b>Stochastic Processes</b>			<b>5</b>
Compulsory	Stochastic Processes	VO	3	5

<b>MBIO</b>	<b>Dynamical Systems and Nonlinear Differential Equations</b>			<b>5</b>
Compulsory	Dynamical Systems and Nonlinear Differential Equations	VO	3	5

<b>MBIG</b>	<b>Mathematical Population Genetics</b>			<b>5</b>
Compulsory	Mathematical Population Genetics	VO	3	5

<b>MBIE</b>	<b>Mathematical Ecology</b>			<b>5</b>
Compulsory	Mathematical Ecology	VO	3	5

<b>MBIS</b>	<b>Seminars: Biomathematics</b>			<b>10</b>
Compulsory	Seminar (biomathematics/ mathematical population genetics/ mathematical ecology)	SE	2	4
Compulsory	Seminar (biomathematics/ mathematical population genetics/ mathematical ecology)	SE	2	4
Compulsory	Proseminar (connected to a VO “Mathematical Population Genetics” or “Mathematical Ecology”)	PS	1	2

#### 1.4.2. Electives

<b>MBIV</b>	<b>Electives in Biomathematics</b>			<b>21</b>
Compulsory	For this module, students have to obtain 21 ECTS credits by completing topics courses allocated to the area of specialization „Biomathematics“, maximum of 4 ECTS credits thereof in the form of seminars. Courses of this module called “Topics courses”.	VO/ SE/ PS/ KO/ etc.		

### 1.5. Geometry and Topology 51 ECTS

#### 1.5.1. Core Modules

<b>MGED</b>	<b>Differential Geometry</b>			<b>9</b>
Compulsory	Analysis on Manifolds	VO	4	6
Compulsory	Riemannian Geometry	VO	2	3

<b>MGET</b>	<b>Algebraic Topology</b>			<b>6</b>
Compulsory	Algebraic Topology	VO	4	6

<b>MGEL</b>	<b>Lie Groups</b>			<b>5</b>
Compulsory	Lie Groups	VO	3	5

<b>MGES</b>	<b>Seminars: Geometry and Topology</b>			<b>10</b>
Compulsory	Seminar (geometry/ topology/ differential geometry/ Lie groups and topological groups/ algebraic geometry)	SE	2	4
Compulsory	Seminar (geometry/ topology/ differential geometry/ Lie groups and topological groups/ algebraic geometry)	SE	2	4
Compulsory	Proseminar (connected to a Topics VO "Analysis on Manifolds", "Algebraic Topology"/ Lie Groups")	PS	1	2

### 1.5.2. Electives

<b>MGEV</b>	<b>Electives in Geometry and Topology</b>			<b>21</b>
Compulsory	For this module, students have to obtain 21 ECTS credits by completing topics courses allocated to the area of specialization „Geometry and Topology“, maximum of 4 ECTS credits thereof in the form of seminars. Courses of this module called "Topics courses".	VO/ SE/ PS/ KO/ etc.		

## 1.6. Mathematical Logic and Theoretical Computer Science 51 ECTS

### 1.6.1. Core Modules

<b>MLOL</b>	<b>Mathematical Logic</b>			<b>9</b>
Compulsory	Introduction to Mathematical Logic	VO	4	6
Compulsory	PS Introduction to Mathematical Logic	PS	2	3

<b>MLOM</b>	<b>Axiomatic Set Theory</b>			<b>8</b>
Compulsory	Axiomatic Set Theory 1	VO	3	5
Compulsory	PS Axiomatic Set Theory 1	PS	2	3

<b>MLOI</b>	<b>Theoretical Computer Science</b>			<b>5</b>
Compulsory	Introduction to Theoretical Computer Science	VO	3	5

<b>MLOS</b>	<b>Seminars: Mathematical Logic and Theoretical Computer Science</b>			<b>8</b>
Compulsory	Seminar (mathematical logic/ set theory theoretical computer science)	SE	2	4
Compulsory	Seminar (mathematical logic/ set theory theoretical computer science)	SE	2	4

### 1.6.2. Electives

<b>MLOV</b>	<b>Electives in Mathematical Logic and Theoretical Computer Science</b>			<b>21</b>
Compulsory	For this module, students have to obtain 21 ECTS credits by completing topics courses allocated to the area of specialization „Mathematical Logic and Theoretical Computer Science“, maximum of 4 ECTS credits thereof in the form of seminars. Courses of this module called “Topics courses”.	VO/ SE/ PS/ KO/ etc.		

### 1.7. Stochastics and Dynamical Systems 51 ECTS

#### 1.7.1. Core Modules

<b>MSTM</b>	<b>Measure and Integration Theory</b>			<b>6</b>
Compulsory	Measure and Integration Theory	VO	4	6

<b>MSTW</b>	<b>Advanced Probability Theory</b>			<b>7</b>
Compulsory	Advanced Probability Theory	VO	4	7

<b>MSTS</b>	<b>Seminars: Stochastics and Dynamical Systems</b>			<b>12</b>
Compulsory	Seminar (stochastics processes/ probability theory/ dynamical systems/ergodic theory/ mathematical finance)	SE	2	4
Compulsory	Seminar (stochastics processes/ probability theory/ dynamical systems/ergodic theory/ mathematical finance)	SE	2	4
Compulsory	Proseminar (connected to the Topics VO “Measure and Integration Theory”/ “Advanced Probability Theory”/ “Stochastic Processes”/ “Dynamical Systems and Nonlinear Differential Equations”))	PS	1	2
Compulsory	Proseminar (connected to the Topics VO “Measure and Integration Theory”/ “Advanced Probability Theory”/ “Stochastic Processes”/ “Dynamical Systems and Nonlinear Differential Equations”))	PS	1	2

<b>MSTP</b>	<b>Stochastic Processes</b>			<b>5</b>
Option A	Stochastic Processes	VO	3	5
<b>MSTO</b>	<b>Dynamical Systems and Nonlinear Differential Equations</b>			<b>5</b>
Option B	Dynamical Systems and Nonlinear Differential Equations	VO	3	5

#### 1.7.2. Electives

<b>MSTV</b>	<b>Electives in Stochastics and Dynamical Systems</b>			<b>21</b>
Compulsory	For this module, students have to obtain 21 ECTS credits by completing topics courses allocated to the area of specialization „Stochastics and Dynamical Systems“, maximum of 4 ECTS credits thereof in the form of seminars. Courses of this module called “Topics courses”.	VO/ SE/ PS/ KO/ etc.		

## 2. Courses from Other Areas of Specialisation 24 ECTS

MOA	Courses from Other Areas of Specialisation	24
Compulsory	For this module, it is only possible to recognise courses that are allocated to at least one area of specialisation other than the one chosen by the student. Students have to obtain a total of 24 ECTS credits for these courses to complete this module. Among these, there have to be at least 15 ECTS credits from courses from core modules of one of the other areas of specialisation. Moreover, a total of 4 of the 24 ECTS credits may be obtained in the form of seminars.	VO/ SE/ PS/ KO/ etc.

## 3. Further Electives 15 ECTS

MFE	Further Electives	15
Compulsory	For this module, courses from the chosen area of specialisation and from other areas of specialisation can be recognised. It is possible to use both courses from core subject and topics courses (provided that they have not already been recognised in other modules). Upon approval by the responsible SPL, courses from fields beyond mathematics are permissible for this module if they are reasonably related to the mathematical courses completed by the student. It is recommended to clarify with the SPL whether a course from another field can be recognised before taking it. Moreover, upon approval by the SPL, up to 6 ECTS credits from this module can be substituted by work placements of at least three weeks (full-time).	VO/ SE/ PS/ KO/ etc.

## 4. Master's Thesis and Master's Examinations 30 ECTS

Compulsory	The topic of the master's thesis must be taken from a mathematical field represented in one of the core modules of the programme. If a different topic is selected, the SPL decides on whether or not it is admissible. In any case, the topic for the master's thesis must be so chosen that the student can reasonably be expected to complete it within six months. Students receive 27 ECTS credits for the master's thesis.	27
Compulsory	To be admitted to a master's examination the student must have successfully passed all required modules and examinations and the master's thesis must have been positively assessed. The examination is held in the form of an oral defence followed by an examination part on the scientific area of the master's thesis. The two parts have roughly the same duration. For this examination, the director of studies ("SPL") has to form an examination committee as stipulated in the "Satzung" of the University. Students receive 3 ECTS credits for the master's examination.	3