



Wintersemester 24/25

# Module Guide

for the study of

## Mathematics

Zweifach im Masterstudiengang "Lehramt an berufsbildenden Schulen -  
Pflege" (M.Ed.)

valid in connection with the examination regulations MPO 2020

Gemäß Prüfungsordnung zum Zweifach Mathematik inklusive der fachdidaktischen Anteile im  
Masterstudiengang Lehramt an berufsbildenden Schulen - Pflege vom 03. Mai 2020.

Generated: October 12, 2024

## Musterstudienplan - Studienfach Mathematik im Masterstudiengang Lehramt an berufsbildenden Schulen - Pflege\*

	Fachwissenschaft	Fachdidaktik
<b>1. Sem.</b>	Analysis 21 CP	Grundzüge der Mathematikdidaktik 6 CP
<b>2. Sem.</b>		
<b>3. Sem.</b>	Angewandte Mathematik 6 CP	Diagnostizieren und Fördern mit Praxisanteilen (POE) 6 CP
<b>4. Sem.</b>		Mathematisch Denken und Handeln 3 CP

Credit Points (kurz: CP) geben den durchschnittlichen Arbeitsaufwand für eine Veranstaltung bzw. ein Modul an, wobei 1 CP = 30 Std.

---

\* Gemäß geltender Regelung für das Zweifach Mathematik inklusive fachdidaktischer Anteile beschlossen am 03.05.2020 (inkl. etwaiger Änderungsordnungen bzw. Berichtigungen)

## Index by areas of study

### 1) Research Subject (27 CP)

Pflichtmodule im Umfang von 27 CP. Auflistung gemäß Studienverlaufsplan.

03-MAT-BA-MGY3: Analysis 1/2 (21 CP).....	3
03-MAT-MA-MGY5: Applied Mathematics (6 CP).....	5

### 2) Subject-Specific Didactics (15 CP)

Pflichtmodule im Umfang von 15 CP. Auflistung gemäß Studienverlaufsplan.

03-MAT-BA-D1: Fundamentals of Mathematics Education (6 CP).....	7
03-MAT-BA-D2: Diagnosis and Support with School Practice (6 CP).....	10
03-MAT-MA-D5: Thinking and acting mathematically (6 CP).....	13

---

**Module 03-MAT-BA-MGY3: Analysis 1/2**

## Analysis 1/2

**Assignment to areas of study:**

- Research Subject

**Content-related prior knowledge or skills:**

None

**Learning content:**

Basic properties of natural, rational, real and complex numbers, sequences, series, elementary functions and continuity of real and complex-valued functions, differential calculus in one variable (mean value theorems, power series). Integral calculus (main theorem, mean value theorems of integral calculus), functions of several variables; differential calculus of several variables: derivation and linearization, integral calculus of several variables. Taylor series; linear differential equations of 1st and 2nd order (const. coefficient), deepening and extension of selected topics.

**Learning outcomes / competencies / targeted competencies:**

Confident and in-depth understanding of mathematical concepts and facts of analysis, active knowledge of proof strategies and techniques, ability to solve problems independently. Sound knowledge of one dimensional and higher dimensional analysis, including how this relates to school mathematics, theoretical mathematics and real world situations.

**Calculation of student workload:**

196 h SWS / presence time / working hours

354 h Preparation / follow-up work

80 h Exam preparation

**Are there optional courses in the modules?**

no

**Language(s) of instruction:**

German

**Responsible for the module:**

Prof. Dr. Anke Dorothea Pohl

**Frequency:**

winter semester, yearly

**Duration:**

2 semester[s]

**The module is valid since / The module is valid until:**

SoSe 24 / -

**Credit points / Workload:**

21 / 630 hours

**Module examinations****Module examination:** Kombinationsprüfung zur Analysis 1 und Analysis 2**Type of examination:** combination exam**Form of examination:**

Announcement at the beginning of the semester

**The examination is ungraded?**

no

**Number of graded components / ungraded components / prerequisites of the examination:**

1 / 1 / -

**Language(s) of instruction:**

Deutsch

<b>Description:</b> Type of Examination: Oral or Written Exam. The Coursework requirements will be decided upon by the Lecturer at the beginning of the course (Weekly Worksheets, Midterm Exam, Presentation etc.).	
<b>Module examination:</b> Studienleistung	
<b>Type of examination:</b> combination exam	
<b>Form of examination:</b> Announcement at the beginning of the semester	<b>The examination is ungraded?</b> no
<b>Number of graded components / ungraded components / prerequisites of the examination:</b> 1 / 1 / -	
<b>Language(s) of instruction:</b> Deutsch	

### Module courses

<b>Course:</b> Vorlesung mit Übung zur Analysis 1	
<b>Frequency:</b> winter semester, yearly	<b>Language(s) of instruction:</b> Deutsch
<b>Contact hours:</b> 6,00	<b>University teacher:</b>
<b>Teaching method(s):</b>	<b>Associated module examination:</b> Kombinationsprüfung zur Analysis 1 und Analysis 2
<b>Associated module courses</b> Analysis 1 (Lecture)	
<b>Course:</b> Plenum zur Analysis 1	
<b>Frequency:</b> winter semester, yearly	<b>Language(s) of instruction:</b> Deutsch
<b>Contact hours:</b> 2,00	<b>University teacher:</b>
<b>Teaching method(s):</b>	<b>Associated module examination:</b> Kombinationsprüfung zur Analysis 1 und Analysis 2
<b>Associated module courses</b> Vertiefung zur Analysis 1 für Lehramt ()	
<b>Course:</b> Vorlesung mit Übung zur Analysis 2	
<b>Frequency:</b> summer semester, yearly	<b>Language(s) of instruction:</b> Deutsch
<b>Contact hours:</b> 6,00	<b>University teacher:</b>
<b>Teaching method(s):</b>	<b>Associated module examination:</b> Kombinationsprüfung zur Analysis 1 und Analysis 2

**Module 03-MAT-MA-MGY5: Angewandte Mathematik**  
Applied Mathematics

**Assignment to areas of study:**

- Research Subject

**Content-related prior knowledge or skills:**

Knowledge from module 03-M-BA-MGY3.

**Learning content:**

In this module, exemplary processes from nature, technology or society are investigated mathematically. This includes mathematical modeling, mathematical analysis and numerical evaluation/simulation. The practical background is formed by questions from physics, biology, chemistry, environmental technology, electrical engineering, economics or other fields, in which specific situations are addressed through the use of mathematical models. The mathematical topics covered include, for example, dynamic systems (ordinary differential equations or sequences), discrete or linear optimization, stochastics, image and signal processing. The mathematical treatment also includes, when implementing the models, the use of software that is most relevant to a school environment.

**Learning outcomes / competencies / targeted competencies:**

Students develop basic knowledge of and skills in mathematical modeling, mathematical analysis and the use of suitable software based on selected situations and problems from practice. They should be able to solve analog problems independently.

**Calculation of student workload:**

84 h Preparation / follow-up work  
40 h Exam preparation  
56 h SWS / presence time / working hours

**Are there optional courses in the modules?**

no

**Language(s) of instruction:**

German

**Responsible for the module:**

Dr. Arsen Narimanyan

**Frequency:**

winter semester, yearly

**Duration:**

1 semester[s]

**The module is valid since / The module is valid until:**

SoSe 24 / -

**Credit points / Workload:**

6 / 180 hours

**This module is ungraded!**

**Module examinations**

**Module examination:** Kombinationsprüfung MGY5 Angewandte Mathematik

**Type of examination:** module exam

**Form of examination:**

Announcement at the beginning of the semester

**The examination is ungraded?**

no

**Number of graded components / ungraded components / prerequisites of the examination:**

- / - / -

**Language(s) of instruction:**

Deutsch

**Description:**

Type of Examination: Oral or Written Exam.

The Coursework requirements will be decided upon by the Lecturer at the beginning of the course (Weekly Worksheets, Midterm Exam, etc.).

**Module courses**

**Course:** Vorlesung mit Übung zur Angewandten Mathematik

**Frequency:**

winter semester, yearly

**Language(s) of instruction:**

Deutsch

**Contact hours:**

4,00

**University teacher:**

Dr. Arsen Narimanyan

**Teaching method(s):**

**Associated module examination:**

Kombinationsprüfung MGY5 Angewandte Mathematik

## Module 03-MAT-BA-D1: Grundzüge der Mathematikdidaktik

### Fundamentals of Mathematics Education

#### Assignment to areas of study:

- Subject-Specific Didactics

#### Content-related prior knowledge or skills:

none

#### Learning content:

Basic didactic mathematical knowledge of

- General education concepts for learning mathematics
- Basic learning theory and psychological approaches and their implications for subject-related diagnostics
- Didactically relevant results of empirical educational and teaching research within the subject
- Subject areas and standards of mathematics teaching
- Fundamental ideas and basic concepts of central mathematics didactic concepts
- Findings and concepts of didactic mathematics as well as concrete approaches to important learning situations (forming concepts, discovering and justifying connections, practicing, modeling, reflection and systematizing, checking performance, developing mathematical terminology, ...)
- Mathematics affiliated teaching/learning research (e.g. motivation, individual ideas and mistakes of students, dispositions, typical processes and hurdles in learning processes, structure and effects of learning environments)
- Social aspects of and influences on the design of mathematics lessons
- Dimensions of diversity in mathematics lessons (e.g. disabilities as defined by the Convention on the Rights of Persons with Disabilities, augmentative and alternative conditions such as language, social living conditions, cultural and religious orientations, gender as well as special gifts and talents)

Manifestation of basic knowledge using the example of a mathematical subject area

(e.g. the didactic of functions):

- Basic concepts, fundamental ideas of the subject area
- Characteristic subject specific argumentation methods, problem-solving strategies and patterns of mathematical interpretation
- Paradigmatic examples
- Typical learner perspectives in the subject area (ideas, error patterns, barriers to understanding, starting points)
- Central didactic concepts and materials for teaching the subject area



**Learning outcomes / competencies / targeted competencies:**

Broad foundation of didactic mathematics skills as a basis for development in the area of knowledge acquisition, i.e. students

- Have structured and interlinked basic knowledge of subject-specific didactic concepts and can use this to analyze tasks, materials and concepts
- Are able to adequately present mathematical facts in both oral and written form, structure mathematical areas by stating driving questions, create and understand connections between them and establish references to school mathematics and its development
- Are able to check other people's arguments and build their own chains of reasoning when conjecturing and proving mathematical statements, apply mathematical thought patterns to internal mathematical and practical problems (mathematize) and create, reflect on and communicate solutions to problems using suitable media
- Have initial experience in planning and designing learning activities, also taking into account the heterogeneity of learners, the possibilities of new media and a variety of methods
- Develop subject-related diagnostic skills
- Analyze their own productions against the background of theoretical knowledge about typical learner perspectives, different argumentation bases, ideas to be developed, etc.
- Design, realize, present and evaluate initial explorations on the basis of their own questions founded on acquired subject-specific didactic principles
- Engage academically with subject-specific didactic literature

**Calculation of student workload:**

72 h Preparation / follow-up work

24 h Exam preparation

84 h SWS / presence time / working hours

**Are there optional courses in the modules?**

no

<b>Language(s) of instruction:</b> German	<b>Responsible for the module:</b> Prof. Dr. Christine Knipping
<b>Frequency:</b> winter semester, yearly	<b>Duration:</b> 2 semester[s]
<b>The module is valid since / The module is valid until:</b> SoSe 24 / -	<b>Credit points / Workload:</b> 6 / 180 hours

**Module examinations**

**Module examination:** Kombinationsprüfung zu Grundzüge der Mathematikdidaktik

**Type of examination:** combination exam

**Form of examination:**

Announcement at the beginning of the semester

**The examination is ungraded?**

no

**Number of graded components / ungraded components / prerequisites of the examination:**

1 / 1 / -

**Language(s) of instruction:**

Deutsch

**Description:**

Type of Examination: Oral or Written Exam.

The Coursework requirements will be decided upon by the Lecturer at the beginning of the course (Weekly Worksheets, Midterm Exam, etc.).

**Module courses****Course:** Vorlesung mit Übung zu Grundzüge der Mathematikdidaktik**Frequency:**

winter semester, yearly

**Language(s) of instruction:**

Deutsch

**Contact hours:**

4,00

**University teacher:**

Dr. Fiene Bredow

**Teaching method(s):****Associated module examination:**

Kombinationsprüfung zu Grundzüge der Mathematikdidaktik

**Associated module courses****Grundzüge der Mathematikdidaktik - Teil 1 (Lecture)****Course:** Seminar zu Grundzüge der Mathematikdidaktik**Frequency:**

winter semester, yearly

**Language(s) of instruction:**

Deutsch

**Contact hours:**

2,00

**University teacher:**

Dr. Fiene Bredow

**Teaching method(s):**

Seminar

**Associated module examination:**

Kombinationsprüfung zu Grundzüge der Mathematikdidaktik

## Module 03-MAT-BA-D2: Diagnostizieren und Fördern mit Praxisanteilen

### Diagnosis and Support with School Practice

#### Assignment to areas of study:

- Subject-Specific Didactics

#### Content-related prior knowledge or skills:

none

#### Learning content:

The module introduces students to the analysis and diagnosis of varying mathematical learning processes, including theory-based preparation and evaluation of supportive learning arrangements. To this end, basic didactic knowledge of the subject matter is expanded, and reference is made to previously covered fundamental content-related concepts of subject teaching, subject-didactic diagnostic approaches; and support concepts based on these, including empirical findings.

The practical component of the course is primarily concerned with testing, expanding and reflecting on theoretical knowledge of diagnosis and support with regard to targeted practical diagnosis and support of subject-related learning processes. The specific content consists of a selection of the following topics, for example:

- Learning difficulties/talents/interests/skills/... in an area of school mathematics in connection with related didactic knowledge (arithmetic, elementary algebra, real numbers, ...)
- Knowledge of quantitative and qualitative methods for analyzing and diagnosing subject-related learning processes for pupils with learning difficulties in everyday lessons
- Theories, strategies, tools, learning materials and models for designing mathematically supportive learning environments
- Didactic-methodical analysis of tasks with regard to their support potential
- Planning, implementation and reflection of a supportive learning sequence
- Dealing with errors, learning hurdles, ideas, ...

There is a selection of possibilities for diagnosing and supporting dyscalculia, geometric imagination, learning delays in algebra, analytical learning hurdles, mathematical giftedness and interested pupils. These are discussed in the situations of inclusive classes, heterogeneous groups, skills in everyday lessons, using results from comparative tests, ...

**Learning outcomes / competencies / targeted competencies:**

Theory-based subject-didactic diagnostics, support, action and reflection, including subject-didactic knowledge: Students

- Develop and activate the knowledge needed to analyze tasks, materials and concepts with regard to the didactically justified design of supportive learning arrangements
- Are able to use subject-specific didactic concepts and empirical findings from mathematics-related teaching and learning research in order to analyze individual situations - the heterogeneous ideas, ways of thinking and error patterns of pupils. They can assess the learning status and potential of individuals, motivate them to learn mathematics and accompany them on their individual learning paths as well as promote and evaluate individual learning progress
- Deepen their subject-related diagnostic competence by planning and carrying out a diagnostically focused exploratory project to analyze typical learner perspectives, competencies, argumentation bases, ideas, learning difficulties, ...
- Understand and use typical literature for the development of diagnostic exploratory designs
- Present their support-diagnostic concept and explain it in a discourse
- Practice learner-adaptive support
- Expand their ability to analyze and critically reflect on their own actions
- Document diagnostic data for the purpose of preparing a written diagnosis and formulate a support recommendation (addressed to potential teachers)
- Take into account various dimensions of diversity in mathematics lessons. This includes disabilities as defined by the Convention on the Rights of Persons with Disabilities as well as special augmentative and alternative learning conditions, e.g. language, social living conditions, cultural and religious orientations, gender as well as special gifts and talents

**Calculation of student workload:**

45 h Preparation / follow-up work

86 h SWS / presence time / working hours

49 h Exam preparation

**Are there optional courses in the modules?**

no

<b>Language(s) of instruction:</b> German	<b>Responsible for the module:</b> Prof. Dr. Christine Knipping
<b>Frequency:</b> winter semester, yearly	<b>Duration:</b> 1 semester[s]
<b>The module is valid since / The module is valid until:</b> SoSe 24 / -	<b>Credit points / Workload:</b> 6 / 180 hours

**Module examinations**

<b>Module examination:</b> Modulprüfung	
<b>Type of examination:</b> module exam	
<b>Form of examination:</b> Portfolio (AT § 8 Abs. 8)	<b>The examination is ungraded?</b> no

**Number of graded components / ungraded components / prerequisites of the examination:**

- / 1 / -

**Language(s) of instruction:**

Deutsch

**Description:**

The coursework includes the diagnosis and support of pupils; portfolio with diagnostic descriptions, support planning and documentation, as well as a recommendation for the required level and type of support.

## Module courses

**Course:** Seminar

**Frequency:**

winter semester, yearly

**Language(s) of instruction:**

Deutsch

**Contact hours:**

2,00

**University teacher:**

**Teaching method(s):**

Seminar

**Associated module examination:**

Modulprüfung

### Associated module courses

**Diagnostizieren und Fördern mit Praxisanteilen (Didaktik der Arithmetik) (Seminar)**

**Course:** Praktikum

**Frequency:**

winter semester, yearly

**Language(s) of instruction:**

Deutsch

**Contact hours:**

-

**University teacher:**

**Teaching method(s):**

Laboratory class

**Associated module examination:**

Modulprüfung

### Associated module courses

**Diagnostizieren und Fördern mit Praxisanteilen (Didaktik der Arithmetik) (Seminar)**

**Module 03-MAT-MA-D5: Mathematisch denken und handeln**

## Thinking and acting mathematically

**Assignment to areas of study:**

- Subject-Specific Didactics

**Content-related prior knowledge or skills:**

none

**Learning content:**

The course content is based on the following list of topics:

1. Mathematical thinking such as problem solving, reasoning, proving, modeling
2. Process-related skills such as communicating, using technical language, writing and reading mathematical texts, using computers in mathematics lessons, the composition of mathematical knowledge, securing mathematical knowledge
3. Horizontal and vertical networking of content-related skills
4. Methods and characteristics of competence-oriented teaching in typical learning situations and in heterogeneous groups
5. Methods and characteristics of cognitively activating and dialogue based mathematics teaching
6. Theories and concepts for the construction of tasks that promote mathematical thinking and action
7. Models and theories of mathematical abstraction and the construction of mathematical knowledge
8. Other topics, especially current movements in mathematical thinking and action

Dimensions of diversity in mathematics teaching (e.g. disabilities as defined by the Convention on the Rights of Persons with Disabilities, augmentative and alternative conditions such as language, social living conditions, cultural and religious orientations, gender as well as special gifts and talents)

**Learning outcomes / competencies / targeted competencies:**

This module covers the enrichment of current research areas of mathematical didactics, thinking and acting. Methodologically, the characteristics of research-based learning should be included as comprehensively as possible. In particular, students should

- Understand special theories and models of mathematical thinking and acting (e.g. competence models, theories of mathematical thinking, ...)
- Use empirical findings and theoretical knowledge to observe and analyze teaching-learning processes
- Adopt research literature on this topic
- Create theoretical based learning arrangements
- Anticipate and methodically design processes of mathematical learning with regard to mathematical thinking and action, e.g. for competence development and the development of thought processes such as modelling, problem solving, networking, patterns of mathematization, ...
- Understand and evaluate tools for competence-oriented mathematics learning and the development of mathematical thinking skills (computer, textbook, didactic material, models, ...), with focus on their learning potential
- Be able to appropriately adopt developments in the field of digitization from a subject-specific and didactic perspective and to critically reflect on the possibilities and limits of digitization. Be able to use the knowledge gained from this in subject-specific didactic contexts and incorporate it into the further development of teaching and curricular concepts
- Be sensitive to the opportunities offered by digital learning media in terms of accessibility and also use digital media for differentiation and individual support in lessons

**Calculation of student workload:**

92 h Preparation / follow-up work  
 52 h SWS / presence time / working hours  
 32 h Exam preparation

**Are there optional courses in the modules?**

no

**Language(s) of instruction:**

German

**Responsible for the module:**

Dr. Ingolf Schäfer

**Frequency:**

summer semester, yearly

**Duration:**

1 semester[s]

**The module is valid since / The module is valid until:**

SoSe 24 / -

**Credit points / Workload:**

6 / 180 hours

**Module examinations****Module examination:** Kombinationsprüfung**Type of examination:** combination exam**Form of examination:**

Portfolio (AT § 8 Abs. 8)

**The examination is ungraded?**

no

**Number of graded components / ungraded components / prerequisites of the examination:**

1 / 1 / -

**Language(s) of instruction:**

Deutsch

**Module courses****Course:** Seminar**Frequency:**

summer semester, yearly

**Language(s) of instruction:**

Deutsch

**Contact hours:**

4,00

**University teacher:**

Lehrende der Mathematik

**Teaching method(s):**

Seminar

**Associated module examination:**

Kombinationsprüfung

**Associated module courses****Mathematisch denken und handeln** (Seminar)