



Board of Teacher Education
Mathematics

Syllabus

Mathematics and Mathematics Teaching III

Course Code:

MAGL13

Course Title:

Mathematics and Mathematics Teaching III
Matematik III med didaktisk inriktning

Credits:

30

Degree Level:

Undergraduate level

**Progressive
Specialisation:**

First cycle, has at least 60 credits in first-cycle course/s as entry requirements (G2F)

Major Field of Study:

MAA (Mathematics)

Course Approval

The syllabus was approved by the Board of Teacher Education 2019-02-11, and is valid from the Autumn semester 2019 at Karlstad University.

Prerequisites

Attended courses MAGL11 och MAGL12, including at least 40 ECTS credits completed, or equivalent

Learning Outcomes

The aim of the course is that students develop further knowledge in mathematics and mathematics education relevant for the teaching profession. The students are expected to develop an attitude towards mathematics based on understanding, which can provide a basis for learning more about the subject and for creating varied instruction that supports pupils' mathematical understanding and creativity.

The course includes four modules.

Module 1: Mathematics Education, 5 ECTS cr

Upon completion of the module, students should be able to:

1. plan mathematics teaching on the basis of steering documents and inspiration from instruction in other countries and choose and motivate methods and approaches that can stimulate pupils' language development, creativity, and joy of discovery,
2. give an account of how gender, age, and cultural background can affect attitudes to learning mathematics and be able to consider this in pedagogical planning,
3. give an account of different ways to individualise teaching on the basis of pupils' different previous knowledge in order to provide opportunities for all pupils to learn and develop, and be able to consider this in pedagogical planning,
4. give an account of the distinguishing features of formative classroom practice and be able to consider this in pedagogical planning, and
5. assess and comment on pupils' solutions in terms of learning outcomes and assessment guidelines.

Module 2a: Practical Placement 1, 7.5 ECTS cr

Upon completion of the module, students should be able to:

1. act in accordance with the core values specified in the Swedish Education Act and national curriculum,
2. explain the meaning of legislation pertaining to teacher confidentiality and obligation to notify irregularities, and relate it to school activities,
3. reflect on how equality and equity perspectives can be integrated in pedagogical activities,
4. communicate professionally with students and staff, both individually and in groups, using a language in speech and writing that is functional and adequate to the situation,
5. under supervision, plan, lead, and conduct a certain amount of teaching based on school steering documents and theoretical knowledge of subject and subject-specific pedagogy,
6. describe special education and students welfare efforts on the basis of local examples,
7. describe and reflect on their own teaching and how it is based on steering documents, subject knowledge, and subject-specific pedagogy, and
8. give an account of their own professional development and identify their needs of further development.

Module 2b: Practical Placement 2, 7.5 ECTS cr

Upon completion of the module, students should be able to:

1. act in accordance with the core values specified in the Swedish Education Act and national curriculum,
2. give an account of legislation concerning school obligations to prevent and take measures against bullying and abuse and compare it to local school policy, for instance the local equal treatment plan,
3. under supervision, integrate a critical discussion of norms in pedagogical practice, with a focus on equality and equity,
4. communicate professionally with students and staff, both individually and in groups, using a language in speech and writing that is functional and adequate to the situation,
5. under supervision, plan, lead, and conduct teaching sequences based on school steering documents and theoretical knowledge of the subject and subject-specific pedagogy,
6. plan and conduct teaching with consideration of pupils' different circumstances and under supervision reflect on special education needs,
7. analyse their own teaching and motivate how it is based on steering documents, subject knowledge, and subject-specific pedagogy,
8. under supervision, assess pupils' knowledge development and social situation in school and discuss how this can be communicated with pupils, guardians, and staff,
9. under supervision, use digital resources in pedagogical practice, and
10. discuss their own professional development and identify their need of further development.

Module 3: Mathematical relationships and change in several variables, 7.5 ECTS cr

Upon completion of the module, students should be able to:

1. formulate and explain definitions and theorems in multivariable calculus, apply them in calculations and problem solving, and prove a given selection of theorems treated in the module,
2. show understanding by combining new concepts, theorems, and experience from examples, identify

analogies
and make generalisations, and
3. illustrate and solve problems in the field, using digital tools.

Module 4: Discrete Mathematics and Algebraic Structures, 10 ECTS cr

Upon completion of the module, students should be able to:

1. communicate some important concepts and methods in discrete mathematics and apply these in solving problems,
2. analyse the structures of different sets and operations treated in school mathematics, and systematise these structures into more general algebraic structures,
3. give an account of basic concepts and methods used in theories on groups, rings, and fields and apply these in solving problems,
4. combine concepts, theorems, and experiences of examples, identify analogues and make generalisations, and prove a given selection of theorems treated in the module, and
5. use basic programming to solve problems related to the matters treated in the module.

Content

Module 1: Mathematics Education, 5 ECTS cr

Current steering documents in an international and historical perspective. Varied mathematics teaching with examples drawn from different countries. Different types of learning resources. Individualisation, mathematical difficulties, and mathematical giftedness. The language of mathematics and the importance of language in learning mathematics. Different perspectives on learning mathematics, such as adult learning, gender perspectives, and cultural aspects. Different aspects on assessment in mathematics.

The content of this module is based on research literature and prepares students for the practical placement in the following module.

Module 2a: Practical Placement 1, 7.5 ECTS cr

In this course module, students have the opportunity to

- meet different groups of staff in school, such as for example teaching teams, student welfare personnel, and school management, and participate in everyday activities,
- apply central steering documents and local pedagogical planning with consideration of equality and equal opportunities policies,
- apply subject-specific teaching theories in practice, transform relevant subject knowledge into teaching, and reflect on the relationship between theory and practice,
- use digital learning resources in school,
- make observations,
- discuss and reflect on the profession and their own professional development,
- describe special education and student welfare efforts in school,
- acquire knowledge of legislation pertaining to confidentiality and obligation to notify irregularities.

Module 2b: Practical Placement 2, 7.5 ECTS cr

In this course module, students have the opportunity to

- use digital learning resources in school
- make classroom observations
- interpret and implement central steering documents and local pedagogical planning

- apply pedagogical and subject-specific teaching theories in practice and transform subject knowledge into teaching practice, with consideration of pupils' different knowledge and interests
- consider the special education perspective
- practise their communicative skills in cooperation with different staff groups and pupils in school
- discuss the profession and their own professional development and identify areas to develop in the third practical placement period.

Module 3: Mathematical relationships and change in several variables, 7.5 ECTS cr

Partial derivatives, tangent planes, gradients, directional derivatives and Taylor polynomials in several variables, and optimisation. Calculation of double and triple integrals with repeated integration and change of variables. Applications of partial derivatives and multiple integrals. Calculation of curve integrals and surface integrals.

Module 4: Discrete Mathematics and Algebraic Structures, 10 ECTS cr

Combinatorial mathematics, generating functions, graph theory, recursion, recurrence relations, and relations including equivalence relations. Algorithms and basic programming.

Rules for operations on, and properties of, numbers and other mathematical objects are generalised. Important concepts are groups, rings, and fields.

Reading List

See separate document.

Examination

Assessment is based on:

Module 1 Mathematics Education, 5 ECTS cr

Group assignment with written and oral report (learning outcomes 1, 4)

Individual assignment with written and oral report (learning outcomes 2, 3)

Individual assignment with oral report (learning outcome 5)

Module 2a: Practical Placement, 7.5 ECTS cr

Learning outcomes 1, 4, and 5 are assessed on the basis of completed and documented practical placement.

Learning outcomes 2, 3, 6, 7, and 8 are assessed on the basis of oral and/or written assignments at the university.

Attendance is required for the introduction and the school placement component. Occasional days of absence can be made up for on agreement with the module convener. Students who are absent more than five days will have to retake the whole module, unless special circumstances exist.

The number of retake opportunities is limited to two for the practical placement component.

Module 2b

Learning outcomes 1, 3, 4, 5, 6, 8, and 9 are assessed on the basis of completed and documented practical placement.

Learning outcomes 2, 7, and 10 are assessed on the basis of oral and/or written assignments at the university.

Attendance is required for the introduction and the school placement component. Occasional days of absence can be made up for on agreement with the module convener. Students who are absent more than five days will have to retake the whole module, unless special circumstances exist.

The number of retake opportunities is limited to two for the practical placement component.

Module 3: Mathematical relationships and change in several variables, 7.5 ECTS cr

Individual written exam (learning outcomes 1, 2)

Group assignment with written and oral report (learning outcome 3)

Module 4: Discrete Mathematics and Algebraic Structures, 10 ECTS cr

Individual written exam (learning outcomes 1-4)

Group assignment with written and oral report, and seminar discussions (learning outcomes 1, 5)

Individual assignment with oral presentation via their own recordings (learning outcome 3).

Grades

One of the grade Distinction (VG), Pass (G), or Fail (U) is awarded in the examination of the course.

Quality Assurance

Follow-up relating to learning conditions and goal-fulfilment takes place both during and upon completion of the course in order to ensure continuous improvement. Course evaluation is partly based on student views and experiences obtained in accordance with current regulations and partly on other data and documentation. Students will be informed of the result of the evaluation and of any measures to be taken.

Course Certificate

A course certificate will be provided upon request.

Additional information

The local regulations for studies at the Bachelor and Master levels at Karlstad University stipulate the obligations and rights of students and staff.

Teacher Education: Secondary school levels