### Module Description

**Overview Algebra and Applied Algebra for Teaching Degree (German Gymnasium)**

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<td>10-M-AALL-Ü-191-m01</td>
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**Module coordinator**
Dean of Studies Mathematik (Mathematics)

**Module offered by**
Institute of Mathematics

**ECTS**
10

**Method of grading**
Numerical grade

**Duration**
2 semester

**Module level**
Undergraduate

**Other prerequisites**
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**Contents**

Topics in Group Theory (particularly finite abelian groups, normal subgroups, sub- and factor groups, isomorphism theorems, solvability, group operations, Sylow theorems; examples: cyclic groups, alternating and symmetric groups, dihedral groups).

Topics in ring theory (particularly ideals, divisibility, polynomial rings, irreducibility of polynomials).

Topics in number theory (particularly Euclidean algorithm, Fermat’s little theorem, Euler’s theorem, Chinese remainder theorem, residue class rings and their unit groups, quadratic number rings).

Topics in field theory (particularly algebraic field extensions, ruler and compass constructions, basics in Galois theory, solvability of equations, cyclotomic fields, finite fields).

Applications of algebra and number theory (e.g., coding theory, cryptography, computer algebra).

**Intended learning outcomes**
The student has extensive knowledge of the mathematical ways of thinking and working as well as of proof methods, so that he/she masters the basic notions of algebra and number theory and can apply them to elementary problems in other fields of mathematics.

**Courses**

- **V (4) + V (4) + Ü (2)**

**Method of assessment**

- Oral examination of one candidate each (20 to 40 minutes)
- Language of assessment: German and/or English
- Assessment will have reference to the contents of modules 10-M-ALGL und 10-M-AALL

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

§ 73 I Nr. 2 (5 LP), § 73 I Nr. 5 (5 LP)

**Module appears in**

First state examination for the teaching degree Gymnasium Mathematics (2019)