

Syllabus MAS 4310 Algebraic Geometry, Class Number 90586

Fall 2026

Book: S. Bosch *Algebraic Geometry and Commutative Algebra*
ISBN 978-1-4471-4828-9

Contents of the course

The course presents an approach to Algebraic Geometry using the language of category theory. The main objects in Algebraic Geometry are algebraic varieties. These can be defined classically as solutions of a system of polynomial equations of several variables over a fixed field. The goal of the course is to learn how algebraic varieties can be interpreted as functors from the category of schemes to the category of sets. This interpretation allows for studying natural constructions with varieties. Also, reversing the point of view, one can start with a functor and ask if this functor corresponds to a variety (if the functor is “representable” in the category of varieties). This latter was the idea of Grothendieck which he realized introducing the language of schemes 70 years ago. In the course, we will first define carefully the category of schemes (the category of sets is supposed to be familiar to the students from the course on Algebraic Structures, for instance). For this we will need some basic knowledge from the theory of commutative rings (the needed facts will be taught whenever and in the amount needed). The next step will be the introduction and study of sheaves of sets on schemes (and on categories). Global studies of schemes follows with a bit of sheaf cohomology. Numerous examples of interesting (and important) schemes will be given along the way. The geometric aspect of the course is contained roughly in chapter 6 and 7 of the book cited above. All we need from the theory of commutative rings can be found in the first part of the book.

Assessment of students’ progress in class

The overall grade will be based on two midterms and a final exam as well as on the participation of the students in class.

Academic Misconduct Statement

knowledge through excellent teaching and research, the rigorous and respectful exchange of ideas and community service. All students should respect the right of others to have an equitable opportunity to learn and honestly to demonstrate the quality of their learning. Therefore, all students are expected to adhere to a standard of academic conduct, which demonstrates respect for themselves, their fellow students, and the educational mission of the University. All students are deemed by the University to understand that if they are found responsible for academic misconduct, they will be

subject to the Academic Misconduct procedures and sanctions, as outlined in the Student Handbook.

Academic Misconduct includes: **Cheating** – The unauthorized use of books, notes, aids, electronic sources; or assistance from another person with respect to examinations, course assignments, field service reports, class recitations; or the unauthorized possession of examination papers or course materials, whether originally authorized or not. **Plagiarism** – The use and appropriation of another's work without any indication of the source and the representation of such work as the student's own. Any student who fails to give credit for ideas, expressions or materials taken from another source, including internet sources, is responsible for plagiarism.

To learn more about the academic integrity policies and procedures visit integrity.fiu.edu ([Links to an external site.](#))

Accessibility and Accommodation

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Important remark: The Instructor reserves the right to make any changes he considers academically advisable. Any such changes will be announced in advanced in class or by posting them to the e-mail accounts of the students. The students are responsible to be aware of the changes announced this way.