האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM

Syllabus

FUNDAMENTAL CONCEPTS IN COMMUTATIVE ALGEBRA AND ALGEBRAIC GEOMETRY - 80599

Last update 24-01-2024

HU Credits: *6*

Responsible Department: *Mathematics*

Academic year: *0*

Semester: *1st Semester*

Teaching Languages: *English and Hebrew*

Campus: *E. Safra*

Course/Module Coordinator: *Prof. Michael Termkin*

Coordinator Email: *michael.temkin@mail.huji.ac.il*

Coordinator Office Hours: *By appointment*

Teaching Staff:
Prof Michael Temkin,
Mr. Omri Solan

Course/Module description:
The main topics of the course are

1) The basic theory of commutative unital rings and their modules.

2) A very basic theory of algebraic varieties.

Course/Module aims:
Introduction to commutative algebra and algebraic geometry

Learning outcomes - On successful completion of this module, students should be able to:
Familiarity with basic concepts in commutative algebra and algebraic geometry. Building the foundations for further research in this field.

Attendance requirements(%):
0

Teaching arrangement and method of instruction: Lecture+Exercise

Course/Module Content:
Unital commutative rings, ideals, modules, localizations, prime ideals and the topological space Spec(A). Modules, lemma of Nakayama, tensor product, exactness.
Integral extensions, Noether normalization and Hilbert Nullstellensatz theorems. Noetherian rings and modules, Hilbert basis theorem

Affine and projective varieties over an algebraically closed field, regular and rational functions, spaces of functions and abstract algebraic varieties, dimension theory, algebraic groups, Bezout theorem.

Required Reading:
The course will come with lecture notes

Additional Reading Material:
"Introduction to commutative algebra" by Atiyah and Macdonald, Ch 1-3,5,7

"Algebraic varieties" by Kempf, Ch 1-3.

"Algebraic geometry" by Hartshorne, Ch 1.

"The Red Book of Varieties and Schemes", by D. Mumford, Ch. 1

Grading Scheme:
Written / Oral / Practical Exam 50 %
Submission assignments during the semester: Exercises / Essays / Audits / Reports / Forum / Simulation / others 50 %

Additional information:
In case it will not be possible to give an ordinary exam, 50% of the grade will be determined by a home assignment, which will replace the exam.