

# The Hebrew University of Jerusalem

Syllabus

## COMPLEX VARIABLES - 80519

*Last update 31-08-2024* 

HU Credits: 4

Degree/Cycle: 1st degree (Bachelor)

Responsible Department: Mathematics

<u>Academic year:</u> 0

<u>Semester:</u> 1st Semester

<u>Teaching Languages:</u> Hebrew

<u>Campus:</u> E. Safra

<u>Course/Module Coordinator:</u> Dr. Adi Glucksam

Coordinator Email: adi.glucksam@mail.huji.ac.il

Coordinator Office Hours:

Teaching Staff:

Dr. Adi Glucksam, Mr. Yonatan Bachar

### Course/Module description:

In this course, we will discuss the complex plane and its various algebraic and topological properties. We will learn about complex differentiation and its implications. We will see important examples of complex functions and explore various applications of complex functions in other fields.

#### Course/Module aims:

Learning outcomes - On successful completion of this module, students should be able to:

The students will be familiar with the basic definitions, special properties, and main examples of functions in the complex plane.

The students will be familiar with the main theorems about complex functions and will know to apply those theorems in different scenarios.

Attendance requirements(%):

Teaching arrangement and method of instruction: Lecture + exercise

#### Course/Module Content:

*Complex number as a field- algebra and topology: The complex plane as a field with basic operations, Riemann sphere and the stereographic projection.* 

*Functions on the complex plane- differentiability and important examples: complex derivative, Mobius maps, power series, the complex exponent, complex trigonometric functions, the argument, the complex logarithm.* 

*Complex Differentiability: Cauchy-Riemann equations, harmonic functions, conformal maps.* 

*Line integrals: Definition and basic properties, examples, Cauchy's theorem and its applications.* 

Laurent series: definitions, formula and radius of convergence, singular points,

residue.

Geometric principles: the argument principle, Rouche's theorem, winding number.

Other topics if time permits: Poisson's formula, Schwarz reflection principle, hyperbolic metric.

<u>Required Reading:</u> None

Additional Reading Material:

<u>Grading Scheme:</u> Written / Oral / Practical Exam 80 % Submission assignments during the semester: Exercises / Essays / Audits / Reports / Forum / Simulation / others 20 %

Additional information: