Study programmes: BACHELOR STUDIES – Astronomy and Astrophysics

Course name: Mathematics 4

Lecturers: Vladimir Grujić, Đorđe Krtinić and other lecturers

Status: Compulsory

ECTS: 9

Attendance prerequisites: Mathematics 1

Course aims: Introduction to basic concepts of variational calculus and complex analysis, special functions of significance in physics, Fourier and Laplace transformation. Elementary introduction to infinite-dimensional spaces.

Course outcome: Ability to use Fourier and Laplace transformation, variation calculus and complex analysis at the level necessary for undergraduate physics and meteorology studies basic studies of physics and meteorology.

Course content:

1. Elements of variational calculus with examples from physics.
2. Improper integral, criteria and examples.
3. Complex analysis: Cauchy-Riemann conditions, holomorphic and conformal functions, overview of elementary functions, complex integral, Cauchy theorem, Cauchy integral formula, Taylor and Laurent series, the residue (application to the calculation of integrals).
4. Some special functions: gamma, beta, Bessel and orthogonal polynomials.
5. Fourier integral, Laplas transform, applications on differential equations.
6. Elementary introduction to infinite-dimensional spaces: example l_2.

Computational exercises: elaboration of concepts intorduced in lectures, solving problems and examples, especially examples important for physics.

Literature:

1. M. Krasnov, A. Kiselev, G. Makarenko I E. Shikin ” Mathematical Analysis for Engineers”, volume I-II, Mir Publishers Moscow 1990, textbook with selected problems.
2. Mary L. Boas, "Mathematical Methods in Physical Sciences", Wiley , 2006, textbook with selected problems.
3. Conway J.B., “Functions of one complex variable”, Springer, 1978.

Number of hours: 8	**Lectures**: 4	**Tutorials**: 4	**Laboratory**: -	**Research**: -

Teaching and learning methods:

Lectures (theoretical representation of thematic units and examples), computational exercises (solving problems, homework), colloquiums.

Assessment (maximal 100 points)

Course assignments	points	Final exam	points
Lectures	5	Written exam	20
Exercises / Tutorials	15	Oral exam	40
Colloquia	-	Written-oral exam	-
Essay / Project	20		