| Program | Level of studies | | First cycle | |
|---|---|---|---|---|
| | Program name | | **Physics** | |
| Course name | **MATHEMATICAL METHODS OF PHYSICS I** | | | |
| Course ID | Semester | Course status | ECTS credits | L+E |
| **PCS3011** | **III** | **MANDATORY** | **10** | **4+4** |
| Lecturer | | | | |
| Aims and intended learning outcomes | Introducing students to mathematical methods used in general and theoretical physics. After completing the course student will be able to solve problems in courses of theoretical physics at senior years. | | | |

Course content

**The Calculus of a function of several variables**

*Function of two and more variables:* continuity, limits and differentiability, partial derivatives, geometrical interpretation of partial derivatives, higher partial derivatives, total differential tangent plane and linear approximation, the chain rule, Taylor's expansion, directional derivatives, gradient vector, maximum and minimum values, methods of Lagrange's multipliers.

*Double integrals:* Double integrals over rectangles and general regions, application of double integrals in mechanics (calculation of a surface area in a plane, volume, mass, moment of a inertia, surface area and centre of a mass of a solid), coordinate transformation in double integrals.

*Triple and multiple integrals:* triple integrals in physics (volume, mass, centre of a mass, moment of inertia, electrostatic potential, gravity force), coordinate transformations in triple integrals, using spherical, cylindrical and general coordinates to calculate triple integrals.

**Vector calculus**

Vectors field in physics, gradient, curl and divergence, potential field in physics, parametric curves, line integrals, Green's theorem, work of a vector field, conservative fields in physics, parametric surfaces surface integrals, Stoke's theorem and Gauss' theorem with application in physics (mass flux, heat flux, magnetic and electric field flux, etc).

**Differential equations**

Linear differential equation of first and second order, differential equations of constant coefficients, general and particular solution, examples of differential equations in physics (Newton's equations of motion, RLC circuit, damped nad forced linear harmonic motion, etc), Bernouli's and Riccati's differential equation, the variation of a constant method, series solution of differential equation, simple pendulum oscillations, systems of differential equations.

| Student workload (hours) | | Grading | |
|---|---|---|---|
| Lectures and Exercises | 120 | Assessment method | Points |
| Exam preparation | 100 | Midterm exam | 50 |
| Assignments | 10 | Final exam | 50 |
| Other | 20 | | |
| Total | 250 | | |
| | | Total | 100 |

Literature


1. Mirza Hadžimehmedović, Milan Pantić, *Matematičke osnove teorijske fizike I*,PrintCom, Tuzla, 2015.
1. James Stewart, *Calculus*, Thomson Learning – Brooks/Cole, 5th Edition, 2003.
2. V. Ilin, E. Poznyak, *Fundamentals of mathematical analysis*, Mir Publishers, Moscow, 1982.
3. D. Mihailović, D. Tošić, *Elementi matematičke analize II*, Naučna knjiga, Beograd, 1983.
4. M. P. Uščumlić, P. M. Miličić, *Zbirka zadataka iz više matematike II*, Naučna knjiga, Beograd.


Remarks