

The Department of Mathematics

2022–23–A term

Course Name Mathematical Principles in Physics 1

Course Number 203.1.1141

Course web page

<https://www.math.bgu.ac.il/en/teaching/fall2023/courses/mathematical-principles>

Office Hours <https://www.math.bgu.ac.il/en/teaching/hours>

Abstract

Requirements and grading¹

Course topics

1. Introduction to scalars and vectors: operations with scalars and vectors, scalar product, vector product, vector equations, indices, Einstein summation convention, kronecker delta, Levi-Civita symbol.
2. Introduction to functions: types, continuity, limits, derivatives, integrals, integration methods, Taylor series, remainder.
3. Functions with scalar input and vector output: curves, tangent, normal, velocity, acceleration, curvature, torsion. Frenet-Serret basis and kinematics.
4. Functions with vector input and scalar output: extrema, contours, gradient, directional derivative, tangent space.
5. Multiple integrals
6. Functions with vector input and vector output: conservative fields, rotational fields, divergence, curl, line integral, surface integral, Stokes and Gauss
7. Differential equations: damped harmonic oscillator with driving
8. Rotations: scalars, vectors, tensors

¹Information may change during the first two weeks of the term. Please consult the webpage for updates



9. Curvilinear coordinates