

The Department of Mathematics

2020–21–A term

Course Name Vector calculus for Electric Engineering

Course Number 201.1.9631

Course web page

<https://www.math.bgu.ac.il/en/teaching/fall2021/courses/vector-calculus-for-ele>

Lecturer Dr. Izhar Oppenheim, <izharo@bgu.ac.il>, Office 316

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

Abstract

Requirements and grading¹

Course topics

1. Lines and planes. Cross product. Vector valued functions of a single variable, curves in the plane, tangents, motion on a curve.
2. Functions of several variables: open and closed sets, limits, continuity, differentiability, directional derivatives, partial derivatives, the gradient, scalar and vector fields, the chain rule, the Jacobian. Implicit differentiation and the implicit function theorem. Extremum problems in the plane and in space: the Hessian and the second derivatives test, Lagrange multipliers.
3. Line integrals in the plane and in space, definition and basic properties, work, independence from the path, connection to the gradient, conservative vector field, construction of potential functions. Applications to ODEs: exact equations and integrating factors. Line integral of second kind and arclength.
4. Double and triple integrals: definition and basic properties, Fubini theorem. Change of variable and the Jacobian, polar coordinates in the plane and cylindrical and spherical coordinates in space. Green's theorem in the plane.

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



5. Parametric representation of surfaces in space, normals, the area of a parametrized surface, surface integrals including reparametrizations
6. Curl and divergence of vector fields. The theorems of Gauss and Stokes.