# Course Descriptions None 2024-2025

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| Course Title | Multivariable Calculus |
| Course Code | BENC2001 |
| ECTS Credits | 5,0 |
| Assessment | Whole/Half Grades |

Period

| Period | Start | End | Mon | Tue | Wed | Thu | Fri |
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| 1 | 2-9-2024 | 20-10-2024 | X | | X | | L |

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| Level | Intermediate |
| Coordinator | Stefan Maubach For more information:s.maubach@maastrichtuniversity.nl |
| Language of instruction | English |
| Goals | The aim of this course is to introduce the main mathematical tools relevant to modern business engineers. In particular, we will extend concepts from single-variable calculus to functions of several variables. This course offers students an additional understanding of the role mathematics plays in modern society, the sciences, and the business world.<br>After completing this course, students should be able to:<br>1. Understand and use multivariate vector spaces, vector products, high-dimensional geometries, multivariate vector functions and higher dimensional curves.<br>2. Understand, use, and graph multivariate functions. Understand the concepts of limits and continuity in higher dimensions. Can calculate partial derivatives by applying partial differentiation rules. In addition, the student can calculate directional derivatives, gradients, tangent planes, Taylor approximations, etc.<br>3. Understands basic concepts from (un)constrained optimization such as determining extreme values and saddle points of multivariate functions, using Lagrange multipliers to incorporate constraints, linear programming, etc.<br>4. Understand the meaning of multiple integrals and calculate multiple integrals by applying multivariate integration techniques. In addition, the student can compute areas, volumes, and related measures using multiple integrals.<br>5. Solve (systems of) first- and second-order differential equations. In addition, the student can interpret differential equations and their solutions for particular applications. |
| Description | As the world becomes flatter in today's global economy, engineers are a key element in the role that a country must play to maintain technological leadership and a sound economy. To do this, the engineer needs to be equipped with a basic mathematical toolkit in order to be able to model and solve mathematical models arising in today's industry. Hence, in this course, you will learn the main mathematical techniques, which are essential to the tackle problems in business engineering relying on precise quantitative answers research. After passing this course, students will be able to perform basic multivariate calculus operations. In particular, we will extend concepts from single-variable calculus to functions of several variables. We will cover vectors and higher dimensional geometries, vector-valued functions and higher dimensional curves, partial differentiation and optimization, multivariable integration, and (systems of) first- and second-order differential equations. We will also extend our knowledge of calculus by analysing convergence of series and sequences. In addition to the main facts and concepts, problem-solving strategies will be discussed. Throughout the course examples from business engineering are used to emphasize the relevance of the learned theory. Weekly exercises, presented and discussed in tutor groups, allow students to test and refine their understanding of the covered material. |
| Literature | "University Calculus: Early Transcendentals in SI Units", 4th by Hass, Joel R. Weir, Maurice D. Thomas, George B. ISBN/EAN 9781292317304. |
| Prerequisites | BENC1002 Calculus |
| Keywords | |
| Teaching methods | PBL / Lecture / Assignment / Groupwork |
| Assessment methods | Attendance / Written Exam / Assignment |
| Evaluation in previous academic year | For the complete evaluation of this course please click http://iwio-sbe.maastrichtuniversity.nl/rapporten.asp?referrer=codeUM |

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| This course belongs to the following programme / specialisation | Bachelor Business Engineering | Year 2 Compulsory Course(s) |