1.	**Module code:**	B19A01E
2.	**Title:**	**QUANTITATIVE METHODS**
3.	**Credit points:**	7
4.	**Start term:**	fall
5.	**Module leader:**	**GYÖNGYI BUGÁR, DR.**
6.	**Accredited by:**	MUBS
7.	**Module restrictions:**	
	• Pre-requisite	none
	• Programme restrictions	BSc in Business Administration and Management
	• Level restrictions	4
	• Other restrictions or requirements	none
8.	Aims: To make students aware of the usefulness of mathematics as an aid in formulating and solving business-related problems. To enable the students to understand the main features of deterministic phenomena and investigate their models. To provide a toolkit to other subjects which use mathematical techniques, e.g. Economics, Finance, Operations Research and Operations Management.	
9.	Learning outcomes: On completion of this module, the successful student will be able to: 1.understand and appreciate the key aspects of function theory, optimisation theory and matrix algebra 2.demonstrate the role and significance of quantitative methods in decision making 3. distinguish the limitations of the different optimisation models and solution methods 4. examine and model deterministic phenomena from Business, Economics, Finance, etc. 5. develop and solve simple business-related optimisation problems 6. analyse and interpret the output given by Excel applications	
10.	Syllabus: • Brief review of the basic concepts of Mathematics: introduction to the theory of sets, numbers, vectors and functions. Operations with sets, numbers and vectors. • Elementary theory of matrices, matrix operations. Determinants, Cramer's Rule. Business applications. Excel applications for matrix operations • Elementary theory of single variable real functions. Continuity, monotonicity, convexity/concavity, extremal values, zeroes, etc. Graphical representation and graphical analysis of single variable real functions. Business applications. • Elementary theory of several variable real functions. Convexity/concavity, extremal values, zeroes, etc. Graphical representation and graphical analysis of several variable real functions. • The level curve method. The elements of linear and nonlinear programming. Graphical solution methods. Business applications. • Introduction to differential calculus. Basic concepts and calculus rules. • Complete analysis of single variable functions. Business applications. • The indefinite integral, basic rules for integration. Differential equations. Business applications. • The definite integral and its geometric meaning. The Newton-Leibniz Rule. Improper integrals. • Differential calculus for functions with several variables. Seeking for extremum. Business applications.	

<table>
<tr><td></td><td colspan="2">• Systems of linear equations. Matrix equations. The inverse of a matrix. Vector space and coordinate transformation methods. The pivot algorithm. Excel applications for supporting the solution.
• Unconstrained optimization problems.
• Equality constrained optimization problems. The Lagrange Multiplier Rule.</td></tr>
<tr><td>11.</td><td colspan="2">Learning and teaching strategy:
There will be weakly lectures (2 hrs/week) and seminars (2 hrs/week). Exercises and business-related problems will be set as the basis for discussion. The solutions will be supported by Excel applications wherever it is possible.</td></tr>
<tr><td rowspan="2">12.</td><td colspan="2">Assessment scheme:</td></tr>
<tr><td colspan="2">Formative assessment scheme
Formative feedback will be provided throughout this module through the discussion of problems given as homework.</td></tr>
<tr><td rowspan="6"></td><td colspan="2">Summative assessment scheme
Indicate tasks and weightings and which tasks assess which learning outcomes

Students will have two closed-book written examinations during the semester (Midterm 1 and Midterm 2) on selected problems.At the end of the semester there will be a closed-book written exam (Final Examination). This will assess the full range of learning outcomes.</td></tr>
<tr><td>Midterm 1
(it will assess LOs 1 and 5)</td><td>15 %</td></tr>
<tr><td>Midterm 2
(it will assess LOs 1, 2, 5 and 6)</td><td>15 %</td></tr>
<tr><td>Final Examination
(it will assess the full range of LOs)</td><td>70 %</td></tr>
<tr><td colspan="2">It is required to achieve more than 50% of the scores onthe Final Exam in order to receive a pass. In case of the Midterms there is no such requirement. Based on all of the assessment elements, however, more than 50% in aggregate is needed for the pass rate. As a consequence, only the final exam can be resat.
Maximum of 25% missing is allowed; otherwise the semester will not be approved.</td></tr>
<tr><td></td><td>Seen examination</td><td>0 %</td></tr>
<tr><td></td><td>Unseen examination</td><td>100 %</td></tr>
<tr><td></td><td>Coursework (no examination)</td><td>0 %</td></tr>
<tr><td>13.</td><td>Timetabled examination required</td><td>YES</td></tr>
<tr><td>14.</td><td>Length of exam</td><td>75 minutes in case of the Midterms, 90 minutes in case of the Final Examination</td></tr>
<tr><td>15.</td><td>Learning materials

• Essential

• Recommended</td><td>

- K. Sydsæter, P. Hammond and A. Strøm: Essential Mathematics for EconomicAnalysis, Pearson Education, 4th edition, 2012.
- Handouts uploaded to Neptun.

- E. F. Haeussler, R. S. Paul and R. J. Wood: Introductory Mathematical Analysis for Business, Economics and Life and Social Sciences, Pearson Education, Thirteenth edition, 2011.</td></tr>
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