Course Syllabus

MTH140G
MATHEMATICS FOR BUSINESS AND ECONOMICS

Number of ECTS credits: 6
Time and Place: Tuesday 16:30 – 18:00
           Wednesday 13:30 – 15:00

Contact Details for Professor
Name of Professor: Jordi Ballart
E-mail: jordi.ballart@vub.ac.be
Office hours: upon appointment

CONTENT OVERVIEW

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Course Prerequisites

Familiarity with algebraic notation: adding, subtracting, multiplying, and dividing fractions. Basic use of MS Excel or other spreadsheet program. Use of calculator.

Classes are interactive in the sense that students will be required to complete exercises and solve problems during class, either individually or in small groups, and present their results or solutions. If you are not prepared to commit to the functioning of the course, you are advised to see your advisor immediately.

Course Description

This course teaches the mathematical skills required for problem solving and decision making in the business world through the use of mathematical models and specialised techniques. Topics include: functions as mathematical models, equation-solving techniques, differential and integral calculus, exponential growth and time-value of money, partial derivatives and their applications in economic functions, and (time permitting) simple matrix algebra.

Students will also learn how best to present data and numerical information.

Course Learning Objectives (CLO)

At the end of this course, students should be able to:

In terms of knowledge:

➢ Demonstrate their knowledge of the basics of solving problems in a wide range of business disciplines including economics, finance and operations management
➢ Understand the mathematical foundation for Finance and Economics courses.

In terms of skills

➢ Analyse given data and optimise the solution
➢ Practise an academic attitude and a critical approach to a variety of situations

In terms of attitudes, students should develop in this course:

➢ Develop critical attitudes, which are necessary for “life-long learning”
➢ Greater appreciation for the importance of quantitative literacy in today’s data rich world
### LINK BETWEEN MAJOR OBJECTIVES, COURSE OBJECTIVES, TEACHING METHODS, ASSIGNMENTS AND FEEDBACK

(BA in Business Studies)

<table>
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<tr>
<th>Major Learning Objectives</th>
<th>Course Learning objectives addressing the Major Objectives (testable learning objectives)</th>
<th>Methods used to Teach Course Objectives</th>
<th>Methods (and numbers/types of assignments) used to test these learning objectives</th>
<th>Type, Timing and Instances of Feedback given to Student</th>
</tr>
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<tr>
<td>To apply knowledge of different functional fields to the analysis of the given situations and solutions</td>
<td>Demonstrate the ability to interpret outputs and results to take decisions</td>
<td>Lectures, problem solving exercises</td>
<td>Homework and in-class assignments</td>
<td>Feedback from the instructor within a week submission as well as after the assignments</td>
</tr>
<tr>
<td>To recognize the importance of life-long learning</td>
<td>Multidisciplinary perspectives in the analysis of the situations and cases</td>
<td>Different concepts will be revised during the course lectures to ensure a comprehensive knowledge base</td>
<td>There will be a final reflection paper due, for self-reflection and evaluation</td>
<td>Students will receive the proper feedback from the instructor</td>
</tr>
<tr>
<td>To be able to communicate clearly, fluently and accurately both in written reports as well as oral</td>
<td>How to structure and compose an academic essay based on alternative and theoretical approaches</td>
<td>Preparation of projects and presentations regarding the solution of the given situations and cases</td>
<td>This class assesses both oral and written expression, through a variety of written and oral assignments</td>
<td>Students will receive the proper feedback from the instructor</td>
</tr>
<tr>
<td>To know and to be able to apply common qualitative and quantitative research methods and to be able to apply these methods in the field of study</td>
<td>To gain a better understanding and with the use of research methodology through the use of the research techniques and knowledge</td>
<td>Students will work together to establish and deliver a research project that illustrates the foundation at research knowledge and comprehension</td>
<td>Students will research their given topic to high standards, which include submission and presentation of the results</td>
<td>Students will receive the proper feedback from the instructor</td>
</tr>
<tr>
<td>To have an open and academic attitude characterized by accuracy, critical reflection and academic curiosity</td>
<td>Students will engage in understanding the need to critically evaluate the situations and their behavior. This will be reflected in critical thinking, inquiry and reflection</td>
<td>Different concepts will be revised during the course lectures to ensure a comprehensive knowledge base</td>
<td>There will be a final reflection paper due, for self-reflection and evaluation</td>
<td>Students will receive the proper feedback from the instructor</td>
</tr>
</tbody>
</table>
Main Course Materials:

The course material consists of PowerPoint presentations, readings and exercises. PowerPoint presentations will be made available after the respective classes have taken place.

The syllabus, PowerPoint presentations and other academic material, as well as important messages, will be uploaded to the Vesalius portal ‘Canvas’. Students are expected to visit this site regularly to keep abreast of course evolutions.

Course material marked as ‘suggested readings’ and ‘additional sources’ is helpful for research and to gain an increased understanding, but is not mandatory. This material can be found online or will be made available upon individual request.

Reference Textbooks:


Additional material will be assigned on a weekly basis

Active Learning and Intensive ‘Reading around the Subject’:

Learning should be an active and self-motivated experience. Students who passively listen to lectures, copy someone else’s notes, and limit their readings to required chapters are unlikely to develop their critical thinking and expand their personal knowledge. At the exam, these students often fail to demonstrate a critical approach. Students are strongly recommended to have an updated understanding of developments related to this course and related to their wider Major. Active and engaged learning will turn out to be enriching to the overall course and class discussions. Students are invited to deepen their understanding of both theoretical and current issues from a variety of sources. You are encouraged to read in the leading manuals and surf the web in search of related issues.

Work Load Calculation for this Course:

This course counts for 6 ECTS, which translates into 150 – 180 hours for the entire semester for this course. This means that you are expected to spend roughly 10 hours per week on this course. This includes 3 hours of lectures or seminars per week and 7 hours ‘out of class’ time spent on preparatory readings, time spent on
preparing your assignments and homework as well as studying time for exams. Please see below the estimated breakdown of your work-load for this course.

**Time spent in class:** 3 hours per week / 45 hours per semester  
**Time allocated for course readings:** 5 hours per week / 75 hours per semester  
**Time allocated for preparing Assignment 1:** 4 hours  
**Time allocated for preparing Assignment 2:** 4 hours  
**Time allocated for preparing Assignment 3:** 4 hours  
**Time allocated for preparing Assignment 4:** 4 hours  
**Time allocated for preparing/revising for written Mid-term Exam:** 10 hours  
**Time allocated preparing/revising for written Final Exam:** 10 hours

**Total hours for this Course:** 156 hours

**Course Assessment: Assignments Overview**

The students will be evaluated on the basis of their performance in the following assignments:

- Spot tests / exercises in class 10%  
- Assignments (four, each carrying 5%) 20%  
- Midterm examination 35%  
- Final examination 35%  
- TOTAL 100%

**Grading Scale of Vesalius College**

Vesalius College grading policy follows the American system of letter grades, which correspond to a point scale from 0 – 100. **All assignments (including exams) must be graded on the scale of 0-100.** To comply with the Flemish Educational norms, professors should on request also provide the conversion of the grade on the Flemish scale of 0-20. The conversion table below outlines the grade equivalents.

<table>
<thead>
<tr>
<th>Letter grade</th>
<th>Scale of 100 (VeCo Grading Scale)</th>
<th>Scale of 20 (Flemish System)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>85-100</td>
<td>17.0-20.0</td>
</tr>
<tr>
<td>A-</td>
<td>81-84</td>
<td>16.1-16.9</td>
</tr>
<tr>
<td>B+</td>
<td>77-80</td>
<td>15.3-16.0</td>
</tr>
<tr>
<td>B</td>
<td>73-76</td>
<td>14.5-15.2</td>
</tr>
<tr>
<td>B-</td>
<td>69-72</td>
<td>13.7-14.4</td>
</tr>
<tr>
<td>C+</td>
<td>66-68</td>
<td>13.1-13.6</td>
</tr>
<tr>
<td>C</td>
<td>62-65</td>
<td>12.3-13.0</td>
</tr>
<tr>
<td>C-</td>
<td>58-61</td>
<td>11.5-12.2</td>
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</tbody>
</table>
Description of Activities, Grading Criteria and Deadlines:

In-class exercises & assignments (10%): Students will be required to complete in-class assignments during the course. The assignments are to be completed individually.

Four Assignments (5% each): Students will be required to complete four assignments during the course. The assignments are to be completed individually. These assignments will consist of: (1) exercises at the end of each chapter, and/or (2) a case proposed by the instructor. There will be 2 individual assignments in each half of the course, i.e. 2 assignments before and 2 after the midterm exam. Late submissions will not be accepted.

Mid-Term Exam (35%): The midterm exam will cover all the topics covered in class during the first six (6) weeks of the term. It will consist on a set of exercises and problems that will test the understanding of the concepts taught in class. The exercises will be similar to the problems sets assigned as assignments and the in-class exercises. Bring your student ID, a pen and a calculator. Some exercises will have to be done by Excel. The professor will indicate if and when a PC will be required. Makeup examinations will be allowed only in an extreme emergency, which must be documented by a physician or college official, in advance when possible.

Final Exam (45%): The final exam will cover all the topics covered in class during the last six (6) weeks of the term. It will consist on a set of exercises and problems that will test the understanding of the concepts taught in class. The exercises will be similar to the problems sets assigned as assignments and the in-class exercises.

Rubrics: Transparent Grading Criteria For Each Assignment

The following criteria will be applied in assessing your written work:

<table>
<thead>
<tr>
<th>Rubric</th>
<th>Grade Range (e.g. FAIL (0-49%))</th>
<th>Grade Range</th>
<th>Grade Range:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0-25</td>
<td>25.5-40</td>
<td>40.5-50</td>
</tr>
<tr>
<td>1.</td>
<td>Ability to solve problems (50 points)</td>
<td>Student fails to understand the mechanics of solving the</td>
<td>A problem is partially solved, but incorrect assumptions are</td>
</tr>
<tr>
<td>Rubrics for the Mid-Term Exam and the Final Exam</td>
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<td></td>
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<tr>
<td>-----------------------------------------------</td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Rubric</strong></td>
<td><strong>Grade Range (e.g. FAIL (0-49%))</strong></td>
<td><strong>Grade Range</strong></td>
<td><strong>Grade Range:</strong></td>
</tr>
<tr>
<td>1. Ability to solve problems (50 points)</td>
<td>Does not know how to get started on a problem</td>
<td>A problem is partially solved, but incorrect assumptions are used or mistakes occurred during computation</td>
<td>Solution is based on correct assumptions; all work is clearly presented and the logic is easy to follow</td>
</tr>
<tr>
<td>2. Knowledge of key concepts (25 points)</td>
<td>Provides wrong definition</td>
<td>Explanation is muddled, contains factual errors, uses imprecise language, provides wrong examples</td>
<td>Provides a precise definition of the concept, backed by examples as appropriate</td>
</tr>
<tr>
<td>3. Interpretation of results (25 points)</td>
<td>Cannot explain substantive meaning behind the results obtained</td>
<td>Explanation is correct for the larger part, but some language is imprecise</td>
<td>Provides accurate and precise interpretation of the results obtained</td>
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**Vesalius College Attendance Policy**

Because the College is committed to providing students with high-quality classes and ample opportunity for teacher-student interaction, it is imperative that students regularly attend class. As such, Vesalius College has a strict attendance policy. Participation in class meetings is mandatory, except in case of a medical emergency (e.g. sickness). Students need to provide evidence for missing class (doctor’s note). If evidence is provided, the missed class is considered as an excused class. If no evidence is provided, the missed class is counted as an absence.

Participation implies that students are on time: as a general rule, the College advises that students should be punctual in this regard, but it is up to the professor to decide whether to count late arrivals as absences, or not.

**Additional Course Policies**

**Preparation for class:** Carefully read the materials indicated in the course schedule before coming to class. Mathematics is a sequential subject: new topics build on concepts introduced before, so it is crucial to keep up with the material as we go along and to regularly review concepts. We will work on mathematical, algebra & calculus problems in class. I expect you to actively work the problems, and be prepared to briefly present the results of your work to the other students. You should bring laptop to class for the sessions indicated by the professor.

**Late assignments:** Assignments are due on the indicated date and time. Late assignments will not be accepted unless there are serious legitimate reasons. Provision of a signed medical note is required, and notice must be given prior to the deadline.

**Academic Honesty Statement**

Academic dishonesty is NOT tolerated in this course. Academic honesty is not only an ethical issue but also the foundation of scholarship. Cheating and plagiarism are therefore serious breaches of academic integrity.

Following the College policy, cheating and plagiarism cases will be communicated in writing to the Associate Dean and submitted to the Student Conduct Committee for disciplinary action.

If you refer to someone else’s work, appropriate references and citations must be provided. Grammar, spelling and punctuation count, so use the tools necessary to correct before handing in assignments.

Please consult the Section “Avoiding Plagiarism” in the College Catalogue for further guidance.
**Turnitin**
All written assignments that graded and count for more than 10% towards the final course grade need to be submitted via the anti-plagiarism software Turnitin or Canvas. You will receive from your professor a unique password and access code for your Class.

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### Course Schedule (Overview)

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<th>Week 1</th>
<th>Jan 22-23</th>
<th>Introduction to the Course Introduction to Mathematics for Business and Economics Repetition of basic algebra, linear equations, slopes</th>
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<tr>
<td>Week 2</td>
<td>Jan 29-30</td>
<td>Linear equations, multiple equations Supply-Demand Curves, Market Equilibrium</td>
</tr>
<tr>
<td>Week 3</td>
<td>Feb 5-6</td>
<td>Non-linear equations, Parabolic functions</td>
</tr>
<tr>
<td>Week 4</td>
<td>Feb 12-13</td>
<td>Exponential and logarithmic functions</td>
</tr>
<tr>
<td>Week 5</td>
<td>Feb 19-20</td>
<td>Mathematics of Finance percentages, compound interest geometric and arithmetic series</td>
</tr>
<tr>
<td>Week 6</td>
<td>Feb 26-27</td>
<td>Effectively presenting data and quantitative information</td>
</tr>
<tr>
<td>Week 7</td>
<td>Mar 5-6</td>
<td>MID-TERM EXAM</td>
</tr>
<tr>
<td>Week 8</td>
<td>Mar 12-13</td>
<td>Differential calculus: first and second derivatives</td>
</tr>
<tr>
<td>Week 9</td>
<td>Mar 19-20</td>
<td>Differential calculus: chain rule</td>
</tr>
<tr>
<td>Week 10</td>
<td>Mar 26-27</td>
<td>Partial differentiation</td>
</tr>
<tr>
<td>Week 11</td>
<td>Apr 2-3</td>
<td>Optimisation problems</td>
</tr>
<tr>
<td><strong>Spring Recess – Apr 8 to Apr 21 2019 – NO CLASSES</strong></td>
<td></td>
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</tr>
<tr>
<td>Week 12</td>
<td>Apr 23-24</td>
<td>Method of Lagrange</td>
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<tr>
<td>Week 13</td>
<td>Apr 30</td>
<td>Integration</td>
</tr>
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Detailed Session-by-Session Course Outline

Session 1 (Tuesday & Wednesday, January 22nd & 23rd 2019)

*Introduction to the Course. Introduction to Mathematics for Business and Economics Repetition of basic algebra, linear equations and slopes*

**Content:**
- Linear equations and inequalities.
- Graphs and lines.
- Linear regression

Session 2 (Tuesday & Wednesday, January 29nd & 30th 2019)

*Linear equations, multiple equations Supply-Demand Curves, Market Equilibrium*

**Required reading:**

**Content:**
- Solving linear equations.
- Systems of linear functions.
- Applications: breakeven analysis, price-demand & linear depreciation

**Assignment 1 is assigned**

Session 3 (Tuesday & Wednesday, February 5nd & 6rd 2019)

*Non-linear equations, Parabolic functions*

**Required reading:**
Barnet R., Ziegler M., Byleen K., Calculus for Business, Economics, Life Sciences and Social Sciences, 12th ed., Prentice Hall, 2010: CHAPTER 2 (2.1, 2.2 & 2.3) (from page 43 to 84)
Content:
Functions
Elementary Functions
Graphs and transformations
Quadratic functions

Session 4 (Tuesday & Wednesday, February 12th & 13th 2019)

Exponential and logarithmic functions

Required reading:
Barnet R., Ziegler M., Byleen K., Calculus for Business, Economics, Life Sciences and Social Sciences, 12th ed., Prentice Hall, 2010: CHAPTER 2 (2.5 & 2.6) (from page 95 to 114)

Content:
Exponential functions
Base “e” Exponential functions
Growth and decay applications
Inverse functions
Logarithmic functions
Properties of logarithmic functions

Session 5 (Tuesday & Wednesday, February 19th & 20th 2019)

Mathematics of Finance percentages, compound interest geometric and arithmetic series

Required reading:
CHAPTER 5 (from page 256 to 290)

Content:
Linear and exponential growth and decay
Simple and compound interest rate operations
Annuities and series of cashflows

Assignment 2 is assigned

Session 6 (Tuesday & Wednesday, February 26th & 27th 2019)

Effectively presenting data and quantitative information

Required reading:

Content:
Two dimensions graphs
One dimension graphs: a timeline
Growth pattern of investments

Session 7A (Tuesday, March 5th 2019)

Tutorial

Session 7B (Wednesday, March 6th 2019)

Midterm exam
Covers all material covered to date. Bring your student ID, a mechanical pencil, an eraser, a pen, and a calculator.

Session 8 (Tuesday & Wednesday, March 12th & 13th 2019)

Differential calculus: first and second derivatives

Required reading:
Barnet R., Ziegler M., Byleen K., Calculus for Business, Economics, Life Sciences and Social Sciences, 12th ed., Prentice Hall, 2010: CHAPTER 3 (3.4, 3.5, 3.6 & 3.7) (from page 165 to 203)

Content:
The derivative
Graphic approach to the concept of derivative
Basic differentiation properties
Differentials
Marginal analysis in business economics

Session 9 (Tuesday & Wednesday, March 19th & 20th 2019)

Differential calculus: chain rule

Required reading:

Content:
The chain rule
Implicit differentiation
Assignment 3 is assigned

Session 10 (Tuesday & Wednesday, March 26th & 27th 2019)

Partial differentiation

Required reading:
Goldstein, Lay, Schneider and Asmar, Calculus and its Applications, 13th ed.,
CHAPTER 7 (from page 347 to 367)

Content:
Functions of several variables
Partial derivatives
Maxima and minima of functions of several variables

Session 11 (Tuesday & Wednesday, April 2nd & 3rd 2019)

Optimisation problems

Required reading:
Barnet R., Ziegler M., Byleen K., Calculus for Business, Economics, Life Sciences
and Social Sciences, 12th ed., Prentice Hall, 2010: CHAPTER 5 (5.4, 5.5 & 5.6) (from
page 310 to 343)

Content:
Curve-sketching
Absolute maxima and minima
Optimisation

Assignment 4 is assigned

Session 12 (Tuesday & Wednesday, April 23rd & 24th 2019)

Method of Lagrange

Required reading:
Barnet R., Ziegler M., Byleen K., Calculus for Business, Economics, Life Sciences
and Social Sciences, 12th ed., Prentice Hall, 2010: CHAPTER 8 (8.3 & 8.4) (from
page 467 to 484)

Content:
Maxima and minima
Maxima and minima using Lagrange multiplier
Session 13 (Tuesday, April 30th 2019)

Integration

Required reading:
Barnet R., Ziegler M., Byleen K., Calculus for Business, Economics, Life Sciences and Social Sciences, 12th ed., Prentice Hall, 2010: CHAPTER 6 (6.1 & 6.4) (from page 350 to 360 & from page 383 to 392) and CHAPTER 7 (7.1 & 7.2) (from page 411 to 431)

Content:
Antiderivatives
The definite integral
Area between curves
Applications of integration in business and economics

Session 14 (Tuesday & Wednesday, May 7th & 8th 2019)

Revision and summary of the course

Session 15A (Tuesday, May 14th 2019)

Tutorial

Session 7B (Wednesday, May 15th 2019)

Final exam
Covers all material covered since the midterm exam. Bring your student ID, a mechanical pencil, an eraser, a pen, and a calculator.