BUSINESS MATHEMATICS

VU University Amsterdam
Faculty of Economics and Business Administration

BSC INTERNATIONAL BUSINESS ADMINISTRATION

COURSE MANUAL

Academic Year 2015-2016
Period 1.1

CONTENTS

1 COURSE DESCRIPTION STUDY GUIDE

Weblink to course description online	http://www.feweb.vu.nl/en/students/study-guide/bsc-international-business-administration/course-descriptions/?view=module&origin=50051725&id=50963622
Course Name	Business Mathematics
Course Code	E_IBA1_BUSM
Period	1.1
Credits	6 ECTS
Language	English
Course Coordinator	dr. Reinout Heijungs
Teachers	Prof.dr. Bernd F. Heidergott (lectures) Dr. Harold Houba, MSc. Mengheng Li, MSc. Zhaokun Zhang (tutorials)
Course Objectives	This course is the first in the line of our academic core, teaching you mathematical thinking and working (*Quantitative skills; Knowledge*). During this course you will get acquainted with a number of important mathematical topics and some basic quantitative tools for business and economics. These tools are not only relevant in an academic research setting, but also help to solve business problems (*Research Skills*). You will not only learn the techniques as such, but you will also learn the art of abstraction from a real-world problem to a formal problem, and back from a formal answer to a real-world answer *(Academic Skills)* Specifically, the knowledge and skills in this course concentrate on: • mathematical thinking: concepts, notation, usefulness; • general mathematical and computational skills; • summation operator; • descriptive statistics (mean, variance, covariance, correlation); • vectors and matrices; • differentiation of functions of one or more variables; • elasticity; • finding extreme values of functions of one or two variables; • finding extreme values of functions of one or two variables under a constraint; • inverse matrices; • solving systems of linear equations; • ordinary least squares for curve fitting (straight line, no statistical tests); • linear programming. • typing formulas in Microsoft Word • using Microsoft Excel for mathematical problems
Content	Mathematics is a challenging, but highly relevant topic for any international business student. Doing business for sure means having a vision, but it also means having the numbers right. You can't develop a sound business plan without understanding and using mathematics, and you need mathematics in order to plan your stocks and trucks. In the business literature, we see many mathematical models, for scheduling, finance, and investments. Using such models requires a basic understanding of mathematical principles related to multi-variable calculus, optimisation, and expectation. Further, today's simple calculations require basic skills in setting up and handling spreadsheets and typesetting formulas. This course therefore also addresses such general skills.

	Moreover, mathematics is more than just calculations and numbers, it is language. A language that is essential to understand if you want to develop and acquire an analytical way of thinking that is not only at the core of any academic, but also the successful business professional. It is a first step on the path of understanding the power of quantitative and mathematical approaches to problems you will face as an international business student.
Form of tuition	Lectures Tutorials
Assessment	Interim exams (computer tests) – Individual assessment Final, written exam – Individual assessment Mandatory attendance tutorials
Literature	Sydsæter, Knut, Peter Hammond, and Arne Strøm (2012), *Essential Mathematics for Economic Analysis*, fourth Edition, Pearson Education (The VU Bookshop and Aureus sell a special edition including extended access code for MyMathLab) Access to Microsoft Word and Excel Additional (required) materials will be announced via Blackboard
Entry Requirements	n/a
Recommended knowledge	n/a
Remarks	Mandatory for Binding Study Recommendation on Continuation of Studies Recommendation ('BSA') in year 1

2   COURSE COORDINATOR AND LECTURERS

This course is largely developed by the course coordinator, Reinout Heijungs. He is responsible for the coordination of both Business Mathematics and Statistics in the first year. He works in close cooperation with not only his lecturers but also coordinators of other courses to give shape to the quantitative skills and the specific needs of the IBA programme.

Throughout the course however, your first point of contact for this course will be Ines Lindner. She is your lecturer for the lectures.

Dr. Reinout Heijungs
Course coordinator
Research interests: mathematics, statistics, methodology
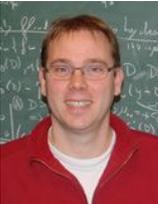Personal webpage   http://personal.vu.nl/R.Heijungs/
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Prof.dr. Bernd F. Heidergott
Lecturer

Research interests: stochastic operations research
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dr. Harold Houba
Lecturer - tutorials
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MSc. Zhaokun Zhang
Lecturer - tutorials
Research interests: econometrics
Personal webpage:
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MSc. Mengheng
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Research interests: econometrics
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3   PROMISE: WHAT TO EXPECT FROM THIS COURSE?

Mathematics is a challenging, but highly relevant topic for any international business student. Doing business for sure means having a vision, but it also means having the numbers right. You can't develop a sound business plan without understanding and using mathematics, and you need mathematics in order to plan your stocks and trucks. In the business literature, we see many mathematical models, for scheduling, finance, and investments.

Using such models requires a basic understanding of mathematical principles related to multi-variable calculus, optimisation, and expectation. Further, today's simple calculations require basic skills in setting up and handling spreadsheets and typesetting formulas. This course therefore also addresses such general skills.

3.1 INTERNATIONAL FOCUS

Mathematics is a language. That is what we stress throughout this course. And it is – even more than English – an international language. It is the *lingua franca* of science. We also emphasize international issues in working with data, think of the confusion between 3.14 and 3,14 and between miles and kilometers.

4 THE IBA ROADMAP: WHERE ARE WE?

The role of the course is to provide quantitative tools for business analysis. In particular it provides the basics for the courses International Economics (period 1.2), Global Supply Chain Management (1.4), Business Statistics (1.4), Accounting (1.5), Business Processes (1.6), Finance (2.2), and Business Research Methods I (2.4).

5 LEARNING OBJECTIVES

Academic skills	Central in mathematics is the skill of abstraction. Probably mathematics is the most abstract course in the entire programme. Just think of the abstraction from an integer, via fraction, negative number and irrational number to a matrix. *Your goal*: understanding the importance of mathematics professionally.
Research skills	Translating a practical problem into a mathematical problem. *Your goal*: translating real-world problems into mathematical language, solving the mathematical problem, translating the mathematical solution back.
Quantitative skills	We offer the student a variety of methods and techniques. The student is supposed to master these techniques, but also to choose the right technique in a given case. *Your goal*: applying mathematical techniques and selecting the right technique.
Knowledge	Knowledge of mathematics is a cultural asset for every academic. It is the oldest academic discipline. A sign at the entrance of Plato's academia stated "Let no-one ignorant of geometry enter here" Arithmetic and geometry were part of the quadrivium, the endpoint of scholarship in the middle ages. In the modern world, mathematics is the starting point. Further, a proper use of digital tools for quantitative analysis and presentation is indispensable nowadays. Therefore, computer skills will be part of the course as well. *Your goal*: reading and writing texts in which mathematics occurs.

6   STUDY MATERIAL

The book used for this course is:
- Sydsæter, Knut, Peter Hammond, and Arne Strøm (2012), *Essential Mathematics for Economic Analysis*, fourth Edition, Pearson Education.

(The VU Bookshop and Aureus sell a special edition including extended access code for MyMathLab)

For this course, we will study the following chapters:
- Chapters: 1.6, 2.1-2.5, 3.1-3.5, 4.1-4.10, 6.1-6.4, 6.6-6.11, 7.1-7.7, 8.1-8.7, 9.1-9.4, 12.3, 11.1-11.2, 13.1-13.3, 14.1-14.2, 14.6, 15.1-15.8, 16.6-16.7, 17.1 (please note that a small update may be posted on BlackBoard).
- Additional documents will be provided through BlackBoard.

7   FORM OF TUITION

Lectures: 2 times 2 lecture hours per week
Tutorials: four weeks 4 tutorial hours per week, two weeks 2 tutorial hours per week
For more details, consult your time schedule.

The **lectures** aim at providing you with new knowledge and insights in mathematics. Note that it is essential to **prepare before** coming to the lectures.

Every week, the **tutorials** focus on showing how to solve problems, posed in the form of exercises. The book contains many exercises. We have made a selection, modified some questions, and added extra questions. While the book gives the answer of many exercises (and so do we on this website), obviously the path to the answer is more important than the answer. The tutorials will show this path for the selected exercises. This is also especially helpful in preparing for your exam in the right way.

Further, there are **computer tutorials**, four times 2 hours. During these sessions, you develop quantitative digital skills, in particular with Word's equation editor and with Excel, including the Solver add-in. The sessions take place in computer rooms. The subjects to be explored are described in the (downloadable) documents. Again, prepare the computer exercises at home or at VU. The time available (2 hours) is definitely insufficient to do everything, so prioritize what you what to do in class, and what you do outside class.

To help you in preparing for the retake of the written exam in December, extra tutorials will be organized in November and December. More information will be provided later. Attendance of these extra tutorials is also mandatory.

8   ASSESSMENT

There will be two intermediate digital tests; each counts for 15%. At the end of the course, there is a written exam which accounts for 70%. The minimum total grade required to pass the course: 5.50. Both parts (digital test and written exam) have a separate minimum of 5.00. There is no minimum for test 1 or test 2, their grades should add up to at least 10.00.

8.1   WRITTEN EXAM

The final grade will be largely, but not completely, based on the written exam, that concludes the course. More information and links to details can be found on BlackBoard.

Because Business Mathematics has a special status as a "BSA" requirement, it is exceptional in having two retake opportunities instead of one. These retakes are likely to be held in December and in March. The result of the retake replaces the result of an earlier written exam. The result of the retake will be combined with that of the digital test to yield a final grade.

8.2   DIGITAL TESTS

Two intermediate digital tests are done. The results of these tests play a role in the final grade. That means the usual rules for exams apply to these tests. Check the time table, be on time, bring your ID and VU card with student number, do not put your book, notes, phone, etc. on your desk.

You don't need to register for the digital tests (but you do need to register for the written exam).

There is a retake of the combined digital tests, probably in early January and in mid April. You can only do a retake of the digital test if you have passed the threshold of 5.00 for the written exam and your final grade is under 5.50. If you do the retake, the grade will replace the two earlier results.

8.3   ATTENDANCE

Note that attendance for the tutorials is compulsory. You need to attend **at least 75%** of the tutorials in order to pass attendance. There are 6 normal tutorials and 4 computer tutorials, so you must attend **at least 8 of the 10 sessions**. In case you fail attendance, a deduction of two points (2.00) of the final grade will be made. We strongly recommend that you adhere to a safe policy, i.e. that you attend **all** tutorials. If you deliberately skip two sessions and then fall ill or miss the train, we will not grant an exception because you took the risk - and lost. If there are special situations (illness, top sport status, etc.) you must inform the coordinator by email as soon as possible.

8.4   ASSESSMENT MATRIX

The matrix illustrates which *learning objectives* are tested with the different tests.

Format	% grade	Elements								
Written exam	70	Open-ended and multiple choice questions					X	x	x	x
Digital test	30	Computer assignments with Excel and Word's equation editor					x	x	x	x

9   DETAILED SCHEDULE

Note that for his course, there is a more comprehensive and up-to-date table presented at BlackBoard, **including slides and other relevant documents to prepare for classes**.

Week	Date	Format	Theme/Topics
1		Lectures	Introduction, summation, derivatives
		Computer tutorial	Working on exercises, typing equations in Word, basic Excel
		Lectures	Indexing, descriptive statistics
		Tutorial	Exercises are posted in advance
2		Lectures	Extreme values, equations
		Computer tutorial	Working on exercises, typing equations in Word, Excel for graphs
		Lectures	Indefinite integrals, vectors, elasticities and approximations
		Tutorial	Exercises are posted in advance
3		Lectures	Partial derivatives, functions
		Digital test	Typing equations in Word, using Excel
		Lectures	Definite integrals, matrices
		Tutorial	Exercises are posted in advance
4		Lectures	Extreme values in two dimensions, numbers
		Computer tutorial	Working on exercises, matrices in Excel
		Lectures	Curve fitting, applications of integrals
		Tutorial	Exercises are posted in advance
5		Lectures	Constrained optimization, implicit functions
		Computer tutorial	Working on exercises, using Excel's Solver
		Lectures	Systems of equations, Gaussian elimination
		Tutorial	Exercises are posted in advance
6		Lectures	Multiple constrained optimization, linear programming
		Digital test	Typing equations in Word, using Excel
		Lectures	Miscellaneous topics
		Tutorial	Exercises are posted in advance
7		Response class	Q&A exam and reviewing practice exams
8		Exam	
RESIT		Exam/Digital test	

10   COMMUNICATION AND CONTACT OPPORTUNITIES

The most important means of communication for this course is BlackBoard. It will contain (links to) the course details, slides, exercises (including answers), documents for the computer tutorials, example tests and exams, video clips, supporting websites, etc.

Note that any communication via email will be send to your **VU email address**. Make sure you check this address on a daily basis!

If you want to contact us, please use your VU email address as well. Emails sent through private email accounts sometimes end up in our spam folders.

11   STUDY LOAD

The estimated time students need for basic study activities in this course are:

Preparing lectures	024 hours
Attending lectures	024 hours
Preparing tutorials	040 hours
Attending tutorials	020 hours
Preparing digital tests	008 hours
Taking digital tests	004 hours
Preparing exam	046 hours
Taking exam	002 hours
Total	168 hours

Take care: **you are supposed to work 20 hours per week on this course**. This means that in addition to the 8 hours per week for lectures, tutorials, and digital tests, you are expected to work 12 more hours per week on our topic. This is on a 7-day-per-week basis 2 hour every day, not counting hours spent in class!