Teaching and Examination Regulations

BACHELOR's study programme

B. Programme-specific section

Business Analytics

Academic year 2017-2018

Section B: programme-specific section

Section B: programme-specific section

1. General provisions

Article 1.1 Definitions

Not applicable

Article 1.2 Study programme information

1. The programme Business Analytics CROHO number 56856 is offered on a part-time and full-time basis and the language of instruction is English.
2. A unit of study comprises 6 EC or a multiple thereof. The units of study listed below have a different size:

Course code	Course component	EC
X_400316	Project Business Analytics 1	3
X_400572	Project Business Analytics 2	3
X_400578	Risk Management	3
X_400621	Sets and Combinatorics	3
X_400433	Philosophy	3
X_400652	History of Science	3

2. Programme objectives and exit qualifications

Article 2.1 Programme objective

The objective of the programme is for students to acquire sufficient basic theoretical and practical knowledge and skills in the field of Business Analytics and any related science disciplines to enable them to go on to pursue a Master's in Business Analytics or a related science discipline, or to enter the labour market. The programme also aims to impress upon the student the importance of the discipline in a broader scientific, philosophical and societal context.

Article 2.2 Exit qualifications

Upon completing the Bachelor's programme in Business Analytics, the student is expected to:

- have thorough theoretical and practical knowledge of the broad field of mathematics and computer science as applied in commercial and industrial processes;
- have experience in the application of basic principles from the fields of mathematics and computer science, also in a multidisciplinary business context;
- have some experience in modelling business processes using methods from the fields of mathematics and computer science;
- be knowledgeable about the principles of business economics;
- have gained experience working on a business problem in a multidisciplinary team; have become familiar with basic research skills in that team; have been positively assessed with regard to those skills;
- be able to report orally and in writing on his own project or a joint project, both to professionals and to a wider audience;
- have knowledge of and experience with a selection of mathematical software packages that are commonly used in business and industry;
- be aware of the role of mathematics, computer science and business economics/econometrics in other sciences and in society;
- be aware of the potential for further study and employment following completion of the Bachelor's programme.

3. Further admission requirements

Article 3.1 Additional previous education requirements

1. The following additional requirements apply to admission to the programme. A VWO (pre-university) diploma with one of the following profiles (from 2010):
    - Nature and Technology profile;

- Science and Health profile, supplemented with Mathematics B;
- Economics and Society profile, supplemented with Mathematics B;
- Culture and Society profile, supplemented with Mathematics B;

2. Applicants with a diploma from a country other than the Netherlands will meet the profile requirements as stated under paragraph 1 if the level of mathematics and the topics covered are comparable to Mathematics B as taught in Dutch pre-university secondary school programmes. The Examination Board will assess whether these conditions have been met. The topics covered are specified in Annex II.
3. The holder of a diploma from a country that has ratified the Lisbon Treaty (Trb. 2002, 137) and that provides access to university education in that country, is exempt from the prior education requirement referred to in paragraph 1 and 2, subject to the proviso that the profile requirements and additional requirements must have been met. The holder of this diploma must also demonstrate sufficient proficiency in the English language.
4. Anyone in possession of a diploma from a country other than those stipulated in paragraph 3 may be admitted after the conditions applied by Vrije Universiteit Amsterdam's admission office have been met. These conditions include mathematics at a sufficient level as referred to in paragraph 2 and a sufficient command of the language of tuition.
5. The prior education requirement specified in paragraph 1 will be waived for those who have earned a degree from another higher education programme and those who have a first-year examination certificate from a programme in higher education, subject to the proviso that the profile requirements and any additional requirements have been met.

Article 3.2 Entrance examination

1. The entrance examination referred to in Article 2.3 (Section A) concerns the following subjects at final pre-university examination level:
   a. Mathematics B equivalent to final-examination university entry level (VWO) and
   b. A command of English equivalent to pre-university final-exam level (VWO).
2. The proof that the entrance examination has been passed provides entitlement to admission to the intended programme or programmes for the academic year after the examination was taken only.

Article 3.3 English language requirement for English-language Bachelor's programmes

1. The proficiency requirement in English as the language of instruction can be met by the successful completion of one of the following examinations or an equivalent:
   - IELTS: 6.5
   - TOEFL paper based test: 580
   - TOEFL internet based test: 92-93
   - Cambridge Advanced English: A, B or C.
   - A command of English equivalent to pre-university final-exam level (VWO).
2. Exemption is granted from the examination in English referred to in paragraph 1 to students who, no longer than two years before the start of the programme, have met the requirements of the VU test in English language proficiency TOEFL ITP, with at least the scores specified in paragraph 1, or
   - had previous education in secondary or tertiary education in an English-speaking country as listed on the VU website, or
   - have an English-language 'international baccalaureate' diploma.

Article 3.4 Free curriculum

1. Subject to certain conditions, the student has the option of compiling a curriculum of his/her own choice which deviates from the curricula prescribed by the programme.
2. The concrete details of such a curriculum must be approved beforehand by the most appropriate Examinations Board.
3. The free curriculum is put together by the student from the units of study offered by Vrije Universiteit Amsterdam or another institution of higher education and must at least have the size, breadth and depth of a regular Bachelor's programme. The student must ensure that the proposed curriculum enables admission to at least one Master's programme. In doing so, he/she makes no undertaking actually to take the Master's programme.

4. Curriculum structure

Article 4.1 Composition of programme

The programme consists of the following units:

1. 150 credits of educational units provided by the programme (major). This includes:
   a. required educational units as specified in Article 4.4;
   b. academic development as specified in Article 4.2;
2. A minor of 30 credits as specified in Article 4.5;

Article 4.2 Academic development

1. Academic development is part of the study programme. This includes:
   (1) Philosophical training/Philosophy of Science/History of Science
   (2) Methods & techniques
   (3) Critical reasoning/academic skills

Course code	Course component	EC
X_400635	Calculus 1	6
X_400619	Introduction to Business Analytics	6
X_400004	Statistics	6
X_400652	History of Science	3
X_400433	Philosophy	3

Article 4.3 Units of study

The major comprises a package of compulsory and possibly optional units of study. In addition, units of study are categorized as introductory (100), in-depth (200) and advanced (300) level.

Article 4.4 The compulsory units of study are:

Business Analytics Year 1
Compulsory Courses

Course code	Course component	EC	Period	Level
X_000008	Mentorship	0	1+2	100
X_000003	Safety Instruction: Theory	0	1	100
X_400635	Calculus 1	6	1	100
X_400636	Calculus 2	6	2	100
X_400619	Introduction to Business Analytics	6	1+2	100
X_400634	Introduction to Programming (Java)	6	1+2	100
X_400316	Project Business Analytics 1	3	3	100
X_400621	Sets and Combinatorics	3	3	100
X_400618	Operations Research	6	4	100
X_400042	Linear Algebra	6	4+5	100
X_400622	Probability Theory	6	4+5	200
E_IBA1_ACC	Accounting IBA	6	5	100
X_400572	Project Business Analytics 2	3	6	100
X_400578	Risk Management	3	6	100

Business Analytics Year 2
Compulsory Courses

Course code	Course component	EC	Period	Level
X_400561	Advanced Programming	6	1	200
X_400004	Statistics	6	1+2	200
X_400646	Stochastic Modeling	6	1+2	200
E_IBA2_FIN	Finance IBA	6	2	200
X_401006	Business Simulation	6	3	200
E_IBK3_BIA	Business Intelligence and Analytics	6	4	300
X_400647	Dynamics and Computation	6	4+5	200
X_401029	Statistical Data Analysis	6	4+5	300
X_401008	Databases	6	5	200
X_400645	Project Big Data	6	6	300

Business Analytics Year 3
Compulsory Courses

Course code	Course component	EC	Period	Level
X_400154	Machine Learning	6	4	300
X_400652	History of Science	3	4	200
X_401067	Combinatorial Optimization	6	4+5	300
X_400433	Philosophy	3	5	200
XB_41000	Bachelor Project: Business Case	12	4+5+6	300

Article 4.5 Electives

The first semester of the third year of the curriculum comprises elective units of study.

For the elective component, the student can take optional units of study designated as such, a minor offered by the faculty, a University minor designated as such or a minor designated as such by the Examinations Board and listed as such in Section B. A minor comprises units of study of which at least two are categorized at level 300 and no more than one at level 100.

Article 4.6 Practical exercise

Components with practical exercises are listed in Article 4.4 and Article 5.1 and 5.2 along with the practical teaching method.

Article 4.7 Sequence of interim examinations

Students may participate in interim examinations [or practical exercises] of the units below only if they have passed the interim examination or examinations for the units mentioned hereinafter:

- All first-year students in the Business Analytics programme are required to participate in the first-year Mentorship in periods 1 and 2.
  Students can only receive credits for completing the Business Analytics Project 1 course if they have participated in the first-year Mentorship.

- All third-year students of Business Analytics are required to take the Study and Career course in period 4. Students can only receive credits for completing the Bachelor Project: Business Case course if they have passed the Study and Career course.

- Students may only start on the Business Case course if they meet the following conditions at the start of the course: a) they have earned at least 120 of the full 180 credits, b) they have passed the Statistical Data Analysis course, c) they have passed the Project Big Data course.

In exceptional cases, the Examinations Board may, at the student's reasoned request, deviate from the sequence mentioned in paragraph 3 of this Article, with or without stipulating conditions.

Article 4.8 Signing up for interim examinations

As laid down in article 4.1 of TER part A.

Article 4.9 Participation in practical exercise and study group sessions

1. Students are expected to participate actively in all degree components for which they are registered.
2. In addition to the general requirement regarding active participation, the study guide details additional requirements for each degree component, as well as component attendance requirements.
3. At the start of each degree component, a specification will be made available which details:
   - The final attainment levels of the degree component;
   - The study guidelines for passing the degree component;
   - The way in which the final attainment levels are assessed;
   - The regulations for examinations and resits;
   - The guidance provided by lecturers during scheduled hours and otherwise;
   - Component attendance requirements;
   - The provision of feedback to the student on assignments and reports submitted, and presentations given during the degree component.
4. If a student is prevented by force majeure from attending a required degree component, then the student must send written notification of his or her absence to the examiner and the study advisor as soon as possible. The examiner may, after consultation with the study advisor, give the student an alternative assignment.
5. Absence from degree components with required attendance is only allowed in the case of force majeure.
6. In the event of inadequate participation, either qualitative or quantitative, the examiner may exclude the student from further participation in the degree component or a part of the degree component. The details of the student's inadequate participation must be recorded in advance and approved by the Director of Studies.

Article 4.10 Maximum exemption

A maximum of 90 EC (including the Minor) of the curriculum can be accumulated through granted exemptions.

Article 4.11 Validity period for results

No further specific provisions to article 4.8 of TER part A.

Article 4.12 Degree

Students who have successfully completed the final examination and met all other requirements stipulated in the WHW will be given the degree of Bachelor of Science, abbreviated to BSc. The degree awarded is stated on the diploma. If it is a joint degree, this will also be stated on the diploma.

5. Electives

Article 5.1 Optional courses in Bachelor's programmes, first semester, third year

The credit requirement for the optional courses may be satisfied with:

1. a faculty minor sanctioned by the programme: 30 credits
2. a VU minor, also known as university minors. Examination Board approval is not required for these minors.
3. free choice subject to the following requirements:
    a. 30 credits of courses that do not overlap with courses from the regular (major) programme with regard to content and level
    b. 30 credits of courses with the following level requirements:
        i. within the major field of study: all courses at 300 level or higher,
        ii. outside of the major field of study: no more than 1 course at 100 level and at least two courses at 300 level
    c. units of study at a university abroad, which are then subject to the same requirements as stated above. Additionally, no more than 1 Master's course (6 credits) at 400 level or higher may be included, subject to approval by the relevant programme. This course may not be part of the examination programme of the Master's programme.
    d. In the case of a, b and c the optional courses must be submitted to the programme's Examination Board for approval.
4. The student does not need the prior approval of the Examination Board to take the following minor:

Minor Business Analytics

Course code	Course component	EC	Period	Level
X_401005	Business Modeling and Requirements Engineering	6	1	200
X_400614	Data Structures and Algorithms	6	1	200
X_401084	Service Logistics	6	2	300
XB_41001	Mathematical Optimization	6	2	300
X_401012	Heuristics	6	3	200

Article 5.2 Electives

Not applicable

Article 5.3 Other electives

If the student wishes to take a different subject than that stipulated in Article 5.1 or 5.2, advance permission must be obtained in writing from the Examinations Board.

6. Honours Programme

The Honours programme comprises 30 EC and consists of the following components:

a. Departmental courses, including Econometrics and OR, 12-18 EC
The following honours courses are offered in the Business Analytics programme:

Business Analytics

Course code	Course component	EC	Period
X_417011	Honours Project Business Analytics *	6	Ac. Year

* Compulsory part within the Honours Program Business Analytics

Mathematics

Course code	Course component	EC	Period
X_400298	Wiskundig Modelleren 1	3	3
X_401107	Grafentheorie	3	2
X_400386	Complexe Analyse	6	4+5
X_400299	Wiskundig modelleren 2	3	6
X_400020	Inleiding Dynamische Systemen	3	3

Computer Science

Course code	Course component	EC	Period
X_400083	Knowledge and Data	6	1

X_400487	Computer Networks	6	2
X_401047	Collective Intelligence	6	2
X_400435	Information Retrieval	6	2
X_401086	Intelligent Systems	6	3

Econometrics and OR

Course code	**Course component**	**EC**	**Period**
E_EOR2_ME1	Mathematical Economics I	6	1+2

b. Interdepartmental courses 12-18 EC
The description of the components is available at
www.vu.nl/nl/opleidingen/bacheloropleidingen/vu-honours-programme

7. Academic student counselling and advice regarding continuation of studies

Article 7.1 Academic student counselling

1. The academic student counselling on this programme consists of tutors and study advisors.

Article 7.2 Binding (negative) advice regarding continuation of studies (BSA)

1. At the end of the first year of registration at the latest, every student is issued with a recommendation from the Faculty Board with regard to the continuation of his or her studies.
2. If, at the end of the first year of registration, a student has earned fewer than 42 credits from the first-year curriculum of the degree programme, a negative recommendation on continuation of studies will be issued (i.e. expulsion), as stipulated in Article 7.8b, paragraphs 3 and 5 of the Act.
3. A negative recommendation on continuation of studies is binding and applies to the following Bachelor's degree programme offered by the faculty: Business Analytics.
4. A negative recommendation on continuation of studies also means that the student concerned may not register for the Bachelor's programme specified in the previous paragraph for a period of three academic years.
5. On request and in individual cases, the Dean may extend the period referred to in paragraphs 2 by a maximum period of one year, taking account of the student's personal circumstances. In this regard, the Dean may only weigh personal circumstances that have been reported to the study advisor or to one of the student counsellors, and in any case within two months of the onset of the personal circumstances.
6. Any student who terminates his or her enrolment during the first semester of the first year of registration and reports this to the Examination Board before 1 February will not be issued with a recommendation on continuation of studies. The termination of enrolment must take effect before 1 February.
7. The Dean draws up faculty regulations for recommendations on continuation of studies which detail all procedures.

8. Transitional and final provisions

Article 8.1 Amendments and periodic review of the Teaching and Examination Regulations

1. Any amendment to the Teaching and Examination Regulations will be adopted by the faculty board after taking advice, and if necessary approval by the Programme Committee concerned. A copy of the advice will be sent to the authorized representative advisory body.
2. An amendment to the Teaching and Examination Regulations requires the approval of the authorized representative advisory body if it concerns components not related to the subject of Section 7.13, paragraph 2 sub a to g and v of the WHW and as long as it does not involve the guidelines of the Executive Board.
3. An amendment to the Teaching and Examination Regulations is only permitted to concern an academic year already in progress if this does not demonstrably damage the interests of students.

Article 8.2 Transitional provisions

By way of departure from the Teaching and Examination Regulations currently in force, the following

transitional provisions apply for students who started the programme under a previous set of Teaching and Examination Regulations:

Not applicable.

Article 8.3 Publication

1. The faculty board will ensure the appropriate publication of these Regulations, and any amendments to them.
2. The Teaching and Examination Regulations will be posted on VUnet.

Article 8.4 Effective date

These Regulations enter into force with effect from 1 September 2017.

Advice from Programme Committee, on 20 April 2017

Advice from Examination Board of the Faculty of Science, on 10 November 2016

Approved by authorized representative advisory body, on 6 July 2017

Adopted by the Board of the Faculty of Science, on 21 July 2017.

Appendix I

List of articles that must be included in the OER pursuant to the WHW (articles in framed boxes):

Section A

Art. 1.1	7.13, para 1 WHW
Art. 2.3	7.29, para 2
Art. 3.2	7.13 para 2 sub e
Art. 4.2	7.13 para 2 sub h and l
Art. 4.3	7.13 para 2 sub n
Art. 4.4	7.13 para 2 sub o
Art. 4.5	7.13 para 2 sub j, h
Art. 4.7	7.13 para 2 sub r
Art. 4.8	7.13 para 2 sub k
Art. 4.9	7.13 para 2 sub p
Art. 4.10	7.13 para 2 sub q
Art. 4.11	7.13 para 2 sub a
Art. 5.1	7.13 para 2 sub v
Art. 6.1	7.13 para 2 sub u
Art. 6.2	7.13 para 2 sub f
Art. 6.3	7.13 para 2 sub f
Art. 6.4	7.13 para 2 sub f
Art. 6.5	7.13 para 2 sub m

Section B

Art. 1.2	7.13 para 2 sub i
Art. 2.1	7.13 para 1 sub b, c
Art. 2.2	7.13 para 2 sub c
Art. 3.1	7.25 para 4
Art. 3.2	7.29 para 2
Art. 4.1	7.13 para 2 sub a
Art. 4.4	7.13 para 2 sub e, h, j, l,
Art. 4.5	7.13 para 2 sub e, h, j, l,
Art. 4.6	7.13 para 2 sub t
Art. 4.7	7.13 para 2 sub s
Art. 4.9	7.13 para 2 sub d
Art. 4.11	7.13 para 2 sub k
Art. 7.2	7.13 para 2 sub f

Annex II

Additional prior education requirements for students with a foreign diploma.

1. A student will meet the prior education requirements if his/her diploma includes mathematics at a level commensurate with Mathematics B as taught in Dutch pre-university programmes (VWO), including at least 7 of the following 10 topics:
   a. Equations and inequalities
   b. Functions and graphs
   c. The derivative function
   d. Exponents and logarithms
   e. Trigonometric functions
   f. Differential calculus
   g. Exponential and logarithmic functions
   h. Integral calculus
   i. Trigonometry
   j. Derivative and second derivative

The topics listed above are specified in greater detail below.

2. An exemption from the required similarity in topics covered as provided for in paragraph 1 may be granted if the level of mathematics is demonstrably higher than Mathematics B at a Dutch pre-university school (VWO).

Specification of topics

a. Equations and inequalities
   - Quadratic Equations
   - Higher order equations
   - Equations with roots and fractions
   - Systems of equations

b. Functions and graphs
   - Linear functions
   - Quadratic functions
   - Change graphs (translations and multiplications)
   - Root functions
   - Fractional functions

c. The derivative function
   - Increment graphs
   - The differential quotient
   - Tangents and rates of change
   - Limit and derivative
   - Applications of the derivative (rate)

d. Exponents and logarithms
   - The standard function
   - Exponential growth
   - Logarithms
   - Applications of logarithms

e. Trigonometric functions
   - Unit circle and radial
   - Trigonometric equations
   - Sinusoidal transformations
   - Plotting sinusoids

f. Differential calculus
   - The derivative of fractional functions (product rule and quotient rule)
   - The derivative of power functions
   - The chain rule

- Tangents and apexes
- Apexes and intersections

g. Exponential and logarithmic functions
- Logarithmic and exponential equations
- Graphs of exponential and logarithmic functions
- Base e
- The natural logarithm

h. Integral calculus
- Riemann sums and integrals
- Surfaces and volumes (in revolutions around the X axis)
- Reduced functions
- Applications of integrals

i. Trigonometry
- Trigonometric formulas
- Differentials of trigonometric functions
- Reducing trigonometric functions

j. Derivative and second derivative
- The second derivative
- Applications of the second derivative
- Tangents in graphs
- Tangentials and perpendicular intersections