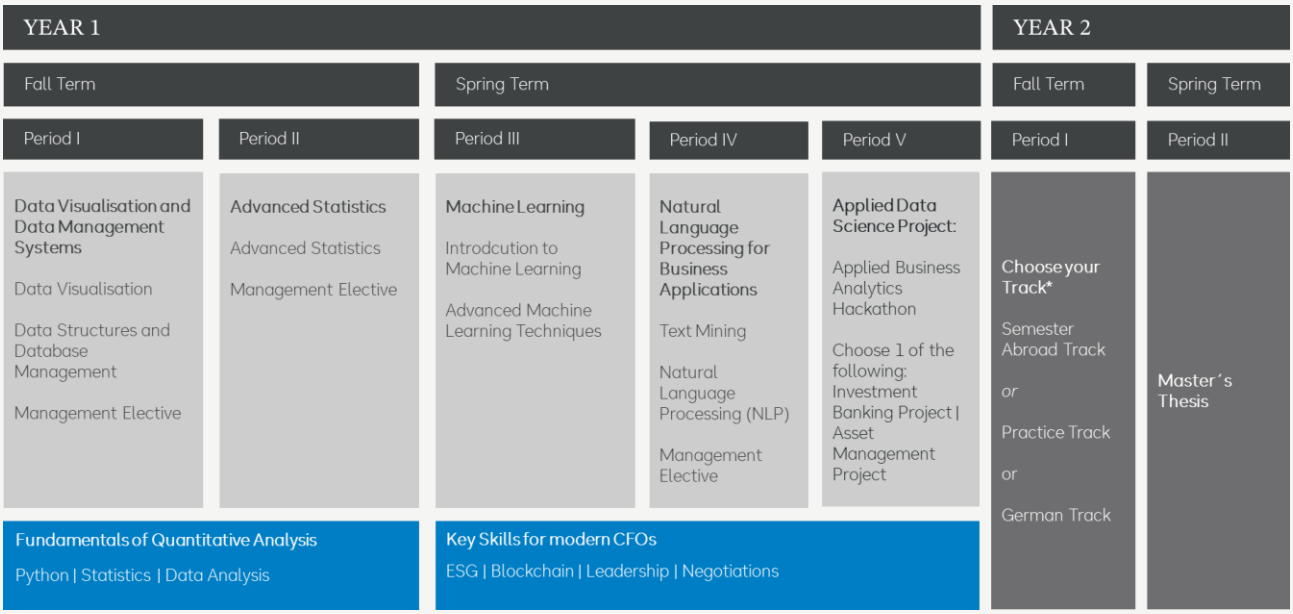


FACTSHEET | STUDY PROGRAMME

Master in Business Analytics MSc

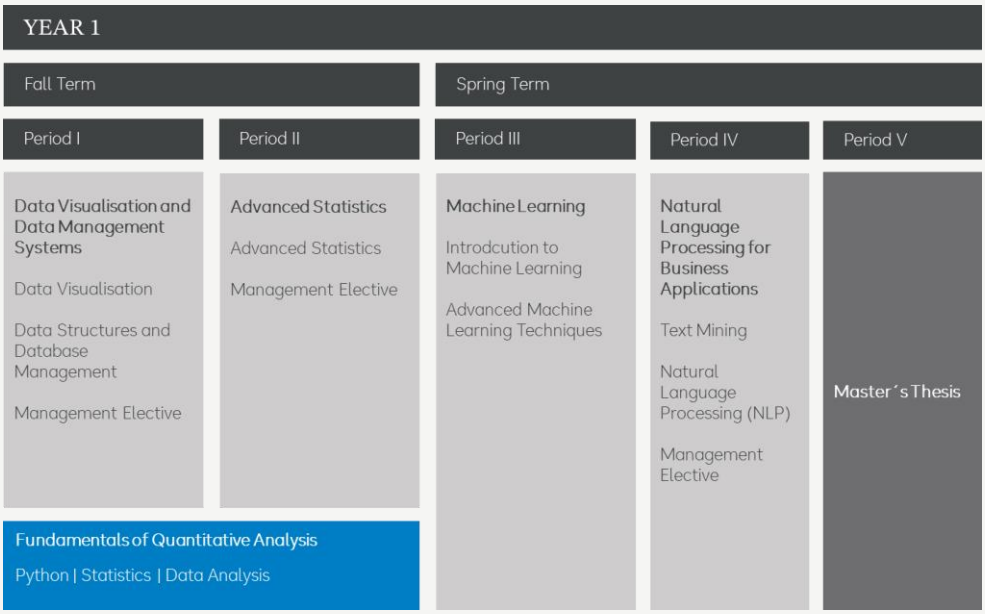
Course of studies 120 ECTS programme



*The German Track is only available for non-German speakers. There will be compulsory, curricular German Language courses included in this Track. The courses will be taught already from the beginning of the first year.



Course of studies 60 ECTS programme



Overview business analytics modules

Data Visualization and Data Management Systems	Mandatory Semester 1 Fall Term	This module covers two courses: / Data Visualization familiarises the students with tools which are widely used in business practices for visualization of data in the form of informative charts, which help with efficiently conveying data-based messages to business managers and policymakers / Data Structures and Database Management Systems familiarise the course participants with the basic structures of a database and discuss different and widely used structures of databases. This course focuses on constructing a database using SQL. Students will be able to organise data and extract relevant and necessary business information and indicators effectively, which could be used in decision-making processes at any business level.
Advanced Statistics	Mandatory Semester 1 Fall Term	This module focuses on advanced topics in statistics, which are widely used in machine learning and statistical learning. The topics this module covers are, among others, A review of hypothesis testing, estimating the CDF and statistical functionals, Bootstrapping, and Bayesian inference.
Fundamentals of Quantitative Analysis	Mandatory Semester 1 Fall Term	This module familiarises the students with the fundamental concepts required for conducting quantitative analyses and develops the quantitative skills of participants from theoretical and empirical perspectives.
Machine Learning	Mandatory Semester 2 Spring Term	The past decade has seen an unprecedented explosion in the amount of data collected by businesses. Commercial enterprises have been quick to recognize the strategic significance of extracting valuable information from these large quantities of data. This module offers a hands-on introduction to machine learning and data science.
Natural Language Processing for Business Applications	Mandatory Semester 2 Spring Term	This module constitutes an introduction to modern techniques in the field of natural language processing (NLP). NLP is the most broadly applied area of machine learning and is critical in effectively analyzing massive quantities of unstructured, text-heavy data. Recent developments in this area are very dynamic and include large pre-trained language models such as GPT-3 from OpenAI.

Applied Data Analytics Project	Mandatory Semester 2 Spring Term	The module consists of one 3 ECTS obligatory course that covers a range of topics, including ESG (environmental, social, and governance) principles, leadership and management techniques, blockchain technology, and effective negotiation strategies. Participants will gain a deep understanding of these key areas and learn how to apply them in real-world situations, enabling them to effectively support the financial goals of their organisations and drive positive change.

Module descriptions

Module	Course	ECTS	Elective | Mandatory	Module Content
Data Visualisation and Data Management Systems	Complete Module	9	Mandatory Semester 1 Fall Term	This module covers two courses: / Data Visualization / Data Structures and Database Management Systems.
	Data Visualisation	3	Mandatory	Data visualization is part of various fields like Data Science and Business Analysis. All jobs there are driven by datasets. Even non-speciality researchers can find insights into their data by managing tools like Tableau Software, QlikSense, or PowerBI. Like Excel became a reference in the early 90's, Dataviz tools are spreading. Every new worker needs to know the basics to be comfortable with Data Viz concepts such as dimensions and KPIs, discrete and continuous data, and common charts. The course covers the following topics: / Introduction to Data Visualization / Create data visualizations with Tableau Software / Overview of Tableau's advanced features / Overview of Tableau's advanced features and Final QCM
	Data Structures and Database Management Systems	3	Mandatory	The course introduces the basic concepts of database management systems (DBMS). It starts with providing a general understanding of database management systems and their evolutionary path. Afterwards, it focuses on relational database modelling. The course then moves to familiarise the students with SQL database language. The following topics are covered: / Database Systems / The Relational Model of Data / Basics of the Relational Model / Defining a Relation Schema in SQL / An Algebraic Query Language / Constraints on Relations / Design Theory for Relational Databases / Relational Database Programming

				⁄ The Database Language SQL ⁄ SQL in a Server Environment
Advanced Statistics	Complete Module	9	Mandatory Semester 1 Fall Term	When it comes to modelling, estimating causal effects, predicting, or making statistical decisions when facing real-world problems, generally, one would need to deviate from parametric and linear models.
	Advanced Statistics	9	Mandatory	This course focuses on advanced topics in statistics, which are widely used in machine learning and statistical learning. The course covers the following topics: ⁄ Review of hypothesis testing ⁄ Estimating the CDF and statistical functionals ⁄ Bootstrapping ⁄ Bayesian inference ⁄ Nonparametric curve estimation ⁄ Simulation methods
Fundamentals of Quantitative Analysis	Complete Module	9	Mandatory Semester 1 Fall Term	This module familiarises the students with the fundamental concepts required for conducting quantitative analyses and develops the quantitative skills of participants from theoretical and empirical perspectives.
	Statistics	3	Mandatory	This course makes the students familiar with the fundamental concepts of probability theory and statistics. The course starts with introducing probability spaces and elementary calculus with probabilities. It then discusses univariate and multivariate random variables and focuses on their properties and representations. When introducing multivariate random variables, topics like marginal and conditional distributions will be discussed. Mathematical expectation and its conditional version will then be used to discuss how to model and uncover the so-called "average dependencies" among different random variables. Classical Law of Large Numbers and Central Limit Theorem will then be discussed to prepare the course participants to conduct simple inference tasks focusing on point estimation as well as confidence sets. This course covers Probability Spaces, Random Variables, Expectation Operator, Estimation, Law of Large Numbers and Central Limit Theorem, and Sampling distribution and hypothesis testing.
	Python	3	Mandatory	The main purpose of this course is to familiarize the student with basic concepts of programming in Python, the most important language used by data scientists now. This prepares the student for further courses,

				particularly Econometrics, Data Science and Machine Learning.
	Econometrics	3	Mandatory	This course introduces the classical econometric tools used in the analysis of financial data. The lectures start with a discussion of regression analysis techniques, which are also applied to different financial series and questions. The methods conventionally used to analyse dynamic systems are introduced and applied to different financial and economic systems. Forecasting financial series will also comprise an important part of the lecture, where the limitations and the merits of widely used forecasting models will be highlighted. Furthermore, the course will cover models for estimating and forecasting volatility and discuss how volatility can be used as a generic measure of risk. Nonstationary models for time series are the next topic covered. Finally, the course will turn to CAPM and test its implications empirically. All the empirical examples will be carried out using Python. Students will learn to empirically implement theoretical models and test them on real-world data using Python. The topics covered in this course are, among others, Regression analysis, Time series models and forecasting, and Nonstationary models.
Machine Learning	Complete Module	9	Mandatory Semester 2 Spring Term	The past decade has seen an unprecedented explosion in the amount of data collected by businesses. Commercial enterprises have been quick to recognise the strategic significance of extracting valuable information from these large quantities of data. This module offers a hands-on introduction to machine learning and data science. The objectives of this course are: / Understand the complexity of Machine Learning algorithms and their limitations / Understand modern notions in data analysis-oriented computing / Be capable of confidently applying common Machine Learning algorithms in practice and implementing their own / Be capable of performing distributed computations / Be capable of performing experiments in Machine Learning using real-world data.
	Introduction to Machine Learning	6	Mandatory	The following topics will be covered in this course: / Introduction to ML / Matplotlib and Visualization Introduction to supervised learning; Pre-processing / Regression Analysis; Classification, SVMs / Trees, Forests & Ensembles; Gradient Boosting, Calibration

				⁄ Learning with Imbalanced Data ⁄ Feature Selection; Parameter tuning ⁄ Dimensionality Reduction; Clustering and mixture models ⁄ Outlier Detection: Working with text data ⁄ Topic models (LDA) ⁄ A. Neural Nets; B. Recurrent Neural Nets and C. Convolutional Neural Nets ⁄ Summary and Pitch (preparation)
	Advanced Machine Learning Techniques	3	Mandatory	Advanced topics in machine learning, including Linear Modeling, Nonlinear Dimension Reduction, Maximum Entropy, Exponential Family Models, Conditional Random Fields, Graphical Models, Structured Support Vector Machines, Feature Selection, Kernel Selection, Meta-Learning, Multi-Task Learning, Semi-Supervised Learning, Graph-Based Semi-Supervised Learning, Approximate Inference, Clustering, and Boosting.
Natural Language Processing for Business Applications	Complete Module	9	Mandatory Semester 2 Spring Term	This module constitutes an introduction to modern techniques in the field of natural language processing (NLP). NLP is the most broadly applied area of machine learning and is critical in effectively analyzing massive quantities of unstructured, text-heavy data. Recent developments in this area are very dynamic and include large pre-trained language models such as GPT-3 from OpenAI.
	Text Mining	3	Mandatory and Elective	Text Mining is a course that covers the techniques and methods used to extract insights and information from unstructured text data. The course provides a comprehensive overview of the key concepts and methods in text mining, including: ⁄ Text Pre-processing ⁄ Feature Extraction ⁄ Text Classification ⁄ Clustering ⁄ Topic Modelling The course will include hands-on exercises and projects to help students apply what they have learned to real-world text data.
	Natural Language Processing (NLP)	3	Mandatory	Natural Language Processing (NLP) is a course that covers the computational methods and techniques used to analyse and understand human language. This course provides a comprehensive overview of the key concepts and methods in NLP, including: ⁄ Part-of-Speech Tagging ⁄ Named Entity Recognition ⁄ Parsing and Dependency Analysis ⁄ Sentiment Analysis

				⁄ Text Summarization ⁄ Text Generation The course will include hands-on exercises and projects to help students apply what they have learned to real-world NLP problems.
Applied Data Analysis Project **Choose 1 out of 2 Elective Courses**	Complete Module	15	Mandatory and Elective Semester 2 Spring Term	The module consists of one mandatory course, and students must choose 1 out of 2 elective courses. Participants will gain a deep understanding of these key areas and learn how to apply them in real-world situations, enabling them to effectively support the financial goals of their organisations and drive positive change.
	Key Skills for a Moder Financial Professional	3	Mandatory	The module consists of one 3 ECTS obligatory course that covers a range of topics, including ESG (environmental, social, and governance) principles, leadership and management techniques, blockchain technology, and effective negotiation strategies. Participants will gain a deep understanding of these key areas and learn how to apply them in real-world situations, enabling them to effectively support the financial goals of their organisations and drive positive change.
	Applied Business Analytics Hackathons	3	Mandatory	In this course, students are engaged in a data challenge in which they get a direct opportunity to create social and business value for the partners of a hackathon by leveraging and applying their business and technical skills for real-world applications. Their analytics and cognitive computing knowledge should enable them to support organisations in major changes. The Applied Business Analytics Hackathon course is designed to provide students with hands-on experience applying data science techniques to real-world problems. Through a combination of lectures, discussions, and individual and group projects, students will learn how to collect, analyse, and interpret data to identify patterns, trends, and insights that can inform decision-making and drive business success.
	Wealth Creation through Active Asset Allocation	6	Elective	Wealth Creation through Active Asset Allocation course is designed to give students an in-depth understanding of the principles and practices of active and passive asset management. Students will learn about portfolio construction, risk management, and investment strategies and will have the opportunity to apply these concepts through hands-on projects in collaboration with our corporate partners. Students will master the analytic tools and the financial theory for making smart investments in stocks, but they will also get their hands

				dirty with the data. Over the course of the module, students will learn about predictive regressions, Fama and Macbeth regressions, and Fama-French regressions and will have the opportunity to apply these methods to a variety of real-world data sets.
	Corporate Finance and Investment Banking	6	Elective	The Applied Corporate Finance Project focuses on the roles and responsibilities of investment banks and other financial institutions in the world of corporate finance. Students will learn about financial analysis, valuation, and deal structuring and will have the opportunity to work on real-world case studies. In this course, we will use classical and the most recent financial theory to solve real-world problem sets faced by financial service firms like consultants, investment and commercial banks, finance departments of firms, etc. The course uses an applied, hands-on approach. Topics can be from all areas of corporate finance (e.g., M&A, restructuring, financial risk management, securitization).

Notice: Please note that the names and content of the modules described in this factsheet are subject to updates and modifications at the discretion of the university.



WE ARE HERE FOR YOU

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