Catalogue report

LUT School of Engineering Science (23B3)

Master's Programme in Business Analytics

Degree programmes in Industrial Engineering and Management for Master of Science in Technology (120 ECTS credits) 2018-19

- The degree is called Master of Science in Technology (M.Sc. Tech.), Diplomi-insinööri (DI) in Finnish
- A higher university degree, giving the students eligibility to apply for scientific doctoral studies
- A total of 120 ECTS credits
- Duration two years, full-time studies of 60 ECTS credits per academic year.

Learning outcomes of the Master's programme in Business Analytics (MBAN) in the academic year 2018-19

The Master's programme in Business Analytics educates experts in analytics and decision-making with an understanding of the business landscape and needs for the service of industrial companies, commercial, and public organizations.

The graduates from the programme have a good understanding of various analytics and decision-support methods, solid hands-on experience of using relevant software to solve real world problems, and the competence to work in development and expert tasks. They have the ability and the will to work in an international environment, and to act in a sustainable and an ethical way. They also have what it takes to develop and enhance their own competencies further.

After completing the degree, the graduate can:

- use business analytics methods and software in practice
- apply data-analysis and machine learning methods in solving industrial and business problems
- model industrial and business processes and perform simulation analyses to study and to enhance them
- make logical conclusions and recommendations in strategic decision-making situations based on output from decision-support methods
- interpret analysis results and present them visually
- renew business architecture with components from digital analytics
- plan and manage development and projects based on business-analytics
- apply new scientific knowledge and methods to develop their competence further
- evaluate and interpret analytics related projects and their compatibility in problem solving
- spar working community related to analytics, based on analytical methods related knowledge.

Degree structures

The Degree structure in Business Analytics in academic year 2018-19

Master of Science in Technology (120 ECTS credits), Industrial Engineering and Management

Core studies 16 ECTS credits
Specialisation studies 104 ECTS credits (min.)

Master's Programme in Business Analytics 2018-19

Degree structure status: accepted

Academic year: 2018-19

Beginning date of the academic year: 01.08.2018

Core Studies (min 16 cr)

If a student has completed some core course during the B.Sc. degree, she/he will be relieved of that course and further, she/he has to choose elective studies to attain min. 120 ECTS cr in M.Sc. degree.

TuDMBan: Core Studies, 16 cr
Obligatory
BM20A5001: Principles of Technical Computing, 4 cr
A210A0601: Information Systems in Corporate Management and Decision-making, 6 cr
A220A0053: Investment and Business Analysis with Excel, 6 cr

Specialisation studies (min 104 cr)

Please note that you can include in the Elective Specialization Studies (min. 14 ECTS) of the Business Analytics programme also 1-3 ECTS credits of the Mathworks online self-study course Financial Toolkit.

The course consists of three options, of which you can choose 1-3 options:

- MATLAB for Financial Applications (1 ECTS cr),
- MATLAB Programming Techniques (1 ECTS cr) and/or
- MATLAB for Data Processing and Visualization (1 ECTS cr)

You can use LUT's Mathworks study license for free.

For more information, please contact Professor Pasi Luukka.

Mathworks webpages for the courses: https://matlabacademy.mathworks.com

To include the Mathworks course credits in your degree, please fill in the credit transfer form in the Uni Portal (see https://uni.lut.fi/en/web/lut.fi-eng/forms1, Uni/ Studies/ Instructions, Regulations and Forms/ Forms/ Credit Transfer) and send it to your study counsellor.

TuDSpecBusAn: Business Analytics Specialisation Studies, 90 - 104 cr
Compulsory specialisation studies 90 ECTS cr
BM20A6500: Simulation and System Dynamics, 6 cr
CS38A0020: Optimization in business and industry, 6 cr
A220A0752: Analytics for Business, 6 cr
CS38A0040: Marketing analytics, 6 cr
CS38A0060: Fuzzy sets and fuzzy logic, 6 cr
CS38A0050: Big data in business and industry, 6 cr

BM20A6100: Advanced Data Analysis and Machine Learning, 6 cr
A220A0550: Advanced Decision-making, 6 cr
A210A0350: Real Options and Managerial Decision Making, 6 cr
CS38A0070: Fuzzy data analysis, 6 cr
CS90A0060: Master's Thesis, 30 cr

Elective specialisation studies min. 14 ECTS cr

A220A0000: Financial Econometrics, 6 cr
BM40A0801: Machine Vision and Digital Image Analysis, 6 cr
BM40A0701: Pattern Recognition, 6 cr
A365A0320: Computational Data Analytics in Business Management, 6 cr
CS31A0720: Basics of ERP systems, 6 cr

Free Elective Studies

If a student is relieved of some core study courses on the basis of the B.Sc. studies, he/she shall choose enough courses to attain the min. of 120 ECTS in the M.Sc. degree.

If the student needs free elective studies, it is recommended that he/she selects the courses from the elective specialisation studies list or considers the courses **CT60A4303 Tietokantojen perusteet** (taught in Finnish) or **CT60A7650 Database Systems Management,** if he/she doesn't have previous experience in databases.
Free elective studies can be any courses offered by LUT if the required prerequisites are fulfilled.

Course descriptions

Descriptions of courses and study modules included in the degree structures

TuDMBan: Core Studies, 16 cr

Validity: 01.08.2018 -
Form of study:
Type: Study module
Unit: LUT School of Business and Management
Grading: Study modules 0-5,P/F

No course descriptions.

Obligatory

BM20A5001: Principles of Technical Computing, 4 cr

Validity: 01.08.2014 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Engineering Science
Grading: Study modules 0-5,P/F
Teachers: Matylda Jablonska-Sabuka

Year:

B.Sc. (Tech.) 2., M.Sc. (Tech.) 1

Period:

1

Teaching Language:

English

Teacher(s) in Charge:

D.Sc. (Tech.) Matylda Jablonska-Sabuka

Aims:

Students get a good understanding of Matlab syntax and programming, gain fluency in principles of technical computing and are able to apply the skills to basic mathematical and engineering problems (the skills are applicable in big part to Octave and R programming, too).

Contents:

Working with various data structures (multidimensional arrays, cell arrays, etc.) and variable types (numeric, logical, textual, etc.), Matlab symbolic functionality, conditional statements (if-else, switch-case), loops (for and while), using built-in functions, handling external data, 2-D and 3-D plotting, writing user-defined functions, optimization of code speed, style and efficiency.

Teaching Methods:

Lectures 12 h, computer class exercises 24 h, independent study 30 h, preparation for exam 34 h, 1st period. Total 100 h. EXAM-tentti.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

Yes

Assessment:

0-5, examination 100 %.

Course Materials:

Lecture material available in Moodle, based partly on textbook: Gilat, A.: An Introduction to Matlab with Applications.

Prerequisites:

Basic university calculus required. Recommended first year university calculus necessarily including matrix calculus.

Places for exchange-students? (Yes, number/No):

max 10

Places for Open University Students?(Yes, number/No):

max 5

A210A0601: Information Systems in Corporate Management and Decision-making, 6 cr

Validity: 01.08.2014 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Business and Management

Grading: Study modules 0-5,P/F

Teachers: Mikael Collan

Note:

Weekly quizzes that will be open for three days each week.

Year:

M.Sc. (Econ. & Bus. Adm.) 1

Period:

2

Teaching Language:

English

Teacher(s) in Charge:

professor, D.Sc. (Econ. & Bus. Adm.) Mikael Collan

Aims:

The aim of the course is to give extensive general knowledge about corporate information systems and how they are used in corporate decision-making, business control, and as a driver of business development. After the course the students: have an understanding of the corporate information systems stack and the most common types of corporate information systems and where they are used, are able to view a business as a system and its parts as parts of a system, know how information systems can collect, summarize, and analyze corporate information, understand what the practice of fact based management is based on and how it is connected to information systems, know the concept of intelligent systems, know selected methods and tools, understand the types of results that they can provide, and the importance of such results for, for example, making the business more effective through optimization, can identify situations where information systems can be used to develop business practices

Contents:

Core content: corporate information stack, business intelligence
Additional content : controlling in a modern corporation based on IS, intelligent systems in business process development, concepts of optimization, machine learning, neural networks, simulation, and fuzzy logic
Special content: importance of visualizing knowledge

Teaching Methods:

Lectures 20 h, independent reading assignments (articles), essay writing, and preparation for lectures 53h. Peer essay evaluation 2h, Quizzes, written exam and preparation for the quizzes and the exam 85 h. Total workload for the student 160 h.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

Grade 0-5, evaluation 0-100 points, Quizzes 40%, Essay 20%, Written exam 40%.

Course Materials:

Lecture slides, lecture videos, assigned video material, assigned reading, collection of articles. All materials will be available via Moodle.

Prerequisites:

For master´s level students only

Places for exchange-students? (Yes, number/No):

15–

Places for Open University Students?(Yes, number/No):

max 5

A220A0053: Investment and Business Analysis with Excel, 6 cr

Validity: 01.01.2018 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Business and Management

Grading: Study modules 0-5,P/F

Teachers: Azzurra Morreale, Mariia Kozlova

Note:

The course requires practicing Excel and self-study on top of the exercises and lectures. If the course enrollment is more than the course maximum, then students are accepted in the following order: students from MSF and MBAN programmes, other master's programme students, other students.

Year:

M.Sc. (Econ. & Bus. Adm.) 1

Period:

3

Teaching Language:

English

Teacher(s) in Charge:

D.Sc. (Econ. & Bus. Adm.), Post-doc researcher Mariia Kozlova
D.Sc. (Eng.), Post-doc researcher Azzurra Morreale

Aims:

After the course the students:
- are able to prepare and handle data ina spreadsheet environment performing tasks such as data classification and ordering
- are able to plan and perform various business and finance related analyses
- know how to create simple models for optimization and to perform statistical analyses on data.

Contents:

Planning and performing various analyses relevant to business and corporate finance, simple optimization and statistical analyses, importing data into the spreadsheet from other software, creating graphics for reporting results.

Teaching Methods:

Seminars 10 h, preparing for the course with reading and video materials 20 h, independent exercise work 70 h, course project 50h, peer to peer evaluation 10 h. Total workload for the student 160h. Moodle is used in this course.

Examination in Moodle (Yes/No):

Yes.

Examination in Exam (Yes/No):

No

Assessment:

Grade pass-fail, evaluation 0-100 points, exercises 70%, course project 30%.

Course Materials:

Lecture materials, video materials, assigned reading Beginning Excel What-If Data AnalysisTools: Getting Started with Goal Seek, Data Tables, Scenarios, and Solver, PaulCornell, 2006, Apress - available as an eBook in the library database.

Prerequisites:

Lecture materials, video materials, assigned reading Beginning Excel What-If Data AnalysisTools: Getting Started with Goal Seek, Data Tables, Scenarios, and Solver, PaulCornell, 2006, Apress - available as an eBook in the library database.

Limitation for students? (Yes, number, priorities/Leave empty):

Yes, max 200 students. Order of priority: students from MSF and MBAN programmes, other master's programme students, other students.

Number of exercise groups where enrollment is in WebOodi (Number/Leave empty):

4

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

No

TuDSpecBusAn: Business Analytics Specialisation Studies, 90 - 104 cr

Validity: 01.08.2017 -
Form of study:
Type: Study module
Unit: LUT School of Business and Management
Grading: Study modules 0-5,P/F

No course descriptions.

Compulsory specialisation studies 90 ECTS cr

BM20A6500: Simulation and System Dynamics, 6 cr

Validity: 01.08.2017 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Engineering Science
Grading: Study modules 0-5,P/F
Teachers: Virpi Junttila, Azzurra Morreale

Year:

M.Sc. (Tech.) 1

Period:

2-3

Teaching Language:

English

Teacher(s) in Charge:

Post-Doctoral Researcher, D.Sc. (Tech.) Virpi Junttila
Post-Doctoral Researcher, Ph.D. Azzurra Morreale

Aims:

The course gives an introduction to the concepts of discrete and continuous simulation models and methods together with numerical examples. After the course, the student is able to create and use different simulation models to solve practical problems. Among the discrete-event based models, the student is able to model basic queuing, server, scheduling

and storage size problems. Also, the student is able to create basic operations and model dynamic systems with Simulink and use Simulink to solve different simulation problems.

Contents:

Basic concepts of discrete and continuous systems. Model-based design, basic modeling work-flow, basic simulation work-flow, running the simulations and interpreting the results. Random numbers, discrete event generation by random numbers. Statistical and empirical distributions for event generation. Building numerical simulation examples with Matlab and Simulink. Modeling dynamics systems and simulation models for dynamic systems with Simulink.
Application examples: queuing systems, storage size optimization, profitability analysis, supply chain management, investment analysis

Teaching Methods:

Lectures 21 h, exercises 14 h, homework 21 h, 2nd period. Lectures 21 h, exercises 14 h, homework 21 h, 3rd period. Practical assignment 22 h, preparation for examination and the examination 22 h, 2nd-3rd period. Total 156 h.

Suitability for doctoral studies (Yes/Leave empty):

Yes

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0-5, examination 80 %, homework and practical assignment 20 %.

Course Materials:

Course material is given in the course homepage.

Prerequisites:

Recommended BM20A1401 Tilastomatematiikka I and BM20A5001 Principles of Technical Computing.

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

max 15

CS38A0020: Optimization in business and industry, 6 cr

Validity: 01.08.2017 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Business and Management
Grading: Study modules 0-5,P/F
Teachers: Pasi Luukka, Sirkku Parviainen

Year:

M.Sc. 1.

Period:

4

Teaching Language:

English

Teacher(s) in Charge:

Pasi Luukka, D.Sc. (Tech.), Associate Professor
Sirkku Parviainen, Lic.Phil., Lecturer

Aims:

By the end of the course student will be able to
- select/ employ mathematical models for various optimization problems
- use optimization software
- interpret information from optimization results
- understand the basic principles of different optimization algorithms for linear, mixed-integer linear, and nonlinear optimization

Contents:

Formulation of optimization models. Linear programming and mixed-integer linear programming, nonlinear optimization algorithms.
Solving optimization problems using Matlab Optimization Toolbox. Business and industry oriented practical examples, i.e. factory, warehouse, sales allocation models etc.

Teaching Methods:

Lectures 28 h, exercises 28 h, 4th period. Independent study 74 h, practical assignment 30 h. Written examination. Total work load 160 h.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0-5, examination 100 %

Course Materials:

Taha, H.A.: Operations Research an introduction, 8th edition, Pearson/Prentice-Hall, 2007.
Hillier, F.S., Lieberman, G.J.: Introduction to Operations Research, 8th edition, McGraw-Hill, 2004.

Prerequisites:

Experience in programming or using mathematical software required.
BM20A4301 Johdatus tekniseen laskentaan or BM20A5001 Principles of Technical Computing

Number of exercise groups where enrollment is in WebOodi (Number/Leave empty):

2

Places for exchange-students? (Yes, number/No):

Yes, max 15

Places for Open University Students?(Yes, number/No):

Yes, max 10

A220A0752: Analytics for Business, 6 cr

Validity: 01.01.2017 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Business and Management

Grading: Study modules 0-5,P/F

Teachers: Azzurra Morreale

Year:

M.Sc. (Econ. & Bus. Adm.) 1-2

Period:

4

Teaching Language:

English

Teacher(s) in Charge:

Post- doctoral researcher, Azzurra Morreale

Aims:

This course enables to learn a significant understanding of data science: the fundamental concepts and principles that underlie techniques for extracting useful knowledge from data. These concepts underlie the analysis of data-centered business problems, the creation and evaluation of data science solutions, and the evaluation of general data science strategies, and proposals. Through several practical examples, at the end of the course the student will acquire a broad range of techniques and practical skills to independently plan and create analysis tools able to finding anomalies, patterns and correlations within large data sets to predict outcomes. Students will be also able to put some models and analysis methods into use with MATLAB and EXCEL.

Contents:

Core content: Data understanding and data preparation, supervised learning (decision-trees, linear regressions, logistic regression, super vector machine), unsupervised learning (clustering methods)
Additional content: neural networks (self-organizing map)
Special content: Performance measure and overfitting: (Roc curve, area under Roc (Auc), confusion matrix, cross-validation)

Teaching Methods:

Lectures and exercises 35 h, reading materials and preparation for the exam (75 h). Course work (50 h). Total workload for the student 160 h.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

Yes

Examination in Exam (Yes/No):

No

Assessment:

During the course the will be several single assignments (50%), where the illustrated methods are applied to new data and a group assignment (50%), where in a seminal paper, at the end of the course, the group will work on a real case study.

Course Materials:

Lecture materials, Assigned reading, Course book
Data Science for Business : What you need to know about data mining and data-analytic thinking, by Foster Provost, Tom Fawcett, 2013- available as an eBook in the library database
Moro S., Cortez. P. and Rita P. (2014). A Data-Driven Approach to Predict the Success of Bank Telemarketing. Decision Support System, 22-31.
Collan M., Ekulnd T., Back. (2007). Using the Self-Organizing Map to Visualize and Explore Socio-Economic Development. EBS Review.
Huysmans J, Baesens B, Vanthienen J, van Gestel T (2006). Failure prediction with self organizing maps. Exp Syst Appl 30:479–487

Prerequisites:

Principles of technical computing course (BM20A5001) or the same in Finnish. is required. Only for master degree students.

Places for exchange-students? (Yes, number/No):

15–

Places for Open University Students?(Yes, number/No):

No

CS38A0040: Marketing analytics, 6 cr

Validity: 01.08.2017 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Business and Management

Grading: Study modules 0-5,P/F

Teachers: Jyrki Savolainen

Note:

If the course enrollment is more than the course maximum, then students are accepted in the following order: students from MBAN programme, students from MIMM programme, other master's programme students, other students.

Year:

M.Sc. (Tech) 1

Period:

4

Teaching Language:

English

Teacher(s) in Charge:

Jyrki Savolainen, D.Sc.(Econ. & Bus. Adm.), Post-doc researcher

Aims:

The aim of the course is to offer extensive knowledge on the use of various analytical techniques in marketing. The students will be introduced to the process of decision support in marketing using analytics in various typical problems. Through several practical examples, the course aims to provide the tools that focus on data understanding and preprocessing, modelling choices and implementation until the interpretation, visualization and utilization of the analysis in various marketing-related problems. The course will provide hands-on lectures to using the various methodologies with the selected software environments. After the course the students: have an understanding of the process of performing marketing analytics, know how to collect, understand and preprocess data to be used in marketing problems, know the most important applications and can identify the appropriate tool for a specific problem, are capable of performing marketing analytics using software, understand the role of big data in marketing.

Contents:

Core content: role of data in modern marketing, traditional methods (clustering, forecasting, market-basket analysis), machine learning-based methods in marketing (recommendation systems, advertising on the web)
Additional content: social network analysis, sentiment analysis
Special content: use of the introduced methods with relevant software

Teaching Methods:

Lectures 20 h, computer room tutorials 10 hours, course assignments involving data analysis with software 75h. Written exam and preparation for the exam 55 h. Total workload for the student 160 h.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

Course assignments (70% of the grade), written examination (30% of the grade), grading 0-5.

Course Materials:

The course will largely be based on the free online book (http://www.mmds.org/)
Leskovec-Rajaraman-Ullman: Mining of Massive Datasets
Additional material will be distributed during the course via Moodle.

Prerequisites:

The course will use an analytics capable software (to be announced later; Matlab or R, perhaps even Excel) - the students are expected to know how to use the software. Basic knowledge in statistics.

Limitation for students? (Yes, number, priorities/Leave empty):

Yes. 50, priority to MBAN students (Masters program in business analytics), then students from MIMM programme, other master's programme students, other students.

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

No

CS38A0060: Fuzzy sets and fuzzy logic, 6 cr

Validity: 01.01.2018 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Business and Management

Grading: Study modules 0-5,P/F

Teachers: Pasi Luukka

Year:

M.Sc. (Tech) 2.

Period:

1-2

Teaching Language:

English

Teacher(s) in Charge:

Pasi Luukka, D.Sc. (Tech.), Professor

Aims:

By the end of the course student will be able to

- understand basic mathematical concepts related to fuzzy set theory and fuzzy logic
- model uncertain concepts using fuzzy set theory
- construct fuzzy models
- deduce meaningful information from fuzzy models

Contents:

The course consists of basics of fuzzy set theory, some algebras of fuzzy sets, fuzzy quantities, logical aspects of fuzzy sets, operations of fuzzy sets, fuzzy relations, fuzzy compositional calculus, aggregation operators, possibility theory, fuzzy inference systems.

Teaching Methods:

Lectures 14 h, tutorials 7 h, exercises 14 h, 1st period. Lectures 14 h, tutorials 7 h, exercises 14 h, 2nd period. Independent study 90 h. Written examination. Total workload 160 h.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0-5, examination 100 %.

Course Materials:

Klir, G., Yuan, B.: Fuzzy Sets and Fuzzy Logic. Theory and Applications, Prentice Hall, 1995.
Fullér, R.: Introduction to Neuro-Fuzzy Systems, Physica-Verlag, 2000.

Prerequisites:

Bachelor level mathematics courses:
BM20A6700 Matematiikka I, osa A , BM20A6800 Matematiikka II, osa A, BM20A6900 Matematiikka III
Experience in programming or using mathematical software required:
BM20A4301 Johdatus tekniseen laskentaan or BM20A5001 Principles of Technical Computing

Number of exercise groups where enrollment is in WebOodi (Number/Leave empty):

1

Places for exchange-students? (Yes, number/No):

max 10

Places for Open University Students?(Yes, number/No):

max 10

CS38A0050: Big data in business and industry, 6 cr

Validity: 01.08.2017 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Business and Management

Grading: Study modules 0-5,P/F

Teachers: Jyrki Savolainen

Year:

M.Sc. (Tech.) 2

Period:

1

Teaching Language:

English

Teacher(s) in Charge:

Jyrki Savolainen, D.Sc., Post-Doctoral Researcher
(Jozsef Mezei, D.Sc., Research Fellow)

Aims:

The course discusses the most important new tools for understanding the potential impact of big data analytics on decision making and business performance. Through analyzing typical business decision

problems from the perspective of data requirements, the course discusses the role of big data analytics in modern organizations. After the completion of the course, the students: know the most important technological requirements of performing big data analytics, understand the role of big data in transforming modern organizations through data driven decision making, understand the impact of data volume, variety, and velocity, understand how to create value with big data, become familiar with the techniques and tools for capturing, processing, and interpreting big data, know the most important methods to reduce big data sets by extracting the most important information, are familiar with several real-world scenarios of big data use from different business sectors, understand the role of big data in creating business value, know how to apply the discussed concepts and tools to business projects.

Contents:

Core content: big data technology, data and dimension reduction, role of data driven decision making in modern organizations.
Additional content: machine learning methods for big data analytics, network analysis
Special content: text analytics

Teaching Methods:

Lectures 20 h, computer room tutorials 10 hours, course assignments involving big data analysis (using relevant software) 75 h. Written exam and preparation for the exam 55 h. Total workload for the student 160 h.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

Course assignments (70% of the grade), written examination (30% of the grade), grading 0-5.

Course Materials:

The following two books cover several topics introduced in the course:
Thomas Davenport, 2015: Big Data at Work
The rest to be annouced later.
Additional material will be distributed in the course.

Prerequisites:

The course will rely on using software, relevant knowledge of the used software required; TBA (Matlab or R)
Basic knowledge in statistics.

Limitation for students? (Yes, number, priorities/Leave empty):

60

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

No

BM20A6100: Advanced Data Analysis and Machine Learning, 6 cr

Validity: 01.08.2015 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Engineering Science

Grading: Study modules 0-5,P/F

Teachers: Heikki Haario, Lasse Lensu

Year:

M.Sc. (Tech.) 2

Period:

1-2

Teaching Language:

English

Teacher(s) in Charge:

Professor, Ph.D. Heikki Haario, Professor, D.Sc. (Tech.) Lasse Lensu

Aims:

The student can pre-process, visualise and analyse multivariate synthetic and real-world data. The student is able to understand and use state-of-the-art regression methods, graphical models and deep learning. The student can use selected methods to solve a practical assignment, analyse the results and report the findings.

Contents:

Characteristics of data sources, and data pre-processing, dimensionality reduction and outlier detection. Principal component and other advanced regression methods. Graphical models and Bayesian networks. Deep learning and convolutional neural networks. Case-based topics on advanced data analysis by visiting lecturers.

Teaching Methods:

Preparation for lectures 7 h, lectures 14 h, preparation for exercise 21 h, exercises 14 h, 1st period. Preparation for lectures 7 h, lectures 14 h, preparation for exercise 21 h, exercises 14 h, practical assignment 36 h, 2nd period. Self-study 5 h. Exam 3 h. Total amount 156 h.

Suitability for doctoral studies (Yes/Leave empty):

Yes

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0-5, exam 50 %, exercises 25 %, practical assignment 25 %.

Course Materials:

Lecture notes in Moodle. Other literature will be announced when the course starts.

Prerequisites:

Recommended: BM20A1901 Statistics II, BM20A2701 Numerical Methods II, BM20A3001 Statistical Analysis in Modelling, BM40A0700 Pattern Recognition or equivalent knowledge.

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

max 5

A220A0550: Advanced Decision-making, 6 cr

Validity: 01.08.2014 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Business and Management

Grading: Study modules 0-5,P/F

Teachers: Jan Stoklasa

Note:

If the course enrollment is more than the course maximum, then students are accepted in the following order: students from the MBAN and MSF programmes, other master´s programme students, other students.

Year:

M.Sc. (Econ. & Bus. Adm.) 2

Period:

3

Teaching Language:

English

Teacher(s) in Charge:

D.Sc. (Tech.) Jan Stoklasa

Aims:

The students learn principles of some modern methods for multiple criteria decision-making, decision analysis, and about systems for supporting decision-making. Students learn about the history of decision-support and operational research and understand that there is a constant evolution in decision support methods. Students are able to understand the benefits of modern decision-support methods in real world business situations. Students can put some models and analysis methods into use with MATLAB or Excel, where applicable and solve real-life decision-making problems using the methods.

Contents:

Core content: This course covers the main topics of multiple criteria decision making under certainty, uncertainty and risk. The topics discussed during the course therefore include: principles of decision making under certainty, uncertainty, risk and ignorance, multiple criteria decision-making (MCDM) and evaluation methods (TOPSIS, AHP), the use evaluations of absolute and relative type, efficiency assessment models (DEA), game theory (non-cooperative games of two players, cooperative games of two players with/without transferable gains, games against nature), validation of decision support systems and models and sensitivity analysis. MATLAB and Excel are used to build the models and solve assignments, to showcase the practical application of the presented methods. Additional content: The history of operational research is summarized. Additionally, fuzzy logic in decision-making is also covered, along with topics such as decision-support systems (DSS), expert systems and optimization. Special content: The course also introduces students to the basics of multiple expert decision-making and reaching consensus, Delphi method.

Teaching Methods:

Lectures and exercises approximately 24 h, reading materials and preparation for the lectures (60 h) & the exam (76 h). Course work, which will reduce the number of hours needed for lecture & test preparation. Total workload for the student 160 h.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

Grade 0-5, based on a written exam. Bonus points can be awarded for homework assignments.

Course Materials:

Lecture materials, Assigned reading and assigned course books MATLAB / Octavia materials available on the mathworks www-site Mengov, G.: Decision Science: A Human-Oriented Perspective, Springer, 2015. Srinivasan, R.: Strategic Business Decisions - A Quantitative Approach, Springer, 2014. San Cristóbal, J. R.: Multi Criteria Analysis in the Renewable Energy Industry, Springer, 2012.

Prerequisites:

Required: BM20A4301 Johdatus tekniseen laskentaan or BM20A5001 Principles of technical computing
Suggested: Information Systems in Corporate Management and Decision-Making

Limitation for students? (Yes, number, priorities/Leave empty):

Yes, 80. If the course enrollment is more than the course maximum, then students are accepted in the following order: students from the MBAN and MSF programmes, other master´s programme students, other students.

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

No

A210A0350: Real Options and Managerial Decision Making, 6 cr

Validity: 01.08.2011 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Business and Management

Grading: Study modules 0-5,P/F

Teachers: Azzurra Morreale, Mikael Collan, Mariia Kozlova

Year:

M.Sc. (Econ. & Bus. Adm.) 2

Period:

3 (intensive week 9)

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Econ. & Bus. Adm.) Mikael Collan
Post-doc researcher D.Eng. Azzurra Morreale
Post-doc researcher, D.Sc. (Econ. & Bus. Adm.) Mariia Kozlova

Aims:

The aim of the course is to give students know-how about how to use the real options approach as a part of decision making in companies and how to apply real options thinking in valuation and analysis in the presence of uncertainty. After the course the students:
- know the mathematical foundations of real options and the connections between the real options approach and financial theory
- know the research tradition of real options and are able to evaluate the limits of the approach
- understand and analyze the role of uncertainty and risk in decision making
- apply the real options approach in managerial decision situations, where suitable
- know the main model types used in real option valuation
- ability to perform real option valuation with the fuzzy pay-off method or with Monte Carlo Simulation and to construct a tool for RO valuation with one of these methods

Contents:

Core content: real options vs. financial options, modeling the real options and the limits of modeling, the usability of real options in strategic decision making
Additional content :the use of mathematical tools applied in the real options context

Special content: how to use the real options approach in managerial decision making situations exemplified by means of different real cases, project of constructing a simple real option valuation tool with excel or with matlab

Teaching Methods:

Lectures and exercises 18 h, independent reading assignments (articles) and preparation for lectures 46h. Written exam and preparation for the exam 93 h. Peer project evaluation 2h. Total workload for the student 160 h. Extra curricular project.

Suitability for doctoral studies (Yes/Leave empty):

Yes

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

Grade 0-5, evaluation 0-100 points, written exam 80%, course project 20%,

Course Materials:

Collan, M., 2012, The Pay-Off Method: Re-Inventing Investment Analysis – With numerical application examples from different industries, CreateSpace, Charleston, SC, USA (ISBN 978-14-782-3842-3) Lecture slides, Assigned reading, collection of articles. Materials will be available in Moodle (except for the course book)

Prerequisites:

For master´s program students only

Limitation for students? (Yes, number, priorities/Leave empty):

Yes. 100, priority for MSF and MBAN students.

Places for exchange-students? (Yes, number/No):

15–

Places for Open University Students?(Yes, number/No):

No

CS38A0070: Fuzzy data analysis, 6 cr

Validity: 01.01.2018 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Business and Management
Grading: Study modules 0-5,P/F
Teachers: Pasi Luukka

Year:

M.Sc. (Tech.) 2

Period:

3

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Pasi Luukka

Aims:

In the end of the course the student is expected to be able to

- understand theoretical aspects of data analysis
- understand basic mathematics from fuzzy set theory related to data analysis
- apply fuzzy set theory based models in data analysis
- analyze and interpret results from the models
- apply fuzzy principal component analysis, fuzzy clustering and classification methods to data analysis problems

Contents:

Fuzzy sets and relations. Uncertainty measures. Qualitative and quantitative analysis of fuzzy data. Principles of individual multi-person, multi-criteria decision making, feature selection, fuzzy principal component analysis, fuzzy clustering and classification, fuzzy regression analysis.

Teaching Methods:

Lectures 28 h, exercises 28 h. Practical assignment. Independent study 100 h. Total work load 156 h.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Number of mid-term examinations:

No

Assessment:

0-5, examination 100 %. Practical assignment.

Course Materials:

Bandemer, H., Näther, W.: Fuzzy Data Analysis, Kluwer Academic Publ., 1992.

Prerequisites:

CS38A0060 Fuzzy sets and fuzzy logic

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

Yes, max 10

CS90A0060: Master's Thesis, 30 cr

Validity: 01.08.2008 -

Form of study: Basic studies

Type: Master's Thesis

Unit: LUT School of Business and Management

Teachers: Lea Hannola

Year:

M.Sc. (Tech.) 2

Period:

1-4

Teaching Language:

Finnish and English

Teacher(s) in Charge:

Lea Hannola, D.Sc. (Tech.), Associate Professor
Other teachers: Professors and Associate Professors of Industrial Engineering and Management

Aims:

Aftercompleting the course, students will be able to:
- demonstrate their knowledge of a topic of scientific and societal importance in a specific professional area
- demonstrate the ability to carry out the project independently and following a plan
- produce the thesis, which is organised coherently, the presentation is academic and the language revised
- act and communicate in different kinds of interactions and work environments in an entrepreneurial way by taking independently and actively responsibility about the development and management of business
- apply and utilize independently new knowledge both in scientific postgraduate studies and other lifelong learning

Contents:

The Master's thesis is the final project of the degree of Master of Science (Technology). Usually it involves a
development project commissioned by a company and takes about six months.
The work entails working on a development project related to industrial management, preparing a report in the form of a
thesis, and presenting the work in a way that the first supervisor requires.
Topic of the master's thesis has to be confirmed as soon as the topic has been decided with the first supervisor. Use
form 1A in UNI-portal.

Teaching Methods:

Development project and related report, presentation of the work (1. supervisor defines the way), maturity test (usually on the contents of the thesis).

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Master's thesis 100 %.

Course Materials:

Electronic guide for Master's Thesis workers and supervisors,
Study support -sites in Uni-portal, Industrial Engineering and Management

Prerequisites:

B.Sc. (Tech.) degree (not required of students admitted directly into a Master's programme), complementary
studies (for students admitted directly into a Master's programme).

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

No

Elective specialisation studies min. 14 ECTS cr

A220A0000: Financial Econometrics, 6 cr

Validity: 01.08.2011 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Business and Management

Grading: Study modules 0-5,P/F

Teachers: Jan Stoklasa

Note:

Additional requirements for doctoral students: read Mikosch, T., Kreiß, J., Davis, R. A., & Andersen, T. G. (2009). Handbook of Financial Time Series. Springer eBooks – selected part(s) after consulting with the teacher in charge, term paper will be written by the student on the selected advanced topic.

If the course enrollment is more than the course maximum, then students are accepted in the following order: students from the MSF and MBAN programmes, other master´s programme students, other students.

Year:

M.Sc. (Econ. & Bus. Adm.) 2

Period:

1

Teaching Language:

English

Teacher(s) in Charge:

D.Sc. (Tech.) Jan Stoklasa

Aims:

At the end of this course a student is expected to have a concise overall understanding of the mechanisms behind the econometrics models covered in the course so that he/she:
- Is able to describe the main ideas of the models and methods and assess the appropriateness of their use in specific application cases, incl. the testing of assumptions of the models
- Is capable of formulating the main questions of his/her empirical research in terms of the econometrics models and their parameters
- Is able to select appropriate methods for the given practical application in financial data analysis and construct appropriate econometrics models and assess their quality
- Is able to design econometrics models for financial data prediction (in case of time series)
- Is able to interpret the outputs of the econometrics models in the context of financial data analysis
- Is able to use the methods and their outputs to explain phenomena in financial data and to assess hypothesis concerning financial data
- Is able to utilize the models in financial theory building and assessment as well as in time series analysis and prediction and financial data analysis in general.
- Is able to implement the designed econometrics models in MATLAB using its econometrics package.

The models covered in this course include for example:
Classical linear regression models, univariate time series models, ARMA processes, multivariate time series models, models for simultaneous equations systems, vector autoregressive (VAR) model, ARCH and GARCH-type models.

Contents:

This course deepens students' knowledge on empirical research methods in financial econometrics. The focus is on the empirical techniques used most often in the analysis of financial markets and how they are applied to actual market data.The course is designed to give advanced-level (Master) knowledge of financial econometrics – that is to provide sufficient insight in the financial econometrics models and hypothesis testing and practical experience with building models for financial econometrics in MATLAB.

The course covers four different areas in econometrics: 1) univariate and multivariate statistical analyses, 2) time series models, 3) modeling volatility and correlation, 4) modeling long-run relationships in financial markets. The students will use MATLAB econometrics package to run analyses.

Teaching Methods:

Lectures & exercises: 36 h, period 1. Preparation for lectures and exam: 64 h, period 1. home assignments: 60 h, period 1. Total workload: 160 h.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

Grade 0-5, on the basis the exam (50%) and home assignments (50%). Students are required to achieve 50 percent of the maximum points in both.

Course Materials:

1. Brooks, Chris: Introductory econometrics for finance. Cambridge, 2002 or newer (Text book) 2. Handouts in class and all additional material required by the lecturer 3. MATLAB materials available on the mathworks www-site

Prerequisites:

Required: BM20A4301 Johdatus tekniseen laskentaan or BM20A5001 Principles of technical computing Compulsory bachelor's level courses in finance and economics.

Limitation for students? (Yes, number, priorities/Leave empty):

Yes, 80. If the course enrollment is more than the course maximum, then students are accepted in the following order: students from the MSF and MBAN programmes, other master´s programme students, other students.

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

No

BM40A0801: Machine Vision and Digital Image Analysis, 6 cr

Validity: 01.08.2016 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Engineering Science

Grading: Study modules 0-5,P/F

Teachers: Heikki Kälviäinen

Note:

The course will be lectured every other year, next during the academic year 2019-2020.

Lectured every other academic year (Yes, next realization year/Leave empty):

Yes, next realization year 2019-2020

Year:

M.Sc. (Tech.) 1-2

Period:

3-4

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Heikki Kälviäinen

Aims:

After the course a student is expected to be able to explain the fundamental steps of image processing and analysis, to introduce and compare machine vision applications, to plan a solution to a given object recognition problem, and to implement practical solutions for machine vision problems using Matlab or other suitable programming language.

Contents:

Digital image processing: digital image, image transforms, image enhancement, image compression. Image analysis: segmentation, representation and description, recognition and interpretation. Hardware, software and applications.

Teaching Methods:

Lectures and seminars 21 h, exercises 14 h, 3rd period. Lectures and seminars 21 h, exercises 14 h, 4th period. Preparation for the seminar presentations and acting as an opponent, homework, and practical assignment 47 h, self-studying of taught matters and relevant literature and preparation for the exam 36 h, 3rd and 4th period. Exam 3 h. Total amount 156 h.

Suitability for doctoral studies (Yes/Leave empty):

Yes

Doctoral School course where enrollment is in WebOodi (Yes/Leave empty):

Yes

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0-5, exam 50 %, exercises 50 %. Seminar presentation. Acting as an opponent. Practical assignment.

Course Materials:

References and material published on the course web page.

Prerequisites:

Recommended BM40A0701 Pattern Recognition, BM40A0901 Computer Vision, BM40A1201 Digital Imaging and Image Preprocessing,BM40A0502 Johdatus laskennalliseen älykkyyteen ja koneoppimiseen

Places for exchange-students? (Yes, number/No):

max 5

Places for Open University Students?(Yes, number/No):

No

BM40A0701: Pattern Recognition, 6 cr

Validity: 01.01.2016 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Engineering Science

Grading: Study modules 0-5,P/F

Teachers: Lasse Lensu

Year:

M.Sc. (Tech.) 1

Period:

1-2

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Lasse Lensu

Aims:

After passing the course, students understand pattern recognition problems and know the common approaches including machine learning methods to solve them. The students are able to select an appropriate pattern recognition method and implement a working solution for a specific problem. The students can analyse the performance and quality of a pattern recognition system.

Contents:

Introduction to pattern recognition, supervised and unsupervised machine learning. Feature processing, selection and system evaluation. Statistical pattern recognition and Bayesian inference. Linear and non-linear classifiers such as the perceptron, artificial neural networks and support vector machines. Context-dependent and reinforcement learning. Unsupervised pattern recognition and method-independent learning.

Teaching Methods:

Lectures 14 h, lecture preparation 7 h, exercises 14 h, exercise preparation 21 h, 1st period.
Lectures 14 h, lecture preparation 7 h, exercises 14 h, exercise preparation 21 h, practical assignment 40 h, 2nd period. Self-study 4 h. Total amount 156 h.

Suitability for doctoral studies (Yes/Leave empty):

Yes

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

Yes

Assessment:

0 - 5. Homework and exercises 30%, exercise quizzes (or exam) 40%, practical assignment 30%.

Course Materials:

Duda, R.O., Hart, P.E., Stork, D.G.: Pattern Classification, Wiley, 2001. Theodoridis, S., Koutroumbas, K.: Pattern Recognition, Academic Press, 2003.

Prerequisites:

Recommended BM20A4301 Johdatus tekniseen laskentaan, BM20A5001 Principles of Technical Computing, BM20A5800 Funktiot, lineaarialgebra ja vektorit, BM20A5810 Differentiaalilaskenta ja sovellukset, BM20A5820 Integraalilaskenta ja sovellukset, BM20A5840 Usean muuttujan funktiot ja sarjat, CT60A0210 Käytännön ohjelmointi, BM20A1401 Tilastomatematiikka I, BM20A1501 Numeeriset menetelmät I, BM20A1601 Matriisilaskenta, BM40A0501 Johdatus laskennalliseen älykkyyteen, or equivalent knowledge.

Places for exchange-students? (Yes, number/No):

max 5

Places for Open University Students?(Yes, number/No):

max 5

A365A0320: Computational Data Analytics in Business Management, 6 cr

Validity: 01.08.2016 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Business and Management

Grading: Study modules 0-5,P/F

Teachers: Samuli Kortelainen

Note:

Teaching is organised in Lahti Campus.

Year:

M.Sc. (Econ. & Bus. Adm.) 1

Period:

4

Teaching Language:

English

Teacher(s) in Charge:

Post.Doctoral Researcher, D.Sc. (Tech) Samuli Kortelainen

Aims:

The importance of different kinds of analytics solutions has significantly risen during the last years in management. Novel analytics solutions have been shown to have significant financial impact by either increasing the efficiency of the company or by even creating totally new business possibilities. This course aims to introduce students to the present capabilities and future possibilities of computational business analytics tools. After this course student will know:
- How to integrate analytics to strategic and operational management of a firm
- Possibilities and limitations of different kinds of computational analytics methods in business management

Contents:

1. Processes and routines necessary for data based business management a. Importance of organizational different kinds of organizational routines b. Different data sources in digitalization age i. Firm’s internal data sources ii. Internet & Big data analytics iii. Internet of things (IoT)
2. Different levels in management of firm’s business environment a. Individual (customers / firms) b. Network (Network between customers / firms) c. System level analysis (e.g. ecosystems)
3. Possibilities created by computational analysis methods in business management a. Possibilities created by network analysis b. Possibilities created by machine learning c. Possibilities in simulation modelling

Teaching Methods:

Virtual on-line lectures and individual work 16 h.
On site lectures 12 h.
1 x Seminar work 80 h.
Preparing for exam 38 h.
24 hour exam 16 h.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

Yes

Assessment:

Seminar work: 50 %, 24 hour exam: 50 %

Course Materials:

Eric Siegel (2013), Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die Course slides

Places for exchange-students? (Yes, number/No):

max 10

Places for Open University Students?(Yes, number/No):

max 5

CS31A0720: Basics of ERP systems, 6 cr

Validity: 01.08.2017 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Business and Management
Grading: Study modules 0-5,P/F
Teachers: Lasse Metso

Note:

Students need own computers (Windows) to which SAP client is installed.

Year:

M.Sc. (Tech.) 1 or 2

Period:

3-4

Teaching Language:

English

Teacher(s) in Charge:

Junior Researcher Lasse Metso, M.Sc. (Tech.)

Aims:

After completing the course students will be able to:

- evaluate the benefits of ERP system
- develop and modify master data to ERP system
- support business processes by use of ERP system

Contents:

Theory of ERP systems and security of ERP systems.
SAP business processes:

Logistics

- Purchasing
- Inventory Management
- Warehouse Management
- Production Contro
- Sales and Distribution
- Plant maintenance
- Project Management

Accounting
- Financial Accounting
- Controlling

Human Capital Management

Teaching Methods:

This course is using distance education methods. All material will be in Moodle or links in Moodle. Students can participate regardless of time and place. SAP client implementation and definition of needed connections (12 h), SAP assignment (90 h) and learning diary (54 h). Total workload 156 h.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

SAP assignments 60 % and learning diary 40 %.

Course Materials:

Materials used in this course are mainly based on SAP UCC material which are given to students and scientific articles (defined during course).

Places for exchange-students? (Yes, number/No):

max 10

Places for Open University Students?(Yes, number/No):

max 5