

## 30E03500 – Data Science for Business II (6cr)

# Syllabus

Instructors' contact information	Course information
<b>Names:</b> Pekka Malo, Eeva Vilkkumaa <b>Teaching Assistants:</b> Philipp Back, Lauri Neuvonen <b>E-mail:</b> firstname.surname@aalto.fi <b>Office:</b> T203 <b>Instructors' webpages:</b> <a href="https://people.aalto.fi/pekka_malo">https://people.aalto.fi/pekka_malo</a> <a href="https://people.aalto.fi/eeva_vilkkumaa">https://people.aalto.fi/eeva_vilkkumaa</a>	<b>Status of the course:</b> Master's degree program in Information and Service Management. Business application course in the Aalto level module on Analytics and Data Science. <b>Academic Year, Period:</b> 2018-2019, Period IV <b>Location:</b> Otaniemi, see MyCourses / Oodi for details <b>Language of Instruction:</b> English <b>Course Website:</b> <a href="https://mycourses.aalto.fi/course/view.php?id=16346">https://mycourses.aalto.fi/course/view.php?id=16346</a>

## 1. Overview

“From Data to Decisions – What You Need to Know About Data-driven Decision Making”

The course focus is on bridging the gap between predictive and prescriptive modelling. This will entail combining probabilistic modelling approaches with modern optimization techniques and decision-analytic tools. In terms of content, the course consists of two parts. In the first part, the students will learn methods and theory (e.g., optimization concepts and fundamentals of statistical learning theory) needed for prescriptive modelling. The material will involve programming assignments with practical applications. The second part will feature applications in the form of visiting lecturers, who come from different industries (e.g., financial analytics, sports analytics).

## 2. Target group and prerequisites

The course is intended for participants with diverse backgrounds:

- Business analysts and developers who will be implementing and evaluating data science solutions;
- Business people who will be working with data scientists, managing data science -oriented projects, or investing in data-driven ventures.

As a prerequisite for enrolling to this course, we assume that you have completed Data Science for Business I (or a similar course). The course has a strong focus on empirical assignments, which requires prior knowledge in the following topics:

- Fundamentals in statistics (e.g., 30A02000 or preferably 30C00600)
- Knowledge in business mathematics; in particular, linear algebra and optimization (e.g., 30A03000 or preferably 30C00355)
- Basic skills in programming/scripting (e.g., Python, R, Scala / Java)

## 3. Learning outcomes

After completing the course, the students will

- understand the importance of prescriptive analytics in business decision-making,
- be able to combine predictive modeling approaches with optimization techniques to build prescriptive analytics solutions,
- be able to implement (program) their solutions with suitable software.

## 4. Assessment, assignments, and grading

The course assessment is comprised of the following two parts:

- Class activity (lectures, tutorials, exercises) 30%
- Team case (course project) 70%

All assignments must be completed to pass the course, and late assignments will not be accepted. Note that the starting level of the student teams will be taken into account in the grading of group assignments and the team case, and thus special attention is paid to the teams' development in knowledge sharing and learning.

## 5. Readings

All materials needed for completing the course are provided during the lectures and assignment / lab sessions. The following list of complementary reading is recommended but not required.

### Complementary readings:

- James, G., Witten, D., Hastie, T., and Tibshirani, R. (2013) "An Introduction to Statistical Learning: with Applications in R." Springer Texts in Statistics.
- Anderson, D., Sweeney, D., and Williams, T. (2000) "An Introduction to Management Science: Quantitative Approaches to Decision Making."

## 6. Preliminary schedule

Week	Dates	Topic
1	25.2. – 27.2.2019	<b>Short recap on predictive modeling</b>
	<b>Mon 15:15-18:00</b>	Lecture (Mon) :
	<b>Tue 15:15-18:00</b>	
	<b>Wed 15:15-18:00</b>	
	<b>Session legend:</b>	
	<b>Compulsory</b>	
	<b>Not compulsory</b>	
	<b>Extra if needed</b>	
		• Fundamental concepts and definitions
		• Recap on feature selection techniques
		• Fundamentals of time series analysis for predictive modeling
		No session (Tue)
		Lab / tutorial (Wed):
		• Feature selection and time series with python

Week	Dates	Topic
2	4.3. – 6.3.2019 <b>Mon 15:15-18:00</b> <b>Tue 15:15-18:00</b> <b>Wed 15:15-18:00</b>	<b>Introduction to prescriptive modeling</b> Lecture (Mon): <ul style="list-style-type: none"> <li>• Introduction to optimization tools</li> <li>• Learning to utilize optimization to support decision-making</li> <li>• Formulation of optimization problems</li> </ul> Solutions to previous assignment (Tue) Lab / tutorial (Wed): <ul style="list-style-type: none"> <li>• First cup of prescriptive modeling</li> </ul>
3	11.3. – 13.3.2019 <b>Mon 15:15-18:00</b> <b>Tue 15:15-18:00</b> <b>Wed 15:15-18:00</b>	<b>Case: Sports analytics</b> Lecture (Mon): <ul style="list-style-type: none"> <li>• SportIQ (Jirka Poropudas)</li> <li>• All: Take-home questionnaire</li> <li>• Case groups: start preparing team case</li> </ul> No assignment session (Tue) Lab / tutorial (Wed): <ul style="list-style-type: none"> <li>• Case-related guidance</li> </ul>
4	18.3. – 20.3.2019 <b>Mon 15:15-18:00</b> <b>Tue 15:15-18:00</b> <b>Wed 15:15-18:00</b>	<b>Case: Prescriptive analytics in finance</b> Lecture (Mon): <ul style="list-style-type: none"> <li>• Nordic Investment Bank (Simo Heliövaara)</li> <li>• All: Take-home questionnaire</li> <li>• Case groups: start preparing team case</li> </ul> No assignment session (Tue) Lab / tutorial (Wed): <ul style="list-style-type: none"> <li>• Case-related guidance</li> </ul>

Week	Dates	Topic
5	25.3. – 27.3.2019 <b>Mon 15:15-18:00</b> <b>Tue 15:15-18:00</b> <b>Wed 15:15-18:00</b>	<b>Visiting lecture: From Data to Business Opportunities</b> Lecture (Mon): <ul style="list-style-type: none"> <li>• Avaamo Konsultointi (Jyrki Koskinen)</li> <li>• Take-home questionnaire</li> </ul> Lab / tutorial & Assignment session (Tue, Wed): <ul style="list-style-type: none"> <li>• The sessions are reserved for preparing the team cases</li> </ul>
6	1.4. – 2.4.2019 <b>Mon 15:15-18:00</b> <b>Tue 15:15-18:00</b> <b>Wed 15:15-18:00</b>	<b>Team Case Presentations</b> Assignment(s): <ul style="list-style-type: none"> <li>• All: submit presentation slides (DL 1.4.)</li> <li>• Sport teams submit final report (DL 13.4.)</li> <li>• Finance teams submit final report (DL 20.4.)</li> </ul> NB! Attendance is compulsory only in the session designated to your team.

## 7. Course workload

The following is a tentative breakdown of the workload of the course. All hours are academic hours.

<b>Contact sessions</b>	
Lectures and tutorials (1-2 × 3h / week)	18h
Exercise demos and workshops (2 × 3h / week)	36h
<b>Class preparation</b>	12h
<b>Assignments</b>	48h
<b>Course project</b>	46h
<b>Total</b>	<b>160h (6op)</b>

## 8. Ethical rules

- Aalto University Code of Academic Integrity and Handling Thereof:  
<https://into.aalto.fi/pages/viewpage.action?pageId=3772443>

## 9. Other issues

- Registration to the course via WebOodi
- Students will be divided into working teams by the teachers in charge
- Evaluation rubrics will be available in MyCourses