Data Science for IE&IS students

Offered by: Department of Industrial Engineering & Innovation Sciences
Language: English
Primarily interesting for: All majors of the Industrial Engineering and Innovation Sciences fac.
Contact person: Ksenia Podoyntsyna - K.S.Podoynitsyna@tue.nl

Content and composition
This coherent package provides students with the basic knowledge on data science including programming, databases and data mining techniques. This coherent package also clears up the requirement on 15ECTS data science courses necessary for the direct admission of students majoring in Industrial Engineering or Innovation Sciences to the master “Data Science and Entrepreneurship” in JADS, Den Bosch. JADS is the Joint Graduate School of Tilburg University and Eindhoven University of Technology (see www.jads.nl for more information).

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name*</th>
<th>Level classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>JBI010**</td>
<td>Programming</td>
<td>1. Basic</td>
</tr>
<tr>
<td>JBI030</td>
<td>Data Mining</td>
<td>1. Basic</td>
</tr>
<tr>
<td>2ID50**///</td>
<td>Data modelling &amp; Databases / Data management for data analytics</td>
<td>2. Intermediate</td>
</tr>
</tbody>
</table>

* - JBI020 “Foundations of computing” is a highly recommended supplement to this coherent package.
** - JBI010 is not allowed for the BPT students. This course has a strong overlap with the obligatory course 0HV120 1e jaars vak BPT studenten. 0HV120 serves as the replacement for JBI010 in this case.
*** - Prior knowledge requirement for the 2ID50 course is 2IT60 “Logic and set theory”, which contents are partially covered in the obligatory courses in the major TBK and P&T. 2ID50 has an entrance test which will validate whether this prior knowledge is sufficient, allowing students to qualify for this course.

From 2018 onwards, students can follow JBI050 “Data management for data analytics” as an alternative to 2ID50 “Data modelling & Databases”, as noted in the table above.

Please note that students have to be directly admissible to the master “Data Science and Entrepreneurship” as a whole in order to follow one or more courses from this master, including an exchange semester. This means that students following master programs of the IE&IS department are only directly admissible in case they have followed this coherent package as part of their bachelor.

BP&T students generations (2016/2017 onwards) have likely fulfilled most of the requirements as part of their major (10ec math, 10ec statistics, 15 ec databases, data mining and programming) and would only need to finish 1 extra course on data mining to be able to join.
Course description

**2ID50 Datamodelling & Databases**

Our lives are awash in data (e.g., social, business, and web) which only continues to grow in both quantity and variety. Database management systems are the key technologies which facilitate our practical use of these massive data sets. In this course, we study fundamental concepts, such as data model design and formulation of queries against databases, which underpin the effective practical use of industrial strength data management systems.

**JBI050 Data management for data analytics**

The focus of the course is on practical problem-solving in an application domain. Students will gain practical experience developing the ability to design effective databases based on a solid understanding of the underlying principles. By design, hands-on practical assignment(s) using contemporary frameworks and technologies are a central component of the course. The following topics will be covered:

- Data modeling: conceptual modeling in the ER model and UML; logical data modeling in the relational database model; optimization of logical models, basics of normalization.
- Querying databases: SQL basic queries, aggregation; Datalog basic queries, recursion.

**JBI010 Programming**

This course introduces imperative and object-oriented programming using Java and Python. Topics: basic imperative programming (assignment, choice, repetition, input/ output, functions), typing, recursion, objects (both data objects, or records, and domain objects), a few collection classes, inheritance, interfaces, specification of methods, coding style practice, API use, basic handling of large data sets.

**JBI030 Data Mining**

The course fits with the educational philosophy of the program by emphasizing the interdisciplinary perspective of data science and introducing students to research in the field of data science. During this course, the students will learn the foundations of data mining and gain hands-on experience in applying data mining in practice.

**JBI020 Foundations of computing - Highly recommended supplement**

Upon completion of this course students:
- understand basic proving techniques and can apply the right technique(s) to prove formal statements
- understand computability and models of computations
- understand what algorithms are and what they are used for, as well as some principles of data representation
- are able to apply techniques from computer science to understand and solve problems