# System integration - course description

## General information

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|---|---|
| Course name | System integration |
| Course ID | 11.3-WE-BizEIP-SystInteg-Er |
| Faculty | Faculty of Engineering and Technical Sciences |
| Field of study | E-business |
| Education profile | practical |
| Level of studies | First-cycle Erasmus programme |
| Beginning semester | winter term 2019/2020 |

## Course information

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|---|---|
| Semester | 6 |
| ECTS credits to win | 5 |
| Course type | obligatory |
| Teaching language | english |
| Author of syllabus | • dr hab. inż. Marek Kowal, prof. UZ |

## Classes forms

| The class form | Hours per semester (full-time) | Hours per week (full-time) | Hours per semester (part-time) | Hours per week (part-time) | Form of assignment |
|---|---|---|---|---|---|
| Lecture | 30 | 2 | - | - | Exam |
| Laboratory | 30 | 2 | - | - | Credit with grade |

## Aim of the course

Presentation of the software used for data integration. Overview of typical data sources. Presentation of data cleaning and transformation methods. Familiarize students with the architecture of ETL systems (Extract, Transform, Load). Developing practical skills in operating selected systems supporting ETL processes. Presentation of the issue of semantic data integration. Familiarization with integration platform architectures.

## Prerequisites

Databases, Data warehouses and reporting services

## Scope

*Data integration using ETL (Extract, Transform, Load) systems*. Architecture of ETL systems. Data sources: relational databases, flat files, XML, JSON. Data transformation and integration methods. Profiling and data cleansing. Software tools supporting the design and deployment of ETL processes. Structure of the ETL package. Learning to program ETL packages using SQL Server Integration Services (SISS). Configuration of SISS packages.

*Semantic data integration*. Electronic document formats. Semantic networks. Domain models. Data description languages. Mechanisms of semantic data integration. Practical exercises in the field of building semantic models and data unification using semantic bridges.

*The architecture of the integration platforms*. SOA (Service-Oriented Architecture). Enterprise ESB (Enterprise Service Bus) architecture. REST architecture (Representational State Transfer). Modeling languages for integration platforms. Methodologies for designing integration platforms. Methods of implementing business process models for integration platforms. Practical exercises in the design of integration platform architecture.

## Teaching methods

Lecture - conventional lecture using a video projector.
Laboratory - practical exercises in the computer laboratory.

## Learning outcomes and methods of theirs verification

| Outcome description | Outcome symbols | Methods of verification | The class form |
|---|---|---|---|
| Student knows IT technologies and software tools used in data integration | | • an examination test with score scale | • Lecture |
| The student can apply modern data integration methods in e-business solutions | | • a preparation of a research paper<br>• an oral response | • Laboratory |
| The student can design architecture and build a model of the integration platform | | • an observation and evaluation of activities during the classes<br>• an observation and evaluation of the student's practical skills<br>• carrying out laboratory reports | • Laboratory |

| Outcome description | Outcomesymbols | Methods of verification | The class form |
|---|---|---|---|
| The student is able to design an integration platform system in a selected architecture | | • an observation and evaluation of activities during the classes<br>• an observation and evaluation of the student's practical skills<br>• carrying out laboratory reports | • Laboratory |
| The student is able to prepare an ETL package for cleaning, transformation, and integration of data from heterogeneous sources | | • an observation and evaluation of activities during the classes<br>• an observation and evaluation of the student's practical skills<br>• carrying out laboratory reports | • Laboratory |
| The student knows methods and IT technologies used for semantic data integration | | • an examination test with score scale | • Lecture |
| The student knows the architecture and technologies of integration platforms | | • an examination test with score scale | • Lecture |
| The student knows the languages for building semantic models | | • a quiz<br>• an observation and evaluation of the student's practical skills<br>• an oral response | • Laboratory |
| The student knows the methods of data profiling and cleaning | | • an examination test with score scale | • Lecture |
| The student knows the methods of data transformation and integration | | • an examination test with score scale | • Lecture |
| The student understands the need to constantly supplement and expand knowledge in the field of data integration | | • a preparation of a research paper<br>• an oral response | • Laboratory |

## Assignment conditions

Lecture - the passing criteria is to obtain positive grades from tests carried out at least once in a semester.

Laboratory - the passing criterion is to obtain positive marks for laboratory exercises and tests.

Final mark components = lecture: 50% + teaching laboratory: 50%

## Recommended reading


1. Kimball, R., Caserta J., The Data Warehouse ETL Toolkit: Practical Techniques for Extracting, Cleaning, Conforming, and Delivering Data, Wiley, 2004.
2. AnHai, D., Halevy A., Ives Z., Principles of Data Integration, Morgan Kaufman, 2012.
3. Aspin, A., SQL Server 2012 Data Integration Recipes: Solutions for Integration Services and Other ETL Tools, APress, 2012.
4. Morris, J., Practical Data Migration, The British Computer Society, 2012.
5. Ehrig, M., Ontology Alignment: Bridging the Semantic Gap, Springer, 2006.
6. Ghosh P.: Semantic Integration of Applications: Application Integration By Linking Semantically Related Objects Shared Across Applications, CreateSpace Independent Publishing Platform, 2016
7. Chappell D.: Enterprise Service Bus: Theory in Practice, O'Reilly, 2004


## Further reading


1. Cody, R.: Cody's Data Cleaning Techniques Using SAS, SAS Press, 2008.
2. Egger, N., Fiechter, J-M. R., Salzmann R., Sawicki R, Thielen T., SAP BW Data Retrieval: Mastering the ETL Process, SAP Press, 2006.
3. Bobak, A.: Connecting the Data: Data Integration Techniques for Building an Operational Data Store (ODS), Technics Publications LLC, 2012.
4. McGilvray, D., Executing Data Quality Projects: Ten Steps to Quality Data and Trusted Information, Morgan Kaufmann, 2008.
5. Maydanchik, A., Data Quality Assessment, Technics Publications, 2007.
6. Ozsu, T., Valduriez P., Principles of Distributed Database Systems, Springer, 2011.


## Notes

Modified by dr hab. inż. Marek Kowal, prof. UZ (last modification: 09-12-2019 13:19)