Course title: DATA WAREHOUSES AND BUSINESS INTELLIGENCE

Lecturers	Full Prof. Kornelije Rabuzin, Ph.D. Maja Cerjan, mag. educ. inf.
Language of instruction	Croatian and English
Study level	Master
Study programme	Data Bases and Knowledge Bases / Business Systems Organization
Semester	2nd (summer)
ECTS	5
Goal	Goal of this course is to introduce the students to basic principles of constructing and applying data warehouses technology, which should result in better decisions and performance improvements. At the end of the course, students should be able to select a data warehouse project, justify the price of a project, plan a data warehouse project, estimate the completeness of the plan, choose the appropriate architecture components, build a good quality data warehouse, integrate the knowledge of business systems and IT and thus achieve the maximum value of such an investment.
General and specific learning outcomes	
Content	**Structural basics** **1. Introduction to data warehouses and business intelligence** Data warehouses (DW). Business intelligence (BI). Decision support systems (DSS). Differences between data warehouses and operational databases. Data Mart. OLAP Systems. **2. Framework for understanding data warehouses** General architecture. Data warehouse components. Goals of building a data warehouse. Complexity of building and using data warehouses. Information retrieval. **3. Modeling data warehouses** Dimensional modeling. Business processes. Granularity concept. Identifying facts. Entity, star and snowflake models. General data warehouse architecture application. Practical guidelines. ERA diagram. Drawbacks of ERA diagram in the context of building data warehouses. Bus architecture. **4. Fact tables** Transactional fact table. Periodical fact table. Accumulating fact table. Non-additive data. Semi-additive data. Additive data. Data atomicity. Data quality. Non-existing data. Aggregated data. Allocating. 3NF. Denormalized tables. **5. Dimensional tables** Dimension concept. Selecting dimensions. Number of dimensions. Degenerative dimensions. Mini-dimensions. Outrigger. Junk dimensions. Role-playing. Attributes. Altering attribute values in dimensional tables. Codes. Data hierarchy. **6. Building a data warehouses (a step-by-step guide)** Requirements. Analysis. Design. Construction. Organization. Expansion. Data integration and distribution. Data quality validation. Analysis of different properties (redundancy, normalization) and the desire to (not) include them in the data warehouse. Basic development requirements. Simplicity. Velocity.

	7. Planning and managing the data warehouse implementation and development project Project planning. Development and organization of data warehouses. Business requirements analysis. Analysis of data warehouse technology implementation costs. Initial organization. Dimensional modeling. Technical design. Physical design. Software package selection. Analytical requirements. Data acquisition. Setting up the solution. Data warehouse management. **8. Metadata management** Importance of metadata. Storing and managing metadata. Metadata standards. Data warehouse usage. Purpose. Potential. Applications. Users and user needs. Usage. **9. Information processing: queries and reports** Business queries modeling. Users and environment. Functions. SQL. Economy considerations. Trends. **10. Analytical processing** Multi-dimensional analysis. OLAP architecture. OLAP system types. ROLAP. MOLAP. Technical requirements and considerations. **11. Data mining** Statistical analysis. Knowledge discovery. Deductive databases. **12. Analysis of concrete practical examples (Part I)** An example of building a data warehouse (orders management, sales, education, items storage). **13. Analysis of concrete practical examples (Part II)** An example of building a data warehouse (customer relationship management, employees management, financial services). **14. Assignment – modeling a data warehouse of a selected business systems** Project phases. Model construction. Dimensional modeling. Model analysis. Discovering possible drawbacks. Discussion. **15. The current practice** Implementation approaches. Product analysis. Guide for product evaluation. Examples. Final remarks.
Exercises	Using adequate graphical tools, the students learn to design and build a data warehouse and create different data reports.
Realization and examination	Class: lectures, seminars, laboratory exercises Examination: Students take two written exams throughout the semester. After passing the laboratory exercises and presenting the seminar project, students can take the final oral exam.
Related courses	1. Carnegie Mellon University, Data warehouses 2. Imperial College, London, Department of Computing, Knowledge Management Techniques.
Literature	Basic: Lectures Ralph Kimball, Margy Ross: The Data Warehouse Toolkit, Wiley, USA, 2013.

	Ralph Kimball, Margy Ross, Warren Thornthwaite, Joy Mundy, Bob Becker. The Data Warehouse Lifecycle Toolkit. Wiley. 2008. Additional: W. H. Inmon: Building the Data Warehouse, 4th edition, Wiley, 2005. Arshad Khan: Data Warehousing 101: Concepts and Implementation, Khan Consulting and Publishing, 2003.