DIGITAL HERITAGE (LM85)

(Università degli Studi)

Teaching DATABASE DESIGN

GenCod A004195

Owner professor GIOVANNI D'ERRICO

Teaching in italian DATABASE DESIGN

Teaching DATABASE DESIGN

SSD code ING-INF/05

Reference course DIGITAL HERITAGE

Course type Laurea Magistrale

Credits 6.0

Teaching hours Front activity hours: 30.0

For enrolled in 2025/2026

Taught in 2025/2026

Course year 1

Language ENGLISH

Curriculum PERCORSO COMUNE

Location

Semester Second Semester

Exam type Oral

Assessment Final grade

Open **Course timetable**

BRIEF COURSE DESCRIPTION

This course introduces the foundations of database design with a focus on relational databases and their role in Digital Heritage (collections, archives, excavation datasets, and research repositories). Students learn how to move from a real-world heritage scenario to a structured database: requirements conceptual model (ER/EER) relational schema SQL implementation and queries. (Optional, final guest lecture) A short overview of NoSQL families and when they can be useful for cultural heritage data.

REQUIREMENTS

Basic computer literacy (files, folders, spreadsheets). No programming background is required.

COURSE AIMS

By the end of the course, students will be able to:

- explain what a database system is (database + DBMS + applications) and why DBMSs matter for Digital Heritage (quality, consistency, reuse, multi-user access);
- elicit and document basic data requirements for a heritage scenario;
- design and draw an ER/EER conceptual model (entities, attributes, relationships, keys, cardinalities);
- map a conceptual model to a relational schema (tables, primary/foreign keys, constraints);
- implement the schema in SQL, populate tables with sample data, and write queries (including at least one view);
- collaborate effectively with technical teams by using correct database vocabulary and deliverables.

TEACHING METHODOLOGY

Lectures introduce core concepts with Digital Heritage examples (collections, provenance, actors, media links). Each theoretical block is followed by guided, hands-on activities: requirements analysis, ER/EER modeling, ER-to-relational mapping, and SQL exercises.
Work is progressively oriented toward the final project, with feedback sessions on students' models and queries.

ASSESSMENT TYPE	Project-based oral assessment. Students present and discuss a database design project related to Cultural Heritage (individual or in pairs). The project must include: 1. **Requirements Analysis** (short document): context, actors, goals, data types, main relationships, and relevant constraints. 2. **ER/EER Conceptual Model** (diagram): derived from requirements; includes keys and cardinalities. 3. **Relational Schema** (diagram): mapping from ER/EER; includes primary/foreign keys and constraints. 4. **SQL Implementation**: DDL statements to create tables and constraints; screenshots or exported scripts. 5. **Data Population**: at least 10 records per table (representative, even if synthetic). 6. **Queries**: at least 6 queries of increasing complexity; at least 1 **VIEW**; show both SQL and results. Submission: a single PDF or slide deck containing all deliverables, to be emailed at least **5 days** before the exam date.
ASSESSMENT SESSIONS	Assessment follows the official exam sessions published by the Degree Programme. Students book the exam session and submit the project at least 5 days before the chosen date.
OTHER USEFUL INFORMATION	Students are encouraged to work in pairs to simulate real-world collaboration between domain experts and technical roles. The course emphasizes clear documentation and well-formed diagrams as professional deliverables in Digital Heritage projects.

FULL SYLLABUS

Part A — Foundations (Digital Heritage context)

- Why databases matter in Digital Heritage: scale, relationships, provenance/traceability, reuse
- Database vs DBMS vs applications; main database operations
- File systems vs database systems; benefits of DBMS (redundancy control, integrity, security, backup/recovery, views, transactions)
- Data models: conceptual vs logical vs physical; introduction to the relational model vocabulary

Part B — Conceptual Design

- ER model: entities, attributes, keys, relationship types, structural constraints, weak entities
- ER diagrams and design guidelines
- EER model: specialization/generalization, inheritance (intro level)

Part C — Logical Design

- Relational model concepts
- Relational constraints and schema design
- ER/EER-to-relational mapping

Part D — SQL Essentials

- SQL DDL and data types
- Constraints in SQL (PK, FK, UNIQUE, NOT NULL; basic referential actions)
- Basic queries (SELECT, filtering, ordering, joins at introductory level)
- Views (intro)

Part E — Optional closing lecture (short seminar)

- NoSQL overview: document, key-value, column-family, graph; when and why (high-level)

REFERENCE TEXT BOOKS

Primary reference:

- Elmasri, R., & Navathe, S. B. **Fundamentals of Database Systems**, 7th edition, Pearson. (Chapters aligned with course topics; optional reading on NoSQL/Big Data topics).

Additional/optional references:

- Course slides and instructor's materials.
- DBMS documentation used in class.