UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Introduction to Knowledge Graphs

2425-114R-03

Title

Introduction to Knowledge Graphs

Teacher(s)

Dott. Marco Cremaschi
Prof. Anisa Rula
Dott. Blerina Spahiu

Language

English

Short description

This course offers an in-depth exploration of knowledge graphs (KGs) - a rapidly growing area of research and application in both industry and academia. Knowledge graphs provide a graph-based abstraction to organize, integrate, and derive value from diverse and complex data sources, forming the backbone of cutting-edge data management and AI systems.

Participants will gain foundational knowledge of KGs, starting with their core principles and extending to advanced

techniques in key topics such as:

- Languages and frameworks for querying knowledge graphs, such as SPARQL.
- Techniques for data integration, enrichment, and profiling to enhance the utility of KGs.
- Methods for assessing and refining knowledge graph quality to ensure reliability and accuracy.

Emerging intersections of KGs with cutting-edge AI technologies, including Retrieval-Augmented Generation (RAGs) and Large Language Models (LLMs).

The course emphasizes practical applications through real-world case studies, illustrating how knowledge graphs are deployed in domains such as healthcare, finance, and robotics. Participants will engage in hands-on discussions, exploring the current limitations of KGs and their future directions, including scalability, explainability, and integration with evolving AI paradigms.

To ensure accessibility, the course employs illustrative examples, intuitive visualizations, and clear explanations throughout. A portion of the course is reserved for discussions, enabling participants to align course concepts with their research interests and develop domain-specific strategies for KG adoption.

Final Exam:
Students will complete a project or in-depth study focused on the application of a knowledge graph in their specific research domain.

Syllabus

1. Introduction to Knowledge Graphs; (2h)
2. Modeling & Reasoning for KGs: Vocabularies, Ontologies, RDFS, OWL (2h)
3. Query languages for KGs (2h)
4. Data integration and Enrichment (2h)
5. Quality Assessment and Refinement (2h)
6. Knowledge Graph Profiling (2h)
7. Knowledge Graph, RAGs and LLMs (4h)
8. Knowledge Graph in practice (4h)

CFU / Hours

20 hours

Teaching period

September - October 2025

Sustainable Development Goals