

INF2032 2017-2  
Tpicos em Bancos de Dados III  
”Foundations of Databases”

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## 1 Motivation

The motivation of this course is to put together theory and practice of database and knowledge base systems. The main content includes a formal approach for the underlying existing technology from the point of view of logical expressiveness and computational complexity. New and recent database models and systems are discussed from theory to practical issues.

## 2 Goal of the course

The main goal is to introduce the student to the logical and computational foundations of database systems.

## 3 Syllabus

The course is divided in two parts:

Classical part: relational database model

1. Revision and formalization of relational databases. Limits of the relational data model;
2. Relational query languages; DataLog and recursion;
3. Logic: Propositional, First-Order, Higher-Order, Second-Order, Fixed points logics;
4. Computational complexity and expressiveness of database query languages;

New approaches for database logical models

1. XML-based models, Monadic Second-Order Logic, XPath and XQuery;
2. RDF-based knowledge bases;
3. Decidable Fragments of First-Order logic, Description Logic, OWL dialects;
4. NoSQL and NewSQL databases;

## 4 Evaluation

The evaluation will be based on homework assignments (70 %) and a research manuscript + seminar (30%).

## 5 Supporting material

Lecture notes, slides and articles. Referenced books are freely available online. More details at a wiki-based web page (available from August 7th on)

## References

- [ABS00] Serge Abiteboul, Peter Buneman, and Dan Suciu. *Data on the Web: From Relations to Semistructured Data and XML*. Morgan Kaufmann Publishers Inc., San Francisco, CA, USA, 2000.
- [AHV95] Serge Abiteboul, Richard Hull, and Victor Vianu, editors. *Foundations of Databases: The Logical Level*. Addison-Wesley Longman Publishing Co., Inc., Boston, MA, USA, 1st edition, 1995.
- [AMR<sup>+</sup>11] Serge Abiteboul, Ioana Manolescu, Philippe Rigaux, Marie-Christine Rousset, and Pierre Senellart. *Web Data Management*. Cambridge University Press, New York, NY, USA, 2011.
- [BCM<sup>+</sup>03] Franz Baader, Diego Calvanese, Deborah L. McGuinness, Daniele Nardi, and Peter F. Patel-Schneider, editors. *The Description Logic Handbook: Theory, Implementation, and Applications*. Cambridge University Press, New York, NY, USA, 2003.
- [GKL<sup>+</sup>05] Erich Grädel, P. G. Kolaitis, L. Libkin, M. Marx, J. Spencer, Moshe Y. Vardi, Y. Venema, and Scott Weinstein. *Finite Model Theory and Its Applications (Texts in Theoretical Computer Science. An EATCS Series)*. Springer-Verlag New York, Inc., Secaucus, NJ, USA, 2005.