

# Information Modeling

University of Illinois School of Information Sciences

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LIS561-LE  
Spring 2017  
Mondays, 5:30-7:30 PM, online  
4 GR hours

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## Course Description

An introduction to the foundations of information modeling methods used in current information management applications. The specific methods considered include relational database design, conceptual modeling, markup systems, and ontologies. The basic concepts underlying these methods are, respectively, relations, entities, grammars, and logic. Implementations include relational database design, FR/EER/UML diagrams, XML markup languages, and RDF/OWL semantic web languages. First order logic is emphasized throughout as the foundational framework for information modeling in general, and for contemporary web-based information management and delivery systems (including semantic web technologies) in particular.

## Course Overview

*This section provides more detailed information about the class including what subjects will be covered and perhaps the class's philosophical underpinnings (broadly understood).*

## Pre- and Co-requisites

None.

## Course Overview

Two sorts of students are anticipated and the course objectives are similar but slightly different for each group. In neither case is prior relevant knowledge assumed.

- LIS561 prepares students anticipating generalist responsibilities (as directors, managers, general staff, etc.) to be effective leaders in making decisions about the design, development, and evaluation of information systems, services, and policies, helping their organizations and communities deal with all aspects of the difficult technology challenges ahead.
- LIS561 prepares students anticipating careers as technology specialists to efficiently acquire and maintain superior information modeling skills throughout their careers and to play leadership roles in the design, development, and evaluation of information systems, services, and policies.

Consistent with the GSLIS goal of producing leaders and not just competent professionals we focus on developing a deep understanding that will have long-term benefits and prepare students to engage the hardest problems facing organizations and society.

Of course LIS561 alone cannot fully realize these objectives; it makes a partial contribution, focusing on the principles and concepts of information modeling. A partial contribution, but a necessary one: the connection between a deep understanding of information modeling concepts and the challenging information management problems facing us today is profound.

## Strategy

The course examines the major modeling approaches currently in use in information management: relational modeling, conceptual modeling, XML markup, and ontologies, focusing on underlying concepts and principles. The course is thus simultaneously a foundations course and a survey course. There are several important cross-cutting themes:

- Data independence through abstraction.
- The interdefinability of fundamental modeling constructs.
- Deep vs. superficial differences in modeling languages.
- The expressiveness vs. tractability tradeoff.
- The fundamental role of a very small set of inter-related concepts.

*This section of the syllabus includes goals and objectives. [This document](#) from the Arizona State University Provost Office suggests some distinctions between learning goals, objectives, and outcomes.*

## Learning Objectives

*Objectives state things the students and instructor will do.*

1. Objective A
2. Objective B
3. Objective C

## Learning Outcomes

*Learning outcomes are much more detailed descriptions of the competencies students will gain during the course.*

### **Outcome A**

In situation X, you will be able to *identify* some specific property of a thing named in this sentence.

### **Outcome B**

Faced with some common professional problem, you will be able to *explain* the difference between two possible diagnoses.

### **Outcome C**

After reading this sentence, you will be able to *recommend* a different strong verb to cue with typographic emphasis.

## **Course Materials**

All required readings for this class are available online. They are listed in the references section at the end of this syllabus.

## **About Dave Dubin**

David Dubin is a Research Associate Professor at GSLIS. His research explores the foundations of information representation and description as well as issues of expression and encoding in documents and digital information resources.

## **Library Resources**

<http://www.library.illinois.edu/lis/>  
[lislib@library.illinois.edu](mailto:lislib@library.illinois.edu)  
Phone: (217) 300-8439

## **Writing and Bibliographic Style Resources**

The campus-wide Writers Workshop provides free consultations. For more information see <http://www.cws.illinois.edu/workshop/> The iSchool has a Writing Resources Moodle site <https://courses.ischool.illinois.edu/course/view.php?id=1705> and iSchool writing coaches also offer free consultations.

## **Academic Integrity**

*Provide information regarding academic integrity. The following is an example.*

Please review and reflect on the academic integrity policy of the University of Illinois, [http://admin.illinois.edu/policy/code/article1\\_part4\\_1-401.html](http://admin.illinois.edu/policy/code/article1_part4_1-401.html) to which we subscribe. By turning in materials for review, you certify that all work presented is your own and has

been done by you independently, or as a member of a designated group for group assignments. If, in the course of your writing, you use the words or ideas of another writer, proper acknowledgment must be given (using APA, Chicago, or MLA style). Not to do so is to commit plagiarism, a form of academic dishonesty. If you are not absolutely clear on what constitutes plagiarism and how to cite sources appropriately, now is the time to learn. Please ask me! Please be aware that the consequences for plagiarism or other forms of academic dishonesty will be severe. Students who violate university standards of academic integrity are subject to disciplinary action, including a reduced grade, failure in the course, and suspension or dismissal from the University.

## Statement of Inclusion

### Inclusive Illinois Committee Diversity Statement

As the state's premier public university, the University of Illinois at Urbana-Champaign's core mission is to serve the interests of the diverse people of the state of Illinois and beyond. The institution thus values inclusion and a pluralistic learning and research environment, one which we respect the varied perspectives and lived experiences of a diverse community and global workforce. We support diversity of worldviews, histories, and cultural knowledge across a range of social groups including race, ethnicity, gender identity, sexual orientation, abilities, economic class, religion, and their intersections.

## Accessibility Statement

To obtain accessibility-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor and the [Disability Resources and Educational Services](#) (DRES) as soon as possible. To contact DRES you may visit 1207 S. Oak St., Champaign, call (217) 333-4603 (V/TTY), or e-mail a message to [disability@illinois.edu](mailto:disability@illinois.edu).

## Emergency response: Run, Hide, Fight

Emergencies can happen anywhere and at any time. It is important that we take a minute to prepare for a situation in which our safety or even our lives could depend on our ability to react quickly. When we're faced with any kind of emergency – like fire, severe weather or if someone is trying to hurt you – The [University of Illinois Police Department](#) recommends three options: [Run, hide or fight](#).

## Assignments and Evaluation

*This section should detail the grading policy (what constitutes an A, B, C, etc.) and also delineate the differences among variable credit assignments. Brief descriptions of assignments can be included here. Instructors who employ a points system should explain how these translate into letter grades. Information regarding what should be included with assignments (name, page numbers, cover sheets, etc.) can also be included in this section.*

*Include information about incomplete grades. Students must request an incomplete grade from the instructor. The instructor and student will agree on a due date for completion of coursework and the student must file an Incomplete Form signed by the student, the instructor, and the student's academic advisor with the School's records representative. More information on incompletes is available here:*

[http://webdocs.ischool.illinois.edu/registration/incomplete\\_grade\\_form.pdf](http://webdocs.ischool.illinois.edu/registration/incomplete_grade_form.pdf)

*Include a policy on late assignments. Describe requirements for attendance, participation, and etiquette. Note any requirements regarding excused absences. Consider linking to the student code, which states that "Regular class attendance is expected of all students at the University" [http://studentcode.illinois.edu/article1\\_part5\\_1-501.html](http://studentcode.illinois.edu/article1_part5_1-501.html)*

## Sample Policy Text

All assignments are required for all students. Completing all assignments is not a guarantee of a passing grade. All work must be completed in order to pass this class. Late or incomplete assignments will not be given full credit unless the student has contacted the instructor prior to the due date of the assignment (or in the case of emergencies, as soon as practicable).

### **Assignments, Exercises & Grade Distribution:**

- Assignment 1: First Assignment Title. Due January 23 (N%).
- Assignment 2: Second Assignment Title. Due April 03 (N%).
- Assignment 3: Third Assignment Title. Due A3DUE (N%).
- Attendance and Class Participation (N%)

### **Grading Scale:**

The following is a sample grading scale.

94-100 = A  
90-93 = A-  
87-89 = B+  
83-86 = B  
80-82 = B-  
77-79 = C+  
73-76 = C  
70-72 = C-  
67-69 = D+  
63-66 = D  
60-62 = D-  
59 and below = F

## Topic Schedule

### Week 1: No live session: Presenting Models

### Week 2: January 23: Models and Domains

**Due this week:** Homework Assignment 1, SVG diagram assignment, Due January 23

### Week 3: January 30: Propositional Logic

**Required Readings:** Benthem et al. 2014a

### Week 4: February 06: Predicate Logic

**Required Readings:** Benthem et al. 2014b

**Due this week:** Homework Assignment 2, Propositional logic assignment, Due February 06

### Week 5: February 13: Predicate Logic

**Required Readings:** Benthem et al. 2014b

**Due this week:** Homework Assignment 3, Predicate logic assignment, Due February 13

### Week 6: February 20: Sets, relations, and functions

**Required Readings:** Partee 2006

### Week 7: February 27: UML and relational modeling

**Required Readings:** Seidl et al. 2015

**Due this week:** Homework Assignment 4, Set theory assignment, Due February 27

### Week 8: March 06: Normal forms and normalization

**Required Readings:** Kent 1983

**Due this week:** Homework Assignment 5, UML class diagram assignment, Due March 06

### Week 9: March 13: Syntax and Grammar

**Required Readings:** Rosen 1988

**Due this week:** Homework Assignment 6, Relational modeling assignment, Due March 13

### Week 10: Spring Break: March 20:

### Week 11: March 27: Semantics and Interpretation

**Required Readings:** Bach 1989

**Due this week:** Homework Assignment 7, Formal grammar assignment, Due March 27

### **Week 12: April 03: Description Logics**

**Required Readings:** Krötzsch et al. 2012

**Due this week:** Homework Assignment 8, Formal semantics assignment, Due April 03

### **Week 13: April 10: Ontologies**

**Required Readings:** Hitzler et al. 2012

**Due this week:** Homework Assignment 9, Description logic assignment, Due April 10

### **Week 14: April 17: Wrapup and Evaluation**

**Due this week:** Homework Assignment 10, RDF description assignment, Due April 17

## **Readings**

Bach, E. 1989. "Background and Beginning, Worlds Enough and Time." In *Informal Lectures on Formal Semantics*. Albany, NY, 1–32.

<https://uofi.box.com/s/lfqsrzjkhzdzml9d2g5w0ndtyvn0ndom>.

Bentham, J van, Ditmarsch, H van, Eijck, J van, and Jaspars, J. 2014a. "Chapter 2: Propositional Logic". In *Logic in Action*. Amsterdam, NL, 2.1–2.37.

<http://www.logicinaction.org/docs/ch2.pdf>.

Bentham, J van, Ditmarsch, H van, Eijck, J van, and Jaspars, J. 2014b. "Chapter 4: The World According to Predicate Logic". In *Logic in Action*. Amsterdam, NL, 4.1–4.53.

<http://www.logicinaction.org/docs/ch4.pdf>.

Hitzler, P, Krötzsch, M, Parsia, B, Patel-Schneider, P F, and Rudolph, S. 2012. "OWL 2 Web Ontology Language Primer". <http://www.w3.org/TR/owl2-primer/>.

Kent, W. 1983. "A Simple Guide to Five Normal Forms in Relational Database Theory". *Commun. ACM* 26.2, 120–125.

<http://doi.acm.org.proxy2.library.illinois.edu/10.1145/358024.358054>.

Krötzsch, M, Simancík, F, and Horrocks, I. 2012. "A Description Logic Primer". *arXiv preprint arXiv:1201.4089*. <http://arxiv.org/abs/1201.4089>.

Partee, B H. 2006. "Basic Concepts of Set Theory, Functions and Relations". [http://people.umass.edu/partee/NZ\\_2006/Set%20Theory%20Basics.pdf](http://people.umass.edu/partee/NZ_2006/Set%20Theory%20Basics.pdf).

Rosen, K H. 1988. "Languages and Grammars". In *Discrete Mathematics and its Applications*. New York, 552–563. <https://uofi.box.com/s/nomrry0e4cone88xvnciaf14gg93t68h>.

Seidl, M, Scholz, M, Huemer, C, and Kappel, G. 2015. "The Class Diagram". In *UML @ Classroom: An Introduction to Object-Oriented Modeling*. Eds. M. Seidl, M. Scholz, C. Huemer, and G. Kappel. Cham, 49–84. [http://dx.doi.org/10.1007/978-3-319-12742-2\\_4](http://dx.doi.org/10.1007/978-3-319-12742-2_4).