Analytical Foundations for Information Problems

University of Illinois School of Information Sciences

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IS203-A  
CRN: 12345  
Spring, 2019  
Tuesday and Thursday, 9:00-11:50 AM, Room 428, Falk Memorial Hall  
3 credit hours

This syllabus may be obtained in alternative formats upon request. Please contact the instructor.

Instructor: Dave Dubin  
Email: ddubin@illinois.edu  
Office: Room 330, Information Sciences Building  
Office Hour: Thursday and Friday, 3:00-5:00 PM and by appointment.  
Preferred contact method is face to face.

Instructional Assistant: Assistant Name  
Email: netID@illinois.edu  
Office: Room NNN, LIS Building  
Office Hour: Assistant Office Hours  
Preferred Contact Method: Phone, email, face to face, etc.

# Course Description

A survey of mathematical topics for students in information sciences. Provides an introduction to sets, relations, graphs, grammars, probability, and propositional and predicate logic. These topics relate to applications in information modeling, representation and expression.

## Pre- and Co-requisites

None.

# Course Overview

## Learning Objectives

1. Introduce mathematical structures and methods essential for understanding information systems.
2. Prepare students for further core and elective undergraduate coursework in information sciences.

## Learning Outcomes

Upon completion of this course, students will be able to:

1. Understand the definitions and uses of discrete and finite mathematical structures that are employed in information systems analysis, planning, and design.
2. Solve elemenary problems involving sets, relations, graphs, and other structures.
3. Recognize and appreciate the roles played by mathematical objects in models of application domains.

## Support of broader goals and objectives

This course advances the following broader learning objectives and goals:

* Degree program: Understand fundamental mathematical and programming tools for solving problems of information modeling, expression, and transformation
* School: Maintain global leadership in education for the information professions
* Campus: Intellectual Reasoning and Knowledge

# Course Materials

### Textbooks

* Wallis, W. D. (2013). *Mathematics in the real world*. Birkhäuser.
* Wallis, W. D. (2012). *A Beginner’s Guide to Discrete Mathematics*. Birkhäuser.
* Wallis, W. D. (2012). *A Beginner’s Guide to Finite Mathematics*. Birkhäuser.
* Magnus, P. D. (2012). *forallx: An Introduction to Formal Logic*. Albany, NY: SUNY.

All of these books are available free of charge online via the university library catalog.

# About your instructor

David Dubin is a Teaching Associate Professor at the University of Illinois School of Information Sciences. He has over twenty five years of teaching experience in the areas of information modeling, information systems analysis and design, and the foundations of information representation and encoding.

# Assignments and Evaluation

* Homework: 12 problem sets (36%)
* Seven quizzes completed in class (49%)
* Final exam (15%)

### Incomplete grades

An exceptional request for an incomplete grade is most often granted to students encountering a medical emergency or other extraordinary circumstances beyond their control. Students must request an incomplete grade from the instructor. The instructor and student will agree on a due date for completion of coursework. The student must submit an Incomplete Form signed by the student, the instructor, and the student’s academic advisor to the front office: <https://uofi.app.box.com/v/ISIncompleteForm> Please see the Student Code for full details: <http://studentcode.illinois.edu/article3/part1/3-104/>

### Assignments policy

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).

### 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

# Course policies

### Attendance/Participation policy

The iSchool expects students to attend all classes except in cases of emergency. Student Code on Attendance: <http://studentcode.illinois.edu/article1/part5/1-501/>

Enrollment in this course includes expectation of regular attendance. If you find you must miss (or have missed) class, contact the instructor as soon as possible. Students may miss one class session with no penalty; thereafter, each unexcused absence will result in your grade being lowered by one step (for example, an A- will become a B+). Repeated tardiness or leaving sessions early may be considered an unexcused absence unless alternate arrangements have been made with the instructor.

### Class conduct policy

Students share some of the responsibility for fostering an inclusive classroom. Students are expected to be respectful of others’ perspectives and lived experiences during class discussion. Students are expected to demonstrate respect for the ideas and opinions of all other members of the class at all times.

# Academic Integrity

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> 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](http://www.inclusiveillinois.illinois.edu/supporting_docs/Inclusive%20Illinois%20Diversity%20Statement.pdf)

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](http://disability.illinois.edu/) (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.

# Topic Schedule

### Week 1: January 15 and 17

#### Topic: Mathematics, information, and systems

* **Required Readings:** Syllabus

### Week 2: January 22 and 24

#### Topic: Sets

* **Required Readings:** Wallis BGDM section 1.1 and chapter 2

### Week 3: January 29 and 31

* **January 31:** in class, Quiz 1
* **January 29:** assignment due, Problem set: Sets

#### Topic: Propositional logic

* **Required Readings:** Magnus chapters 2 and 3

### Week 4: February 5 and 7

* **February 5:** assignment due, Problem set: Propositional Logic

#### Topic: Relations and relational models

* **Required Readings:** Wallis BGDM chapter 4

### Week 5: February 12 and 14

* **February 12:** assignment due, Problem set: Relations
* **February 14:** in class, Quiz 2

#### Topic: First order logic

* **Required Readings:** Magnus chapter 4

### Week 6: February 19 and 21

* **February 19:** assignment due, Problem set: Predicate Logic

#### Topic: Combinations and arrangements

* **Required Readings:** Wallis BGDM chapter 5

### Week 7: February 26 and 28

* **February 26:** assignment due, Problem set: Combinatorics
* **February 28:** in class, Quiz 3

#### Topic: Probability

* **Required Readings:** Wallis BGDM chapter 6

### Week 8: March 5 and 7

* **March 5:** assignment due, Problem set: Probability

#### Topic: Data and Probability Distributions

* **Required Readings:** Wallis MRW chapters 4 and 5

### Week 9: March 12 and 14

* **March 14:** in class, Quiz 4
* **March 12:** assignment due, Problem set: Distributions

#### Topic: Introduction to Graphs

* **Required Readings:** Wallis BGFM chapter 4

### Week 10: Spring Break: March 16-25

### Week 11: March 26 and 28

* **March 28:** in class, Quiz 5

#### Topic: Graphs problems and algorithms

* **Required Readings:** Wallis BGDM chapter 7

### Week 12: April 2 and 4

* **April 2:** assignment due, Problem set: Graphs, part 1

#### Topic: Trees and maps

* **Required Readings:** Wallis MRW chapter 8

### Week 13: April 9 and 11

* **April 11:** in class, Quiz 6
* **April 9:** assignment due, Problem set: Graphs, part 2

#### Topic: Matrices

### Week 14: April 16 and 18

* **April 16:** assignment due, Problem set: Matrices

#### Topic: Symbols and coding

* **Required Readings:** Wallis MRW chapter 10 and Schneider v. 2.72

### Week 15: April 23 and 25

* **April 25:** in class, Quiz 7
* **April 23:** assignment due, Problem set: Symbols and codes, part 1

#### Topic: Number theory and privacy

* **Required Readings:** Wallis BGDM chapter 9

### Week 16: April 30

* **April 30:** assignment due, Problem set: Symbols and codes, part 2

#### Topic: Semester Wrapup

### Week 17: Finals week

* **date to be announced:** in class, Final Exam

# Library Resources

http://www.library.illinois.edu/lis/  
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.

## 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](http://police.illinois.edu/safe) recommends three options: [Run, hide or fight](http://police.illinois.edu/dpsapp/wp-content/uploads/2016/08/syllabus-attachment.pdf).

## Appendix: Program, unit, and campus goals and objectives

### Goals of the BS/IS

* Equip students to be leaders in a knowledge society and innovators in a knowledge economy
* Educate students for known, emerging, and currently unforeseeable careers in information sciences
* Provide an interdisciplinary education where studies in fundamentals of information sciences and in application areas are fully integrated
* Ensure that various upper-division elective pathways of the major share a common core of information sciences knowledge
* Provide a program with enough flexibility to facilitate transfers into the major at the sophomore level, transfer across colleges at the sophomore and junior level, and transfers from two-year colleges
* Since information sciences is a rapidly developing field, offer a flexible program that responds quickly to new needs and opportunities, and to new findings and approaches in the information sciences
* Prepare interested students for graduate study in information sciences and related fields

### Objectives of the BS/IS

* Understand relationships among people, information, and technology
* Understand the history, theory, philosophy and methodologies of the field of information sciences
* Apply various approaches to research in the information sciences, including social science methods, data and text mining, digital humanities, historical approaches, and others
* Apply critical analytical skills to information issues
* Understand fundamental mathematical and programming tools for solving problems of information modeling, expression, and transformation

### iSchool Goal

* Maintain global leadership in education for the information professions

### University of Illinois Campus-Wide Learning Goals

1. Intellectual Reasoning and Knowledge
2. Creative Inquiry and Discovery
3. Effective Leadership and Community Engagement
4. Social Awareness and Cultural Understanding
5. Global Consciousness