Foundations of Computer Science

COMP 2230

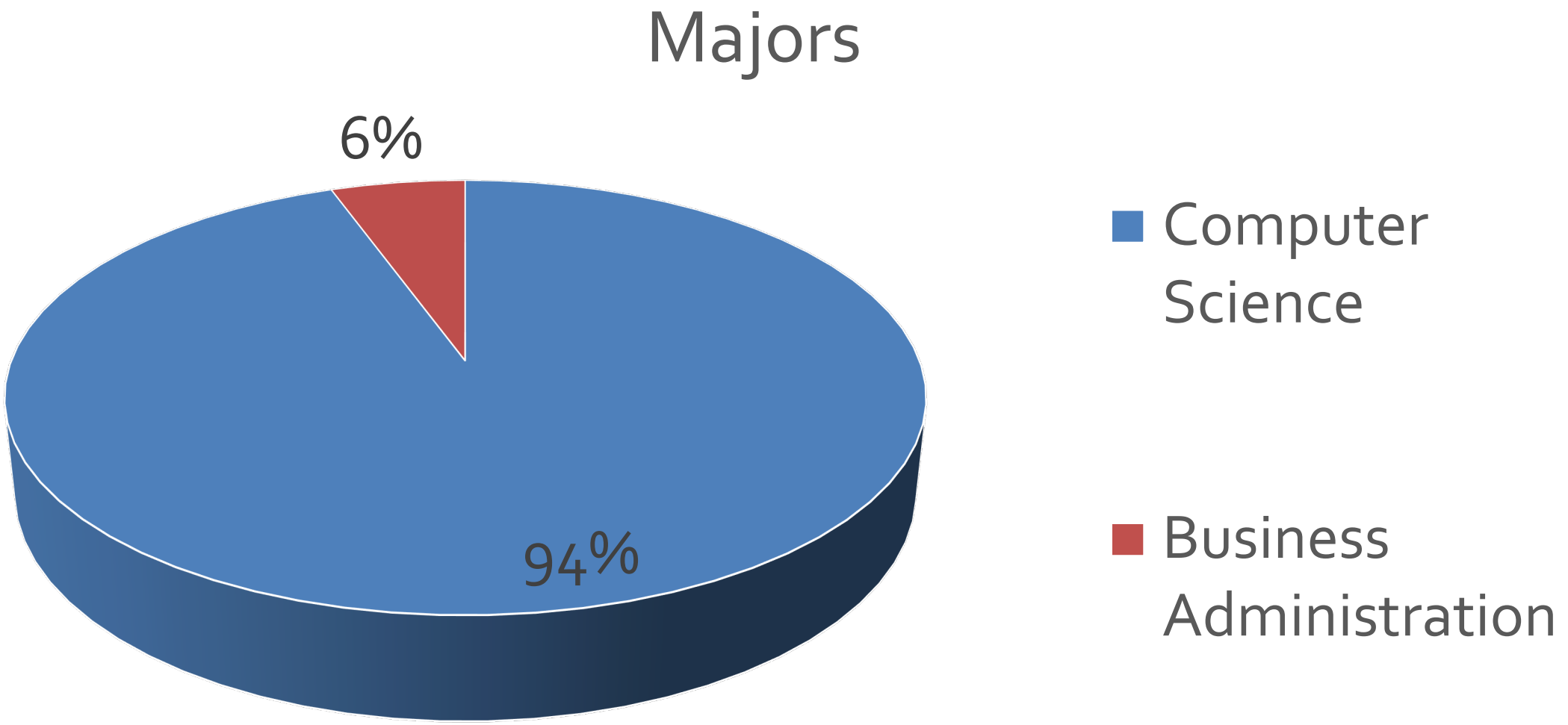
Who am I?
(for those of you who don't know me already)

- Dr. Barry Wittman
- Not Dr. Barry Whitman
- Education:
  - PhD and MS in Computer Science, Purdue University
  - BS in Computer Science, Morehouse College
- Hobbies:
  - Reading, writing
  - Enjoying ethnic cuisine
  - DJing
  - Lockpicking
  - Stand-up comedy

How can you reach me?

- **E-mail:** wittman1@otterbein.edu
- **Office:** Art & Communication C123
- **Phone:** (614) 823-2944
- **Office hours:** **MF** 2:00 – 4:00 p.m.,
  W 2:00 – 3:30 p.m.,
  TR 10:00 – 11:15 a.m.,
  TR 2:00 – 4:00 p.m.,
  and by appointment
- **Website:**
  http://faculty.otterbein.edu/wittman1/

Who are you?



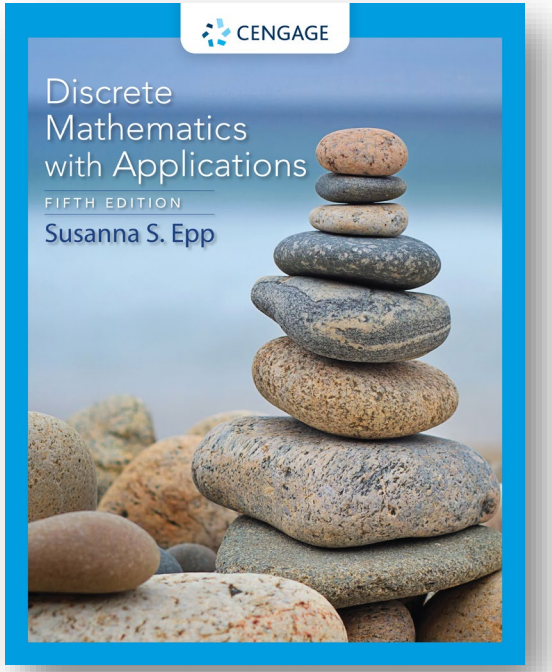
Why are we here?

- What's the purpose of this class?
- What do you want to get out of it?
- Do you want to be here?

Course Overview

Textbook

- Susanna S. Epp
- ***Discrete Mathematics with Applications***
- 5th Edition, 2019, Cengage Learning
- ISBN-10: 1337694193
- ISBN-13: 978-1337694193



You have to read the book

- You are expected to read the material before class
- If you're not prepared, you may be asked to leave
- You may forfeit the education you have paid around **$100 per class meeting** to get

This is a math class

- It's mostly **discrete** math
  - Meaning math that is not continuous
- It is not **discreet** math
  - Meaning math that won't tell people what you did
- There are certain kinds of math that are really beneficial to CS
- We have collected a big chunk of these and put them in this course
- It's a grab bag

Topics to be covered

- Review:
  - Logic
  - Proofs
  - Basic number theory
  - Set theory
- Mathematical induction
- Functions and relations
- Counting and probability
- Graphs and trees
- Regular expressions and finite automata
- Running time
- Formal languages and grammars

More information

For more information, visit the webpage:

`http://faculty.otterbein.edu/wittman1/comp2230`

- The webpage will contain:
  - The most current schedule
  - Notes available for download
  - Reminders about exams and homework
  - Detailed policies and guidelines

Homework

Six homework assignments

- 36% of your grade will be six equally weighted homework assignments
- Each will focus on a different set of topics from the course
- All homework is to be done individually
- I am available for assistance during office hours and through e-mail

Turning in homework

- Homework assignments must be turned in by uploading them to Brightspace **before** the deadline
- Late homework will not be accepted
- Paper copies of homework will not be accepted
- Each homework done in LaTeX will earn 0.75% extra credit toward the **final semester grade**
- Doing every homework in LaTeX will raise your final grade by 4.5% (almost half a letter grade)

Tickets Out the Door

Tickets out the door

- 5% of your grade will be tickets out the door
- These tickets will be based on material covered in the previous one or two lectures
- They will be graded leniently
- They are useful for these reasons:
  1. Informing me of your understanding
  2. Feedback to you about your understanding
  3. Easy points for you
  4. Attendance

Exams

Exams

- There will be three equally weighted in-class exams totaling 45% of your final grade
  - **Exam 1:** 1/26/2026
  - **Exam 2:** 2/23/2026
  - **Exam 3:** 3/30/2026
- The final exam will be worth 14% of your grade
  - **Final:** 8:00 – 10:00 a.m.

    4/29/2026

Course Schedule

Tentative schedule

Week	Starting	Topics	Chapters	Notes
1	01/05/26	Introduction		
2	01/12/26	Review of Logic	2 and 3	
3	01/19/26	Review of Proofs	4	MLK Day
4	01/26/26	Sequences	5	Exam 1
5	02/02/26	Recursion	5	
6	02/09/26	Review of Set Theory	6, 7.4	
7	02/16/26	Relations	8	
	02/23/26	Counting and probability	9	Exam 2
8	03/02/26	Counting and probability continued	9	
9	03/09/26	Spring Break		
10	03/16/26	Graphs and trees	10	
11	03/23/26	Running time	10 and 11	
12	03/30/26	Regular languages	11 and 12	Good Friday, Exam 3
13	04/06/26	Higher level languages	12	
14	04/13/26	Review	Handouts	
15	04/20/26	More Review	All	

Policies

Grading breakdown

- 36% • Six homework assignments
- 5% • Tickets out the door
- 45% • Three equally weighted midterm exams
- 14% • Final exam

Grading scale

A	93-100	B-	80-82	D+	67-69
A-	90-92	C+	77-79	D	60-66
B+	87-89	C	73-76	F	60-62
B	83-86	C-	70-72		

Academic dishonesty

- Don't cheat
- **First offense:**
  - I will try to give you a zero for the assignment, then try to lower your final letter grade for the course by one full grade
- **Second offense:**
  - I will try to fail you for the course and try to kick you out of Otterbein
- Refer to the syllabus for the school's policy
- Ask me if you have questions or concerns
- **You are not allowed to look at another student's work**
- **Don't use AI tools like ChatGPT to do *any* math you turn in**

Disability Services

The University has a continuing commitment to disability inclusion (e.g., learning disabilities, mental health diagnoses, and chronic or temporary medical conditions). Disability Services (DS) helps to facilitate reasonable accommodations, provides referrals to students interested in exploring a potential diagnosis, and assists students and faculty to minimize barriers for an accessible educational experience. If you need accommodations or guidance, please contact DS at DisabilityServices@otterbein.edu as soon as possible or visit www.otterbein.edu/ods for more information. While we strive to meet your needs within the parameters of our course requirements and learning objectives, accommodations are not typically retroactive and late requests may not be guaranteed. Please let us know how we can best support you. Your instructor is happy to discuss this privately with you as well.

Logical warmup

- On a given island, everyone is either a Knight or a Knave
- Knights always tell the truth, and Knaves always lie
- Imagine that I meet two inhabitants of this island and ask, "Is either of you a Knight?"
- Given his response, I know the answer to my question
- Are the inhabitants in question Knights or Knaves?

Review of Propositional Logic

Combining truth and falsehood

- Politicians lie.
  - True statement!
- Cast iron sinks.
  - True statement!
- Politicians lie in cast iron sinks.
  - Absurd statement!

Propositional logic

- Propositional logic is the logic that governs **statements**
- A statement is either **true** or **false** (but nothing else!)
- We want to combine them, infer things about them, prove them true or false
- First, we have to learn their rules

p and *q*

- "The moon is made of green cheese" is a statement, that is, something that is either true or false
- It takes a long time to write "The moon is made of green cheese"
- Mathematicians are lazy, and so they let a variable represent this statement
- ***p*** and ***q*** are common choices for propositional logic
- So, we can use ***p*** in place of "The moon is made of green cheese"
- Similarly, we can use ***q*** in place of "The earth is made of rye bread"

AND, OR, NOT

- Like programming, combining two values with AND will be true only if both values are true
- Using OR makes the result true if either is true
- NOT changes a true to false and a false to true
- Mathematicians use their own symbols for AND, OR, and NOT

Operation	Symbol	Example
AND	$\wedge$	$p \wedge q$
OR	$\vee$	$p \vee q$
NOT	~	$\sim p$

Truth tables

- To better understand an operation, we can make a **truth table**, giving all possible input values and the corresponding output values
- This truth table is for $p \vee q$

p	q	$p \vee q$
T	T	T
T	F	T
F	T	T
F	F	F

Think about it…

- What's the truth table for $q \vee p$?
- Consider: $(p \vee q) \wedge \sim(p \wedge q)$
  - What's its truth table?
  - What's its meaning?
- What's the truth table for $p \vee q \vee r$?
- How many lines are in a truth table with n symbols?
- How many different truth tables are possible for two input symbols?

Logical equivalence

- Two different statements can be written differently and yet be logically equivalent
  - $p \equiv \sim(\sim p)$
- Make a truth table
  - If all outputs match up, the statements are logically equivalent
  - If even one output doesn't match, the statements are **not** equivalent

De Morgan's Laws

- What's an expression that logically equivalent to $\sim(p \vee q)$?
- What about logically equivalent to $\sim(p \wedge q)$?
- De Morgan's Laws state:
  - $\sim(p \wedge q) \equiv \sim p \vee \sim q$
  - $\sim(p \vee q) \equiv \sim p \wedge \sim q$
  - Essentially, the negation flips an AND to an OR and vice versa

What are you implying?

- You can construct all possible outputs using combinations of AND, OR, and NOT
- But, sometimes it's useful to introduce notation for common operations
- This truth table is for $p \rightarrow q$

p	q	$p \rightarrow q$
T	T	T
T	F	F
F	T	T
F	F	T

If …

- We use $\rightarrow$ to represent an **if-then** statement
- Let p be "The moon is made of green cheese"
- Let q be "The earth is made of rye bread"
- Thus, $p \rightarrow q$ is how a logician would write:
  - If the moon is made of green cheese, then the earth is made of rye bread
  - Here, p is called the hypothesis and q is called the conclusion
- What other combination of p and q is logically equivalent to $p \rightarrow q$?

Upcoming

Next time…

- More on propositional logic
- Predicate logic
  - Universal quantifiers
  - Existential quantifiers

Reminders

- Read 2.3, 3.1, and 3.2