

Algorithms in Systems Engineering IE172

Introduction

Dr. Ted Ralphs

Introductory Stuff

- Welcome back!
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- Office [473 Mohler Lab](#)
- WR 1-2
- Teaching assistants
 - Kresimir Mihic
- Check the syllabus for other administrative information

Course Description

- This class is about **algorithms**, especially those occurring in systems engineering applications.
- We will consider
 - how to **design** algorithms,
 - how to **implement** them,
 - how to **analyze** their behavior, and
 - how to use them to **solve problems**.

General Approach

- The course will be focused on **applications**.
- The first two weeks will lay the theoretical foundation.
- However, we will spend most of the course discussing the application of algorithms to solving specific kinds of problems.
- We will try to motivate everything we do with **examples**.
- The laboratories will provide context for the lectures.

Laboratories

- Each laboratory will focus on developing and implementing an algorithm to solve a given scenario-based problem.
- Typical lab requirements
 - Write a program implementing a particular algorithm to solve a given problem.
 - Analyze the algorithm, theoretically and empirically.
 - Report your results.
- During the laboratory itself, you will be asked to accomplish certain milestones in the development of your program.
- The final lab write-up, along with well-commented source code and answers to supplementary problems, will be due on a specified date after the laboratory, usually approximately two weeks.
- We will program in Python using Eclipse with PyDev as our IDE.

What do I expect you to know already?

- The basics of object-oriented programming.
- Some basic mathematics.

Approximate Syllabus

<u>Week</u>	<u>Block</u>	<u>Topic</u>	<u>Reading</u>	
1	Introduction	Algorithms and Python	Chapter 1	
2		Analyzing Algorithms	Chapter 2	
3		Basic Data Structures	Chapter 3	
4		Recursion and Recurrences	Chapter 4	
5	Search/Sort	Hash Tables	Chapter 5	
6		Sorting Algorithms	Chapter 5	
7	Networks	Trees	Chapter 6	
8		Tree Algorithms	Chapter 6	
9		Graphs	Chapter 7	Mid-term
10		Shortest Paths	Chapter 7	
11	Minimum Spanning Trees	Chapter 7		
12	Applications	Pattern Matching	Chapter 8	
13		Image Analysis	Chapter 8	
14		Cryptography	Chapter 8	

Course Requirements

- Attendance
- Participation
- Reading
- Laboratories/Homework
- Exams
 - Mid-term
 - Final

Grading

- Your grade will correspond to your learning and understanding of the course material.
- Some areas to keep in mind
 - Source code
 - * should be well-commented,
 - * should run without any errors “out of the box”, and
 - * should run correctly.
 - Homework write-ups should be clear and concise.
 - Homework will be submitted via Google Classroom.
 - Read the syllabus for more.
- Weighting
 - 40% Labs/Homework
 - 20% Mid-term
 - 20% Final
 - 20% Class and Laboratory Participation

Lateness

- You will get **seven total late days** over the semester.
- Each 24-hour period after the time the assignment is due counts as a late day.
- Your seven late days can be allocated in any way that you like.
- After that, there is a penalty of **10% per day late**.
- No assignment will be accepted more than seven days late.
- For group work, late days will be deducted for each person in the group.
- Please note on your assignment when it was turned in.

Group Work

- I encourage you to discuss ideas with other students and/or with the instructors orally.
- You must do the coding and the write-up yourself.
- YOU MAY NOT COPY ANY PART OF SOMEONE ELSE'S SOURCE CODE OR WRITE-UP.
- NO SHARING OF ELECTRONIC FILES!
- If you work with someone else, please acknowledge them in your write-up.

Use of External References

- The material in this course is covered extensively on the Internet.
- There is source code available for many of the algorithms we will discuss.
- **With the exception of source code**, you can use this supplementary material to enhance your understanding of course material.
- Please do not abuse this privilege.
- During the laboratories, please don't use the Internet.
- Outside of the lab, you may use external references for help.
- **YOU MUST CITE ANY EXTERNAL REFERENCES YOU USE!!**
- However, you may not copy other people's source code or anything else off of the Internet.
- Above all, please be aware of and do not violate intellectual property laws.

The Textbook

- We will cover almost all of the material in the textbook.
- In some cases, I will supplement the material in the book with other references for more depth.
- The textbook has an associated Web site

<http://pythonworks.org>

Course Web Site

- The course Web site will be at

<http://coral.ie.lehigh.edu/~ted/teaching/ie172/>

- I will post lecture slides before class so you can use them to take notes.
- The slides will be in PDF format.
- All handouts for the class will also be available.
- There will also be links to other relevant sites and reference materials.
- Please read the syllabus.

Approach to Lectures

- Lectures should be as **interactive** as possible.
- You will get more out of this course if you **ask questions during lecture**.
- The pace and structure of the lectures can be adjusted.
- **I need feedback** from you to adjust appropriately.

Feedback

- If you have constructive comments on the way the class is going, please tell me!
- I will be making adjustments as we go, so I strongly encourage you to provide me feedback.
- There will be no retribution for constructive criticism.

Questions?