JOHNS HOPKINS
WHITING SCHOOL
of ENGINEERING

Computer Science 600.469
Approximation Algorithms
Spring, 2015
(3 credits, EQ)

Instructor
Professor Michael Dinitz, mdinitz@cs.jhu.edu, http://www.cs.jhu.edu/~mdinitz/
Office: Malone 217, 410-516-7185
Office hours: Thursdays 3pm–4pm, and by appointment

Teaching Assistant
Zeyu Zhang, zyzhang92@gmail.com, http://www.cs.jhu.edu/~zzy/
Office hours: By appointment

Meetings
Tuesday, Thursday, 12–1:15 pm, Hodson 211

Textbook
David P. Williamson and David B. Shmoys. *The Design of Approximation Algorithms*. Cambridge University Press, 2011. http://www.designofapproxalgs.com/

Online Resources
Course webpage: http://www.cs.jhu.edu/~mdinitz/classes/ApproxAlgorithms/Spring2017/

Course Information

- This course provides an introduction to approximation algorithms. Topics include vertex cover, TSP, Steiner trees, cuts, greedy approach, linear and semi-definite programming, primal-dual method, and randomization. Additional topics will be covered as time permits. There will be a final project.
- **Prerequisites**
  Introduction to Algorithms (600.363) or Algorithms I (600.463)
- **Required, Elective or Selective Elective:** Elective

Course Goals
Specific Outcomes for this course are that:

- Students will learn the basic definitions of approximation algorithms.
- Students will learn basic algorithmic tools used to design approximation algorithms.
- Students will learn the limits of approximation, and the basic ways of proving hardness of approximation.

This course will address the following Criterion 3 Student Outcomes:

- An ability to apply knowledge of computing and mathematics appropriate to the discipline (a)
- An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution (b)

- An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs (c)
- An ability to function effectively on teams to accomplish a common goal (d)
- An ability to use current techniques, skills, and tools necessary for computing practice (i)
- An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices (j)

Course Topics

- Basic definitions of approximation ratios
- Algorithmic tools such as greedy, LP, and SDP rounding.
- Basic problems such as steiner tree, TSP, vertex cover, and set cover.
- Hardness of approximation.

Course Expectations & Grading

There will be homework assignments approximately every other week and a take-home final. Class participation (including scribe notes) is also required.

Homeworks: 50%
Final Project: 30%
Participation: 20%

This class will be graded on a curve, but not a strict one. That is, the correspondence between numeric and letter grades will be determined by the final distribution of numeric grades, but there is no specific letter grade distribution that will be targeted.

You are free to work on the homework in groups of up to 3, but you must write up your solutions entirely on your own. That is, collaboration is limited to discussing the problem, and does not include writing down the solution. Please list the members of your group on your submission.

Assignments & Readings

These will be posted on the course webpage.

Ethics

The strength of the university depends on academic and personal integrity. In this course, you must be honest and truthful, abiding by the *Computer Science Academic Integrity Policy*:

> Cheating is wrong. Cheating hurts our community by undermining academic integrity, creating mistrust, and fostering unfair competition. The university will punish cheaters with failure on an assignment, failure in a course, permanent transcript notation, suspension, and/or expulsion. Offenses may be reported to medical, law or other professional or graduate schools when a cheater applies.
>
> Violations can include cheating on exams, plagiarism, reuse of assignments without permission, improper use of the Internet and electronic devices, unauthorized collaboration, alteration of graded assignments, forgery and falsification, lying, facilitating academic dishonesty, and unfair competition. Ignorance of these rules is not an excuse.
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> Academic honesty is required in all work you submit to be graded. Except where the instructor specifies group work, you must solve all homework and programming assignments without the help of others. For example, you must not look at anyone else.s solutions (including program code) to your homework problems. However, you may discuss assignment specifications (not solutions) with others to be sure you understand what is required by the assignment.
>
> If your instructor permits using fragments of source code from outside sources, such as your textbook or on-line resources, you must properly cite the source. Not citing it constitutes plagiarism. Similarly, your group projects must list everyone who participated.

Falsifying program output or results is prohibited.

Your instructor is free to override parts of this policy for particular assignments. To protect yourself: (1) Ask the instructor if you are not sure what is permissible. (2) Seek help from the instructor, TA or CAs, as you are always encouraged to do, rather than from other students. (3) Cite any questionable sources of help you may have received.

On every exam, you will sign the following pledge: "I agree to complete this exam without unauthorized assistance from any person, materials or device. [Signed and dated]". Your course instructors will let you know where to find copies of old exams, if they are available.

You can find more information about university misconduct policies on the web at these sites:

- Undergraduates: `e-catalog.jhu.edu/undergrad-students/student-life-policies/`
- Graduate students: `e-catalog.jhu.edu/grad-students/graduate-specific-policies/`

Students with Disabilities

Any student with a disability who may need accommodations in this class must obtain an accommodation letter from Student Disability Services, 385 Garland, (410) 516–4720, `studentdisabilityservices@jhu.edu`.