Faculty of Science

Department of Computer Science

Course Outline (Winter 2017)

CPS 616 – Advanced Algorithms

Instructor	Sophie Quigley Dept. of Computer Science, Ryerson University Office: ENG263 Tel: 416-979-5000, x7401, Email: cps616@scs.ryerson.ca Office Hours: Thursdays 2:00-4:00PM
Prerequisites	CPS305 and (MTH210 or CPS616)
Calendar Description	Order notations, the greedy method, job scheduling, correctness, exchange argument, divide and conquer techniques, recurrence equations, the master method, integer multiplications, dynamic programming, matrix chain-product, the knapsack problem, graph algorithms (minimum spanning trees, single-source shortest paths, all-pairs shortest paths), text processing and pattern matching techniques, approximation algorithms.
Compulsory Textbook	The Design and Analysis of Algorithms 3rd Edition by Anany Levitin. Addison-Wesley 2012 ISBN-13: 978-0-13-231-681-1 This textbook is also available as a CourseSmart eTextbook
Reference Textbooks	None
Course Organization	3 hours of lecture and 1 lab hour per week for 12 weeks
Learning Objectives	This course has a strong mathematical component. It is expected that students who successfully complete this course will • be able to recognize the level of difficulty of problems that have algorithmic solutions, • have a good knowledge of standard algorithmic solutions to different classes of problems, • be able to design efficient algorithms to solve problems,

- know how to assess mathematically the space and time efficiency of computer algorithms

Course Content

Topics (approximate hours)
- Review of fundamentals of the analysis of algorithm efficiency (5)
- Brute force and exhaustive search (4)
- Decrease-and-conquer and divide-and-conquer (7)
- Transform-and-conquer (3)
- Dynamic Programming (3)
- Greedy technique (2)
- Iterative improvement (3)
- Limitations of Algorithmic power and NP-completeness (7)

Course Evaluation

Type	Handed out	Due	Late Penalty	Weight	Team Size
8 Labs	To be announced for each lab		-3^n	Total: 35%	TBA
Assignment	Feb 16	Mar 17	-3^n	10%	1 or 2
Midterm	Mar 10, 6-8PM		-100%	15 %	1
Final Exam	Exam period		-100%	40%	1
Participation and attendance	Immediately during lectures.		-100%	Bonus 5%	1

Details

Details on how to submit assignments on the due date, late penalties, team sizes are available by clicking on the links in the above table or at http://cps616.scs.ryerson.ca/. In particular: Teams who want to have one more member that the specified maximum for an assignment can do so with a penalty, but they must declare all team members on the marking sheet of that assignment when the assignment is submitted. Failure to do so constitutes academic misconduct and will be treated accordingly.

Course Technology

- D2L is used for grades and communications
- Tophat is used for lectures, attendance, and classroom participation.
- Other course information is posted on http://cps616.scs.ryerson.ca/

Evaluation Guidelines

Details on the evaluations will be available in D2L and on http://cps616.scs.ryerson.ca/

Missed Evaluations	Students are required to inform their instructors of any situation which arises during the semester which may have an adverse effect upon their academic performance, and must request any considerations and accommodations according to the relevant policies and well in advance. Failure to do so will jeopardize any academic appeals. ● *Medical certificates* – If a student misses the deadline for submitting an assignment, or the date of an exam or other evaluation component because of illness, he or she must submit a Ryerson Student Medical Certificate AND an Academic Consideration form within 3 working days of the missed date. Both documents are available at www.ryerson.ca/senate/forms/medical.pdf. If you are a full-time or part-time degree student, then you submit your forms to your own program department or school. If you are a certificate or non-certificate student, then you submit your forms to the staff at the front desk of the Chang School. ● *Religious observance* – If a student needs accommodation because of religious observance, he or she must submit a Request for Accommodation of Student Religious, Aboriginal and Spiritual Observance AND an Academic Consideration form within the first 2 weeks of the class or, for a final examination, within 2 weeks of the posting of the examination schedule. If the required absence occurs within the first 2 weeks of classes, or the dates are not known well in advance as they are linked to other conditions, these forms should be submitted with as much lead time as possible in advance of the required absence. Both documents are available at http://www.ryerson.ca/senate/forms/relobservforminstr.pdf. If you are a full-time or part-time degree student, then you submit the forms to your own program department or school. If you are a certificate or non-certificate student, then you submit the forms to the staff at the front desk of the Chang School. ● *Students who need academic accommodation support* should register with the Academic Accommodation Support office (formerly called the Access Centre). Before the first graded work is due, registered students should inform their instructors through an "Accommodation Form for Professors" that they are registered with Academic Accommodation Support and what accommodations are required.
Communication with Students	Ryerson's email policy http://www.ryerson.ca/content/dam/senate/policies/pol157.pdf states that only Ryerson e-mail accounts are to be used for communication with students. All students, including continuing education students, have access to Ryerson email through their my.ryerson.ca site, and this is the official way in which they receive communication. All students are required to register for and maintain this account. ***Emails sent from other accounts may not be answered!***
Academic Policies	a. *Ryerson Policies of Interest* Ryerson Senate Policies - http://www.ryerson.ca/senate/policies/ Ryerson Academic Integrity - http://www.ryerson.ca/academicintegrity/ Policy 46 - Undergraduate Grading, Promotion and Academic Standing Policy 60 - Student Code of Academic Conduct Policy 61 - Student Code of Non-academic Conduct Policy 134 - Undergraduate Academic Consideration and Appeals

Policy 135 - Examination Policy
Policy 150 - Accommodation of Student Religious Observance Obligations
Policy 157 - Student Email Accounts for Official University Communication

b. *Obligations* – Students need to inform faculty of any situation arising during the semester which may have an adverse effect upon their academic performance; they must request any necessary considerations (e.g. medical or compassionate), or accommodations [e.g. religious observance, disability (should be registered with the Access Center), etc.] according to policies and well in advance. Failure to do so will jeopardize any academic appeals.

c. *Re-grading and Re-calculation* – Must be requested within 10 working days of the return of the graded assignment to the class.

Academic Conduct	http://www.ryerson.ca/academicintegrity/ In order to create an environment conducive to learning and respectful of others' rights, phones and pagers must be silenced during lectures, lab sessions and evaluations. Students should refrain from disrupting the lectures by arriving late and/or leaving the classroom before the lecture is finished.
Academic Misconduct	According to the Ryerson policy 60 (http://www.ryerson.ca/content/dam/senate/policies/pol60.pdf), academic misconduct includes, but is not limited to: ▪ Plagiarism which is the claiming of words, ideas, artistry, drawings or data of another person. This also includes submitting your own work in whole or in part for credit in two or more courses. ▪ Cheating ▪ Misrepresentation of personal identity or performance ▪ Submission of false information ▪ Contributing to academic misconduct ▪ Damaging, tampering, or interfering with the scholarly environment ▪ Unauthorized copying or use of copyrighted materials ▪ Violations of departmental policies or professional behavior ▪ Violations of specific departmental or course requirements *Committing academic misconduct will trigger academic penalties, including:* ● *course-grade reduction greater than a grade of "zero" (0) on course work* ● *failing grades, suspension and possibly expulsion from the University.* *As a Ryerson student, you are responsible for familiarizing yourself with Ryerson conduct policies.* When submitting the assignment and the labs in this course, students will also need to fill out a "Submission Declaration" for each such submission declaring the type of assistance received for the work in question. Assignments and labs will not be graded unless accompanied by this declaration.
Non-Academic Conduct	Ryerson's Student Code of Non-academic Conduct is described in Senate Policy 61: http://www.ryerson.ca/content/dam/senate/policies/pol61.pdf

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Among many other infractions, the code specifically refers to the following as a violation: "Disruption of Learning and Teaching - Students shall not behave in disruptive ways that obstruct the learning and teaching environment".