Engineering Faculty Document No. *8-22*
August 26, 2021
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TO: The Faculty of the College of Engineering

FROM: Elmore Family School of Electrical and Computer Engineering

RE: New Graduate Course, ECE 51220 Applied Algorithms

The faculty of the School of Electrical and Computer Engineering has approved the following new course. This action is now submitted to the Engineering Faculty with a recommendation for approval.

ECE 51220 Applied Algorithms
Sem. 1, Lecture 3, Cr. 3.
Prerequisite by Topic: ECE 36800 or equivalent

Description: Solving large-scale problems typically rely on many clever data structures and algorithms. This course aims to cover many such useful algorithms for solving large-scale problems. These algorithms include greedy algorithms, dynamic programming and more advanced graph algorithms. The course also aims to demonstrate how such algorithms can be applied to solve optimization problems encountered in engineering applications. In particular, applications in the design of VLSI (very large scale integration) at circuit, layout, or system level will be used to demonstrate how an engineering problem can be formulated as a tree/graph problem and solved using established tree/graph algorithms.

Reason: There is no algorithms course in between ECE 36800 and 60800. This course would serve advanced undergraduate students and master's level students. This course targets mainly undergraduate students who have completed ECE36800 and master students. At the conclusion of ECE368, there are always a group of students who want to explore more advanced algorithms. However, the only class available is ECE608, which is not available to undergraduate students. This course can help to fill that gap. This course is also suitable for master students who have some experience with data structures and algorithms at the undergraduate level.

Milind Kulkarni,
Associate Head for Teaching and Learning
Elmore Family School of Electrical and Computer Engineering

ECE 595 Applied algorithms

Course Introduction

Instructor: Cheng-Kok KOH

Office	MSEE 254
Hours	MWF 9:00-11:00am Open-door policy, availability on google calendar (class and office hours are marked busy): https://www.google.com/calendar/embed?src=chengkok.koh@gmail.com&ctz=America/New_York&gsessionid=OK
Phone	(765) 496-3683
Email	chengkok@purdue.edu

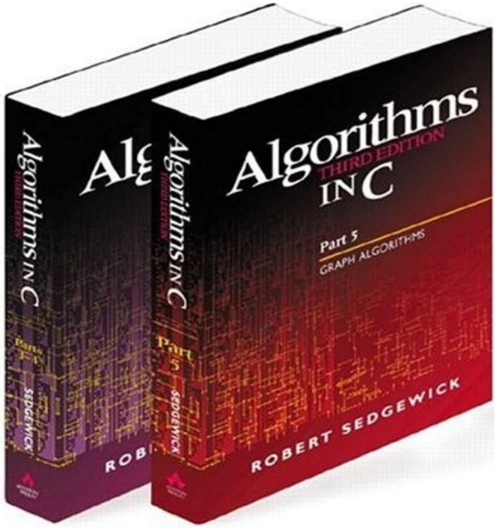
Course references

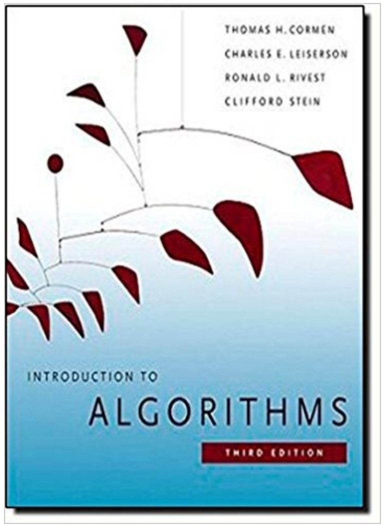
Algorithms in C, Parts 1-4: Fundamentals, Data Structures, Sorting, Searching, Third edition, Robert Sedgewick, Addison Wesley, 1999, ISBN-10: 0201314525, ISBN-13: 9780201314526

Algorithms in C, Part 5: Graph Algorithms, Third edition, Robert Sedgewick, Addison Wesley, 2002, ISBN-10: 0201316633, ISBN-13: 9780201316636

Introduction to Algorithms, Third edition, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, The MIT Press, ISBN-10: 0262033844, ISBN-13: 978-0262033848

Technical papers from various conferences and journals





Learning objectives

A student who successfully fulfills the course requirements will have demonstrated:

1) An understanding of greedy algorithms and dynamic programming (ABET outcome 1)
2) An understanding of advanced graph algorithms (ABET outcome 1)
3) An ability to design and implement appropriate data structures and algorithms for engineering applications (ABET outcomes 1 and 2)

Learning objective assessment

- Students must meet *all* learning objectives to receive a passing grade; “F” otherwise
- Meeting all objectives is a necessary (but not sufficient) condition to receive a passing grade
- For learning objectives 1 and 2, at least two opportunities will be provided:
  - Non-programming homework exercises (HW)
  - Midterm test(s) and final examination (EX)
  - You meet a learning objective if you score 50% or more on one of the evaluation instruments
- For learning objective 3, the assessment is based on your completion of a series of programming assignments (PA)
  - You meet the learning objective if you score 50% or more overall

Homework exercises (HW)

- 7 (±2) non-programming homework exercises
- Turn in your homework in class on the due date
- No late submission is accepted
- All non-programming homework exercises carry the same weight

Mid-term and final exams (EX)

- Open-book, open-notes
- Means to meet learning objectives
- There may be one or two midterm exams
  - Will announce in class at least two weeks before the exam
- If there is only one midterm exam, there will be a final exam
- No make-up exams (If conflict, notify me as soon as possible)
- All exams carry the same weight

Programming assignments (PA)

- 4 (±1) programming assignments (one of them could be a group project)
  - To be developed on Linux and submitted electronically (through Blackboard)
  - Do not wait until the last minute
- Work on your own for the individual programming assignments
- The group project requires you to work with partners and if time permits, a presentation by your group
- All individual programming assignments carry the same weight
- If there is a group project, the weight of the group project is twice the weight of an individual programming assignment

Grade determination

Non-programming homework exercises (HW)	20% (±10%)
Programming assignments (PA)	40% (±10%)
Midterm and final exams (EX)	40% (±10%)

- Assuming you have met all learning objectives (“F” otherwise)
  - “A”: $80\% \le \text{HW+PA+EX}$
  - “B”: $70\% \le \text{HW+PA+EX} < 80\%$
  - “C”: $60\% \le \text{HW+PA+EX} < 70\%$
  - “D”: $50\% \le \text{HW+PA+EX} < 60\%$
  - “F”: $\text{HW+PA+EX} < 50\%$
- This is the basis of your grade. The instructor has the discretion to “improve” your grade based on bonuses (earned through quizzes, for example)

Academic honesty

- We expect every member of the Purdue community to practice honorable and ethical behavior both inside and outside the classroom
- Any actions that might unfairly improve your grade will be considered cheating
  - If you received help for your exercise or assignment, acknowledge it – but do your own work!
  - All programming assignments are subject to computer-based comparison and analysis
- Cheating on an exercise/assignment/exam will result in a zero for the exercise/assignment/exam
  - It will be reported to the Dean of Students Office
  - It could result in a failing grade for the course, at the discretion of instructor

Topics covered (not in order)

- Greedy algorithms
- Dynamic programming
- Advanced graph algorithms
- Advanced heap structures
- Flow networks
- Applications of these algorithms

In case of emergency

- Course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances
- Any course changes will be posted on Blackboard
- Visit website http://www.purdue.edu/emergency_preparedness/ for more details on how to respond in an emergency

Addendum: EFD 8-22

Previous Course Offerings:

ECE 59500 Applied Algorithms, Fall 21 (31), Fall 19 (10), Fall 18 (27),