CIS 5515 Design and Analysis of Algorithms

- **Catalog Description:**

  – Prerequisite: CIS 5511 (Programming Techniques): minimum grade of C; may not be taken concurrently.

  – The course objective is to provide students with an understanding of the principles and techniques used in the design and analysis of efficient algorithms. Emphasis will be on critical thinking, problem-solving, and rigorous analysis. The main topics cover Greedy Algorithms, Divide and Conquer, Dynamic Programming, Network Flow, Approximation Algorithms, Adversary Arguments for Lower Bounds, and Theoretical results related to NP-completeness. A variety of classic algorithms will be chosen for discussion throughout the course, as they are important and/or are helpful for understanding the fundamental concepts.

- **Textbook:**

  – *Algorithm Design*

  Jon Kleinberg and Eva Tardos, Addison-Wesley, 2005.

  Reference book:

  – *Introduction to Algorithms*, Third Edition

  Thomas Cormen, Charles Leiserson, Ronald Rivest, and Clifford Stein, MIT Press, 2009.

- **Instructor:**

  – Dr. Jie Wu, Laura H. Carnell Professor, CIS, Temple University

  jiewu@temple.edu, www.cis.temple.edu/~wu

- **Goals:**

  – The student will get exposed to some advance problem-solving skills, including design and analysis of algorithms, and research trends in this area.

- **Class time:**

  – Wednesday: 5:30 pm - 8:00 pm, Tuttleman Learning Center 402

- **Office hours**

  – Wednesday: 3:00 pm - 5:00 pm, SERC 362

- **Grading policy:**

  – Homework: 6 * 6% = 36%

  – Midterm: 32%

  – Final: 32%

- **Attendance policy:**

  Attendance is required for all in person classes.

- **Prerequisite by topic:**

1. Basics of data structure and classic algorithms
2. Knowledge of a high-level programming language
3. Elementary discrete mathematics

- **Tentative class schedule:**

1. Jan. 12 Introduction and algorithm analysis (Chaps. 1 & 2)
2. Jan. 19 Greedy algorithms I (Chaps. 3 & 4)
3. Jan. 26 Greedy algorithms II (Chap. 4)
4. Feb. 2 Divide and conquer I (Chap. 5) and HW1 due
5. Feb. 9 Divide and conquer II (Chap. 5)
6. Feb. 16 Dynamic programming I (Chap. 6) and HW2 due
7. Feb. 23 Dynamic programming II (Chap. 6)
8. March 2 **Spring break** and HW3 due
9. March 9 **Midterm Examination**
10. March 16 Network flow I (Chap. 7)
11. March 23 Network flow II (Chap. 7)
12. March 30 NP and computational intractability I (Chap. 8) and HW4 due
13. April 6 NP and computational intractability II (Chap. 8)
14. April 13 Approximation I (Chap. 11) and HW5 due
15. April 20 Approximation II and adversary arguments (Chap. 11and Handouts)
16. April 27 **Final Examination** and HW6 due