Department of Computer Science
Shanghai Jiao Tong University

CS214 -- Algorithm and Complexity

Course Syllabus -- Spring 2020

COURSE INFORMATION:

Time: 10:00 – 11:40, Monday & Thursday
Location: Xia Yuan 413（下院 413）

February 2020

week	S	M	T	W	T	F	S
							1
	2	3	4	5	6	7	8
	9	10	11	12	13	14	15
	16	17	18	19	20	21	22
	23	24	25	26	27	28	

March 2020

week	S	M	T	W	T	F	S
(1)	1	2	3	4	5	6	7
(2)	8	9	10	11	12	13	14
(3)	15	16	17	18	19	20	21
(4)	22	23	24	25	26	27	28
(5)	29	30	31				

April 2020

week	S	M	T	W	T	F	S
(5)				1	2	3	4
(6)	5	6	7	8	9	10	11
(7)	12	13	14	15	16	17	18
(8)	19	20	21	22	23	24	25
(9)	26	27	28	29	30		

May 2020

week	S	M	T	W	T	F	S
(9)						1	2
(10)	3	4	5	6	7	8	9
(11)	10	11	12	13	14	15	16
(12)	17	18	19	20	21	22	23
(13)	24	25	26	27	28	29	30
(14)	31						

June 2020

week	S	M	T	W	T	F	S
(14)		1	2	3	4	5	6
(15)	7	8	9	10	11	12	13
(16)	14	15	16	17	18	19	20
(17)	21	22	23	24	25	26	27
(18)	28	29	30				

Class Day
Holiday
Final Exam Week

INSTRUCTOR INFORMATION:

Name: Xiaofeng Gao（高晓沨）
Office: Telecom Building 3-543
Phone: 021-34207407
Email: gao-xf@cs.sjtu.edu.cn
Office Hour: By appointment (Please mention your class ID and purpose in email beforehand)
Teaching Assistant: Yiming Liu (刘一鸣), Shuodian Yu (俞铄点)

COURSE PREREQUISITES:

Discrete Mathematics, Programming Language, Data Structure

TEXTBOOKS:

- T. Cormen, C. Leiserson, R. Rivest, C. Stein, Introduction to Algorithms, MIT Press, 2009.
- J. Kleinberg, and E. Tardos, Algorithm Design, Pearson-Addison Wesley, 2005.
- S. Dasgupta, C. Papadimitriou, U. Vazirani, Algorithm, McGraw-Hill, 2007.

OTHER REFERENCES:

- **Algorithm:**
  - M. H. Alsuwaiyel, Algorithm Design Technique and Analysis, World Scientific, 1999.
  - Alfred V. Aho, John E Hopcroft, Jeffery D. Ullman, The Design and Analysis of Computer Algorithms, Addison-Wesley, 1974.
  - Udi Manber, Introduction to Algorithms: A Creative Approach, Addison-Wesley, 1989.
  - Henming Zou, The Way of Algorithms, China Machine Press, 2010.
- **Computational Complexity:**
  - Christos Papadimitriou, Computational Complexity, Addison Wesley, 1994.
  - Theory of Computational Complexity, by Ding-Zhu Du, and Ker-I Ko, published by John Wiley & Sons, Inc., 2000.
  - John Martin, Introduction to Languages and the Theory of Computation, McGraw-Hill, 2002.
  - Computational Complexity: A Modern Approach, by Sanjeev Arora and Boaz Barak, Cambridge University Press, 2006.
- **Approximation:**
  - Vijay V. Vazirani, Approximation Algorithms, Springer-Verlag, 2001.
  - D.P. Williamson and D.B. Shmoys, The Design of Approximation Algorithms, 2011.
  - D.Z Du, K-I. Ko, X.D. Hu, Design and Analysis of Approximation Algorithms, 2012.

EVENTS AND GRADING:

The final grade will be derived from your performance on the tests, and assignments. The class participation is shown as follows:

Events:	
Midterm Exam	25%
Final Exam	25%
Assignments	30%
Project	10%
Class Participation	10%
Total	100%

Grading Policy:	
90-100%	**A**
80-89%	**B**
70-79%	**C**
60-69%	**D**
59% and below	**F**

WEBPAGE AND MATERIALS:

- All the class materials (slides, references), homework assignments, announcements, and other information can be seen from http://cs.sjtu.edu.cn/~gao-xf/Teaching/

- Please check the webpage often to get the up-to-date information.

INSTRUCTOR/COURSE POLICIES

Common Sense Notices

- Please attend every class and do not be late. **15-minute** late attendance is considered absent.
- Please turn off all cell phones, buzzers, and other noisy electronic devices during class time.
- Please show common courtesy to your fellow classmates and professor.

Homework

- **English only**.
- **Electronic Submission only**.
- **Late assignments**. Every effort should be made to hand assignments by the due date and time. NO late submission is accepted. Missed work will result in a grade of ZERO.
- **Academic dishonesty**. Your work must be your own. Cheating will result in a grade of 0 for the applicable assignment; further disciplinary action, including assigning a failing grade for the entire course and reporting your name to the department may also be taken.

Computer Practical Report

- **English only**.
- **Electronic Submission only**.
- Include source code and other required materials (like data testing results, samples, etc.).

Email Netiquette

- My response will be irregular on the weekend or when I am away from campus.
- When you email me you should consider the email as official correspondence. As such, the email should not appear as a text message but should have proper grammar and punctuation. The email title should include: **Class ID/Your Purpose.** An example is below.

(Email Title: [CS214] Want a material for midterm)

Dear Dr. Gao,

My name is John Smith. I'm from your class CS214-Algorithm. I will not attend tomorrow's class due to sickness. Can you send me a copy of the midterm review so I may use it as a study tool? Thanks a lot.

Sincerely Yours,

John Smith
SID: 509030XXXX
Department of Computer Science and Engineering
Shanghai Jiao Tong University
Email: JohnSmith@gmail.com

TENTATIVE SCHEDULE: (These dates could be changed depending upon the pace of the course)

Week	Date	Lecture Topic	Event
1	Mar.02	**Algorithm Design and Analysis (1)** Introduction of This Class, Basic Concepts, Time / Space Complexity, etc.	
	Mar.05	**Algorithm Design and Analysis (2)** Sorting, Searching, and Selection (Deterministic & Randomized)	**Lab-01**
2	Mar.09	**Divide-and-Conquer (1)** Mergesort, Selection, Master's Theorem, etc.	
	Mar.12	**Divide-and-Conquer (2)** Sorting Network, etc.	**Lab-02**
3	Mar.16	**Greedy Approach (1)** Interval Scheduling, Interval Partitioning, Minimum Lateness, etc.	
	Mar.19	**Greedy Approach (2)** Independent System, Matroid, etc.	**Lab-03**
4	Mar.23	**Greedy Approach (3) & Dynamic Programming (1)** Matroid Example: Greedy-Max Algorithm. Basic Dynamic Programming	
	Mar.26	**Dynamic Programming (2)** Weighted Interval Scheduling, Segmented Least Squares, Knapsack, etc.	**Lab-04**
5	Mar.30	**Dynamic Programming (3) & Midterm Review** RNA Secondary Structure, Sequence Alignment, etc.	
	Apr.02	Midterm Exam	**Midterm**
6	Apr.06	**Amortized Analysis** Aggregate Analysis, Accounting Method, Potential Method, Dynamic Table, etc.	
	Apr.09	**Linear Programming** Basic Form, Duality Theory, Simplex Algorithm, etc.	**Lab-05**
7	Apr.13	**Graph Algorithms (1)** Basic Concepts, Minimum Spanning Tree, Searching and Exploration, etc.	
	Apr.16	**Graph Algorithms (2)** Single Source Shortest Paths (Greedy & DP), etc.	**Lab-06**
8	Apr.20	**Graph Algorithms (3)** All-Pair Shortest Paths, Flow Problem, etc.	
	Apr.23	**Graph Algorithms (4)** Maximum Flow, Minimum Cut, etc.	**Lab-07**
9	Apr.27	**Turing Machine** Computability, Turing Machine, etc.	
	Apr.30	**NP-Completeness (1)** NP class, Polynomial time, etc.	**Lab-08**
10	May.04	**NP-Completeness (2)** Reducibility, Proofs, etc.	
	May.07	**NP-Completeness (3)** Reducibility Examples, Proofs, etc.	**Lab-09**
11	May.11	**Approximation (1)** Approximation Ratio, Approximation Class, etc.	
	May.13	**Approximation (2)** Greedy Algorithm, Local Search, etc.	**Lab-10**
12	May.18	**Approximation (3)** LP+Rounding (Deterministic & Randomized), etc.	
	May.21	**Final Review**	