CS214 -- Algorithm and Complexity

Course Syllabus -- Spring 2019

COURSE INFORMATION:

Time: 10:00 – 11:40, Monday & 16:00 – 17:40, Thursday

Location: Dong Zhong Yuan 4-103（东中院 4-103）

February 2019

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
(1)	24	25	26	27	28		

March 2019

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

April 2019

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

May 2019

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

June 2019

week	S	M	T	W	T	F	S
(14)							1
(15)	2	3	4	5	6	7	8
(16)	9	10	11	12	13	14	15
(17)	16	17	18	19	20	21	22
(18)	23	24	25	26	27	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: Jiahao Fan (范佳豪), Mingran Peng (彭铭燃)

COURSE PREREQUISITES:

Discrete Mathematics, Data Structure, Programming Language

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:			Grading Policy:	
Midterm Exam	30%		90-100%	**A**
Final Exam	30%		80-89%	**B**
Assignments	30%		70-79%	**C**
Class Participation	10%		60-69%	**D**
Total	100%		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	Feb.25	**Algorithm Design and Analysis** Sorting Algorithm, Time Complexity, Space Complexity, etc.	
	Feb.28	**Amortized Analysis** Aggregate Analysis, Accounting Method, Potential Method, Dynamic Table, etc.	**Lab-01**
2	Mar.04	**Divide-and-Conquer (1)** Mergesort, Selection, Master's Theorem, etc.	
	Mar.07	**Divide-and-Conquer (2)** Sorting Network, etc.	**Lab-02**
3	Mar.11	**Greedy Approach (1)** Interval Scheduling, Interval Partitioning, Minimum Lateness, etc.	
	Mar.14	**Greedy Approach (2)** Matroid, Greedy-Max Algorithm, etc.	**Lab-03**
4	Mar.18	**Dynamic Programming (1)** Weighted Interval Scheduling, Segmented Least Squares, Knapsack, etc.	
	Mar.21	**Dynamic Programming (2) + Graph Algorithms (1)** RNA Secondary Structure, Sequence Alignment, Minimum Spanning Tree, etc.	**Lab-04**
5	Mar.25	**Graph Algorithms (2)** Searching and Exploration, etc.	
	Mar.28	**Graph Algorithms (3)** Single Source Shortest Paths (Greedy & DP) , All-Pair Shortest Paths, etc.	**Lab-05**
6	Apr.01	**Graph Algorithms (4)** Flow Problem, Maximum Flow, Minimum Cut, etc.	
	Apr.04	**Linear Programming** Basic Form, Duality Theory, Simplex Algorithm, etc.	**Lab-06**
7	Apr.08	University Anniversary	
	Apr.11	Midterm Exam	**Midterm**
8	Apr.15	**Turing Machine** Computability, Turing Machine, etc.	
	Apr.18	**NP-Completeness (1)** NP class, Polynomial time, etc.	**Lab-07**
9	Apr. 22	**NP-Completeness (2)** Reducibility, Proofs, etc.	
	Apr. 25	**NP-Completeness (3)** Reducibility, Proofs, etc.	**Lab-08**
10	Apr. 29	**Approximation (1)** Approximation Ratio, Approximation Class, Greedy Algorithm, etc.	
	May.2	**Approximation (2)** Local Search, LP+Rounding (Deterministic & Randomized), etc.	**Lab-09**
11	May.6	**Randomized Algorithm (1)** Max-3SAT Approximation, Universal Hashing, etc.	
	May.9	**Randomized Algorithm (2)** Load Balancing, Exercises, etc.	**Lab-10**
12	May.13	**Online Algorithm (1)** TBD.	
	May.16	**Online Algorithm (2) + Final Review** TBD.	**Lab-11**