**CSE5311: Design and Analysis of Algorithms**

Fall 2016

**Instructor(s):** Junzhou Huang

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**Faculty Profile:** https://www.uta.edu/profiles/junzhou-huang

**Office Hours:** 12:30-2:00pm Tuesday and Thursday

**Section Information:** CSE5311-001

**Time and Place of Class Meetings:** FA409

**Description of Course Content:** This course provides an overview of the Design and Analysis of Algorithms. Computer algorithms are at the heart of computer sciences. Algorithms are used everywhere, from operating systems to databases, to solving a variety of optimization problems. This course will cover all major areas of algorithms: sorting algorithms, greedy algorithms, graph algorithms, dynamic programming, maximum flow problems, string matching algorithms, geometric algorithms, and randomized algorithms. Besides above traditional algorithms, several state-of-art practical algorithms will be covered. Major ideas are introduced through examples and historical perspectives, so that students will have a grasp on the evolution and development of algorithms. Class projects are required to practice the algorithms learned in the class.

**Student Learning Outcomes:** After completing this course, students will have the ability to independently investigate a computational problem, design a practical algorithm to solve it and analyze the performance of the algorithm.

**Required Textbooks and Other Course Materials:** T.H. Cormen, C.E. Leiserson, R.L. Rivest, and C. Stein, Introduction to Algorithms. 3nd edition, McGraw-Hill, 2009

**Descriptions of major assignments and examinations:** There will be homework sets, projects, the midterm exam and final exam.

**Attendance:** I will take attendance sporadically. The attendance is strongly recommended

**Grading**:

Class participation --- 5%

Projects --- 20%

Midterm --- 35%

Final Exam --- 40%

**Drop Policy:** Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. **Students will not be automatically dropped for non-attendance**. Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (<http://wweb.uta.edu/aao/fao/>).

**Disability Accommodations:** UTArlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including *The Americans with Disabilities Act (ADA), The Americans with Disabilities Amendments Act (ADAAA),* and *Section 504 of the Rehabilitation Act.* All instructors at UT Arlington are required by law to provide “reasonable accommodations” to students with disabilities, so as not to discriminate on the basis of disability. Students are responsible for providing the instructor with official notification in the form of **a letter certified** by the Office for Students with Disabilities (OSD).Only those students who have officially documented a need for an accommodation will have their request honored. Students experiencing a range of conditions (Physical, Learning, Chronic Health, Mental Health, and Sensory) that may cause diminished academic performance or other barriers to learning may seek services and/or accommodations by contacting:

**The Office for Students with Disabilities, (OSD)** [www.uta.edu/disability](http://www.uta.edu/disability) or calling 817-272-3364. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at [www.uta.edu/disability](http://www.uta.edu/disability).

Counseling and Psychological Services, (CAPS) [www.uta.edu/caps/](http://www.uta.edu/caps/) or calling 817-272-3671 is also available to all students to help increase their understanding of personal issues, address mental and behavioral health problems and make positive changes in their lives.

**Non-Discrimination Policy:** *The University of Texas at Arlington does not discriminate on the basis of race, color, national origin, religion, age, gender, sexual orientation, disabilities, genetic information, and/or veteran status in its educational programs or activities it operates. For more information, visit*[*uta.edu/eos*](http://www.uta.edu/hr/eos/index.php)*.*

**Title IX Policy:** The University of Texas at Arlington (“University”) is committed to maintaining a learning and working environment that is free from discrimination based on sex in accordance with Title IX of the Higher Education Amendments of 1972 (Title IX), which prohibits discrimination on the basis of sex in educational programs or activities; Title VII of the Civil Rights Act of 1964 (Title VII), which prohibits sex discrimination in employment; and the Campus Sexual Violence Elimination Act (SaVE Act). Sexual misconduct is a form of sex discrimination and will not be tolerated.*For information regarding Title IX, visit* [www.uta.edu/titleIX](http://www.uta.edu/titleIX) or contact Ms. Jean Hood, Vice President and Title IX Coordinator at (817) 272-7091 or [jmhood@uta.edu](file:///C:\Users\gotcherxx\Downloads\jmhood@uta.edu).

**Academic Integrity:** Students enrolled all UT Arlington courses are expected to adhere to the UT Arlington Honor Code:

*I pledge, on my honor, to uphold UT Arlington’s tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence.*

*I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.*

UT Arlington faculty members may employ the Honor Code in their courses by having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System *Regents’ Rule* 50101, §2.2, suspected violations of university’s standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student’s suspension or expulsion from the University. Additional information is available at <https://www.uta.edu/conduct/>.

**Electronic Communication:** UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at <http://www.uta.edu/oit/cs/email/mavmail.php>.

**Campus Carry:** Effective August 1, 2016, the Campus Carry law (Senate Bill 11) allows those licensed individuals to carry a concealed handgun in buildings on public university campuses, except in locations the University establishes as prohibited. Under the new law, openly carrying handguns is not allowed on college campuses. For more information, visit <http://www.uta.edu/news/info/campus-carry/>

**Student Feedback Survey:** At the end of each term, students enrolled in face-to-face and online classes categorized as “lecture,” “seminar,” or “laboratory” are directed to complete an online Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student’s feedback via the SFS database is aggregated with that of other students enrolled in the course. Students’ anonymity will be protected to the extent that the law allows. UT Arlington’s effort to solicit, gather, tabulate, and publish student feedback is required by state law and aggregate results are posted online. Data from SFS is also used for faculty and program evaluations. For more information, visit <http://www.uta.edu/sfs>.

**Final Review Week:** for semester-long courses**,** a period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week *unless specified in the class syllabus*. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

**Emergency Exit Procedures:** Should we experience an emergency event that requires us to vacate the building, students should exit the room and move toward the nearest exit, which is located the right of the classroom FA409. When exiting the building during an emergency, one should never take an elevator but should use the stairwells. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist individuals with disabilities.

**Student Support Services**:UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include [tutoring](http://www.uta.edu/universitycollege/current/academic-support/learning-center/tutoring/index.php), [major-based learning centers](http://www.uta.edu/universitycollege/resources/college-based-clinics-labs.php), developmental education, [advising and mentoring](http://www.uta.edu/universitycollege/resources/advising.php), personal counseling, and [federally funded programs](http://www.uta.edu/universitycollege/current/academic-support/mcnair/index.php). For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to [resources@uta.edu](mailto:resources@uta.edu), or view the information at <http://www.uta.edu/universitycollege/resources/index.php>.

**The IDEAS Center (**2nd Floor of Central Library) offers **free** tutoring to all students with a focus on transfer students, sophomores, veterans and others undergoing a transition to UT Arlington. To schedule an appointment with a peer tutor or mentor email [IDEAS@uta.edu](mailto:IDEAS@uta.edu) or call (817) 272-6593.

The Library’s 2nd floor Academic Plaza offers students a central hub of support services, including IDEAS Center, University Advising Services, Transfer UTA and various college/school advising hours. Services are available during the library’s hours of operation. <http://library.uta.edu/academic-plaza>

## Syllabus

* **Week 1**
  + **Aug. 25: Introduction (**[**Slides**](http://ranger.uta.edu/~huang/teaching/CSE5311/CSE5311_Lecture1.pdf)**)**
* **Week 2**
  + **Aug. 30: Algorithms and Growth functions (**[**Slides**](http://ranger.uta.edu/~huang/teaching/CSE5311/CSE5311_Lecture2.pdf)**)**
  + **Sep. 1: Divide-and-Conquer (**[**Slides**](http://ranger.uta.edu/~huang/teaching/CSE5311/CSE5311_Lecture3.pdf)**)**
* **Week 3**
  + **Sep. 6: Master Theorem (**[**Slides**](http://ranger.uta.edu/~huang/teaching/CSE5311/CSE5311_Lecture4.pdf)**)**
  + **Sep. 8: Fast Fourier Transform (**[**Slides**](http://ranger.uta.edu/~huang/teaching/CSE5311/CSE5311_Lecture5.pdf)**)**
* **Week 4**
  + **Sep. 13: Heapsort (**[**Slides**](http://ranger.uta.edu/~huang/teaching/CSE5311/CSE5311_Lecture6.pdf)**) (HW1 Due)**
  + **Sep. 15: Quicksort (**[**Slides**](http://ranger.uta.edu/~huang/teaching/CSE5311/CSE5311_Lecture7.pdf)**)**
* **Week 5**
  + **Sep. 20: Sorting in Linear Time (**[**Slides**](http://ranger.uta.edu/~huang/teaching/CSE5311/CSE5311_Lecture8.pdf)**)**
  + **Sep. 22: Median and Order Statistics (**[**Slides**](http://ranger.uta.edu/~huang/teaching/CSE5311/CSE5311_Lecture9.pdf)**)**
* **Week 6**
  + **Sep. 27: Binary Search Trees (**[**Slides**](http://ranger.uta.edu/~huang/teaching/CSE5311/CSE5311_Lecture10.pdf)**)**
  + **Sep. 29: Red-Black Trees (**[**Slides**](http://ranger.uta.edu/~huang/teaching/CSE5311/CSE5311_Lecture11.pdf)**)**
* **Week 7**
  + **Oct. 4: Dynamic Programming (**[**Slides**](http://ranger.uta.edu/~huang/teaching/CSE5311/CSE5311_Lecture12.pdf)**) (HW2 Due)**
  + **Oct. 6: Dynamic Programming (**[**Slides**](http://ranger.uta.edu/~huang/teaching/CSE5311/CSE5311_Lecture13.pdf)**)**
* **Week 8**
  + **Oct. 11: Dynamic Programming (**[**Slides**](http://ranger.uta.edu/~huang/teaching/CSE5311/CSE5311_Lecture14.pdf)**)**
  + **Oct. 13: Dynamic Programming (**[**Slides**](http://ranger.uta.edu/~huang/teaching/CSE5311/CSE5311_Lecture15.pdf)**)**
* **Week 9**
  + **Oct. 18: Recitation Class by GTA**
  + **Oct. 20: Midterm Exam (Chapter 1-4, 6-9, Chapter 12-13, Chapter 30) (**[**Practice**](http://ranger.uta.edu/~huang/teaching/CSE5311/CSE5311_MidtermPractice.pdf)**)**
* **Week 10**
  + **Oct. 25: Greedy algorithms (**[**Slides**](http://ranger.uta.edu/~huang/teaching/CSE5311/CSE5311_Lecture16.pdf)**)**
  + **Oct. 27: Greedy algorithms (**[**Slides**](http://ranger.uta.edu/~huang/teaching/CSE5311/CSE5311_Lecture17.pdf)**) (HW3 Due)**
* **Week 11**
  + **Nov. 1: Graph Algorithms: BFS and DFS(**[**Slides**](http://ranger.uta.edu/~huang/teaching/CSE5311/CSE5311_Lecture18.pdf)**)**
  + **Nov. 3: Topological Sort (**[**Slides**](http://ranger.uta.edu/~huang/teaching/CSE5311/CSE5311_Lecture19.pdf)**)**
* **Week 12**
  + **Nov. 08: Minimum Spanning Trees (**[**Slides**](http://ranger.uta.edu/~huang/teaching/CSE5311/CSE5311_Lecture20.pdf)**)**
  + **Nov. 10: Single-source Shortest Path (**[**Slides**](http://ranger.uta.edu/~huang/teaching/CSE5311/CSE5311_Lecture21.pdf)**)**
* **Week 13**
  + **Nov. 15: All-pairs Shortest Path (HW4 Due) (**[**Slides**](http://ranger.uta.edu/~huang/teaching/CSE5311/CSE5311_Lecture22.pdf)**)**
  + **Nov. 17: Maximum Flow (**[**Slides**](http://ranger.uta.edu/~huang/teaching/CSE5311/CSE5311_Lecture23.pdf)**)**
* **Week 14**
  + **Nov. 22: NP-Completeness (**[**Slides**](http://ranger.uta.edu/~huang/teaching/CSE5311/CSE5311_Lecture25.pdf)**) (HW5 Due)**
  + **Nov. 24: No class due to Thanksgiving Holidays**
* **Week 15**
  + **Nov. 29: Project Due and Class Presentation**
  + **Dec. 1: Project Due and Class Presentation**
* **Week 16**
  + **Dec. 6: Final Review Class (**[**Slides**](http://ranger.uta.edu/~huang/teaching/CSE5311/CSE5311_FinalExamPractice.pdf)**)**
* **Week 17**
  + **Dec. 13: Final Exam 2:00-4:30 PM**

The lecture slides will be posted at the class website: <http://ranger.uta.edu/~huang/teaching/CSE5311-001.htm>

“*As the instructor for this course, I reserve the right to adjust this schedule in any way that serves the educational needs of the students enrolled in this course. – Junzhou Huang.”*

**Emergency Phone Numbers**: In case of an on-campus emergency, call the UT Arlington Police Department at **817-272-3003** (non-campus phone), **2-3003** (campus phone). You may also dial 911. Non-emergency number 817-272-3381

[We strongly recommend that you place this information at the very end of your course syllabus or in the footer of the first page. We further recommend that you enter the UTA Police Department’s emergency phone number into your own mobile phone.]

All library services can be found by going to the main page. For direct links, see below.

**Library Home Page**[**library.uta.edu**](http://library.uta.edu/)

**Resources for Students**

**Academic Help**

Academic Plaza Consultation Services [library.uta.edu/academic-plaza](http://library.uta.edu/academic-plaza)

Ask Us [ask.uta.edu/](http://ask.uta.edu/)

Library Tutorials [library.uta.edu/how-to](http://library.uta.edu/how-to)

Subject and Course Research Guides [libguides.uta.edu](http://libguides.uta.edu/)

Subject Librarians [library.uta.edu/subject-librarians](http://library.uta.edu/subject-librarians)

**Resources**

A to Z List of Library Databases [libguides.uta.edu/az.php](http://libguides.uta.edu/az.php)

Course Reserves [pulse.uta.edu/vwebv/enterCourseReserve.do](http://pulse.uta.edu/vwebv/enterCourseReserve.do)

FabLab [fablab.uta.edu/](http://fablab.uta.edu/)

Special Collections [library.uta.edu/special-collections](http://library.uta.edu/special-collections)

Study Room Reservations [openroom.uta.edu/](http://openroom.uta.edu/)

**Teaching & Learning Services for Faculty**

Copyright Consultation [library-sc@listserv.uta.edu](http://library-sc@listserv.uta.edu)

Course Research Guide Development, Andy Herzog [amherzog@uta.edu](http://amherzog@uta.edu) or your subject librarian

Data Visualization Instruction, Peace Ossom-Williamson [peace@uta.edu](http://peace@uta.edu)

Digital Humanities Instruction, Rafia Mirza [rafia@uta.edu](http://rafia@uta.edu)

Graduate Student Research Skills Instruction, Andy Herzog [amherzog@uta.edu](http://amherzog@uta.edu) or your subject librarian

Project or Problem-Based Instruction, Gretchen Trkay [gtrkay@uta.edu](http://gtrkay@uta.edu)

Undergraduate Research Skills Instruction, Gretchen Trkay [gtrkay@uta.edu](http://gtrkay@uta.edu) or your subject librarian.