

Syllabus

Course Information

Course Number: CSCE 430
Course Title: Problem Solving Programming Strategies
Section: 500, 200 (see supplement for section 200 additional information)
Time: Lecture: MW 4:15-5:05
Lab: F 2:00-4:30
Location: Lecture: ARCC 105
Lab: ZACH 350
See Canvas for links for online access
Credit Hours: 3

Instructor Details

Instructor: John Keyser
Office: HRBB room 527C (but not available for in-person in Spring 2021)
Phone: (979)458-0167
E-Mail: keyser@cse.tamu.edu
Office Hours: Monday, Wednesday 2:45-3:45, or by appointment
(via zoom: <https://tamu.zoom.us/my/johnkeyser>)

Teaching Assistant: Presley Graham
E-Mail: presley.graham@tamu.edu
Office hours: TBD

Teaching Assistant: Dhruv Patel
E-Mail: dhruv414@tamu.edu
Office hours: TBD

Course Description

This course teaches methods for analyzing fundamental programming problems from a variety of domains and implementing solutions quickly and efficiently. The class will use problems based on competitive programming contests to develop skills in problem analysis, coding, and testing. Solving problems will involve identifying and applying a range of algorithmic solutions, including those dealing with combinatorics, dynamic programming, graphs, numerical calculations, string processing, and geometry, along with other more specialized algorithms.

Course Prerequisites

CSCE 411 or Permission of Instructor

Course Learning Outcomes

At the conclusion of this course, students should be able to:

- Analyze a given programming problem to identify the algorithms needed to solve the problem
- Implement a program, including implementing the basic algorithms needed, to solve specified problems
- Develop test cases that will ensure that implemented programs are robust to a full range of valid inputs.

Textbook and/or Resource Materials

Competitive Programming, by Steven Halim, Felix Halim, and (for the 4th edition) Suhendry Effendy. The book can be bought via the website: <https://cpbook.net>. The 4th edition is in two separate books, available only in paperback. The 3rd edition is available in e-book format. We will cover almost everything in book 1, and will cover parts of book 2.

The textbook is considered required, in the sense that we will refer to it and you will be able to make use of it through the course. However, students in the past have been able to go through the course without buying it.

Grading Policy

The course grades will consist of a large number of programming problems of varying difficulty and topics given over the course of the semester. Problems will be assigned in 3 different ways:

- Problems to be completed individually on the student's own time. Generally, individual problems will be assigned each week and due on Saturdays, unless the class agrees on a different time. You should expect to spend several hours every week on your own, working on these problems.
- Problems to be completed within a timed period - lab. In each lab period, students will be given a set of problems to be solved during that lab period. These problems are meant to be challenging, with the time pressure being a significant factor.
- Team problems to be completed within a timed period - lab. During some of the lab portions of the class, students may be teamed up with one or two other students, and together they may be asked to complete problems during the lab period. In this case, all students on the team will receive credit for problems completed. *Note: with the hybrid offering of the class and the need for social distancing, we may eliminate team problems in this semester.*

For each set of problems, students will be given a "base" number of problems they are expected to solve; there may be more problems given than that number, and students may solve more than the base number, if they are able to do so. The total number of base problems over the course of the semester will be approximately 125. In all cases, completing a problem will mean that the code passes a series of validated test data that the students will not be shown. Each problem will be noted as either complete or incomplete by the given time (either the due date or the end of the timed lab period).

Problems completed after the deadline (i.e. after the submission time for weekly individual problems, or outside of lab time during the timed period) can receive half credit. This is

referred to as “upsolving.” Students will have a limited period to upsolve these problems late for half credit; typically this will be one week following the original deadline.

The final grade in the course will be based on the percentage of problems solved by each student (i.e. the number completed divided by the base number). That is, the number completed will be the number of problems completed individually on their own time, plus the number completed individually within a timed period, plus the number completed on a team within a timed period. The number possible will be the number of problems assigned as a base for students’ own time, plus the number assigned as a base during the individual timed periods, plus the number assigned as a base during team timed periods. All problems will be weighted equally.

To earn an A grade, a student must also get at least 50% of the base points for the problems to be completed individually on their own time, in every week of the class. This can include points for solving during the week, or later upsolving of the problems.

The grading scale will be:

- A = 90 % or greater, **and** at least 50% of available problems in individual weeks
- B = 80-89 %
- C = 70-79 %
- D = 60-69 %
- F = <60 %

Late Work Policy

Late work is not accepted (see excused absence information below). The deadlines for submission will be set automatically and are strict. Note, however, that the upsolve period allows for solving problems following the due date.

Course Schedule

Schedule

The following is the expected schedule, including some of the types of algorithms that are expected to be covered each week. However, as the semester goes on, this will likely be adjusted.

Week	Topic	Chapters
1	Introduction; Problem formats; Online judging systems; Parsing Input; Formatting Output	1
2-4	Fundamental Data Structures and their implementation on your own or in libraries (various trees, sets, graphs, search structures)	2
5-7	Applying Divide and Conquer, Greedy, and Dynamic Programming Approaches	3
8-11	Applying Graph Algorithms (search, shortest path, minimum spanning tree, network flow, bipartite graph matching)	4, 8.4-8.5
12	String Processing (editing, edit distance, subsequences, suffixes)	6

13	Applying Numerical algorithms and Combinatorics (GCD, LCM, Chinese Remainder Theorem and modular math, Large number computations, generating and counting permutations and combinations)	5
14	Applications of Geometric Algorithms (2D line segment and polygon queries – intersection, area; calculations on a sphere; 3D volume calculations; ray-surface intersection; convex hull; spatial subdivisions)	7
?	Selected additional algorithms and their application (if time allows)	8-9

Optional Course Information Items

Fee for online system

We will be using the Kattis system (see Online Judging below) under a program that allows free use for our educational activities. However, at some point in the semester there may be a fee required to continue to use the Kattis system. This fee will not exceed \$35 per student. If this fee becomes required, students must agree to pay the fee individually (likely requiring a credit/debit card payment) promptly.

Online judging

Online judging systems will be used to perform the testing and acceptance of solutions to problems. This will require students to obtain a user account on these external systems. The Kattis system (tamu.kattis.com) will be the main system used, but others might be used on occasion. Students are expected to keep their login information private, as they would for a department computer system. The online system's judgment will be the sole factor determining whether problems are accepted or not, and this will generally mean passing all test cases (not just some) for the problem.

Communication

We will use Canvas for the course materials. The discussion area of Canvas will be used to allow students to post and answer questions, to make course announcements, etc. Grades will be posted on Canvas, though the actual submission and grading will be through the Kattis system. Students are responsible for checking Canvas regularly for communications and occasionally verifying that grading matches their Kattis judgments.

Limitations on Anonymity

The course will use a competitive programming framework for judging and posting results of all problem sets. This means that students will be able to see an indication of which problems other students have attempted, and their success or lack of success in having these accepted. While there can be the option of hiding the specific user name, students cannot expect their performance to be kept completely anonymous from others, and it may be that other individuals can determine their performance on problem sets either by process of elimination, or from other information they determine from the competitive system.

Source Code Presentations

Some problems worked on may have multiple solutions, and throughout the course, individuals' work might be used as examples for illustrating approaches to solving a problem,

writing code, etc. Students may be called on to describe their own solution to a problem or the approach they tried; advance warning will be given in such cases with students given the opportunity to opt-out of presenting. Alternately, students' code may be used as an example shown to other students for how a given solution might be coded; code presented this way will be kept anonymous unless the student has first agreed to let it be presented.

Computers

You will need to use your own computer for programming and submitting assignments, including during lab. Students attending lab in person will need to bring their own laptop to the Friday lab sessions, and those attending remotely will need to have internet access throughout lab time. The laptop should be sufficient to enable to students to write and test their own computer programs.

University Policies

Attendance Policy

The university views class attendance and participation as an individual student responsibility. Students are expected to attend class and to complete all assignments.

Please refer to [Student Rule 7](#) in its entirety for information about excused absences, including definitions, and related documentation and timelines.

Here are clarifications regarding how excused absences will be handled. Students missing a timed individual or team event for an excused reason will not have the base score for that period used in their grade calculation; any problems upsolved later for half credit will add to both the base and the solved portions of the grade. For the individual problems that students do on their own time (i.e. weekly problem sets), it is expected that students will work on these problems throughout the period of time they are assigned, so that any absences of less than 2 days should not affect the student's ability to complete the problems on time. If the student has an excused absence of more than 2 days during the period for which the problems are assigned, the student will be given a number of days equal to the length of the excused absence, less two days, following the original due date or the student's return (whichever is later). For example, a student who is sick for 4 days during a week would have the deadline for individual problems extended by 2 days. Note that the period for upsolving problems after the deadline for half credit might not be extended, since coded solutions might be posted at that time.

Makeup Work Policy

Students will be excused from attending class on the day of a graded activity or when attendance contributes to a student's grade, for the reasons stated in Student Rule 7, or other reason deemed appropriate by the instructor.

Please refer to [Student Rule 7](#) in its entirety for information about makeup work, including definitions, and related documentation and timelines.

Absences related to Title IX of the Education Amendments of 1972 may necessitate a period of more than 30 days for make-up work, and the timeframe for make-up work should be agreed upon by the student and instructor” ([Student Rule 7, Section 7.4.1](#)).

“The instructor is under no obligation to provide an opportunity for the student to make up work missed because of an unexcused absence” ([Student Rule 7, Section 7.4.2](#)).

Students who request an excused absence are expected to uphold the Aggie Honor Code and Student Conduct Code. (See [Student Rule 24](#).)

Make-up work will be handled in this course as described above under attendance. Generally, there will not be make-up opportunities for timed activities (i.e. lab activities) but they will also not count in the base score. For the longer problem sets, the same problems will be solved with the deadline extended as appropriate.

Academic Integrity Statement and Policy

“An Aggie does not lie, cheat or steal, or tolerate those who do.”

“Texas A&M University students are responsible for authenticating all work submitted to an instructor. If asked, students must be able to produce proof that the item submitted is indeed the work of that student. Students must keep appropriate records at all times. The inability to authenticate one’s work, should the instructor request it, may be sufficient grounds to initiate an academic misconduct case” ([Section 20.1.2.3, Student Rule 20](#)).

You can learn more about the Aggie Honor System Office Rules and Procedures, academic integrity, and your rights and responsibilities at aggiehonor.tamu.edu.

For this course, a significant amount of work will require solving problems for which a solution or test data might be available or posted online. Unless otherwise specified, students are *not allowed* to seek out or examine code/data for these problems on their own, prior to turning in their own solutions. Likewise, students should not read explanations of how to solve a specific problem prior to the original due date (i.e. the original deadline); note that reading a **description** of the solution is allowed *for problems solved after the deadline for half credit (i.e. during upsolving)*. Accessing unallowed information will be considered a violation of the honor code, and students caught doing so will be referred to the honor council, regardless of whether the actual code is copied or not. Given the ease with which it may be possible to cheat in this way, any violations should expect to receive the maximum penalty from the honor council.

Americans with Disabilities Act (ADA) Policy

Texas A&M University is committed to providing equitable access to learning opportunities for all students. If you experience barriers to your education due to a disability or think you may have a disability, please contact Disability Resources in the Student Services Building or at (979) 845-1637 or

visit disability.tamu.edu. Disabilities may include, but are not limited to attentional, learning, mental health, sensory, physical, or chronic health conditions. All students are encouraged to discuss their disability related needs with Disability Resources and their instructors as soon as possible.

Title IX and Statement on Limits to Confidentiality

Texas A&M University is committed to fostering a learning environment that is safe and productive for all. University policies and federal and state laws prohibit gender-based discrimination and sexual harassment, including sexual assault, sexual exploitation, domestic violence, dating violence, and stalking.

With the exception of some medical and mental health providers, all university employees (including full and part-time faculty, staff, paid graduate assistants, student workers, etc.) are Mandatory Reporters and must report to the Title IX Office if the employee experiences, observes, or becomes aware of an incident that meets the following conditions (see [University Rule 08.01.01.M1](#)):

- The incident is reasonably believed to be discrimination or harassment.
- The incident is alleged to have been committed by or against a person who, at the time of the incident, was (1) a student enrolled at the University or (2) an employee of the University.

Mandatory Reporters must file a report regardless of how the information comes to their attention – including but not limited to face-to-face conversations, a written class assignment or paper, class discussion, email, text, or social media post. Although Mandatory Reporters must file a report, in most instances, you will be able to control how the report is handled, including whether or not to pursue a formal investigation. The University's goal is to make sure you are aware of the range of options available to you and to ensure access to the resources you need.

Students wishing to discuss concerns in a confidential setting are encouraged to make an appointment with [Counseling and Psychological Services](#) (CAPS).

Students can learn more about filing a report, accessing supportive resources, and navigating the Title IX investigation and resolution process on the University's [Title IX webpage](#).

Statement on Mental Health and Wellness

Texas A&M University recognizes that mental health and wellness are critical factors that influence a student's academic success and overall wellbeing. Students are encouraged to engage in proper self-care by utilizing the resources and services available from Counseling & Psychological Services (CAPS). Students who need someone to talk to can call the TAMU Helpline (979-845-2700) from 4:00 p.m. to 8:00 a.m. weekdays and 24 hours on weekends. 24-hour emergency help is also available through the National Suicide Prevention Hotline (800-273-8255) or at suicidepreventionlifeline.org.

COVID-19 Temporary Addendum to Minimum Syllabus Requirements

The Faculty Senate temporarily added the following statements to the minimum syllabus requirements in Spring 2021 as part of the university's COVID-19 response.

Campus Safety Measures

To promote public safety and protect students, faculty, and staff during the coronavirus pandemic, Texas A&M University has adopted policies and practices for the Spring 2021 academic term to limit virus transmission. Students must observe the following practices while participating in face-to-face courses and course-related activities (office hours, help sessions, transitioning to and between classes, study spaces, academic services, etc.):

- Self-monitoring—Students should follow CDC recommendations for self-monitoring. **Students who have a fever or exhibit symptoms of COVID-19 should participate in class remotely if that option is available, and should not participate in face-to-face instruction.**
- Face Coverings—[Face coverings](#) (cloth face covering, surgical mask, etc.) must be properly worn in all non-private spaces including classrooms, teaching laboratories, common spaces such as lobbies and hallways, public study spaces, libraries, academic resource and support offices, and outdoor spaces where 6 feet of physical distancing is difficult to reliably maintain. Description of face coverings and additional guidance are provided in the [Face Covering policy](#) and [Frequently Asked Questions \(FAQ\)](#) available on the [Provost website](#).
- Physical Distancing—Physical distancing must be maintained between students, instructors, and others in course and course-related activities.
- Classroom Ingress/Egress—Students must follow marked pathways for entering and exiting classrooms and other teaching spaces. Leave classrooms promptly after course activities have concluded. Do not congregate in hallways and maintain 6-foot physical distancing when waiting to enter classrooms and other instructional spaces.
- To attend a face-to-face class, students must properly wear an approved face covering. If a student refuses to wear a face covering, the instructor should ask the student to leave and join the class remotely. If the student does not leave the class, the faculty member should report that student to the [Student Conduct office](#) for sanctions. Additionally, the faculty member may choose to teach that day's class remotely for all students, or dismiss the class in the case of a traditional face to face lecture.

Personal Illness and Quarantine

Students required to quarantine must participate in courses and course-related activities remotely, if that option is available, and **must not attend face-to-face course activities**. Students should notify their instructors of the quarantine requirement. Students under quarantine are expected to participate in courses and complete graded work unless they have symptoms that are too severe to participate in course activities.

Students experiencing personal injury or illness that is too severe for the student to attend class qualify for an excused absence (See [Student Rule 7, Section 7.2.2.](#)) To receive an excused absence, students must comply with the documentation and notification guidelines outlined in Student Rule 7.