

# CSCE 313 – Introduction to Computer Systems

## Spring 2022

### Course Logistics

1. Time and Place
  - a. Lectures (Online-Asynchronous): Canvas Modules
  - b. Labs (In-Person): Various (Refer to HOWDY for your Section)
2. Course Content: Canvas (<https://canvas.tamu.edu/courses/137772>)
3. Course Discussion Forum: MS TEAMS: TEAM- CSCE-313 SP22.
4. Instructor: Aakash Tyagi, [tyagi@cse.tamu.edu](mailto:tyagi@cse.tamu.edu)
  - a. Office Hours: Will be posted on Canvas and TEAMS
5. Teaching Staff:

*ROLE: Graduate TA's and Undergraduate Peer Teachers will conduct the labs and QnA. Undergraduate TA's will work behind the scene on lab content creation and QnA. Graders will take the frontline role in grading the programming assignments and quiz/exams.*

  - a. Graduate TA's
    - i. Gabriel Stella [gabrielstella@tamu.edu](mailto:gabrielstella@tamu.edu)
    - ii. Feras Khemakhem [foufou1560@tamu.edu](mailto:foufou1560@tamu.edu)
    - iii. Mary Julian [mjulian@tamu.edu](mailto:mjulian@tamu.edu)
  - b. Undergraduate TA's
    - i. Ezekiel Blevins [ezeb209@tamu.edu](mailto:ezeb209@tamu.edu)
    - ii. Sravan Sriram [ssravan360@tamu.edu](mailto:ssravan360@tamu.edu)
  - c. Peer Teachers (listed on [Peer Teachers Central Site](#))
6. A baseline R0 version of the Course Master Plan is made available on Canvas. Although some amount of buffer planning has been built-in to the schedule, we will respond to situation 'on the ground' and respond as dictated by the over-arching goal of maximizing learning and assimilation.

### Prerequisites

- CSCE 312 (Computer Organization)
- Familiarity with C/C++ programming (CSCE 121, CSCE 221)

### Description

The objective of this course is to provide us with a general understanding of what system software is involved for an application program to run, both on a single node and over a network, and how this system software is to be used. In support of this objective, the course will prepare us to do system-level programming. This course will demonstrate how to "use" (as opposed to "design") system components, such as memory, file systems, process control, inter-process communication, and networking. By the end of this course, we will have an understanding of the problems and pitfalls typically encountered in the design and implementation of multithreaded and networked applications and systems. More

specifically, by the end of this course we should be fairly good at making full use of the services provided by the underlying operating system by programming directly at the operating system interface level. We will review the following aspects of a computer system, in no particular order:

- What is an operating system; what are its components; why system calls?
- Execution of a program; function calls; interrupts.
- The OS application interface; file system; process control; etc.
- Inter-process communication
- Concurrency, Threads, Process/Thread Synchronization
- Network Socket Programming
- Principles and practices for secure computing. Security threats in centralized and distributed systems; authentication, authorization, confidentiality; security mechanisms.
- Parallel and Distributed Computing

### **Books (NOT REQUIRED FOR PURCHASE)**

**There is no required textbook for this class:** the course material is assembled from multiple sources (books, existing courses, conversation with experts, and published research). However, the following list of books are most referenced in the assembled material for those who'd like an additional source of material to supplement lectures.

- **Primary**
  - [OSPP] Operating Systems: Principles and Practice, 2<sup>nd</sup> Edition, Thomas Anderson and Michael Dahlin, Recursive Books, 2014 ([HERE](#))
  - [OSTEP] Operating Systems: Three Easy Pieces. [Available online free [HERE](#)]
- **Secondary**
  - [APUE] Advanced Programming in the UNIX Environment, 3rd Edition, W. Richard Stevens and Stephen A. Rago, Addison-Wesley Professional Computing Series, 2013.
  - [MOLAY] Understanding Unix/Linux Programming: A Guide to Theory and Practice, Bruce Molay, Pearson Education Inc., 2003

### **Other Interesting Readings**

- **Computer Systems**
  - [CSAPP] *Computer Systems: A Programmer's Perspective*, 3<sup>rd</sup> Edition, Randal E. Bryant and David R. O'Hallaron, Prentice Hall, 2016.
- **Operating Systems**
  - [OSC] *Operating System Concepts*, 10<sup>th</sup> Edition, Silberschatz, Galvin, Gagne, John Wiley and Sons, Inc. 2021

### **Lectures**

**Lectures will be remote-asynchronous** meaning the lecture content will be released on Canvas weekly according to the Master Schedule. Barring exception, effort will be made to release weekly content on the weekend in case you have discretionary time to read ahead. During

lectures we will be covering Operating Systems and Systems Programming concepts and case studies. The material covered in the lectures will provide the background and foundation for you to appreciate the lab exercises designed to buttress lecture concepts and to prepare to succeed in programming assignments.

### Quizzes

**Quizzes will be 'take-home' format offered on Canvas**, and aligned with key topic learnings. In most cases, quizzes will be online short format, multiple choice type of questions to test basic understanding of concepts presented during the lectures.

### Labs

**Labs will be held in-person, face-2-face.** Given the university requirements for the prescribed format of this course, the labs will NOT be conducted over Zoom so if you are unable to be in College Station physically, you may need to defer this course to a later semester. Labs are where we will put into practice the material learned in the lectures, and where we will acquire a working knowledge of the UNIX/LINUX operating system. **Labs will meet twice weekly (TR for Sections 500-507 and two back-2-back sessions on Friday for Sections 597-599)** where we will be presenting a new problem to motivate learning and facilitate skill-building. After an introductory session to familiarize you with the particular environment that we will be using, there will be a continuing series of lab exercises and programming assignments of moderate difficulty level, which will exercise different parts of the operating system: process and thread management, inter-process communication, networked execution, and so on.

There will be 6 Programming Assignments (PA0-5) assigned roughly on a bi-weekly basis. We will kick-off the course with PA0 which is a simple, warm-up exercise in C++. The master-plan contains the details. Lab attendance is critical to ensure you understand the problem, actively hash the problem out with your classmates, and clarify with lab TA's and PT's.

### Assessment Method (Subject to Minor Changes!):

The course will have two exams and a series of quizzes and programming assignments. The grade allocation is as follows:

1. Exams (Midterm and Final) = 40% (Midterm=22%, Final = 18%)
2. Programming Assignments = 54% (each project is 9% of the grade)
3. Online-take-home Quizzes (20+) = 6%

The grading scale is as follows:

- 90-100: A
- 80-89: B
- 70 – 79: C
- 60 – 69: D
- 59 and below: F

### Late Submission Policy – SUBJECT TO CHANGE

Exam and Quiz late policies are stringent and fairly straightforward

- **Exams:** No exception without prior e-mail approval from the instructor. See University policy for details.
- **Quizzes:** Online on Canvas. Late submissions will not be accepted without prior e-mail approval from the instructor.

For the programming assignments, we are attempting something new for the late submission policy. Below, a general philosophy is presented.

**Philosophy:** We all have varying working habits - some start early, some wait till the last minute. We are also affected by our environment - last minute surprises can come, health, etc. In addition, this course is typically paired with CSCE-315 which is also project intensive. So, we are planning to adopt a policy that accommodates the unknowns to some extent and also gives you the flexibility to respond to peaks and troughs in your enrolled course schedules: Early turnin wins credit, Late turnins earn penalty but can use earned credits to offset the penalty. In the end, the overall accrued credit/penalty is applied on the sum total which is then scaled. A separate document describing the policy in detail with examples will be made available on Canvas.

### Exams

There will be one midterm and one final examination. Both exams will be offered online on Canvas with required in-person attendance during designated lab session. Those with accommodations from the Department of Disability Resources ([LINK](#)) must arrange to take the exam at the center. Any exceptions to the above must be obtained from the instructor well in advance with proper justification via e-mail. The course master calendar will contain the exam dates and they will also be communicated in TEAMS and Canvas well in advance.

### Communication Policy

Your teaching staff will do their best to communicate relevant administrative information (deadlines, information about posted material, details about projects, locations of tutorials, and so on) in an effective and timely manner. We will be using Microsoft TEAMS platform for all course communication.

Please refer to the document “**CSCE313 How do I setup Microsoft TEAMS**” available on **Canvas in Student Resources Module**. It contains simple steps to install TEAMS and sign on to our course TEAMS site.

At times, reinforcement messages may also be sent via Canvas, but our discussion forum is MS Teams. E-mails listed on course roster are used for enrollment in Canvas and TEAMS. If you are not receiving TEAMS or CANVAS updates, please contact the instructor.

### Teaching Staff Support

It is important to lay out broad expectations for support as follows based on the roles:

Your **instructor** will be on hand to answer queries on lectures and practice questions, offer mentoring, and conduct quiz/exam review sessions/support.

Your **TA's** will conduct labs (graduate TA's), answer queries on PA's, lab exercises, and lab quizzes, provide code quality feedback for PA submissions. Their time is best spent on providing clarifications on assignments and offer detailed feedback on coding quality and organization.

Your **graders** will not directly interface with you in labs but will work behind the scene in grading programming assignments, and quizzes/exams per discretion of your instructor.

**As a general policy, I am asking the TA's to not assist with debugging student code.** It is both counter-productive to student learning and extremely stressful for the teaching staff. They will expend much of the feedback in providing a clear understanding of the programming assignment expectations and common best practices.

### Course Acknowledgments

**Lecture Content:** The course website and lecture notes have incorporated course materials developed by Dr. Riccardo Bettati, Dr. Guofei Gu, Dr. Sarker Tanzir Ahmed, and Dr. Dmitri Loguinov of Texas A&M University, Dr. Avi Silberschatz (Yale), Dr. Lawrence Angrave (UIUC), Dr. Thomas Anderson (UW), Dr. Michael Dahlin (Google), Drs. Randall Bryant and David O'Hallaron of CMU, Drs. Anthony Joseph and David Culler of UC Berkeley, Dr. Kuenning (HMC), Dr. Snoeren (UCSD). The copyright of these materials belongs to them. The instructor is especially grateful to Drs. Bettati and Ahmed for making their entire course content available for use in this semester offering, especially because the instructor is returning to teach this course after a nearly 4+year hiatus.

**Programming Assignment Content:** PA's have gone through evolution in the last several years. Original programming assignments were created under the auspices of Professors Riccardo Bettati and Guofei Gu. The instructor (Tyagi) taught this course between 2014-2016. During Spring 2016, a small number of enterprising undergraduate students took the daunting task of working with the instructor and (then TA) Prof. Sarker Tanzir Ahmed to create a new set of programming assignments in addition to revising the existing ones. The resulting set of programming assignments was piloted by Prof. Ahmed in his Fall 2016 CSCE-313 course and resulting student feedback was rolled in to the Spring 2017 offering, and improved ever since. The lion's share of contributions was made by Andrew Kirfman and Joshua Higginbotham, both former CSCE undergraduate students. Both the instructor and Prof. Ahmed are grateful for their contributions and honor their lasting legacy toward the benefit of the CSE student community.

And finally, a note for the sake of our health and well-being: To help protect Aggieland and stop the spread of COVID-19, Texas A&M University urges students to be vaccinated and to wear masks in classrooms and all other academic facilities on campus, including labs. Doing so exemplifies the Aggie Core Values of respect, leadership, integrity, and selfless service by

putting community concerns above individual preferences. COVID-19 vaccines and masking — regardless of vaccination status — have been shown to be safe and effective at reducing spread to others, infection, hospitalization, and death.

### **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.

### **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](#).)

### **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](http://aggiehonor.tamu.edu).*

## **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 the Disability Resources office on your campus (resources listed below). 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.

*Disability Resources is located in the Student Services Building or at (979) 845-1637 or visit [disability.tamu.edu](http://disability.tamu.edu).*

## **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, a person who is subjected to the alleged conduct 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 healthy self-care by utilizing available resources and services on your campus

*Students who need someone to talk to can contact Counseling & Psychological Services (CAPS) or 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](https://suicidepreventionlifeline.org).*