Syllabus

1 Course Information

1.1 Class

Semester: Spring 2020 **Course number**: CIS 657 **Section:** M001 **Credits**: 3

Meeting times: Mon and Wed, 2:15PM – 3:35PM

Location: HB Crouse Gifford Auditorium (`https://goo.gl/maps/CtrAtw71EFq9rqYf6`)

Course page: `https://blackboard.syr.edu/` (accessible with your SU NetID)

Discussion forum: Blackboard

1.2 Instructor

Name: Endadul Hoque (`https://endadul.github.io`)
Email: `enhoque@syr.edu`
Office: CST 4-187
Office hours: TBA (see the course page)

1.3 TAs

Name: TBA (will be updated on the course page)
Email: TBA
Help sessions: **TBA (see the course page)**
Location: TBA

2 Course Overview

This is a graduate course, focusing on the fundamentals of operating systems as well as some advanced topics. This course revolves around the design and implementation of a general-purpose multiprogramming system. It covers principles, design decisions and techniques, policies, and mechanisms behind process and memory management, resource scheduling, synchronization, file system management, I/O, kernel services and so on. The course is structured to include lectures, hands-on programming assignments, and exams.

This course aims to engage students in (a) understanding the components along with their abstractions in designing and implementing an operating system, the underlying design goals and the associated trade-offs; and (b) gaining hands-on experience with user-space programming on a real-world OS (say, Linux[1]) and kernel-space programming on an education OS (say, Nachos[2])

3 Course Objectives

The learning objectives include:

- Understand three high-level abstractions of an operating systems: *virtualization*, *concurrency*, and *persistence*
- Learn the design principles, available techniques and their trade-offs
- Learn the policies and mechanisms behind the existing components and abstractions of an OS

[1] `https://www.linux.com/what-is-linux/`
[2] `https://en.wikipedia.org/wiki/Not_Another_Completely_Heuristic_Operating_System`

- Understand the guarantees and the limitations of existing mechanisms
- Gain hands-on experience with user-space programming on Linux (*e.g.*, Ubuntu) and kernel-space programming on Nachos
- Engage in critical discussion around some advanced topics related to operating systems

4 Prerequisites

CIS/CSE 486 (or equivalent to an undergraduate "Operating Systems" course)

Additional Requirements

- Strong background in **Computer Science**
- Good understanding of programs written in **C** and **C++**
- Good programming experience in **C** and **C++**
- Comfortable with Linux environment (mostly, **terminal**) and scripting (*e.g.*, **bash**)
- Learn new tools (required for programming assignments) – **on your own**

It is important for you to understand that this course is largely built on and dealing with the fundamentals of Computer Science. A large portion of it deals with computer *programs*, *operating systems* and *their internals*. It is **expected** that you approach this course with some **programming maturity** and experience on using some **Linux-based OS** (*e.g.*, Ubuntu). In addition, you must have the ability to **understand, write** and **debug programs**, as necessary. Finally, you must know how to **install** software tools in a Linux environment, if necessary for any programming assignments, and how to **troubleshoot** installation related issues.

5 Textbooks and Additional Materials

Required: *Operating Systems: Three Easy Pieces* by Remzi H. Arpaci-Dusseau and Andrea C. Arpaci-Dusseau. version 1.00. You may want to purchase this book. However, free PDFs of the book chapters are available on the authors' website (`http://pages.cs.wisc.edu/~remzi/OSTEP/`). Feel free to go for your preferred option.

Slides and **additional reading materials** will be made available on the course page (§ 1.1).

Background concepts

If you need to brush up on background material in detail, any online search engine will be your friend to find necessary materials.

6 Course Schedule

To be posted on the course page (§ 1.1)

7 Grading Summary

The following assessments will make up the indicated percentages of your grade (out of 100):

- Programming assignments (45%)
- Mid-term exam (20%)

- Final exam (25%)
- Class participation/Paying attention/Attendance/Pop-up quizzes (10%)

No extra credit!

Important

- This grading distribution is however **subject to change**
- **Programming assignments:** There will be 5 or 6 (tentative) programming assignments, where you have to use C, C++, and BASH languages. Some assignments will be related to Linux OS and the others will be on NachOS (an educational operating system).
- **Mid-term/Final exam:** It will be an in-class, closed-book and closed-notes exam. The dates will be announced well ahead of time.
- **Pop-up quizzes:** There can be some pop-up quizzes throughout the semester. However, the dates/topics will not be announced ahead of time. The quizzes are expected to include the recently covered topics in the class.
- **Class participation/Paying attention/Attendance:** See Section 8.5 for more information.

There is **no curve** for grades. Final grades are based on a simple scale as shown below: Let G be a student's total final score. Then

Total Score	**Letter Grade**
$G \geq 93$	A
$90 \leq G < 93$	A-
$87 \leq G < 90$	B+
$83 \leq G < 87$	B
$80 \leq G < 83$	B-
$75 \leq G < 80$	C+
$70 \leq G < 75$	C
$60 \leq G < 70$	D
$G < 60$	F

The grade points equivalent to these letter grades are available here (`http://coursecatalog.syr.edu/content.php?catoid=17&navoid=2249#table-f-letter-grades`).

NOTE: No **Incomplete** grade will be provided. Graduate students will not be assigned `D` grades. Violations of academic integrity override the foregoing table and could result in a `F` grade.

8 Course-specific Policies

8.1 Ethics

Behave responsibly! Honest and ethical behavior is expected at all times.

Warning

- We may discuss vulnerabilities in widely-deployed computer operating systems. This is not intended as an invitation to exploit those vulnerabilities. It is important that we be able to discuss real-world experience candidly; students are expected to behave responsibly.
- You may not break into machines that are not your own. Breaking into other people's systems is inappropriate, and the existence of a security hole is no excuse.
- Unethical or inappropriate actions may result in failing the course and being referred for further discipline.

8.2 Exams Policy

The exams are in-class, closed-book, and closed-notes. No electronic device – laptops, tablets, phones, etc. – is allowed during the exam, unless otherwise stated. The exams cover everything, including lectures, assignments and quizzes.

Important

The only excuse for missing an exam is a university-accepted reason (*e.g.*, verifiable cases of illness, medical emergencies, religious holidays). Please check the date for the exams (TBA) on the course page and inform me at the earliest of any conflict due to the above-mentioned reasons. Otherwise, there will be **NO makeup or rescheduling** for the exams.

8.3 Submission Policy for Programming Assignments

 ❝ ***Read & Follow instructions in the handouts/descriptions!!!*** ❞

If a programming assignment is required you to submit the source code (and additional materials), you must do so as mentioned in the handout.

General recommendation: You can submit your assignments anytime prior to or at the time of the deadline. However, you should not wait till the last moment.

Late Submission

2^{2n}**% points** of the total points will be subtracted from your obtained score for n **late days**, where $n \in \mathbb{Z}^+$ (*i.e.*, $n = 1, 2, \ldots$).

Suppose, a programming assignment is worth of a total $\mathcal{T}$ points and your obtained score is $\mathcal{S}$. As a result, your final score can be $\textbf{max}(0, \mathcal{S} - \frac{2^{2n} \times \mathcal{T}}{100})$ for n late days.

First late day will start right after the exact time of the deadline. s There will be no excuse, such as 1 min or 1 hr late.

8.4 Collaboration Policy

- Each programming assignment is to be done **individually**, *if not stated otherwise*. You may discuss any programming related problems (*e.g.*, debugging issues) *at a* ***conceptual*** *level* **while** working on your assignment; however, you MUST write the code **INDIVIDUALLY** (if not stated otherwise).

- You may take a look at code snippets or libraries from online resources, such as `github` and `stack-overflow`, but **never copy source code directly** from those resources. *Using code snippets without understanding what they actually do may result in incorrect outcomes or unexpected bugs.*
- **Never** ever have a **COPY** of someone's solutions/code in your possession, and **never share** your written work or program (or your account's password) with anyone else. **Never publish** your code to publicly available websites like `github`, `gitlab`, `bitbucket` and so on.
- **Pop-up quizzes** (if any) are to be taken **individually**, not in groups.
- From time to time (without announcing ahead of time), we may use automated software **similarity detection** tools (aka **plagiarism detection** tools) across this semester's submissions and previous years submissions.

NO CHEATING WILL BE TOLERATED. Any CHEATING will automatically result in **failing** the course and being **reported** to the university administration.

 ***"Always think about the worst-case scenario if you get caught!!!"***

8.5 Attendance & Paying Attention

It is **strongly recommended** to attend classes and **take notes**.

You MUST **actively be present** in the class, **pay attention** to class *discussions*, *announcements*, and *instructions* in assignment descriptions, and **participate** in Q/As related to the course.

Paying attention to the materials being discussed in the class will increase your chances to obtain a good grade in this course.

If you **miss** class(es), it is your responsibility to go through the covered material (including, discussions on assignments/exams) on your own.

8.6 Re-grading

You have **1 WEEK** to ask for REGRADING of your (**originally submitted, not revised**) assignments and the mid-term exam from the moment solutions were released or discussed in class.

Make sure you read and **understand the solution** before asking for a regrade.

It is the student's responsibility to keep track of all the grades and make sure that they are recorded correctly.

8.7 Communication Policy

Online discussion and questions will be handled through **the discussion board** (see section 1.1), **not via email**. A best effort attempt will be made to respond to posts within **48 hours** on **weekdays** during **normal working hours**. *Students are **encouraged** to respond as well.* To ensure a timely response, you **SHOULD NOT** wait to ask questions until the night before a submission deadline or until the day of the deadline.

How to ask a question on the discussion board?

- First read slides, notes, book chapters, or assignment description/handout
- Check if there is any ongoing thread related to your question
- Describe the problem clearly, using the right terms
- Use #hashtags (#lecture2, #assignment3, #mid-term, etc.), if it is available on the discussion board

- Add any other relevant information, if necessary

When to Email?
For issues (*e.g.*, grading, TA help sessions), you should **email** a TA and CCed the instructor. For other issues related to the course (*e.g.*, scheduling one-on-one meetings, containing sensitive information), you should **email the instructor**. You must use your **official university email** address. All emails should have the prefix "**[CIS 657]**" (without the quotes) in the subject line. Complying with this requirement will enable the instructor/TAs to process emails faster. A best effort attempt will be made to respond to emails within **48 hours on weekdays** during **normal working hours**.

You are required to check your SU email and the course page (see Section 1.1) at least once a day for any class updates/announcements.

No meetings will be accepted/scheduled on the day when a programming assignment is due or on the day of the exam.
No questions on the discussion board will be answered on the day when a programming assignment is due or on the day of the exam.

For any programming assignment, it is highly recommended that you
Start Early, Plan Carefully!

8.8 Miscellaneous but Important

On some days of the semester (**announced ahead of time**), physical class meeting **may not be** held. Instead, the instructor may utilize other arrangements (say, video conferencing) for those days.

9 Weather/Emergency

In the event of any major campus emergency or severe weather, class members should seek appropriate shelter immediately, leaving the classroom if necessary. The class will continue if possible when the event is over.

This class will operate in accord with SU's emergency policy (see `http://emergencyguide.syr.edu/`) and weather policy (`https://policies.syr.edu/policies/campus-safety-and-emergency-services/inclement-weathersevere-storm-closing/`). You should monitor campus status (`https://www.syracuse.edu/about/contact/campus-status/`) and your SU email particularly for any weather or emergency announcements.

10 Add/Drop Deadlines

Please refer to `https://www.syracuse.edu/academics/calendars/academic-year/#s:spring-2020` for specific dates. You are responsible for knowing and abiding by the registration dates and deadlines.

11 University-wide Policies

11.1 Academic Integrity

Syracuse University's Academic Integrity Policy reflects the high value that we, as a university community, place on honesty in academic work. The policy defines our expectations for academic honesty and holds students accountable for the integrity of all work they submit. Students should understand that it is their responsibility to learn about course-specific expectations, as well as about university-wide academic integrity expectations. The policy governs appropriate citation and use of sources, the integrity of work submitted

in exams and assignments, and the veracity of signatures on attendance sheets and other verification of participation in class activities. The policy also prohibits students from submitting the same work in more than one class without receiving written authorization in advance from both instructors. Under the policy, students found in violation are subject to grade sanctions determined by the course instructor and non-grade sanctions determined by the School or College where the course is offered as described in the Violation and Sanction Classification Rubric. Syracuse University students are required to read an online summary of the Universitys academic integrity expectations and provide an electronic signature agreeing to abide by them twice a year during pre-term check-in on MySlice.

The Violation and Sanction Classification Rubric establishes recommended guidelines for the determination of grade penalties by faculty and instructors, while also giving them discretion to select the grade penalty they believe most suitable, including course failure, regardless of violation level. Any established violation in this course may result in course failure regardless of violation level.

11.2 University Attendance Policy (including Absence Notification)

Attendance in classes is expected in all courses at Syracuse University. It is a federal requirement that faculty promptly notify the university of students who do not attend or cease to attend any class. Faculty will use Early-Semester Progress Reports and Mid-Semester Progress Reports in Orange SUccess to alert the Registrar and Financial Aid Office on non-attendance. For more information visit:
Faculty: `http://registrar.syr.edu/faculty-staff/non-attendance/`
Students: `http://registrar.syr.edu/students/non-attendance/`

Students may contact their home school/college Dean's Office or the Case Management staff in Dean of Students Office when they are absent from class for an extended period of time (48 hours or more). The Case Management staff will require documentation for the absence and will utilize Orange SUccess to send notifications to faculty to verify that documentation has been received for the stated absence.

Barnes Center at the Arch (Health, Counseling, etc.) staff will not provide medical excuse notes for students. When Barnes Center staff determine it is medically necessary to remove a student from classes, they will coordinate with the case management staff to provide absence notification to faculty through Orange Success. For absences lasting less than 48 hours, students are encouraged to discuss academic arrangements directly with their faculty.

Additional information may be found at: `http://studentassistance.syr.edu/our-services/absence-notifications.html`

11.3 Diversity and Disability

Syracuse University values diversity and inclusion; we are committed to a climate of mutual respect and full participation. There may be aspects of the instruction or design of this course that result in barriers to your inclusion and full participation in this course. I invite any student to meet with me to discuss strategies and/or accommodations (academic adjustments) that may be essential to your success and to collaborate with the Office of Disability Services (ODS) in this process.

If you would like to discuss disability-accommodations or register with ODS, please visit their website at `http://disabilityservices.syr.edu`. Please call (315) 443-4498 or email `disabilityservices@syr.edu` for more detailed information.

ODS is responsible for coordinating disability-related academic accommodations and will work with the student to develop an access plan. Since academic accommodations may require early planning and generally are not provided retroactively, please contact ODS as soon as possible to begin this process.

11.4 Discrimination or harassment

The University does not discriminate and prohibits harassment or discrimination related to any protected category including creed, ethnicity, citizenship, sexual orientation, national origin, sex, gender, pregnancy, disability, marital status, age, race, color, veteran status, military status, religion, sexual orientation, domestic violence status, genetic information, gender identity, gender expression or perceived gender.

Any complaint of discrimination or harassment related to any of these protected bases should be reported to Sheila Johnson-Willis, the Universitys Chief Equal Opportunity & Title IX Officer. She is responsible for coordinating compliance efforts under various laws including Titles VI, VII, IX and Section 504 of the Rehabilitation Act. She can be contacted at Equal Opportunity, Inclusion, and Resolution Services, 005 Steele Hall, Syracuse University, Syracuse, NY 13244-1120; by email: `titleix@syr.edu`; or by telephone: 315-443-0211.

Federal and state law, and University policy prohibit discrimination and harassment based on sex or gender (including sexual harassment, sexual assault, domestic/dating violence, stalking, sexual exploitation, and retaliation). If a student has been harassed or assaulted, they can obtain confidential counseling support, 24-hours a day, 7 days a week, from the Sexual and Relationship Violence Response Team at the Counseling Center (315-443-4715, 200 Walnut Place, Syracuse, New York 13244-5040). Incidents of sexual violence or harassment can be reported non-confidentially to the University's Title IX Officer (Sheila Johnson Willis, 315-443-0211, `titleix@syr.edu`, 005 Steele Hall). Reports to law enforcement can be made to the University's Department of Public Safety (315-443-2224, 005 Sims Hall), the Syracuse Police Department (511 South State Street, Syracuse, New York, 911 in case of emergency or 315-435-3016 to speak with the Abused Persons Unit), or the State Police (844-845-7269). I will seek to keep information you share with me private to the greatest extent possible, but as a professor I have mandatory reporting responsibilities to share information regarding sexual misconduct, harassment, and crimes I learn about to help make our campus a safer place for all.

11.5 Additional University Policies

Students should review SU's policies regarding:

Religious Observances Policy(`https://policies.syr.edu/policies/university-governance-ethics-integrity-and-legal-compliance/religious-observances-policy/`),
Orange SUccess (`http://orangesuccess.syr.edu/getting-started-2/`), and
other Academic Rules (`http://coursecatalog.syr.edu/content.php?catoid=17&navoid=2249`).