Northeastern
College of Engineering

CSYE 6225 Network Structure & Cloud Computing

Fall 2024

Course Information
Course Title: Network Structure & Cloud Computing
Course Number: CSYE 6225
Term and Year: Fall 2024
Credit Hour: 4
CRN: 12922 (SEA) & 13401 (BOS)
Course Format: on-ground (BOS), Livestream (SEA)

Instructor Information
Full Name: Tejas Parikh
Email Address: t.parikh@northeastern.edu
Office Hours: By Appointment Only

Email Communication
Assignment-related questions must be posted on Canvas.

Send all email correspondence to t.parikh@northeastern.edu. When you send me an email, please be sure to:

- Send me emails from your NEU email address ONLY (note that emails sent from non-NEU email addresses may be detected as spam and will not be received or answered!)
- Type "CSYE 6225 [CAMPUS]" in the subject line where CAMPUS may be BOS or SEA
- Type your full name and NEU ID in the message in ENGLISH.

Emails will usually be answered within 48 hours. Responses may be delayed over the weekend or holidays.

Instructor Biography
Tejas Parikh is a Part-Time Lecturer at Northeastern University and Principle Site Reliability Engineer at Tamr, Inc. He has been teaching Master's level courses at Northeastern University since 2017. He received his Bachelor of Science in Computer Science from Eastern Michigan University in 2006 and a Master of Science in Computer Science from Northeastern University in 2009. He has been working on cloud computing technologies for over 10 years and in the industry for over 15 years, focusing on containers, container orchestration, and hybrid cloud architecture and design. He is passionate about all things open source, Linux, DevOps, SRE, automation, cloud, containers, and Kubernetes.

Teaching Assistant Information
See Canvas for Details

Course Prerequisites
- CSYE 6200 or INFO 5100
- Web Application Development
- Familiarity with high-level programming languages such as Java, Python, JavaScript, Go, Rust, etc.
- Familiarity with RDBMS such as MySQL, PostgreSQL, Oracle, DB2, or MS SQL

Course Description
This graduate-level course covers topics and technologies related to cloud computing and its practical implementations. You will gain hands-on experience with the various features of popular cloud platforms such as Google Cloud Platform, Amazon Web Services, Microsoft Azure, etc. We will explore different models, techniques, and architecture of cloud computing and prepare you to meet current market demands. The lectures and assignments aim to help you develop skills to build, maintain, and operate highly available, highly reliable, cloud-native applications deployed using a continuous deployment pipeline. You will also learn Linux system administration, networking fundamentals, polyglot programming, polyglot persistence with RDBMS and NoSQL databases, source control management using git, microservices architecture, and serverless computing.

Course Learning Outcomes
- Understand basic concepts related to cloud computing.
- Understand cloud architecture and models such as IaaS, PaaS & SaaS.
- Obtain hands-on knowledge about Linux system administration and networking fundamentals.
- Compare cloud platform providers such as Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform.
- Understand cloud storage options such as file storage, CDNs, Relational Databases, NoSQL databases, etc.
- Learn to develop scalable applications using various AWS features such as auto-scaling and load balancing.
- Learn to secure SSL applications and protect user data against XSS, CSRF, and SQL injection attacks.
- Hands-on experience with microservices & APIs.
- Understand Agile development, Git version control system, Continuous Integration, and Deployment using tools like GitHub Actions, Jenkins, etc.
- High-level understanding of DevOps and Site Reliability Engineer (SRE) role.

Required Tools and Course Textbooks

There are no required textbooks for this course. Details about required tools and software will be posted in Canvas. *Students are solely responsible for the cost of acquiring the tools listed below. Northeastern University, College of Engineering, and the instructor will not be responsible for any charges incurred. Signups with cloud service providers might require a valid credit or debit card,* even for free tiers.

Topics Covered

- DevOps, GitOps, SRE
- Linux, Shell Scripting
- Version Control with Git
- Computer Networking
- Cloud Computing
- Microservices Architecture
- Identity & Access Management
- Infrastructure as Code
- Cloud Storage Solutions
- Continuous Integration, Continuous Delivery, and Continuous Deployment
- Operational Visibility (Logging, Metrics, Monitoring, and Alerting)
- Load Balancers
- Auto-scaling Applications
- Event-driven Architecture
- Serverless Computing
- Securing cloud applications and infrastructure

Tentative Course Schedule

Please review the appropriate Academic Calendar for important Graduate School dates for the current and upcoming semesters.

WEEK #	LECTURE #	BOSTON	SEATTLE	TOPICS COVERED
1	1	08/05	08/07	• Course Overview • Fundamentals of Cloud Computing
2	2	08/12	08/14	• Overview of Public Cloud Providers • Identity & Access Management (IAM) • Networking Fundamentals
3	3	08/19	08/21	• Version Control with Git • Introduction to DevOps • Infrastructure as Code
4	4	08/26	08/28	• The Linux Command Line • Editing with Vi
5	5	10/03	10/05	• Shell Scripting • Continuous Integration • GitHub Actions
6	6	10/10	10/10	• Virtualization • Custom Machine Images
7	7	10/17	10/19	• Cloud Storage Solutions
8	8	10/24	10/26	• Content Delivery Network (CDN) • Site Reliability Engineering • Observability – Logging & Metrics • Monitoring & Alerting
9	9	10/31	11/02	• Domain Name System (DNS) • Email Service
10	10	11/07	11/09	• Load Balancing • Auto-scaling • Continuous Deployment
11	11	11/14	11/16	• Microservices Architecture • Serverless Computing • Event Driven Architecture
12	12	11/21	11/23	• Cloud Security
13	**-**	**11/28**	**11/30**	• **Thanksgiving Break**
14	14	12/05	12/07	• Architecting for the Cloud: Best Practices
15	**15**	**12/12**	**12/14**	• **Final Exam**

Assignment Grading
Grade Breakdown

Assignments: 50%

Quizzes & Exams: 50%

Students will be assigned assignments at the end of the lecture. Assignment due dates will be posted with each assignment. *Given that an assignment is due every week, if you fall behind on an assignment, it will be extremely difficult to catch up as the next assignment depends on it.*

Grading Process

- Each student will be assigned a TA for assignment grading. The assignment page will provide a link to the document to find the assigned TA.
- Students will book an appointment with their assigned TA in the Canvas calendar.
- While Canvas allows you to cancel appointments at any time, *cancellations of appointments less than 24 hours away may incur a penalty of 5%* for the assignment.
- TAs will time-box demos to the appointment period (15-60 mins). If the assignment demo cannot be finished in the allocated time, it may be assumed that the student did not meet all assignment objectives. I recommend showing up a bit early for the grading appointments and getting the laptop set up and ready for the demo.
- *Using demo time to debug/diagnose/fix assignment issues is inappropriate. The deadline has passed, and fixes applied during the demo will not help with grading.*
- TA will provide feedback on the demo and list any assignment objectives you may have missed. You are expected to meet them in the next assignment.

Grading/Evaluation Standards

Grading will be based on the absolute grading system. This grading system assigns a range of point values to a letter grade. The grading is absolute, irrespective of other students' grades in the class. I do not round scores to the closest percentage.

Grading Scale

Grade	Range
A	**100% to 95.0%**
A-	**< 95.0% to 90.0%**
B+	**< 90.0% to 87.0%**
B	**< 87.0% to 84.0%**
B-	**< 84.0% to 80.0%**
C+	**< 80.0% to 77.0%**
C	**< 77.0% to 74.0%**
C-	**< 74.0% to 70.0%**
F	**< 70.0%**

Attendance/Late Work Policy

Attendance Policy

Students registered in MGEN courses (INFO, CSYE, and DAMG) are allowed a maximum of 2 absences per course, with 3 or more absences resulting in an automatic 'F' for the course. Students are expected to inform their instructors of any absences in advance of the class; if a student is sick long-term or experiences a medical issue that prevents class attendance, it is strongly encouraged that they speak with their Academic Advisor (coe-mgen-gradadvising@northeastern.edu) to learn more about the Medical Leave of Absence. Should a student anticipate being unable to attend 3 or more classes, they should discuss their situation with their Academic Advisor to explore other types of leave in accordance with the University's academic and global entry expectations. International students should review the Office of Global Services webpage to understand their visa compliance requirements.

Teaching Assistants (TAs) or Instructional Assistants (IAs) will be present at each class to collect student attendance.

Late Work Policy

Students must submit assignments by the deadline in the time zone noted in the syllabus. If they anticipate work will be submitted late, they must communicate with the faculty prior to the deadline. **Work submitted late without prior communication with faculty will not be graded.**

End-of-Course Evaluation Surveys

Your feedback regarding your educational experience in this class is particularly important to the College of Engineering. Your comments will make a difference in the future planning and presentation of our curriculum.

At the end of this course, please take the time to complete the evaluation survey at **https://neu.evaluationkit.com**. Your survey responses are **completely anonymous and confidential**. For courses 6 weeks in length or shorter, surveys will be open one week prior to the end of the courses; for courses greater than 6 weeks in length, surveys will be open for two weeks. An email will be sent to your Northeastern University Mail account notifying you when surveys are available.

Academic Integrity

A commitment to the principles of academic integrity is essential to the mission of Northeastern University. The promotion of independent and original scholarship ensures that students derive the most from their educational experience and their pursuit of knowledge. Academic dishonesty violates the most fundamental values of an intellectual community and undermines the achievements of the entire University.

As members of the academic community, students must become familiar with their rights and responsibilities. In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, examinations of whatever kind, collaborative work, the use of study aids, the appropriateness of assistance, and other issues. Students are responsible for learning the conventions of documentation and acknowledgment of sources in their fields. Northeastern University expects students to complete all examinations, tests, papers, creative projects, and assignments of any kind according to the highest ethical standards, as set forth either explicitly or implicitly in this Code or by the direction of instructors.

Go to http://www.northeastern.edu/osccr/academic-integrity-policy/ to access the full academic integrity policy.

Academic integrity violation will result in an automatic F grade in the course.

MGEN Student Feedback
Students who would like to provide the MGEN unit with anonymous feedback on this particular course, Teaching Assistants, Instructional Assistants, professors, or to provide general feedback regarding their program, may do so using this survey: https://neu.co1.qualtrics.com/jfe/form/SV_cTIAbH7ZRaaw0Ki

University Health and Counseling Services
As a student enrolled in this course, you are fully responsible for assignments, work, and course materials as outlined in this syllabus and in the classroom. Over the course of the semester if you experience any health issues, please contact UHCS.

For more information, visit https://www.northeastern.edu/uhcs.

Student Accommodations
Northeastern University and the Disability Resource Center (DRC) are committed to providing disability services that enable students who qualify under Section 504 of the Rehabilitation Act and the Americans with Disabilities Act Amendments Act (ADAAA) to participate fully in the activities of the university. To receive accommodations through the DRC, students must provide appropriate documentation that demonstrates a current substantially limiting disability.

For more information, visit https://drc.sites.northeastern.edu.

Library Services
The Northeastern University Library is at the hub of campus intellectual life. Resources include over 900,000 print volumes, 206,500 e-books, and 70,225 electronic journals.

For more information and for education specific resources, visit https://library.northeastern.edu
Network Campus Library Services: Northeastern University Library Global Campus Portals

24/7 Canvas Technical Help
For immediate technical support for Canvas, call 617-373-4357 or email help@northeastern.edu

Canvas Student Resources: https://canvas.northeastern.edu/student-resources/

For assistance with my Northeastern e-mail, and basic technical support:
Visit ITS at https://its.northeastern.edu
Email: help@northeastern.edu
ITS Customer Service Desk: 617-373-4357

Diversity and Inclusion
Northeastern University is committed to equal opportunity, affirmative action, diversity, and social justice while building a climate of inclusion on and beyond campus. In the classroom, members of the University community work to cultivate an inclusive environment that denounces discrimination through innovation, collaboration, and an awareness of global perspectives on social justice.

Please visit http://www.northeastern.edu/oidi/ for complete information on Diversity and Inclusion

Title IX
Title IX of the Education Amendments of 1972 protects individuals from sex or gender-based discrimination, including discrimination based on gender-identity, in educational programs and activities that receive federal financial assistance.

Northeastern's Title IX Policy prohibits Prohibited Offenses, which are defined as sexual harassment, sexual assault, relationship or domestic violence, and stalking. The Title IX Policy applies to the entire community, including male, female, and transgender students, faculty, and staff.

In case of an emergency, please call 911.

*Please visit **https://www.northeastern.edu/ouec** for a complete list of reporting options and resources both on- and off-campus*.