Northeastern University
College of Engineering

Multidisciplinary Graduate Engineering
Course Syllabus

Course Information
Course Title: Network Structure & Cloud Computing
Course Number: CSYE 6225
Term and Year: Spring 2022
Credit Hour: 4
CRNs:

- 13757 – Boston
- 14389 – Silicon Valley, CA
- 13635 – Seattle, WA
- 13791 – Online

Instructor Information
Full Name: Tejas Parikh
Email Address: t.parikh@northeastern.edu
GitHub ID: tejasparikh (https://github.com/tejasparikh)

Email Communication:
Assignment related questions must be posted in 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 senf 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, VTL, SJO, 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.

Course Prerequisite

- CSYE 6200 or INFO 5100
- Web Application Development
- Familiarity with high level programming language such as Java, Python, JavaScript, Go, PhP, 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.

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

Student Learning/Course Outcomes (SLOs)

- Understand basic concepts related to cloud computing.
- Understand cloud architecture and different cloud models such as IaaS, PaaS & SaaS.
- Obtain hands-on knowledge about Linux system administration and networking fundamentals.
- Compare different cloud platform providers such as Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform.
- Understand cloud storage options such 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 applications using SSL and protect user data against attacks such as XSS, CSRF, and SQL injection.
- Hands-on experience with microservices & APIs.

- Gain an understanding of Agile development, Git version control system, Continuous Integration, and Deployment using tools like GitHub Actions, CircleCI, Jenkins, etc.
- High-level understanding of DevOps and Site Reliability Engineer (SRE) role.

Technical/Course Materials Requirements

There are no required textbooks for this course. Details about required tools and software will be posted in Canvas. *Students are solely responsible for cost to acquire 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.

Attendance Policy

Students are expected to complete course readings, participate in class discussions or other learning activities during the unit, and complete written assignments for each unit during the time of that unit. It is understood that there might be one week when active participation in ongoing class conversations and learning activities might be delayed. Beyond one week time, if there is an absence or lateness in participation (1) faculty must be notified in advance; (2) grades will be adjusted accordingly.

Assignments

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.*

Assignment Grading

- 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). It may be assumed that the student did not meet all assignment objectives if the assignment demo cannot be finished in the allocated time. I would recommend showing up a bit early for the grading appointments and getting the laptop setup and ready for the demo.
- *It is not appropriate to use demo time to debug/diagnose/fix issues in assignments. Deadline has already passed, and fixes applied during the demo will not help with grading.*
- TA will provide you feedback on the demo and list any assignment objectives that 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. In this grading system, a range of point values is assigned to a letter grade. The grading is absolute, irrespective of the grade of other students in the class. I do not round scores to the closest percentage.

Late Work Policy

Assignments and Grading are expected to be completed by their respective due date. For every day the assignment submission and/or demo is late after the due date, points will be deducted as follows:

Late By	**Penalty**
One Day (24 hours) or less	10%
Two days (48 hours)	25%
More than two days and less than seven days	40%
More than seven days but less than two weeks	60%
More than 2 weeks	100%

Exams

All exams will be conducted online via Canvas.

Grade 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% to 00.0%**

Grade Breakdown:

Assignments: 75%

Exams: 25%

End-of-Course Evaluation Surveys

Your feedback regarding your educational experience in this class is particularly important to the College of Professional Studies. 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 Husky 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

Academic integrity violation will result in an automatic F grade in the course. You may also be referred to the Office of Student Conduct and Conflict Resolution for further disciplinary action.

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 http://www.northeastern.edu/drc/getting-started-with-the-drc/.

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 http://subjectguides.lib.neu.edu/edresearch.

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

Canvas Faculty Resources: https://canvas.northeastern.edu/faculty-resources/

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, member 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, transgender students, faculty, and staff.

In case of an emergency, please call 911.

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

Tentative Course Schedule

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

WEEK #	LECTURE #	BOS/ONLINE	SEA/SJO	TOPICS COVERED
1	1	09/08/22	09/10/22	• Course Overview • Introduction to DevOps
2	2	09/15/22	09/17/22	• The Linux Command Line • Shell Scripting • Editing with VI
3	3	09/22/22	09/24/22	• Version Control with Git • Continuous Integration • GitHub Actions
4	4	09/29/22	10/01/22	• Fundamentals of Cloud Computing • Identity & Access Management (IAM) • Overview of Public Cloud Providers
5	5	10/06/22	10/08/22	• Networking Fundamentals • Infrastructure as Code (IaC)
6	6	10/13/22	10/15/22	• Virtualization • Domain Name System (DNS)

7	7	10/20/22	10/22/22	• Cloud Storage Solutions
				  ○ Relation Databases (RDBMS)
				  ○ NoSQL Databases
				  ○ Object Storage
				  ○ Block Storage
				  ○ Instance Store

8	8	10/27/22	10/29/22	• Load Balancing • Load Testing • Auto-scaling
9	9	11/03/22	11/05/22	• Microservices Architecture • Serverless Computing • Event Driven Architecture (pub/sub)
10	10	11/10/22	11/12/22	• Continuous Deployment • Email Service
11	11	11/17/22	11/19/22	• Content Delivery Network (CDN) • Role of SRE • Observability ○ Logging

				○ Metrics • Monitoring & Alerting
12		11/24/22	11/26/22	• Thanksgiving Break
13	12	12/01/22	12/03/22	• Cloud Security • Application Security
14	13	12/08/22	12/10/22	• Architecting for the Cloud: Best Practices
15	**14**	**12/15/22**	**12/17/22**	• **FINAL's WEEK**