



## **DAMG 7374 Construction & Deployment of Microservices**

### **Course Information**

Course Title: Construction & Deployment of Microservices

Course Number: DAMG 7374

Term and Year: Spring 2024

Credit Hour: 4

Course Format: On-Ground

### **Instructor Information**

Full Name: Krishna Avala

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### **Instructor Biography:**

Krishna Avala is a leader in DevOps and Software development with over 20 years of experience in developing and leading application development and delivery, has extensive experience in developing automation tools, SQL Tuning, designing and managing Microservices Infrastructure in Cloud

### **Course Prerequisites**

- Good in any one of the programming language(Ex: Java, Python, Go..)
- Basic understanding of Cloud infrastructure
- Basic understanding of Databases and SQL
- Basic understanding of Docker and containerization
- Basic understanding of Infrastructure as Code (Ex: Terraform)

### **Course Description:**

Constructing microservices and deploying to the Amazon EKS/minikube. This includes containerization, Infrastructure as Code(IaC), kubectl, AWS CLI, the integration using CI/CD pipelines Monitoring and Observability.

### **Learning Outcomes:**

- **Understanding of Microservices Architecture:** Gain a foundational understanding of microservices, including their architecture and how they differ from monolithic applications.
- **K8S/EKS:** Develop hands on knowledge of Amazon EKS, including its components, architecture, and comparison to traditional Kubernetes setups.
- **Development Environment Mastery:** Become proficient in setting up and using the necessary development tools such as Docker, Kubernetes, AWS CLI, and Terraform.
- **Microservice Development Skills:** Learn to build a simple microservice using Python and understand how to connect it to Postgres/MySQL databases.

- **Application Security:** Acquire skills perform authenticate and authorization for transaction management
- **Containerization with Docker:** Master the containerization of applications with Docker, including best practices for image creation and container management.
- **Infrastructure as Code:** Understand and apply Infrastructure as Code (IaC) principles using Terraform for resource provisioning and management on AWS.
- **EKS Deployment:** Learn how to configure and deploy containers to Amazon EKS using Helm.
- **CI/CD Pipeline Configuration:** Gain knowledge in setting up and integrating continuous integration and continuous deployment (CI/CD) pipelines for automated deployment.
- **Monitoring and Observability:** Acquire skills in monitoring, logging, and implementing observability for Microservices

### Required Tools and Course Textbooks:

- **Tools:** Python, Docker, Helm, kubectl, AWS Cloud, AWS CLI, minikube, Git, Terraform
- **Books:**
  - Building Microservices: Designing Fine-Grained Systems** by Sam Newman
  - Mastering Elastic Kubernetes Service on AWS** by Malcolm Orr & Yong-xin Cao

### Topics Covered:

- Microservices Architecture
  - Monolith and Microservices
  - Microservices patterns
  - Pain points of Microservices
  - Cloud computing and Microservices
- Tools and Environment
  - conda/pyenv
  - Docker
  - kubectl
  - AWS CLI
  - Helm
  - Terraform
- Databases
  - Creating Schema
  - Key aspects of Database design for microservices
  - Performance aspects while designing Database Schema
- Developing a Microservice
  - Create Microservices using Python
  - Apply some of the Microservice patterns
  - Store retrieve data from database
  - Key Security aspects while creating Services
- Containerization
  - Docker file
  - Key aspects of Docker
- Kubernetes and EKS
  - Creating Helm charts
  - Deploying application to K8S/EKS
  - Key aspects of EKS deployment
- Infrastructure as Code(IaC)
  - Using Terraform for IaC

- Maintaining remote state
- Key aspects of Iac
- Monitoring and Observability
  - Observability solutions such as Open telemetry Grafana
- CI/CD pipelines
  - Git Actions/Jenkins/AWS CodePipeline
- Advanced Topics in K8S/EKS
  - Blue Green deployment
  - Microservices security

### Grading Scale:

Grades scored %	Grade
94% and 100%	A
90% and < 94%	A-
87% and < 90%	B+
84% and < 87%	B
80% and < 84%	B-
77% and < 80%	C+
74% and < 77%	C
70% and < 74%	C-
0% and < 70%	F

Assessment – Tentative	Allocation %
Weekly Assignments and Quizzes	30%
2 Exams MCQ based (Multiple choice questions)	30%
Project – Team submission	40%

### 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.

## **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/uhrs>.

## **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>.

## **24/7 Canvas Technical Help**

For immediate technical support for Canvas, call 617-373-4357 or email [help@northeastern.edu](mailto: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](mailto: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, 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.*