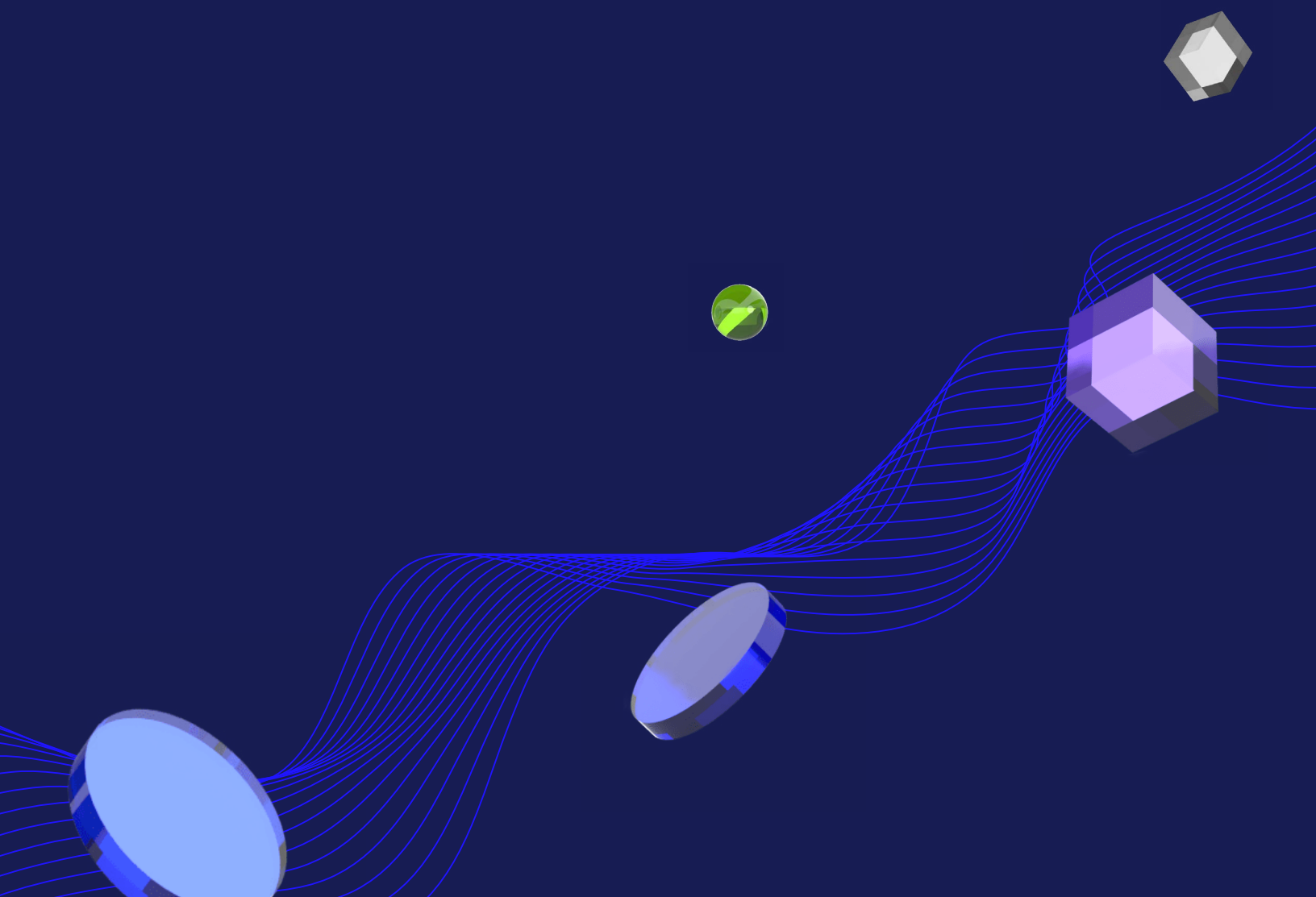
INDIVIDUAL LEARNERS

UDACITY

SCHOOL OF CLOUD COMPUTING

Cloud DevOps Engineer

Nanodegree Program Syllabus



Overview

Companies are looking for talented DevOps engineers to remain competitive in this agile world. Enroll now to operationalize infrastructure at scale and deliver applications and services at high velocity, an essential skill for advancing your career. Learn to design and deploy infrastructure as code, build and monitor CI/CD pipelines for different deployment strategies, and deploy scalable microservices using Kubernetes.

Program information

Estimated Time

4 months at 10hrs/week*

Skill Level

Intermediate

Prerequisites

A well-prepared learner should have intermediate programming skills in Javascript and some familiarity with:

- Web development (HTML, CSS)
- Object oriented programming
- Linux command line basics

Required Hardware/Software

Learners need access to a computer running recent versions of Windows, Mac OS X, or Linux and an unmetered broadband internet connection. For an ideal learning experience, a computer with Mac or Linux OS is recommended.

*The length of this program is an estimation of total hours the average student may take to complete all required coursework, including lecture and project time. If you spend about 5-10 hours per week working through the program, you should finish within the time provided. Actual hours may vary.

Course 1

Cloud Fundamentals

The cloud has become a key enabler for innovation with beneficial features like high availability, unlimited capacity, and on-demand scalability and elasticity. Learn the fundamentals of cloud computing while being introduced to compute power, security, storage, networking, messaging, and management services in the cloud. Learners will explore tools and they will explore tools and services offered by Amazon Web Services (AWS) through interactive hands-on exercises. By the end of the course, they will have deployed their first website to AWS, and they will be prepared to continue their learning journey in the Cloud Developer Nanodegree program.

Course Project

Deploy Static Website on AWS

The cloud is perfect for hosting static websites that only include HTML, CSS, and JavaScript files that require no server-side processing. In this project, learners will deploy a static website to AWS. First, they will create a S3 bucket, configure the bucket for website hosting, and secure it using IAM policies. Next, they will upload the website files to their bucket and speed up content delivery using AWS's content distribution network service, CloudFront. Lastly, learners will access their website in a browser using the unique S3 endpoint.

Lesson 1

Cloud Overview

- Learn the basics of cloud computing including cloud deployment models, benefits, and popular options.
- Explore services provided by Amazon Web Services(AWS).

Lesson 2

Foundational & Compute Services

- Learn why we need servers, compute power, and security.
- Explore AWS compute services like Elastic Cloud Compute (EC2), Virtual Private Cloud (VPC), Lambda for serverless framework, and Elastic Beanstalk in action.
- Launch a secure EC2 instance, create and execute a Lambda, and deploy an application to Elastic Beanstalk.

Lesson 3

Storage & Content Delivery

- Learn why we need storage and content delivery in the cloud.
- Learn storage services like S3, DynamoDB, Relational Database Service (RDS), and CloudFront.
- Create a DynamoDB table, launch a MySQL database instance, and create a CloudFront distribution.

Lesson 4

Security

- Learn the importance of security in the cloud.
- See Identity & Access Management (IAM) in action.
- Secure applications using IAM users, groups, and policies.

Lesson 5

Networking & Elasticity

- Learn the basics of networking and elasticity in the cloud.
- Examine services like Route 53, EC2 Auto Scaling, and Elastic Load Balancing.
- Add an auto scaling policy to your EC2 instance.

Lesson 6

Messaging & Containers

- Learn the basics of messaging and containers in the cloud.
- Explore services like Simple Notification Service (SNS), Simple Queue Service (SQS), and Elastic Container Service (ECS).
- Create cloud notifications using SNS.

Lesson 7

AWS Management

- Learn why we need logging, auditing, and resource management in the cloud.
- Understand services like CloudWatch, CloudTrail, CloudFormation, and the AWS Command Line Interface (CLI).
- Explore the CLI.

Course 2

Deploy Infrastructure as Code (IAC)

With the advent of cloud computing, along came several tools that enabled us to deploy the underlying infrastructure components that provide security and services to our servers by writing scripts. In this course, learners will deploy this infrastructure using CloudFormation, AWS' tool for Infrastructure as Code. They will use CloudFormation to deploy infrastructure patterns that are used broadly in the industry and can be readily used to deploy any cloud application. Like in the real world, learners will begin with initial business requirements that they will turn into cloud architecture diagrams. Then, they will deploy this architecture using CloudFormation.

Course Project

Deploy a High-Availability Web App Using CloudFormation

In this project, learners will deploy web servers for a highly available web app using CloudFormation. They will write the code that creates and deploys the infrastructure and application for an Instagram-like app from the ground up. Learners will begin with deploying the networking components followed by servers, security roles, and software. The procedure they follow here will become part of their portfolio of cloud projects. Learners will do it exactly as it's done on the job: following best practices and scripting as much as possible.

Lesson 1

Getting Started with CloudFormation

- Set up the necessary tools to get started with CloudFormation and deploy your first server using CloudFormation.

Lesson 2

Infrastructure Diagrams

- Convert business requirements into infrastructure diagrams and understand the principles behind design choices.

Lesson 3

Networking Infrastructure

- Implement a virtual private network and subnets and learn how to provide inbound and outbound internet access to your public and private subnets inside your VPC.
- Use routing table to route the traffic within your virtual private cloud.

Lesson 4

Servers & Security Groups

- Deploy a web server into an autoscaling group.
- Implement load-balancer to increase capacity of your app.
- Implement security groups and understand the concept of least-privilege as it applies to network traffic.

Lesson 5

Storage & Databases

- Deploy S3 storage for images, config files, and more.
- Deploy relational database and encryption service for your application.

Course 3

Build CI/CD Pipelines, Monitoring & Logging

Learn the process of taking software from source code to deployment and beyond. Learners will explore automated testing, choosing the right deployment strategy for the business needs and deploying an appropriate CI/CD pipeline. They'll also learn about monitoring and logging to ensure that their application running at peak performance and stays that way. Learners will also learn to manage and make changes to their servers in an automated way, using Ansible, a leading configuration management tool.

Course Project

Build an Automated CI/CD Pipeline for UdaPeople

In this project, learners will demonstrate their Cloud DevOps engineer skills as a new employee at UdaPeople, an innovative new human resources company that depends on quick release cycles and a rock solid, high-quality product. Learners will help the development team deliver value continuously by building an automated CI/CD pipeline. Those new skills will also be put to the test as learners set up automated monitoring and alerting to ensure the delivered value stays valuable.

Lesson 1

Continuous Integration & Continuous Deployment

- Understand the fundamentals of CI/CD.
- Give examples of business-centered benefits of CI/CD.
- Examine the utility of continuous delivery in a dev team.
- List best practices.
- Differentiate deployment strategies.
- Recognize common building blocks of CI/CD pipelines.

Lesson 2

Building a Continuous Integration Pipeline

- Understand how and why to use configuration management tools.
- Utilize a configuration management tool to accomplish deployment to cloud-based servers.
- Design a complete CI pipeline.

Lesson 3

Enabling Continuous Delivery with Deployment Pipelines

- Know what configuration management tools are and how to use them.
- Design an Ansible Playbook and control a remote machine.
- Build an Ansible Inventory file.
- Make various types of CD jobs in a CI/CD pipeline.

Lesson 4

Monitoring Environments

- Install and configure Prometheus as a monitoring tool.
- Get various data sources into Prometheus.
- Analyze monitoring data.
- Set up alerts.

Course 4

Microservices at Scale Using Kubernetes

Create and deploy a Kubernetes cluster, configure Kubernetes autoscale, and load test a Kubernetes application. Learn to operationalize both existing and new microservices, and apply containers best practices. Learners will deploy machine learning microservices that are elastic and fault tolerant. They'll also learn to pick the appropriate abstraction for microservices: serverless (AWS Lambda) or container orchestration (Kubernetes).

Course Project

Operationalize a Machine Learning Microservice API

In this project, learners will continue their work on operationalizing microservices by deploying an elastic and fault-tolerant machine learning inference API using Kubernetes. Learners will configure this microservice to be highly available by using Kubernetes best practices. They will validate their design by load testing the service and verifying the application architecture performs as designed.

Course Project

Capstone Project

The purpose of the Cloud DevOps capstone project is to give learners a chance to combine what they've learned throughout the program. This project will be an important part of their portfolio that will help them achieve their cloud development-related career goals. In the capstone project, each project is unique to the learner. Learners will build a CI/CD pipeline for a microservices application for different deployment strategies. They define the scope of the project and select the right deployment strategy based on different business requirements.

Lesson 1

Deploy Highavailability Microservice Event-Driven Application

- Understand serverless (AWS Lambda) concepts.
- Understand which container abstraction to use: AWS Lambda or Kubernetes.
- Deploy producer/consumer AWS Lambda applications.
- Configure CloudWatch events.

Lesson 2

Use Docker Format Containers

- Understand Docker image format.
- Run and modify Docker containers locally.
- Deploy customized containers to Amazon ECR.

Lesson 3

Containerization of Existing App

- Use the appropriate Docker base image.
- Install packages into Docker image.
- Copy application into Docker image.
- Configure application setup and start in Docker image.

Lesson 4

Operationalize & Orchestrate Kubernetes

- Understand Kubernetes concepts.
- Configure monitoring, alerts, and incidence response.
- Integrate CI/CD Pipeline.
- Configure autoscaling.

Meet your instructors.

Kesha Williams

Software Engineering Manager at Chick-fil-A

Kesha has over 20 years experience in software development and is a software engineering manager at Chick-fil-A, routinely leading innovation teams in proving out the use of cloud services to solve complex business problems. She was recently named an Alexa Champion by Amazon.

Noah Gift

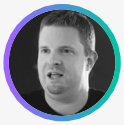
Founder of Pragmatic Ai Labs

Noah Gift teaches and consults at top universities and companies globally, including Duke and Northwestern. His areas of expertise are machine learning, MLOps, AI, data science, and cloud architecture. Noah has authored several bestselling books, including Python for DevOps.

Carlos Rivas

Senior Solutions Architect at Infiniti Consulting

Carlos is a senior solutions architect at Infiniti Consulting where he helps institutions move traditional data centers to the cloud. He has worked for several large telecommunication providers managing and configuring network infrastructure, using Java, Groovy, Python, Perl, and PHP.

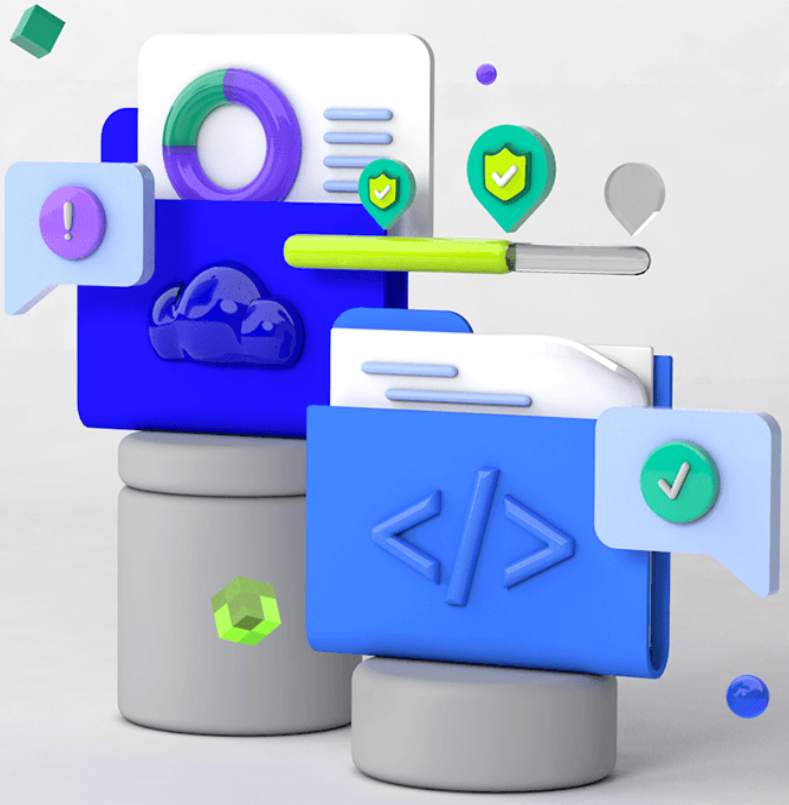


Byron Sommardahl

CTO at Acklen Avenue

Byron is co-founder and CTO of Acklen Avenue, an agile software development company. Byron has been developing software since he was 9 years old, and is a true believer in anything that improves software maintainability, usability, and delivery.

Udacity's learning experience



Hands-on Projects

Open-ended, experiential projects are designed to reflect actual workplace challenges. They aren't just multiple choice questions or step-by-step guides, but instead require critical thinking.

Quizzes

Auto-graded quizzes strengthen comprehension. Learners can return to lessons at any time during the course to refresh concepts.

Knowledge

Find answers to your questions with Knowledge, our proprietary wiki. Search questions asked by other students, connect with technical mentors, and discover how to solve the challenges that you encounter.

Custom Study Plans

Create a personalized study plan that fits your individual needs. Utilize this plan to keep track of movement toward your overall goal.

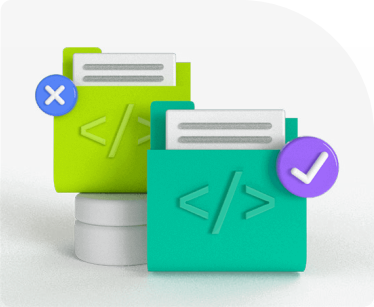
Workspaces

See your code in action. Check the output and quality of your code by running it on interactive workspaces that are integrated into the platform.

Progress Tracker

Take advantage of milestone reminders to stay on schedule and complete your program.

Our proven approach for building job-ready digital skills.



Experienced Project Reviewers

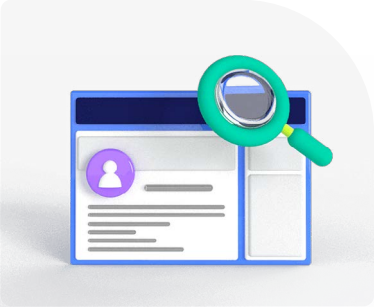
Verify skills mastery.

- Personalized project feedback and critique includes line-by-line code review from skilled practitioners with an average turnaround time of 1.1 hours.
- Project review cycle creates a feedback loop with multiple opportunities for improvement—until the concept is mastered.
- Project reviewers leverage industry best practices and provide pro tips.

Technical Mentor Support

24/7 support unblocks learning.

- Learning accelerates as skilled mentors identify areas of achievement and potential for growth.
- Unlimited access to mentors means help arrives when it's needed most.
- 2 hr or less average question response time assures that skills development stays on track.



Personal Career Services

Empower job-readiness.

- Access to a Github portfolio review that can give you an edge by highlighting your strengths, and demonstrating your value to employers.*
- Get help optimizing your LinkedIn and establishing your personal brand so your profile ranks higher in searches by recruiters and hiring managers.

Mentor Network

Highly vetted for effectiveness.

- Mentors must complete a 5-step hiring process to join Udacity's selective network.
- After passing an objective and situational assessment, mentors must demonstrate communication and behavioral fit for a mentorship role.
- Mentors work across more than 30 different industries and often complete a Nanodegree program themselves.

*Applies to select Nanodegree programs only.

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