



Carnegie Mellon University  
Master of  
Software Engineering

## 17-616 (316) DevOps: Engineering for Deployment and Operations

TR 8:00-9:20 REMOTE

Fall 2020, 12 Units]

### Instructor

Prof. Len Bass  
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### Office Location & Hours

by appointment  
by appointment  
by appointment

**Course Description.** DevOps has three facets: culture, organization, and technology. This course focuses on the technology aspect. You will learn the basics of the infrastructure important to utilizing DevOps tools. That is, virtualization, networking, the cloud, and infrastructure security. You will also learn the theory of fundamental DevOps concepts – Infrastructure as Code, configuration management, the deployment pipeline, microservice architecture, management of configuration parameters, the things that happen after a service is deployed, disaster recovery, and development oriented security. You will also see several case studies having to do with specialized forms of DevOps – Machine Learning and the DoD. Finally, you will see samples of the main DevOps tools.

**Activities.:** The activities you will do for the course are:

Prior to each class session.

1. Watch the videos as enumerated below.
2. Read the sections of the textbook and additional references as enumerated below
3. Create a Mind Map of the material in the video.
4. Create a question for class discussion

Used as input to  
“instructor’s discretion”

During each class session

1. Take a short quiz over the preceding day’s videos, readings, and discussion.
2. Participate in a discussion over the material in that day’s video and reading.
3. Participate in other discussions and breakout groups as assigned during the class.

Perform the assignments as specified. The specific assignments and their due dates are enumerated below.

**Prior Knowledge.** Although no specific programming knowledge is required, you should know several programming languages and several operating systems. You should not be intimidated

about navigating the internet to find information about specific tools, their installation, and their use.

**Learning Objectives.** After completing this course, you will be able to:

- Explain the basic concepts of the cloud infrastructure and infrastructure security
- Enumerate and explain the basic theory of DevOps
- Explain the basic classes of DevOps tools
- Navigate the internet to learn about tool installation and use.

**Learning Resources.** There is a textbook required for this course. The details are:



**Title: Deployment and Operations for Software Engineers**

**Authors: Len Bass and John Klein**

Software engineering practices require knowledge of the environment in which an application is to be run. In the modern world, this means knowledge of virtualization, containers, networking, the cloud, and security techniques for the internet. A developer should also know about microservices, configuration management, the deployment pipeline, monitoring and post production, disaster recovery, and how to develop secure applications. These topics, and more, are all covered in this book. The book includes exercises and discussion questions to facilitate classroom or group learning.. [Order it from Amazon.](#)

**Assignments and due dates. Available on Canvas**

Each assignment has three portions

- Fulfilling the assignment by performing the specified actions and code/scripts (60%)
- Enumerating the steps required to perform the specified actions. This enumeration should be usable by someone unfamiliar with the actions and Screen shots of each key steps (20%)
- A one-page reflection on a topic specified as a portion of the assignment. 20%)

Assessments	Due Date
1-Vagrant	Sept 15 <sup>th</sup>
2-Docker	Sept 29 <sup>th</sup>
3-Wireshark	Oct 1 <sup>st</sup>
4-Jenkins	Oct 15 <sup>th</sup>

Assignments	Due Date
5- Ansible/Saltstack	Oct 22 <sup>nd</sup>
6-Kubernetes	Oct 29 <sup>th</sup>
7-Ansible Vault	Nov 5 <sup>th</sup>
8-Nagios	Nov 19 <sup>th</sup>
9-Logstash	Dec 3 <sup>rd</sup>

## Assessments.

- **Assessment 1**, Daily quizzes:
- **Assessment 2**, Comprehensive final (given last day of classes).
- **Assessment 3**, Assignments:
- **Class participation**, to enrich the discussion with your insight, relevant experience, critical questions, and analysis of the material. The quality of contribution is more important than the quantity.

Assessment	Final Grade %	Grade	Percentage Interval
Daily quizzes	20%	A	90-100%
Final	20%	B	80-89%
Assignments	50%	C	70-79%
Class participation	10%	D	60-69%
		R (F)	59% or below

## Course and Grading Policies

- **Late-work policy:** All work is expected to be handed in at the indicated due date and time. For fairness to the whole class, no late submissions will be accepted for the group work. In the first week of classes, you should receive a course schedule for each course; please use them to plan ahead.

Each student is allowed one late submission for the individual homework assignments. You should immediately notify the course TA(s) before the submission deadline that you will submit late. Late work must be submitted as soon as circumstances allow, ordinarily within 24 hours of the due date. If you have any questions you should raise them immediately rather than waiting for conflicts to arise.

- **Participation policy.** Class participation will be graded by in-class engagement, including asking relevant questions based on a critical review of required readings, lectures, and comments made by your peers. The lack of attendance, and the use of mobile devices, including phones and laptops, will count against your participation grade.

**Course Schedule.** The following schedule provides a general overview of topics and assignments. Please refer to the syllabus online in Canvas for specific lecture topics, reading assignments and due dates.



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Class date	Topic and video	Readings
Tues, Sept 1	Lecture 0 Introduction, logistics	
Thur, Sept 3	What is DevOps 1 <a href="https://presentationtube.com/users/watch/?v=Z5YBygXZagt">https://presentationtube.com/users/watch/?v=Z5YBygXZagt</a>	
Tues, Sept 8	What is DevOps 2 <a href="https://presentationtube.com/users/watch/?v=qUEeWiB3oyg">https://presentationtube.com/users/watch/?v=qUEeWiB3oyg</a>	
Thurs, Sept 10	Infrastructure as code <a href="https://presentationtube.com/users/watch/?v=pD9gPnSYBae">https://presentationtube.com/users/watch/?v=pD9gPnSYBae</a>	
Tues, Sept 15	Configuration Management <a href="https://presentationtube.com/users/watch/?v=0k9AK2teGU0">https://presentationtube.com/users/watch/?v=0k9AK2teGU0</a>	Chap 7 - Configuration management
Thur, Sept 17	George Snow keynote <a href="https://www.youtube.com/watch?v=UdaeTNTlqm0">https://www.youtube.com/watch?v=UdaeTNTlqm0</a> (first 45 minutes)	
Tues, Sept 22	Virtual Machines <a href="https://presentationtube.com/users/watch/?v=Q1gU5wOejAD">https://presentationtube.com/users/watch/?v=Q1gU5wOejAD</a>	Textbook Section 1.1-1.3 VMs
Thur, Sept 24	Containers <a href="https://presentationtube.com/users/watch/?v=LJYowH8yMfu">https://presentationtube.com/users/watch/?v=LJYowH8yMfu</a>	Textbook Section 1.4 containers
Tues, Sept 29	Networking -1 <a href="https://presentationtube.com/users/watch/?v=QsRLpBVuHNG">https://presentationtube.com/users/watch/?v=QsRLpBVuHNG</a>	Textbook Chap 2 - Networking

Class date	Topic and video	Readings
Thur, Oct 1	Networking -2 <a href="https://presentationtube.com/users/watch/?v=2Cf0eTe3GW9">https://presentationtube.com/users/watch/?v=2Cf0eTe3GW9</a>	
Tues, Oct 6	The Cloud -1 <a href="https://presentationtube.com/users/watch/?v=UdHRPISEOtp">https://presentationtube.com/users/watch/?v=UdHRPISEOtp</a>	Textbook Chap 3 - The Cloud
Thurs. Oct 8	The Cloud -2 <a href="https://presentationtube.com/users/watch/?v=2kr6nMsnDgr">https://presentationtube.com/users/watch/?v=2kr6nMsnDgr</a>	
Tues, Oct 13	Container Management <a href="https://presentationtube.com/users/watch/?v=q9RI4PiUyhx">https://presentationtube.com/users/watch/?v=q9RI4PiUyhx</a>	Textbook Chap 4 - Container management
Thurs, Oct 15	Infrastructure Security 1 <a href="https://presentationtube.com/users/watch/?v=6liFL7f2F4k">https://presentationtube.com/users/watch/?v=6liFL7f2F4k</a>	Chap 5 - Textbook Infrastructure security
Tues, Oct 20	Infrastructure Security - 2 <a href="https://presentationtube.com/users/watch/?v=XctaZedfbs7">https://presentationtube.com/users/watch/?v=XctaZedfbs7</a>	
Thur, Oct 22	Deployment Pipeline - 1 <a href="https://presentationtube.com/users/watch/?v=w796t4XCX7t">https://presentationtube.com/users/watch/?v=w796t4XCX7t</a>	Textbook Chap 8 – Deployment pipeline
Tues, Oct 27	Deployment Pipeline – 2 <a href="https://presentationtube.com/users/watch/?v=FQbB2gQgmUA">https://presentationtube.com/users/watch/?v=FQbB2gQgmUA</a>	
Thur, Oct 29	Deployment Pipeline - 3 <a href="https://presentationtube.com/users/watch/?v=lwLkXV1aLAC">https://presentationtube.com/users/watch/?v=lwLkXV1aLAC</a>	
Tues, Mov 3	Microservices Architecture - 1 <a href="https://presentationtube.com/users/watch/?v=VhbnLQfmb2Z">https://presentationtube.com/users/watch/?v=VhbnLQfmb2Z</a>	Textbook Chap 6 Microservices Architecture

Class date	Topic and video	Readings
Thur, Nov 5	Microservices Architecture – 2 <a href="https://presentationtube.com/users/watch/?v=5CHHxxOanRE">https://presentationtube.com/users/watch/?v=5CHHxxOanRE</a>	
Tues, Nov 10	Service mesh <a href="https://www.dropbox.com/s/wcfbdzj5hwwwvgr/video%20Tammo%20van%20Less%20en%20Taming%20Micro%20Services%20Complexity%20with%20Service%20Meshes.mp4?dl=0">https://www.dropbox.com/s/wcfbdzj5hwwwvgr/video%20Tammo%20van%20Less%20en%20Taming%20Micro%20Services%20Complexity%20with%20Service%20Meshes.mp4?dl=0</a>	
Thur, Nov 12	Post Production <a href="https://presentationtube.com/users/watch/?v=mXMgWlyRcqX">https://presentationtube.com/users/watch/?v=mXMgWlyRcqX</a>	Textbook Chap 9 - Postproduction
Tues, Nov 17	Disaster Recovery <a href="https://presentationtube.com/users/watch/?v=bEGJB3kLXe9">https://presentationtube.com/users/watch/?v=bEGJB3kLXe9</a>	Textbook Chap 10 - Disaster recovery
Thur, Nov 19	Secure Development - 1 <a href="https://presentationtube.com/users/watch/?v=cYcabjPUR0C">https://presentationtube.com/users/watch/?v=cYcabjPUR0C</a>	Textbook Chap 11 - Secure development -2
Tues, Nov 25	Secure Development - 2 <a href="https://presentationtube.com/users/watch/?v=jkixxKW2eex">https://presentationtube.com/users/watch/?v=jkixxKW2eex</a>	
Tues, Dec 1	Domain Specific Dev Ops – DoD <a href="https://presentationtube.com/users/watch/?v=QxhxfL1y0j8">https://presentationtube.com/users/watch/?v=QxhxfL1y0j8</a>	
Thurs, Dec 3	Domain Specific DevOps – Machine Learning <a href="https://presentationtube.com/users/watch/?v=Mq7QvRn9Fhw">https://presentationtube.com/users/watch/?v=Mq7QvRn9Fhw</a>	<a href="https://martinfowler.com/articles/cd4ml.html">https://martinfowler.com/articles/cd4ml.html</a>
Tues, Dec 8	Review & Makeup Quiz	
Thurs, Dec 10	Comprehensive Final	



**Accommodations for Students Disabilities.** If you have a disability and have an accommodations letter form the Disability Resources office, I encourage you to discuss your accommodations and needs with me as early in the semester as possible. I will work with you to ensure that accommodations are provided as appropriate. If you suspect that you may have a disability and would benefit from accommodations but are not yet registered with the Office of Disability Resources, I encourage you to contact them at [access@andrew.cmu.edu](mailto:access@andrew.cmu.edu).

**Academic Integrity.** Honesty and transparency are important to good scholarship. Plagiarism and cheating, however, are serious academic offenses with serious consequences. If you are discovered engaging in either behavior in this course, you will earn a failing grade on the assignment in question, and further disciplinary action may be taken.

For a clear description of what counts as plagiarism, cheating, and/or the use of unauthorized sources, please see the [University's Policy on Academic Integrity](#).

If you have any questions regarding plagiarism or cheating, please ask me as soon as possible to avoid any misunderstandings. For more information about Carnegie Mellon's standards with respect to academic integrity, you can also check out the [Office of Community Standards & Integrity](#) website.

**Student Wellness.** As a student, you may experience a range of challenges that can interfere with learning, such as strained relationships, increased anxiety, substance use, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may diminish your academic performance and/or reduce your ability to participate in daily activities. CMU services are available, and treatment does work. You can learn more about confidential mental health services available on campus at the [Counseling and Psychological Services](#) website. Support is always available (24/7) from Counseling and Psychological Services: 412-268-2922.

**Respect for Diversity.** It is my intent that students from all diverse backgrounds and perspective be well served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength, and benefit. It is my intent to present materials and activities that are respectful of diversity: gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture. Your suggestions are encouraged and appreciated. Please let me know if any of our class meetings conflict with your religious observations so that I can make alternate arrangements for you.