Carnegie Mellon University
Master of
Software Engineering

Applied Distributed Systems 17-636 (17-336)
REMOTE
Mini 3, 2021, 6 Units]

Instructors	Email	Office Location & Hours
Prof. Len Bass	lenbass@cmu.edu	by appointment
Prof. Scott Pavetti	spavetti@cmu.edu	

Course Description. Modern computing systems are frequently hosted on the cloud. That is, they are inherently distributed systems. To appropriately build and deploy these systems developers should know not only about development tools such as container management tools but also the structure of the cloud – in particular how it utilizes virtual machines, containers and networks. They should also understand security mechanisms both in the internet and how to authorize users and maintain credentials securely. Finally, to protect the system once it is placed into production, a developer needs to know how to enable the detection of problems during execution through collection and navigation of logs produced by the system. These are the topics covered by this course.

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 question for class discussion
4. Post a mind map of the contents of the video

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.

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 distributed systems including security
- Understand how to manage credentials in a secure fashion
- Understand Virtual Machines and Containers and their use in the cloud
- Understand the Cloud and how to use the cloud for applications
- Gain some familiarity with container based development 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**

Assignment 1: Docker. Due Feb 16

Assignment 2: Kubernetes Due Mar 2

Assignment 3: Logstash Due Mar 16

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 or two paragraph reflection describing the most serious problem you ran into while performing the assignment and how you got around the problem.

Assessments.

- **Assessment 1**, Daily quizzes:
- **Assessment 2**, Comprehensive final (given last day of classes).
- **Assessment 3,** Assignments:
- **Class participation**, Remaining until the end of class, posting questions as described above, participating in class discussions.

Assessment	Final Grade %
Daily quizzes	20%
Final	20%
Assignments	40%
Class participation	20%

Grade	Percentage Interval
A	90-100%
B	80-89%
C	70-79%
D	60-69%
R (F)	59% or below

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

Class date	Topic and video	Readings
Tues, Feb 2	Intro and organization	
Thurs, Feb 4	Virtual Machines https://youtu.be/Sr0HyUnrc2w Containers https://youtu.be/01dLohJREGA	Textbook: Chapter 1
Tues, Feb 9	Network 1 https://youtu.be/o17eo2IN62E	Textbook Chap 2 - Networking
Thurs, Feb 11	Network 2 https://youtu.be/zLvDnVNs0Bc	
Tues, Feb 16	Cloud 1 https://youtu.be/S7XxYoIyRkc	Textbook Chap 3 - The Cloud
Thurs, Feb 18	Cloud 2 https://youtu.be/Lnph0tRmpq8	
Tues, Feb 23	No class	
Thurs, Feb 25	Container Management https://youtu.be/OiknFONxe_M	Textbook Chap 4 - Container management
Tues, Mar 2	Measurement https://youtu.be/h8YmtkZlspw	Textbook Chapter 9 Postproduction

Class date	Topic and video	Readings
Thurs, Mar 4	Infrastructure security 1 https://youtu.be/BniBb_fO0-0	Chap 5 - Textbook Infrastructure security
Tues, Mar 9	Infrastructure security 2 https://youtu.be/Xe42J0rumKo	https://dl.dod.cyber.mil/wp-content/uploads/devsecops/pdf/DevSecOps_Enterprise_Container_Image_Creation_and_Deployment_Guide_2.6-Public-Release.pdf
Thurs, Mar 11	Credential management https://youtu.be/cvxAOp5Hl1g	Textbook Chapter 11
Tues, Mar 16	Vulnerabilities and patch management https://youtu.be/zKwFjf0XPLw	
Thurs, Mar 18	Comprehensive final	