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DevOps: Architecting your infrastructure (syllabus)

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Course Title: DEVOPS**Subtitle:** Architecting your infrastructure

Course Description: Devops is a term that generally refers to an engineer or architect that manage the configuration and deployment of technical projects and core infrastructure including delivery and maintenance. Applications can be a simple js node app, or require more complexity through a series of API/REST integrations and database management. Whether you are supporting a current application or a new one, creating and maintaining a stable environment is vitality important for a good user experience. A devops engineer may also be responsible to create or design specs, technical documentation and control concepts when needed. As a career, devops is in high demand and requires impeccable communication skills that bridge gaps between technical groups and business leaders.

Software Requirements:**Required:**

1. Code Anywhere - Cloud IDE (Included In Course Package)
2. OVH - Cloud Development/Production Server (\$3.95/Month)
3. BitBucket (Included with Course Package)
4. Gitlab (Included with Course Package)Additional Pipeline Tools (TBD)
5. Computer (With Wi-Fi capabilities)

Electronic Resources:

1. Required Textbooks Books
 - a. The Devops Handbook 480 pages ([Amazon](#))
 - b. The Phoenix Project 345 Pages ([Amazon](#))
2. Optional But Highly Recommended
 - a. Activate Your Agile Career: How responding to Change Will Inspire Your Life's Work
3. Online Resources
 - a. Devops.com
 - b. Dzone

Grading Rubric: (Test Invite)

1. Homework Assignments: (7.5% of Grade)
2. Reading Discussion Participation (7.5% of grade)
3. Quizzes (15% of Grade)
 - a. 11 Quizzes – always 10 questions, 9 multiple choice, 1 short answer
 - b. One Quiz is a bonus and won't count towards the grade
4. Mid Term (20% of Grade)
 - a. Part 1 will consist of 25 multiple choice questions. (60% of grade)
 - b. Part 2 will consist of create a small build with Docker given a pre-defined scenario (20%)
 - c. Part 3 is a group coding presentation on a Devops related topic (20%)
5. Final (20% of Grade)
 - a. Part 1 will consist of 25 multiple choice questions. (60% of grade)
 - b. Part 2 will consist of a more complex Docker networking build (40%)
6. Group Project #1: (15% of Grade)
 - a. Install , Build, Run, Push, Pull A Docker Container On Live Server
7. Group Project #2: (15% of Grade)
 - a. Install Build, Run, Push, Pull a 5 Stage Docker Container on a Live Server

Final Exam: Thursday December 19th t

Topics:

Heavy Use:

1. Linux/Ubuntu 18
2. Docker
3. Git
4. Gitlab
5. Bitbucket

Light Use:

6. Kubernetes
7. Pipeline Tools
8. Applications
 - a. Static Site Generators
 - b. CMS: Wordpress
 - c. Ecommerce: Magento
9. Server Monitoring Tools
10. API Documentation

Application Resources:

1. HTML 5 (Simple HTML Site) – Link to webpage
2. Hugo (Static Content Generator) - Link to Webpage
3. Wordpress (Dynamic CMS) – Link to Webpage
4. Magento (Ecommerce) – Link to Webpage

Cheat Sheets

1. Link to some Linux cheat sheets.
2. Link to Docker Site
3. Link to Git Cheat sheets

August 29th

4. Breakdown:

- a. PART I (80 Minutes)
 - i. Student Introduction (60 Minutes)
 - ii. Survey for background knowledge (20 minutes)
- b. 10 minute Break
- c. Discovery (90 Minutes)
 - i. What is Devops
 - ii. History Of Devops
 - iii. Present Devops State - Containers (Docker), Orchestration
 - iv. Future Devops State (Stateless Functions - FAAS)
 - v. Tools we will be using in this course

5. Homework Assignments:

- a. Pipeline Setup
 - i. Setup Bitbucket and GitLab
 - ii. Share configuration when complete
- b. Devops Handbook: Read Part 1
- c. Groups Selection by next week

6. Bonus Homework Assignment (Optional)

- a. Get ISP Config Control Panel up and running without a Docker container (extra credit assignment) 2.5 points for getting it working. 2.5 points for demo. Will be provided an empty container.

September 5th

7. Breakdown

- a. Part 1 Lecture (85 Minutes)
 - i. Feedback/Discussion of Homework Assignment
 - ii. Feedback/Discussion of Reading Material or Case Study
 - iii. Devops Architecture Decisions
 - 1. Moving Deeper into Docker
 - 2. Base Images
 - 3. Build your own image or Stack On Top
 - 4. Official vs unofficial images
- b. 15 Minute Break
- c. Part 2 (80 Minutes)
 - i. Architectural Design
 - ii. Your Devops toolset

8. Homework Assignments:

- a. Devops Handbook: Read Part 2
- b. Devops Troubleshooting Scenarios
 - i. Review Guide and troubleshoot areas
- c. Choose 5 Official Docker Images you and run with Docker Run Commands
- d. Install application of your choice (no docker required for this exercise)
 - i. Students will explain the services needed and the steps they took to install the application.
- e. Group Selections for first Project Due

September 12th

9. Breakdown

- a. Part 1 Lecture (80 Minutes)
 - i. Feedback/Discussion of Homework Assignment
 - ii. Feedback/Discussion of Reading Material or Case Study
 - iii. Mastering Linux Commands
 - iv. Mastering Docker Commands
- b. 15 Minute Break
- c. Part 2 Lecture (80 Minutes)
 - i. Application requirements
 - ii. Nginx
 - iii. Apache

10. Homework Assignments:

- a. Devops Handbook: Read Part 3
- b. Devops Troubleshooting Scenarios
- c. Create a simple Docker file
 - i. Operating System
 - ii. Application Framework
 - iii. Web Application
- d. Create Image from file and Run Container
- e. Install/Run/Deploy a Static HTML site (template provided) with Docker and Nginx

September 19th

11. Breakdown

- a. Part 1 Lecture (80 Minutes)
 - i. Feedback/Discussion of Homework Assignment
 - ii. Feedback/Discussion of Reading Material or Case Study
 - iii. Continuous Integration (CI/CD)
 - iv. Source Code Management (SCM)
 - v. Pipelines (Auto Devops)
- b. 15 Minute Break
- c. Part 2 Lecture (80 Minutes)
 - i. Security (DevSecOps)
 - ii. Agile Development
 - iii. Value Stream Management

12. Homework Assignments:

- d. Devops Handbook: Read Part 4
- e. Devops Troubleshooting Scenarios
- f. Install Hugo or Jekyll (Static Site Generators) (No Docker Required – no official image exist)
- g. Setup an about me page with Hugo or Jekyll

Bonus Group Assignment: Build a Hugo/Jekyll Docker Image

Groups that participate will swap images. When no group swap is available, the professor will test and run the image.

September 26th

13. Breakdown

- a. Part 1 Lecture (80 Minutes)
 - i. Feedback/Discussion of Homework Assignment
 - ii. Feedback/Discussion of Reading Material or Case Study
 - iii. Know Your Application (Review Application Requirements)
 1. Wordpress
 2. Magento
 3. ERPS
- b. 15 Minute Break
- c. Part 2 Lecture (80 Minutes)
 - i. Know Your Application (Design Architecture for Application Sharing)

14. Homework Assignments:

- d. Study for Mid Terms Exam

October 3rd

15. Mid Term Exam

16. Homework Assignments:

- a. Devops Handbook: Read Part 5
- b. Devops Handbook: Read Part 6 (Final Chapter)

October 10th

1. Breakdown

- a. Part 1 Lecture (80 Minutes)
 - i. Feedback/Discussion of Homework Assignment
 - ii. Feedback/Discussion of Reading Material or Case Study
 - iii. Volumes vs Bind Mounts
 - iv. Volume Flag vs Mount Flag
 1. <https://4sysops.com/archives/introduction-to-docker-bind-mounts-and-volumes/>
 - v. Data Storage (Persistent vs temporary)
- b. 15 Minute Break
- c. Part 2 Lecture (80 Minutes)
 - i. Docker Database Server(s) – Enterprise Edition
 - ii. Docker Database Containers
 - iii. Using tools tool like PhpMyAdmin, DB Adminier

2. Homework Assignments:

- a. Devops Troubleshooting Scenarios
- b. Setup Wordpress With Docker Container
 - i. PHP and MySql services must be a separate image

October 17th

1. Breakdown

- a. Part 1 Lecture (80 Minutes)
 - i. Feedback/Discussion of Homework Assignment
 - ii. Feedback/Discussion of Reading Material or Case Study
 - iii. Local vs Production with Docker
 - iv. Docker Compose.yml
 - v. Replicas, Resources Limits
- b. 15 Minute Break
- c. Part 2 Lecture (80 Minutes)
 - i. Docker Swarm
 - ii. Docker Networks
 - iii. Creating your own DockerFile

2. Homework Assignments:

- a. The Phoenix Project
- b. Case Study
- c. Devops Assignment #7
- d. Devops Assignment #8
- e. Devops Assignment #9

October 24th

1. Breakdown

- a. Part 1 Lecture (80 Minutes)
 - i. Feedback/Discussion of Homework Assignment
 - ii. Feedback/Discussion of Reading Material or Case Study
 - iii. Docker Swarm
 - iv. Docker Networks
- b. 15 Minute Break
- c. Part 2 Lecture (80 Minutes)
 - i. Continuous Integration Tools (In Detail)
 - ii. Docker Tools for Production Grade Environments
 - iii. Docker Third Party Extensions for production

2. Homework Assignments:

- a. The Phoenix Project
- b. Case Study
- c. Prepare For group Presentations

October 31st

3. Breakdown

- a. Present Group Projects
- b. 15 Minute Break
- c. Present Group Projects

4. Homework Assignments:

- a. Devops Assignment #10
- b. Devops Assignment #11

November 7th

5. Breakdown

- a. Part 1 Lecture (80 Minutes)
 - i. Feedback/Discussion of Homework Assignment
 - ii. Feedback/Discussion of Reading Material or Case Study
 - iii. Jira, Bitbucket, Confluence, and SCM
- b. 15 Minute Break
- c. Part 2 Lecture (80 Minutes)
 - i. Gitlab CI/CD

6. Homework Assignments:

- a. Devops Assignment #12

November 14th

1. Breakdown

- a. Part 1 Lecture (80 Minutes)
 - i. Feedback/Discussion of Homework Assignment
 - ii. Feedback/Discussion of Reading Material or Case Study
 - iii. Intro to Pipelines
- b. 15 Minute Break
- c. Part 2 Lecture (80 Minutes)
 - i. Intro to DevSec Ops

2. Homework Assignments:

- a. Devops Assignment #13

November 21st

1. Breakdown

- a. Part 1 Lecture (80 Minutes)
 - i. Feedback/Discussion of Homework Assignment
 - ii. Feedback/Discussion of Reading Material or Case Study
 - iii. Stacks
 - iv. Kubernetes
- b. 15 Minute Break
- c. Part 2 Lecture (80 Minutes)
 - i. Deploying Your App

2. Homework Assignments:

- a. Devops Assignment #14

December 5th

1. Breakdown
 - a. Part 1 Lecture (80 Minutes)
 - i. Feedback/Discussion of Homework Assignment
 - ii. Feedback/Discussion of Reading Material or Case Study
 - iii. Agile Delivery
 - iv. Intro to Kubernetes
 - b. 15 Minute Break
 - c. Part 2 Lecture (80 Minutes)
 - i. Preparing for the final

1. Homework Assignments:

- a. Prepare To Present Group Projects

2. Homework Assignments:

- a. Devops Assignment #15

December 12th

1. Breakdown
 - a. Group Presentations
 - b. 15 Minute Break
 - c. Group Presentations

December 19th

1. Final Exam