USC Viterbi
School of Engineering
Information Technology Program

ITP 111 : What is the Cloud? : An Introduction to Cloud Computing with DevOps

Units: 2
Fall 20XX : Monday / Wednesday 10am – 11:20am

Location: See schedule of classes

Instructor: Nathan Greenfield
Office: OHE 530F
Office Hours: See contacts on Blackboard
Contact Info: All general course/assignments questions should be asked on Piazza (every student will receive an invitation at the start of the semester).
Other questions should be asked via email: ngreenfi@usc.edu.

Teaching Assistant: TBD, see Blackboard
Office: TBD
Office Hours: TBD
Contact Info: TBD

IT Help: Viterbi Information Technology
Hours of Service: Monday-Friday 8AM – 9PM
Contact Info: Phone: 213-740-0517; Email: engrhelp@usc.edu

Course Description

This course is an introduction to digital infrastructure and digital architecture that makes up the Cloud. Digital infrastructure refers to both physical and virtual digital system and the interconnecting pieces between them. Digital architecture is the structured and intentional combination of digital systems to achieve a goal. Together these pieces are the foundation for anything on the Cloud, from serving a basic website to allowing millions of customers to simultaneously stream movies anywhere in the world. This is a survey course that serves as the gateway to the ITP *Cloud Computing with DevOps* minor. We will introduce many topics that will be investigated in more depth in subsequent classes.

Learning Objectives

This course offers an overview of DevOps (software DEVelopment and information technology OPerationS). Students will learn the history of DevOps and the Cloud. They will examine Cloud Computing in relation to topics like business processes, startup feasibility, security, privacy, and social impact. Students will also examine several real-world examples of deployed digital infrastructure and the underlying architectures.

Learning Outcomes

By the end of this course, students will…

- Understand the fundamentals of digital networks including
    - their composition
    - how to secure them
    - how to maintain them
- Be able to articulate the difference between physical and virtual infrastructure
- Define “the Cloud” and explain different examples of cloud services
- Model the appropriate infrastructure for a variety of use cases
- Articulate the impact of digital infrastructure on current events

Prerequisite(s): None
Co-Requisite(s): None
Concurrent Enrollment: None
Recommended Preparation: None

Course Notes

Students will be assigned a letter grade. Lecture slides and assignments will all be posted on Blackboard. Course discussions will occur on Piazza. Lectures will feature in-class polls conducted via PollEverywhere. Students can respond to these polls via their mobile device or laptop. Lectures will be immediately followed by a lab that introduces the technical aspects covered in lecture.

Technological Proficiency and Hardware/Software Required

Students must have access to laptop that they bring to class. Students should have basic technical knowledge of their computer, including the ability to install software, download course material, and properly submit their assignments online.

ITP has laptops that are available to borrow for ITP classes. Visit the ITP office during the week (Monday - Friday, 8:30 am - 5 pm) to fill out a loan contract to receive a laptop and power adapter. You must return the laptop each week though you may renew the laptop for another week. If you do not return it after a week, you will lose the privilege to a loaner laptop and the laptop will be repossessed.

You will not be able to save your work on the ITP lab computers and the ITP laptops. Once restarted, all work will be deleted. Use an external USB drive or cloud storage to save your work. ITP is not responsible for any lost work.

ITP offers Open Lab use for all students enrolled in ITP classes. These open labs are held beginning the second week of classes through the last week of classes. They are listed on the ITP website at http://itp.usc.edu.

Required Readings and Supplementary Materials

Al Anderson; Ryan Benedetti. *Head First Networking*. O'Reilly Media, Inc. 2009. ISBN: 9780596521554
Derrick Rountree; Ileana Castrillo. *The Basics of Cloud Computing*. Syngress. 2013. ISBN: 9780124059320
Additional readings such as excerpts from other books or online articles will be provided on Blackboard.

Participation

Participation will be evaluated based on the percentage of in-class polls students participate in. Students must participate in at least 80% of the in-class polls to receive the full participation grade.

Current Events

To promote class discussion, each student will be required to submit an article for class discussion. Articles must be posted with a hyperlink to the article and a one-paragraph summary to the class Piazza news board for the appropriate week at least 24 hours prior to the second class meeting of each week. The news story should directly relate to topics covered in the previous week's lecture. News stories should be no more than one month old and cannot duplicate another submitted news article. Stories behind a pay-wall, subscription-wall or otherwise requires a login should be submitted as a PDF along with the link. Students should be prepared to give a short two-minute summary of the article and any surrounding background details to facilitate class discussion. Press releases or other public relations announcements with no analysis are not news content. You must validate the veracity of the news story, for example unsubstantiated Reddit posts do not count.

Weekly Quizzes

Reading will be assigned weekly and be tested on with an in-class quiz at the beginning of each meeting. These quizzes will be relatively short multiple-choice questions and will be administered in the first 10 minutes of every class meeting.

Assignments

In class assignments (typically called "labs") and homework assignments (called "homeworks") will be posted on Blackboard under the "Assignments". Each assignment will include instructions, a due date, and a link for electronic submission. All assignments must be submitted using this link. Do not email your assignments to the course staff. Lab assignments are often the first step of a larger task that will continue in a homework assignment.

Lab assignments must be completed in class and will not be accepted if submitted late. Homework assignments will typically be due a week after they are assigned. Homework assignments will be accepted up to two days late. Assignments submitted within 24 hours after the due date receive a 20% deduction. Assignments submitted before 48 hours of the due date receive 50% deduction. Any work submitted later will get no credit. Extensions are only provided in the event of a documented reason satisfactory to the instructor, such as an illness or family emergency.

Plagiarism detection tools will be used throughout the semester. All work submitted will be compared with current, previous, and future students' submissions using these tools. If your submission significantly matches another student's submission, you will be referred to SJACS with a recommended penalty of an F in the course.

Exams

There are two exams in this course. The exams are cumulative of the course's material. To make up for a missed exam, the student must provide a satisfactory reason (as determined by the instructor) along with documentation. Make-up exams are only allowed under extraordinary circumstances.

Joining After the Class First Meeting

If you join the class after the first lecture meeting it is your responsibility to contact the instructor and establish a timeline in which you will catch up on class material. Students who do not promptly contact the instructor will be held to the same due dates as the other students.

Grading Breakdown

Item	% of Grade
Participation	10
Current events	10
Weekly quizzes	10
In class labs	10
Homework	10
Midterm exam 1	15
Midterm exam 2	15
Final paper	20
Total	**100**

Final Paper

Instead of a final exam, you will demonstrate your mastery of the course material by analyzing the digital infrastructure currently deployed by a large company or an industry tool or trend and its impact. You must propose the topic of this paper before you begin work. The paper must represent the student's sole effort; online tutorials or other examples may be consulted, but they must be improved upon and noted in the final documentation. Failure to note and provide links to reference material will be considered cheating.

Sample topics

- *"How does StackOverflow work?"* This paper investigates the underlying infrastructure that supports StackOverflow. The paper will briefly define StackOverflow (including identifying customers, revenue models, and business history). The paper will present a broad, high level version of the current StackOverflow infrastructure and explain how StackOverflow arrived at their current solution.
- *"What is the Simian Army and why did Netflix develop it?"* This paper discusses the Simian Army, a solution Netflix developed to plan for and handle service problems. It explains why Netflix developed the Simian Army, overviews its components, and its value to Netflix's daily operations.

Paper timeline

Week 12: Final paper requirements released
Week 13: Final paper definition, scope, and topics delivered
Week 15: Results of current research presented (including bibliography), paper outlines delivered
Final Exam Period: Final draft of final paper delivered

Grading breakdown:

- Definition, scope, and topic proposal (10%)
- Week 15 check-in results (30%)
- Final bibliography (20%)
- Final paper (40%)

Tentative Course Schedule

	Topics	Readings	Work assigned
Week 1	Introduction		Lab: Install and validate VirtualBox
	How Facebook works	Indicated articles from Facebook technical blog (code.fb.com)	Homework: Install class VM and validate system (due week 2)
Week 2	Foundations of computer networks (P1)	Anderson & Benedetti Chs 1 – 3	Lab: Explore your network settings
	Foundations of computer networks (P2)	Anderson & Benedetti Chs 4 – 6	Homework: Configure VM network settings (due week 4)
Week 3	**Labor Day**		
	Networks review and wrap up	Anderson & Benedetti Chs 7 – 8	
Week 4	Network security	Anderson & Benedetti Chs 9 – 11	Lab: Inspect unknown network
	Network devices	Course notes	Homework: Use network inspection tools on virtual network (due week 5)
Week 5	Network administration	Course notes	Lab: Midterm review
	Network diagrams	Microsoft Visio documentation	Homework: Create local network diagram (due week 6)
Week 6	**Exam 1**		
	What's in your computer?	Course notes	Homework: Create small personal network diagram (due week 7)
Week 7	Virtualization	Rountree & Castrillo Ch2	Lab: Explore VMWare virtualization
	the Cloud	Rountree & Castrillo Ch1	Homework: Create small business network diagram (due week 8)
Week 8	Cloud deployments	Rountree & Castrillo Ch3	Lab: Explore Viterbi virtualized resources
	Cloud services	Rountree & Castrillo Ch4	Homework: Create small retail business network diagram (due week 9)
Week 9	IaaS	Course notes	Lab: Cloud provider APIs
	PaaS	Course notes	Homework: Create small medical - retail business network diagram (due week 10)
Week 10	SaaS	Course notes	Lab: Explore SaaS offerings at USC
	Cloud providers overview	Rountree & Castrillo Ch5	Homework: Create small virtual network diagram, final paper parameters given (due week 11)
Week 11	Cloud networking	Rountree & Castrillo Ch6	Lab: Explore SaaS offerings at USC

	Cloud infrastructure	Rountree & Castrillo Ch7	Homework: Create online retail network diagram (due week 13)
Week 12	Infrastructure as code	Terraform documentation from www.terraform.io	Final paper proposal due
	Containers and virtualization	Docker documentation from www.docker.com	
Week 13	Use case 1	Course notes	
	Use case 2	Course notes	Final paper assigned
Week 14	**Exam 2**		
	Thanksgiving		
Week 15	Managing people	Antipatterns catalog at wiki.c2.com	Final paper check-in
	Managing technology (BYOD)	Course notes	
FINAL	Final papers due For the date and time of the final period for this class, consult the USC *Schedule of Classes* at www.usc.edu/soc.		

Statement on Academic Conduct and Support Systems

Academic Conduct:

Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, "Behavior Violating University Standards" policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, policy.usc.edu/scientific-misconduct.

Support Systems:

Counseling and Mental Health - (213) 740-9355 – 24/7 on call
studenthealth.usc.edu/counseling
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call
suicidepreventionlifeline.org
Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-9355(WELL), press "0" after hours – 24/7 on call
studenthealth.usc.edu/sexual-assault
Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED) - (213) 740-5086 | Title IX – (213) 821-8298
equity.usc.edu, titleix.usc.edu
Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298
usc-advocate.symplicity.com/care_report
Avenue to report incidents of bias, hate crimes, and microaggressions to the Office of Equity and Diversity |Title IX for appropriate investigation, supportive measures, and response.

The Office of Disability Services and Programs - (213) 740-0776
dsp.usc.edu
Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Campus Support and Intervention - (213) 821-4710

campussupport.usc.edu

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC - (213) 740-2101

diversity.usc.edu

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

dps.usc.edu, emergency.usc.edu

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call

dps.usc.edu

Non-emergency assistance or information.

Office of the Ombuds - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

ombuds.usc.edu

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.