SSW 590: DevOps Principles and Practices

This course introduces students to the Software Engineering principles and practices of DevOps. DevOps helps companies to shorten development cycles and deliver higher quality products to customers more quickly by creating a culture of working together in a unified team, using automated processes throughout the product lifecycle, and focusing on continual improvement by monitoring and experimentation. Students will learn about the team culture, processes, technologies, and tools that enable successful DevOps teams to deliver better products faster. Prerequisites: Programming experience with Python, Java, or permission of the instructor.

Course Objectives:

After successful completion of the course, students will be able to:

- Identify the culture, principles, tools, and practices used by successful DevOps teams to deliver high quality functionality to customers
- Describe the needs of deployment and maintenance of software products beyond the development phase of a software project
- Summarize alternative software development lifecycles
- Apply Software Engineering life cycle principles to development projects

List of Course Outcomes:

- Name and describe the Three Ways: Flow, Feedback, and Continual Learning and Experimental and explain why they are important for successful DevOps teams
- Summarize the strengths and weaknesses of Cloud architectures and technology
- Apply tools to create an automated pipeline from software change through automated tests, continuous integration, and deployment.

Grading Percentages: 10% Class work ☒ 25% Mid-term ☒ 25% Final ☒ 40% Project ☒

Textbooks and References:

- (KBS) The Phoenix Project By G. Kim, K. Behr and G. Spafford
- (BWZ) DevOps: A Software Architect's Perspective, by L.Bass, I. Weber, and L. Zhu, 2015, ISBN 0134049845
- (KHDW) The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, by Gene Kim, Jez Humble, Patrick Debois, and John Willis, 2016, **ASIN**: B01M9ASFQ3
- (BASH) Bash Tutorial: https://linuxconfig.org/bash-scripting-tutorial-for-beginners
- (VIM) Vim Tutorial: https://www.tutorialspoint.com/vim/
- (DOCKER) Docker technologies: https://docs.docker.com/get-started/
- (AWS) DevOps and AWS, https://aws.amazon.com/devops/
- More as appropriate

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	Topic(s)	**Reading(s)**	**Class exercises (Optional)**	**HW**
Week 1	Introduction to DevOps; Compare DevOps to other software development life cycles including waterfall, agile	KHDW: chapter 1 KBS: whole book		Describe how DevOps differs from traditional and agile methods. Identify the advantages of DevOps for an online service.
Week 2	DevOps Culture; Principles of Flow, the three ways	KHDW: chapters 2, 3, 4		Describe the three ways and how they help to improve product delivery,
Week 3	DevOps Practices; the need for automation, infrastructure as code, automated testing, continuous integration,	BWZ: chapter 5		Explain why automation is critical for DevOps? What should be automated?

	continuous delivery			
Week 4	Operations; provisioning hardware and software, deployment strategies	BWZ: chapter 3		Describe the role of operations. Compare and contrast traditional deployment strategies with Blue-Green deployment.
Week 5	Monitoring; what to monitor, making use of the data	BWZ: chapter 7		Describe what should be monitored and how to take advantage of the information gathered by monitoring.
Week 6	Cloud computing overview; SaaS, PaaS, IaaS, virtualization	BWZ: chapter 2		Describe advantages, disadvantages, and risks of cloud computing.
Week 7	Unix fundamentals: using Bash and Vim	https://www.tutorialspoint.com/vim/ https://linuxconfig.org/bash-scripting-tutorial-for-beginners		Use Vim to create simple Bash scripts.
Week 8	Docker containers; running Docker locally with pre-defined containers	https://docs.docker.com/get-started/		Install Docker on your laptop and start a web server from a pre-defined container.
Week 9	Docker containers; Building and deploying custom docker containers	https://docs.docker.com/get-started/part2/		Build a simple Docker container.
Week 10	Amazon Web Services overview; scaling with EC2, storage with Amazon S3, Elastic load balancing	https://docs.aws.amazon.com/aws-technical-content/latest/aws-overview/introduction.html		Create an AWS account and demonstrate the docker container from week 9 running on AWS.

Week 11	Managing software builds with AWS; manage Git repositories with AWS CodeCommit, build code, run tests, produce packages with AWS CodeBuild	https://d1.awsstatic.com/whitepapers/AWS_DevOps.pdf?trk=gs_card		Demonstrate using AWS tools for configuration management, automated tests, and building your Docker container.
Week 12	Continuous Deployment with AWS: AWS CodeDepoy, Blue-Green deployment	https://aws.amazon.com/getting-started/tutorials/continuous-deployment-pipeline/		Create and deploy a new release of your Docker container using AWS tools.
Week 13	Automation and monitoring with AWS: AWS OpsWorks, Amazon CloudWatch	https://console.aws.amazon.com/opsworks https://aws.amazon.com/cloudwatch/		Add automated monitoring support to your Docker container using AWS tools.
Week 14	Final Exam			