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CSER 2021 Spring

# DevOps Undergraduate Course Proposal

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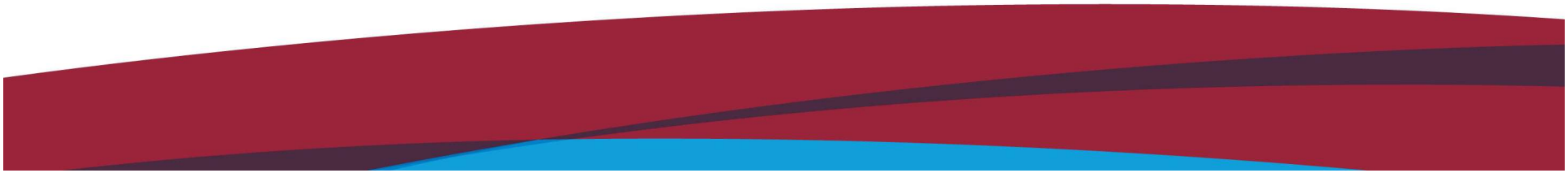

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# DevOps Popularity

- DevOps Engineers are highly demanded in industry.
- Graduated students asked why they have not learned DevOps in their Computer Science degrees.

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# DevOps Education

- Candy Pang, **Grounded Theory for DevOps Education**, Ph.D. dissertation, Dept. of Computing Science, University of Alberta, Edmonton, AB, 2019. https://doi.org/10.7939/r3-b09b-vd20.
- C. Pang, A. Hindle and D. Barbosa, **Understanding DevOps Education with Grounded Theory**, ICSE-SEET'20, pp. 107-118, ISBN 978-1-4503-7124-7, https://doi.org/10.1145/3377814.3381711.
- 15 years of Technical Architect experience.

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# What is DevOps?

- Students said …

DevOps is one of the Agile practices

DevOps == Automated Testing

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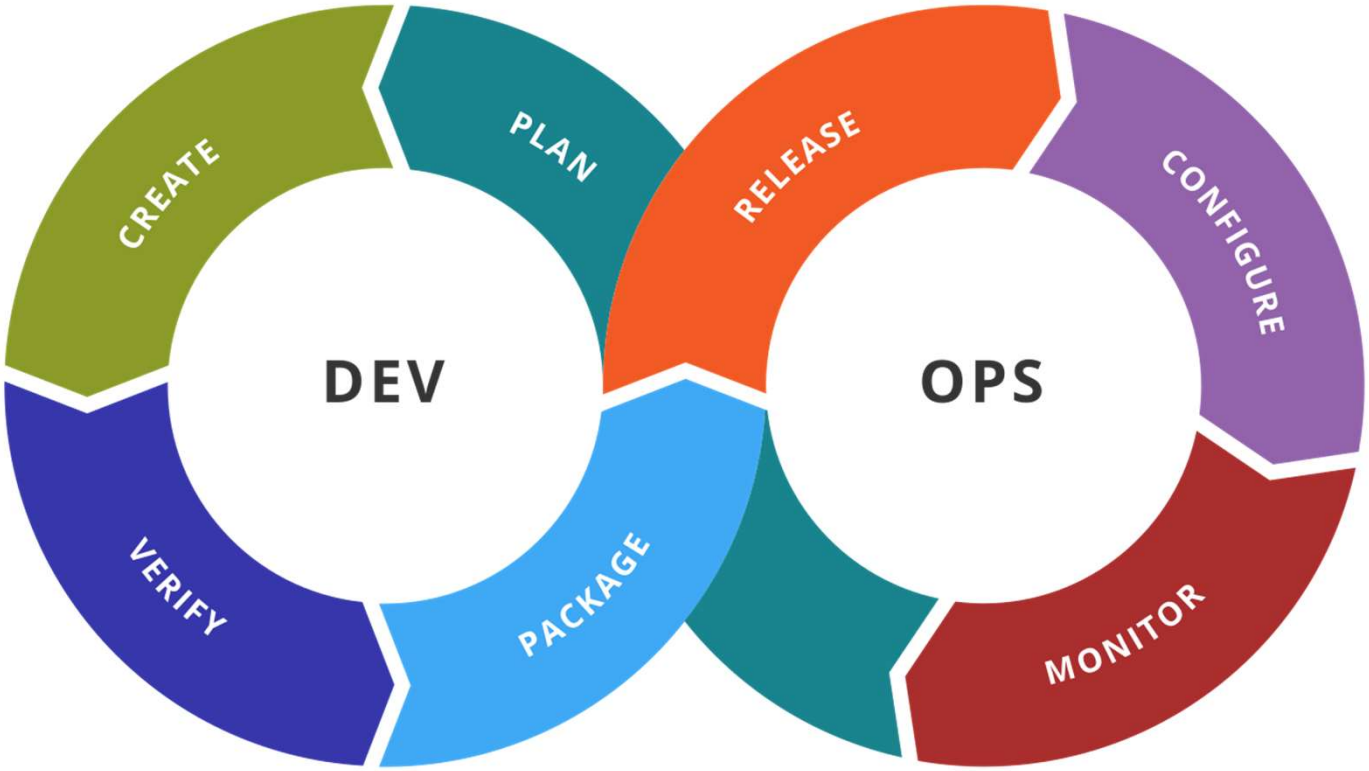
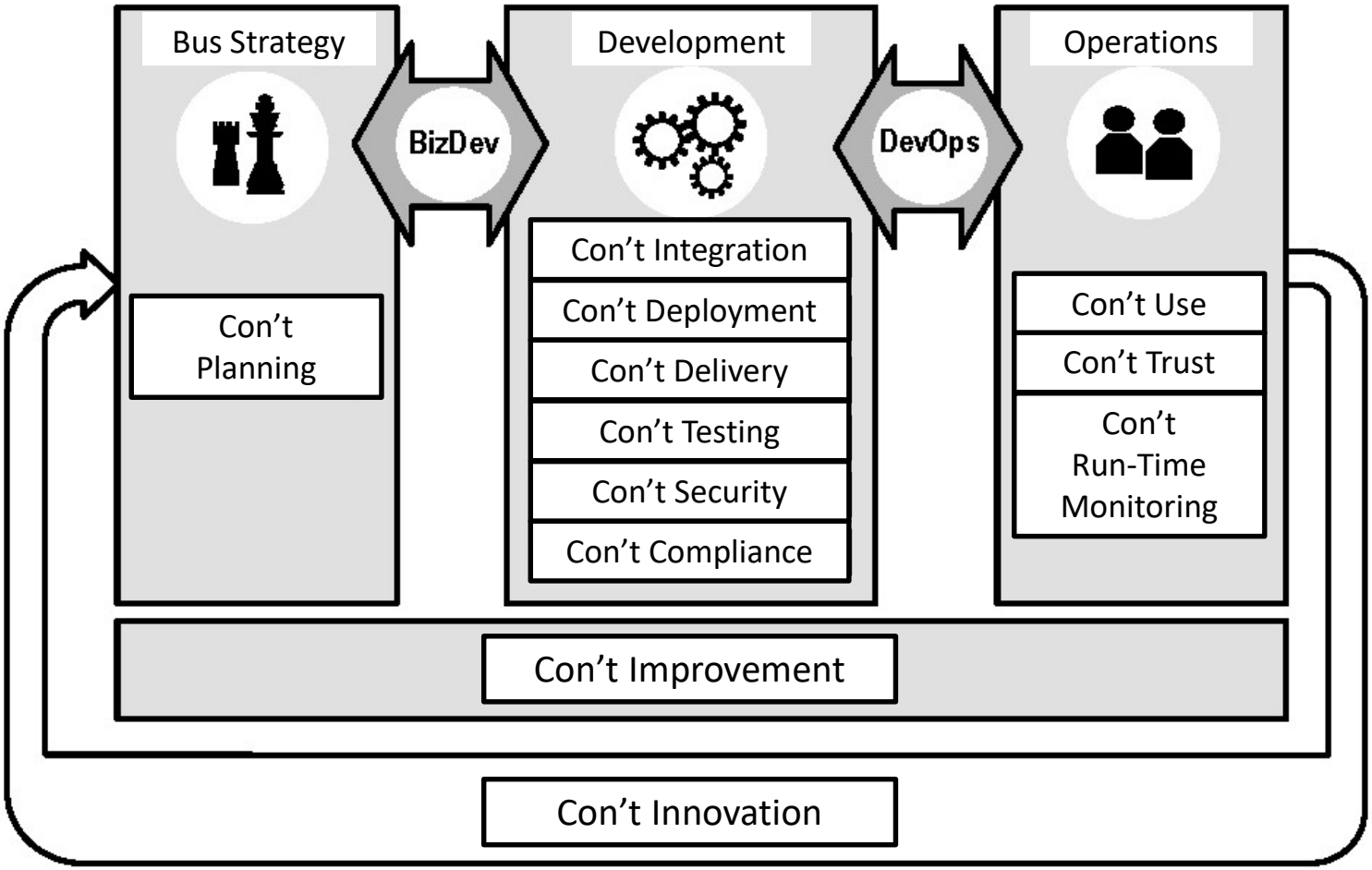
# What is DevOps?




https://en.wikipedia.org/wiki/File:Devops-toolchain.svg

# DevOps is too broad!




[Fitzgerald et al. 2014]

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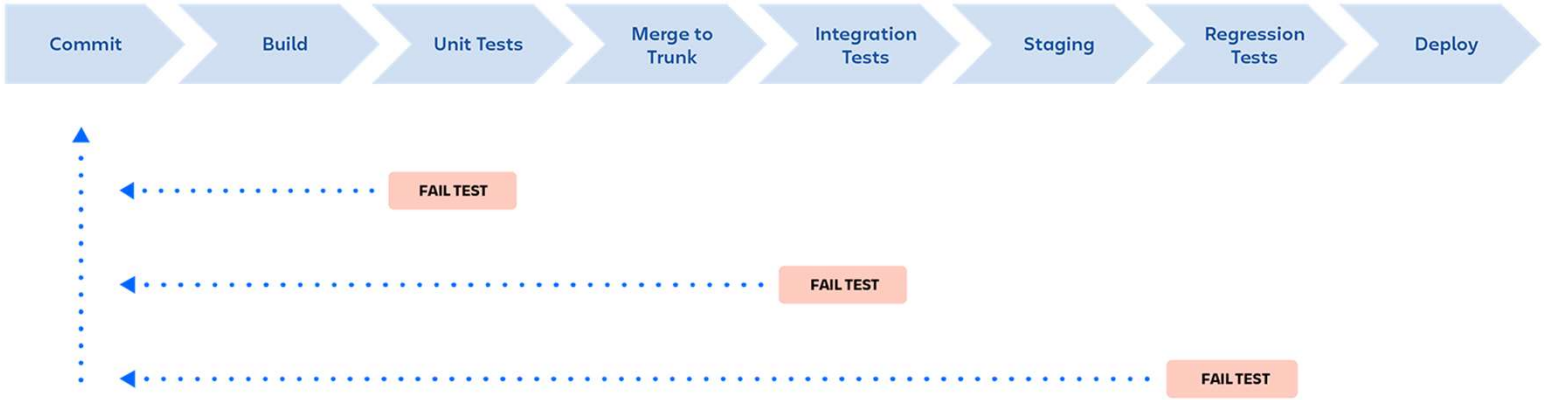
# DevOps is too broad!

- Continuous Integration [Duvall et al. 2007]
  - Continuous Code Integration
  - Continuous Database Integration
  - Continuous Testing
  - Continuous Inspection
  - Continuous Delivery
  - Continuous Feedback

# DevOps is too broad!

- Continuous Delivery [Humble et al. 2010]
  - Deployment pipeline




https://www.atlassian.com/devops/devops-tools/devops-pipeline

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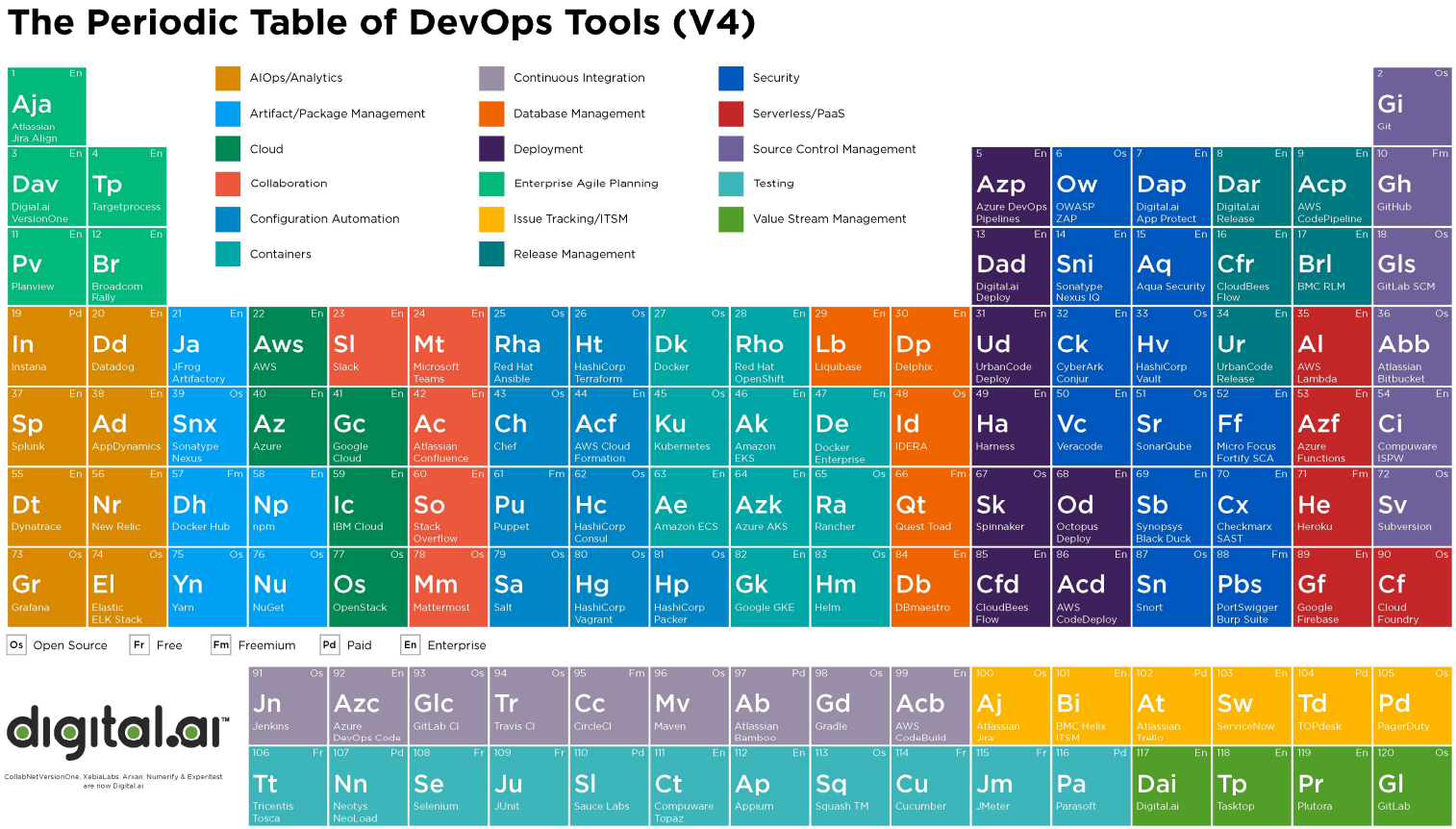
# DevOps changes too fast!




https://digital.ai/periodic-table-of-devops-tools

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# DevOps changes too fast!

## Expanding DevOps Topics

- AIOps
- BizDevOps
- CloudOps
- DataOps
- DevSecOps
- GitOps
- ModelOps
- NoOps
- Microservices
- Serverless
- Observability
- Performance Testing
- Resilience Testing
- Infrastructure as Code
- Site Reliability Engineering (SRE)

[Belagatti 2021 and others]

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# DevOps Institute

https://devopsinstitute.com/

# DevOps Institute

- Researched about DevOps skills needed by industry.


https://info.devopsinstitute.com/2021-upskilling-report-download?utm_campaign=Upskilling%202021&utm_source=SKILupDay-Download-Upskilling-2021

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# DevOps Institute

- 16-hour online certificate courses
  - DevOps Foundation
  - DevOps Leader
  - DevSecOps Foundation
  - Continuous Testing Foundation
  - Continuous Delivery Ecosystem Foundation
  - Site Reliability Engineering Foundation

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# ICAgile – DevOps Track

https://www.icagile.com/Agile-Delivery/DevOps

- DevOps Track Certifications
  - Foundations of DevOps Professional (ICP-FDO)
  - Implementing DevOps Professional (ICP-IDO)
  - DevOps Expert (ICE-DO)

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# ICAgile – DevOps Track

- ICAgile Learning Roadmap – DevOps Track
  - ICAgile depends on experienced DevOps practitioners for guidance. Hence, the primary source of DevOps knowledge is from experience.
  - The roadmap was created collaboratively by pioneers, experts, and trusted advisors.
  - ICAgile does not offer DevOps training directly.
  - Training providers develop courses according to the roadmap, and verify by ICAgile.

# ICAgile – DevOps Track

Adventures with Agile
Appddiction Studio
Assurity Consulting Limited
Clear Systems LLC
Coveros, Inc.
Cprime
CyberBahn Federal Solutions, LLC
Datacom
Daugherty
John Okoro (Auspicious Agile)
Knowledgehut Solutions Pvt Ltd
Leanpitch Technologies Privat...
Learning Tree International
LitheSpeed
PALO IT
Washington University

cprime (https://www.cprime.com/)

- DevOps Implementation Boot Camp (ICP-FDO)
  - 3 days / 24 hours of instruction
  - In-Person / Live Online

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# Lectures

- ICAgile Learning Roadmap DevOps Track [ICAgile 2018]
  - Creative Commons Attribution 4.0 International License (https://creativecommons)
  - Possibility for the course to offer the Foundations of DevOps Professional (ICP-FDO) certification

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# Lectures – 1.0

1. The Case of DevOps
    1.1. History of DevOps
    1.2. Mindset and Principles
    1.3. Cultural Challenges

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# Lectures – 2.0

2. Configuration Management
    2.1. Version Control
    2.2. Managing Configuration

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# Lectures – 3.0

3. Continuous Integration
    3.1. Principles of Continuous Integration
    3.2. Practices of Continuous Integration
    3.3. Quality Assurance

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# Lectures – 4.0

4. Continuous Delivery
    4.1. Definition of Continuous Delivery
    4.2. Principles of Continuous Delivery
    4.3. Practices of Continuous Delivery
    4.4 Deployment Pipeline

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# Lectures – 5.0

5. Operations
    5.1. Managing Infrastructure
    5.2. Managing Database

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# Labs

- Continuous Integration [Duvall et al. 2007]
  - Base on a simple Java application
    - 1.0 Continuous Code Integration
    - 2.0 Continuous Database Integration
    - 3.0 Continuous Testing
    - 4.0 Continuous Inspection
    - 5.0 Continuous Delivery
    - 6.0 Continuous Feedback

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# Lab – 1.0

- 1.0 Continuous Code Integration
  - Configuration Management
  - Create git repository for multi-user development
  - Maven Configuring

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# Lab – 2.0

- 2.0 Continuous Database Integration
  - Database scripting
  - Extract Translate Load (ETL)
  - Database backup
  - Schema update

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# Lab – 3.0

- 3.0 Continuous Testing
  - JUnit configuration
  - Test cases management
  - Test data management
  - *Authentication & authorization testing?*

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# Lab – 4.0

- 4.0 Continuous Inspection
  - Inspector configuration in the build process
  - Inspection results handling

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# Lab – 5.0

- 5.0 Continuous Delivery
  - Deployment configuration
  - Software library management
  - Rollback
  - *Container or virtual machine?*
  - *Infrastructure as code?*

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# Lab – 6.0

- 6.0 Continuous Feedback
  - Log records create, backup, and archive
  - Log monitoring

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# Student Evaluation

- Labs 50%
- Assignments 30%
- Final Exam 20%

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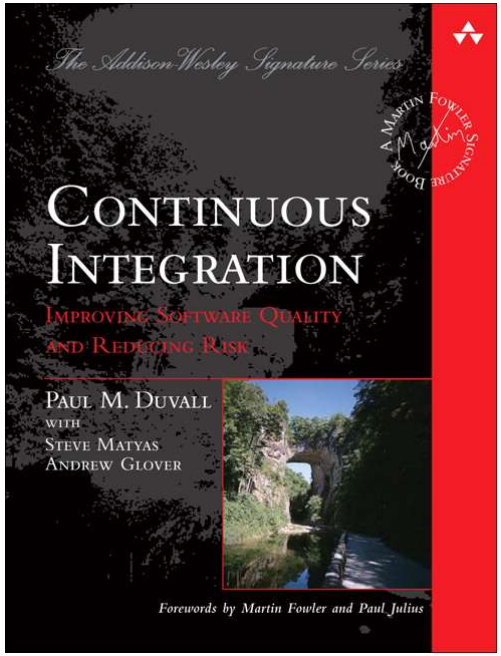
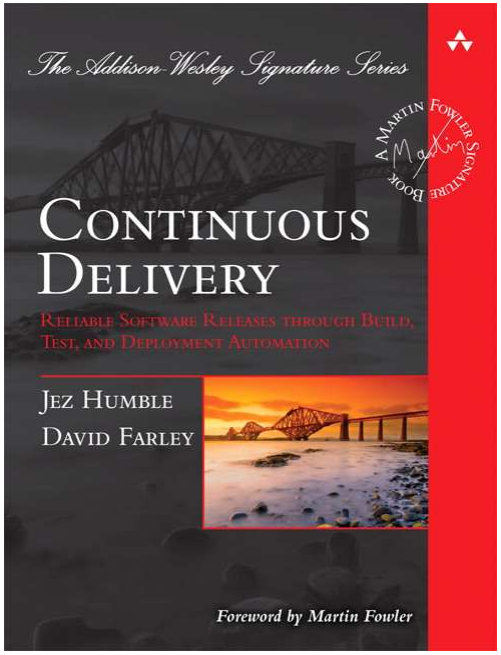
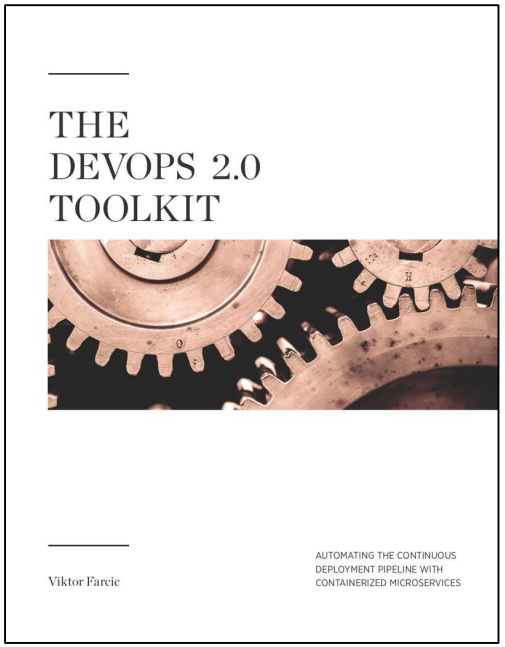
# Text Books & References




[Duvall et al. 2007]




[Humble et al. 2010]




[Farcic 2016]

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# What's next?

- Prepare lecture material
- Prepare labs
  - Hire students to help planning and creating lab exercises
  - Apply for funding
- Look for opportunity to deploy the course

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# References


- [Fitzgerald et al. 2014]
  B. Fitzgerald and S. Klaas-Jan, "Continuous Software Engineering and Beyond: Trends and Challenges," in Proceedings of the 1st International Workshop on Rapid Continuous Software Engineering, Hyderabad, India, 2014.
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  J. Humble and D. Farley, “Continuous Delivery: Reliable Software Releases Through Build, Test, and Deployment Automation”, Addison-Wesley, 2010.
- [Farcic 2016]
  V. Farcic, “The DevOps 2.0 Toolkit - Automating the Continuous Deployment Pipeline with Containerized Microservices”, CloudBees, 2016.

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- [ICAgile 2018]
  C. Garlick, D. DeGrandis, G. Gotimer and T. Guay, "ICAgile Learning Roadmap DevOps Track," International Consortium for Agile (ICAgile), 04 2018. [Online]. Available: https://icagile.com/Portals/0/LO%20PDFs/DevOps%20Learning%20Outcomes.pdf. [Accessed 27 07 2018].

# Contact Info


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Thank you very much 😎