DevOps Engineering

Innopolis University Fall 2022

by

Dr. Paolo Ciancarini

Welcome!

Dr. Paolo Ciancarini

- Professor
  - University of Bologna (since 1992)
  - Dept.of Computer Science
- My Research
  - Advanced software engineering methods, techniques and tools
- My Teaching (BS, MS, PhD)
  - Software Engineering
  - Distributed software systems
  - Digital transformation (eg. Semantic Web, AI, digital entertainment, etc)
- My Contact info
  - Email: paolo [DOT] ciancarini [AT] unibo.it
  - Telegram: @PaLoCaPa
  - Skype: paolociancarini

Course description

Course card

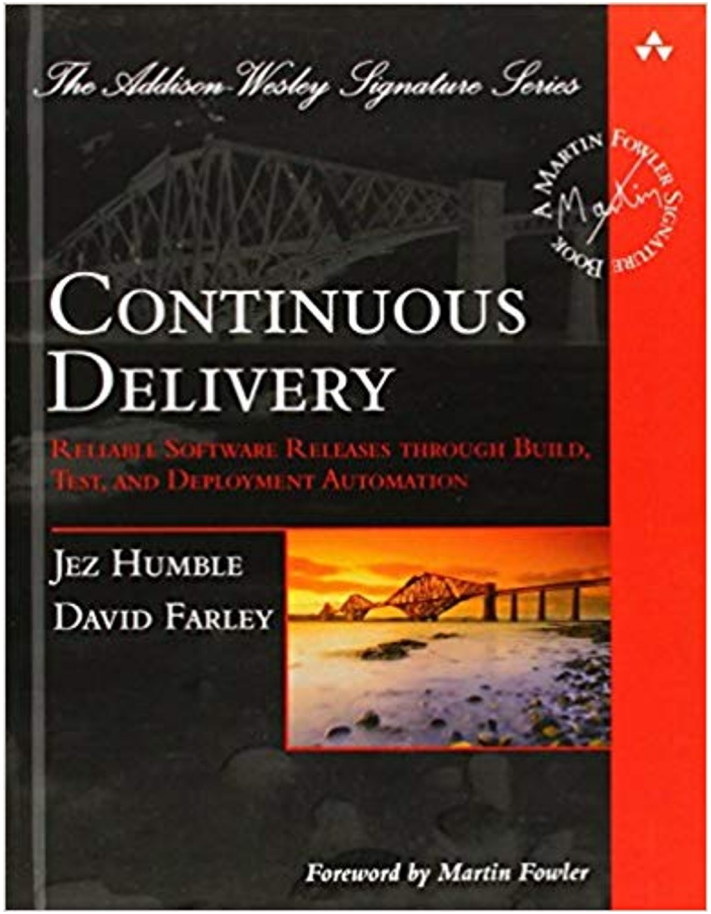
Property	Details
Title	DevOps Engineering
Course type	Core
Faculty	Computer Science and Engineering
Major	Computer science
Term	3th (S6) and 4th (S8) year bachelor
ECTS	5 (Note: 1 ECTS requires between **25-30hs** of both in-class and out-of class work)
Starting	29/8/2022
Ending	30/11/2022 (tentative)
Instructors	Dr. Paolo Ciancarini, Dmitriy Creed (PoP), Kiril Saltanov (TA)
Weekly load	**25 hours/week** (150hs/6 weeks) in “average” for an “average” student

Objectives

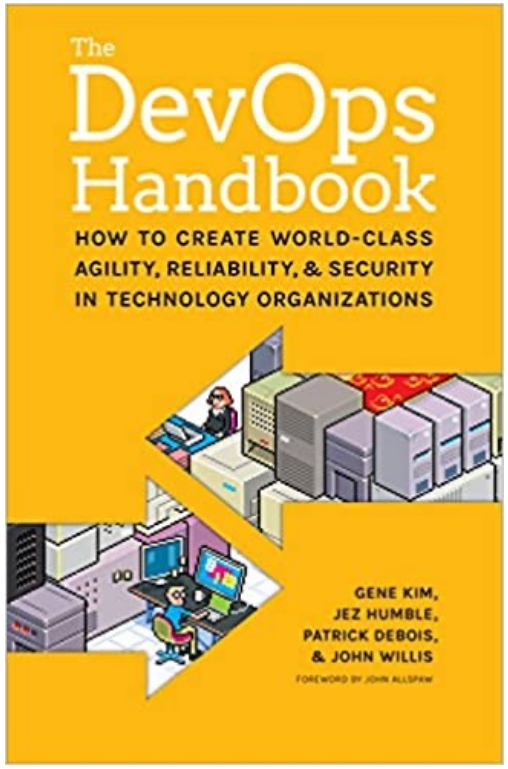
- Making software industrially
  - Recall on sw processes
  - Introduction to DevOps
  - Deployment pipeline
  - Configuration Management
  - Build Management
  - Test Management
  - Deploy/Release Management
  - Metrics
- Organisation and People
  - Project management
  - Collaborative work
  - DevOps culture
  - DevOps as a software architect
- R&D
  - Project development
  - Reporting
  - Reviewing

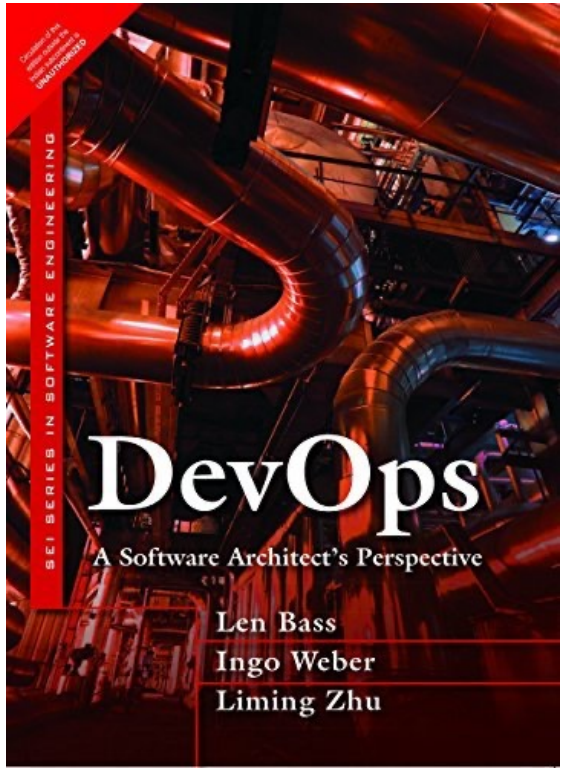
Bibliography: main reference

- Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation (Addison-Wesley Professional); 2010,
  by Jez Humble and David Farley.



Two more books





Bibliography: complementary relevant references

- DevOps: A Software Architect's Perspective, SEI, Addison-Wesley Professional; 1 edition (May 28, 2015), by Len Bass, Ingo Weber, and Liming Zhu.
- Deployment and Operations for Software Engineers (Paperback, April 29, 2019), by Len Bass and John Klein.
- Effective DevOps: Building a Culture of Collaboration, Affinity, and Tooling at Scale, O'Reilly Media; 1 edition (June 24, 2016).
- DevOps for Developers, Apress; 1 edition (September 12, 2012).
- The DevOps Handbook, IT Revolution Press; (October 15, 2016).
- DevOps Defined, O'Reilly Media, Inc.; (December 15, 2017).
- Continuous Integration, Addison-Wesley Professional; (June 29, 2007).

Activities

- Lectures
- Readings
- Project lab (individual)
  - Analysis, Design, and Implementation
  - Report writing
- Assessment

Schedule

15 lectures

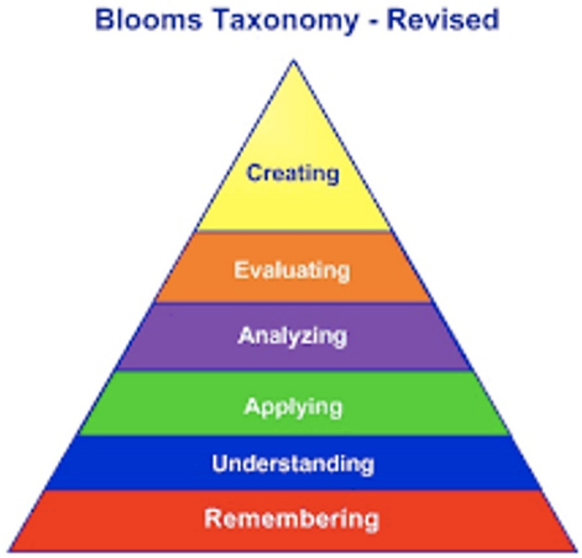
This week: five lectures offline
Mon 13:10-14:40 and 14:50-16:20
Tue 11.10-12.40
Thursday 13:10-14:40 and 14:50-16:20
Next weeks: 10 lectures online (MS Teams), one per week
Tue 11.10-12.40

Also available on Moodle

(Expected) Learning outcomes

- Design and implement a Deployment Pipeline for a software development project **(LO1)**
- Classify sw development tools based on certain quality attributes **(LO2)**
- Use and integrate existing tools **(LO3)**
- Write a report of scientific and technical quality **(LO4)**
- Plan, coordinate, and report activities in a multi-participant project **(LO5)**

Learning outcome	Bloom's level [1]
LO1	Apply (L3)
LO2	Evaluate (L5)
LO3	Apply (L3)
LO4	Create (L6)
LO5	Apply (L3)



Mapping Activity - Learning outcome

Activity	Learning Outcome
Summary recall on sw processes (Lecture)	LO4
Introduction to DevOps (Lectures)	LO1,LO3
DevOps culture and background (Lecture)	LO2,LO4
Deployment pipeline (Lecture)	LO1, LO2, LO3
Configuration Management (Lecture)	LO1, LO3
Build Management (Lecture)	LO1, LO3
Test & Deploy/Release Management (Lectures)	LO1, LO3
Metrics (Lectures)	LO1, LO3
Lab sessions	LO1, LO2, LO3, LO4, LO5
Report writing	LO4, LO5

LO1: Design and implement a Deployment Pipeline for a particular software development project.

LO2: Classify tools based on certain quality attributes.

LO3: Use and integrate existing tools.

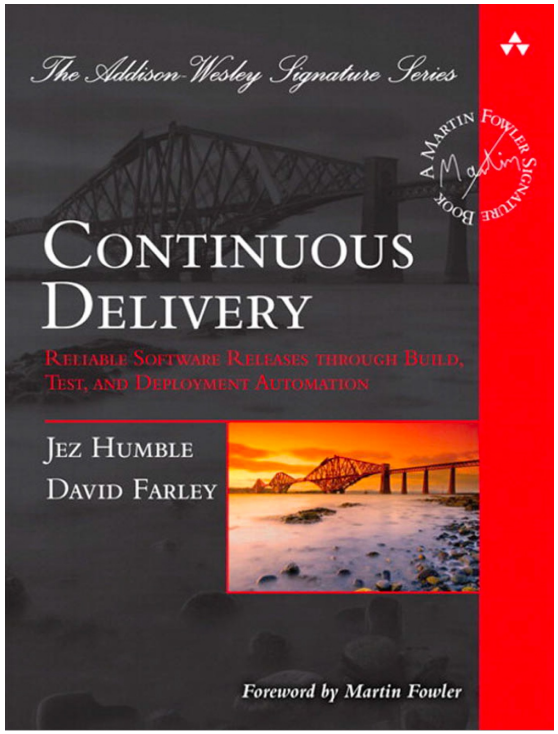
LO4: Write a report of scientific and technical quality.

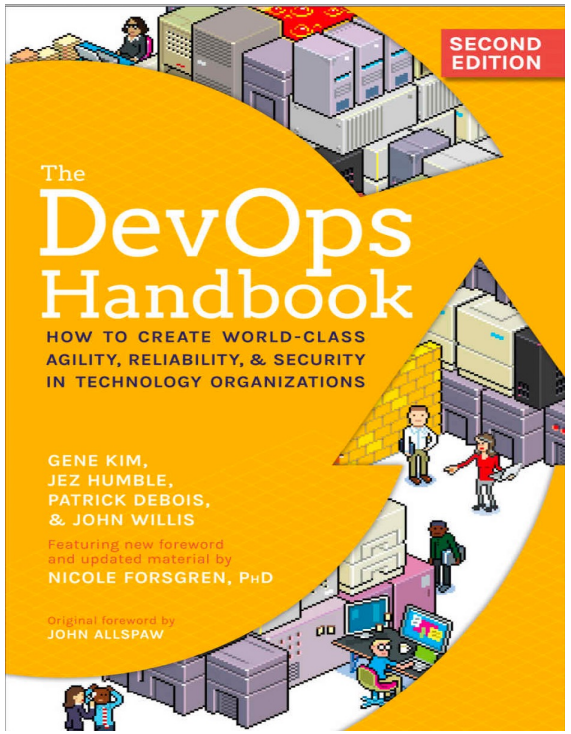
LO5: Plan, coordinate, and report activities in a DevOps project.

Tools

- Moodle@IU
  - Material
    - Slides
    - Docs
- Telegram group B18 DevOps
- Submissions (to be agreed with TA)

Textbooks


The Addison-Wesley Signature Series
A Martin Fowler Signature Book
Continuous Delivery
Reliable Software Releases through Build, Test, and Deployment Automation
Jez Humble
David Farley
Foreword by Martin Fowler


SECOND EDITION
The DevOps Handbook
How to Create World-Class Agility, Reliability, & Security in Technology Organizations
Gene Kim,
Jez Humble,
Patrick DeBois,
& John Willis
Featuring new foreword and updated material by
Nicole Forsgren, PhD
Original foreword by
John Allspaw

Grading: overall view

- Attending class: **10%**
- Project deliverables: **70 %**
  - 1x group submission **[individual grade]**
- In-class assessment: **20%**
  - 1x **[individual grade]**

Grading: Project deliverables (70%)

- One single packaged submission (.zip file) consisting of:
  - Artefacts
    - Selected Product (source files)
    - Test Cases
    - Scripts, configuration files, … to setup the Deployment Pipeline
    - ***Readme.txt***: detailed step-by-step instructions on how to make use of the provided files to setup the Deployment Pipeline
    - **Scenarios.txt** file that contains enough test cases that allow to demonstrate the correct functioning of the Deployment Pipeline.
  - Report
    - .pdf file adhering to the IEEE Manuscript Templates for Conference Proceedings
    - between 3000 and 4000 words (6 pages long, max.)

Grading: Project deliverables (70%) - cnt'd

- Important remarks
  - Submission
    - Made through Moodle.
      - In case of size limit problem, then use a file transfer web service (e.g. Google Drive, Dropbox, etc), and add the info into the ***Readme.txt***
  - Correctness
    - Explanations should be precise enough to:
      - create the Deployment Pipeline in a given state (***Readme.txt***)
      - reproduce the state required to run the provided test cases ((***Scenarios.txt***)

Grading: In-class assessment (20%)

- Made using Multiple Choice Questions (MCQs) approach
- Questions based on textbooks *Continuos Delivery*, by Humble and Fairleyn and on *DevOps Handbook* (2 edition), by Kim.
  - Complement the theoretical material presented during the session.
- Aim of the questions: to assess whether the student has
  - read the given material
  - understood the main takeaways of the given material.
- Grade (20%)
  - Individual grade based on answers to questions

Grading: summary

- Project deliverables:
  - 70 %
  - individual grade
  - **1 submission required**

- In-class assessment:
  - 30% composed as follows:
    - 20% individual grade from quiz
    - 10% individual grade from attending classes
  - **NO submission required**

- A = 90+
- B = 75+
- C = 60+

That’s all about the course introduction.

Questions?

I have some questions for you!

- How good are you in understanding software development problems?
- Which software development methods do you know?
- How do you choose a method?
- How can you be sure that you follow the method correctly?

Student

- What is your pre-state?
  - Acquired knowledge
    - Conceptual
    - Technical

- Useful as reference
  - For the teacher
  - For yourself
    - To find out what you have learnt after having followed the course

References

1. Anderson, L., Krathwohl, D., Bloom, B.: A taxonomy for learning, teaching, and assessing: a revision of Bloom's taxonomy of educational objectives. Longman (2001).

Bloom’s levels

- No knowledge at all **(L0)**
- Remember **(L1)**: capable to explain very partially it
- Understand **(L2)**: capable to explain clearly it and illustrate
- Apply **(L3)**: capable to execute a task that implies to understand the knowledge
- Analyse **(L4)**: capable to understand all the sub-knowledge parts and their relations that constitute the knowledge.
- Evaluate **(L5)**: capable to define appropriate criteria and associated evaluation metrics in order to decide on the relative value of the knowledge.
- Create **(L6)**: capable to synthesize a new version of the knowledge in order to improve it with respect to the evaluation of some evaluation criteria.

Bloom’s levels example: “an apple”

L0 = never encountered this notion in my life.

L1 (Remember) = an apple is something round and green.

L2 (Understand) = an apple is the fleshy usually rounded red, yellow, or green edible pome fruit of a usually cultivated tree.

L3 (Apply) = I can provide a list of fruits = apple, orange, tomato, ...

L4 (Analyse) = an apple has a shape, a skin, a flesh, a pollination process and nutrition properties.

L5 (Evaluate) = the shape of an apple is measured using a diameter, the skin has a color mainly belonging to the colors [red, yellow, green, pink] or bi- or tri-coloured from those colors, the flesh has a color mainly belonging to the colors [pale yellowish-white, pink, yellow]. The nutrients of an apple are the energy measured in kcal and the following categories measured in g: carbohydrates, fat, protein, vitamins, minerals and water. The nutrition values can be qualified according to the daily needs of a human being.

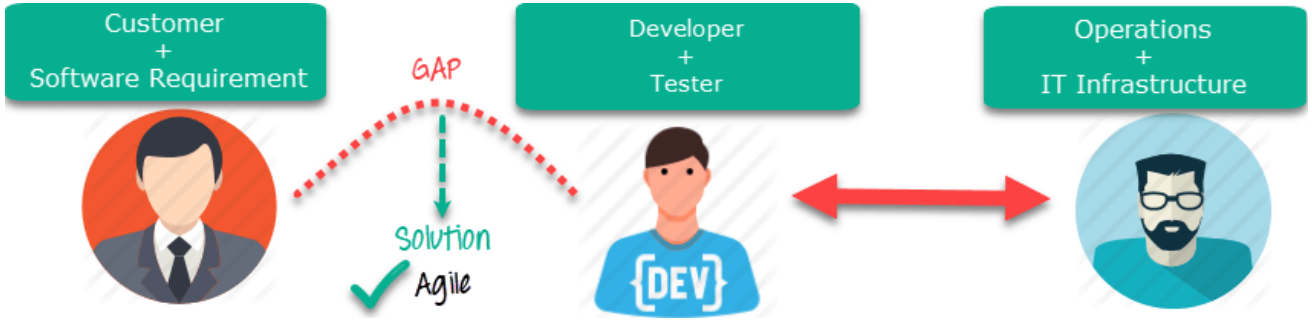
L6 (Create) = I can create a new variety of apple with more intense red color by supplying less water to the plant than it requires for maximum transpiration and growth, thereby inducing a low level of water stress. The vegetative growth of the tree is reduced, allowing more light to penetrate the canopy and color the fruit.

Example: introducing HTML to beginners

- **Lesson 1 (Level 1, Remember):** Explain the essential HTML elements to them. At the end of the lesson, your team will be able to *recall* the important elements of HMTL.
- **Lesson 2 (Level 2, Understand):** At the end of this lesson, attendees will be able to *summarize* the purpose of HTML in some of your website's actual pages.
- **Lesson 3 (Level 3, Apply):** At the end of this lesson, each of your team members will be able to *implement* their own basic web page for the first time, solving problems as they arise.
- **Lesson 4 (Level 4, Analyze):** Upon completing this lesson, each team member will *research* and explain what elements they should add to their web page to take it to the next level.
- **Lesson 5 (Level 5, Evaluate):** At the end of this lesson, each team member will be able to *critique* each other's web pages, highlighting their advantages and disadvantages.
- **Lesson 6 (Level 6, Create):** At the end of the final lesson, each team member will be able to *create* new web pages to meet certain objectives which they will add to your website. Here, they use what they have learned to create something entirely new.

Since DevOps complements agile…

Agile addresses gaps in Customer and Developer communications



DevOps addresses gaps in Developer and IT Operations communications

Review your knowledge on Scrum

- https://www.scrum.org/open-assessments

Initial assessment of your “agile” knowledge

- Fill out the survey in Google form (see link below)
  - Use Bloom’s levels to express “your knowledge” to the given statement.
  - be honest
    - No judgment, No grading
    - I want to get an overall view of the class

- Fill the form -> https://forms.gle/Qcv1fFBzjVyT2DRw7

Attendance check

- https://baam.duckdns.org/AttendanceCheck