Continuous Integration and Deployment (CI/CD)

1. **Course number and name:** 020IDCES5/020CIDES5 Continuous Integration and Deployment

2. **Credits and contact hours:** 4 ECTS credits, 2x1:15 contact hours

3. **Name of course coordinator:** Maroun Ayli

4. **Instructional materials:** Course handouts; lab experiments; slides; in-class problems

   References:
   - ACloudGuru online Courses.
   - G. Kim, J. Humble, P. Debois, and J. Willis, The DevOps Handbook. Portland, OR: IT Revolution Press, 2016.
   - J. Verona, Practical DevOps. Birmingham, UK: Packt Publishing, 2016.

5. **Specific course information**
   a. **Catalog description:**
      This DevOps course provides a thorough overview of DevOps principles, practices, and key tools, offering a comprehensive understanding of the software development lifecycle (SDLC). Students will learn about DevOps fundamentals, containerization, continuous integration pipelines, and Infrastructure as Code (IaC) using technologies such as Docker, GitHub Actions, Jenkins, Ansible, and more. A semester-long project will allow practical application of concepts learned in class. Upon completion, students will be well-prepared for careers in software development and IT operations.

   b. **Prerequisites:** None

   c. **Selected Elective** for CCE students

6. **Educational objective for the course**
   a. **Specific outcomes of instruction:**
      - Implement DevOps methodologies to streamline the Software Development Life Cycle (SDLC), focusing on continuous integration, delivery, and deployment to enhance collaboration, reduce time to market, and improve product quality.
      - Utilize essential tools such as version control software, Docker for container management, and container repositories to manage code changes, ensure consistent application environments, and streamline the distribution of container images.
      - Apply continuous testing strategies and monitoring tools to maintain code quality, detect issues early, and monitor application performance and system health, ensuring proactive problem-solving and optimization.

- Leverage automation and orchestration tools like Jenkins, GitHub Actions/GitLab CI, Kubernetes, and load balancers to automate development processes, efficiently manage containerized applications, and distribute network traffic, enhancing overall efficiency and scalability.
- Integrate infrastructure management and automation technologies such as Ansible, Terraform, and cloud platforms like GCP and AWS to efficiently manage and scale IT infrastructure, ensuring agility and consistency across development and production environments.

b. PI addressed by the course:

PI	1.1	1.2	2.2	2.4	5.2	6.3	6.4
Covered	x	x	x	x	x	x	x
Assessed		x	x	x	x	x	x

7. Brief list of topics to be covered and approximate lecture hours:

- What is DevOps: (1 lecture)
  - Demystifying DevOps
  - Benefits of DevOps in the SDLC
  - Reasoning about the efficiency of DevOps
- DevOps Basics: (3 lectures)
  - Build Tools and Automation
  - Continuous Testing
  - Version Control Software
- Containerization: (3 lectures)
  - Docker Images and Containers
  - Container Repositories
  - Monitoring Tools
  - Kubernetes
  - Load balancer
- Continuous Integration Pipelines (4 lectures):
  - GitHub Actions / GitLab CI
  - Jenkins
  - Branch Protection Rules
- Infrastructure as Code: (2 lectures)
  - Ansible/Terraform/GCP/AWS
- Cloud Infrastructure (AWS/Azure/GCP) (2 lectures)

9 sessions will be dedicated for follow-ups to the project that will be started at the beginning of the semester as well as the video lectures on A Cloud Guru (ACG).