Virtualization

1. **Course number and name:** 020VRTES4 Virtualization

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

3. **Name(s) of instructor(s) or course coordinator(s):** Jihane Sayah

4. **Instructional materials:** Course handouts, Powerpoint slides

5. **Specific course information**
   a. **Catalog description:**
      Introduction to virtualization and its fundamental principles; advantages and disadvantages of virtualization; hardware virtualization: the role and components of a hypervisor, types of virtualization (full virtualization, paravirtualization, hardware-assisted virtualization, partitioning), review of existing solutions such as Xen, ESXi, KVM, OpenVz, etc.; network virtualization (NFV and SDN), storage virtualization and SAN, software virtualization and containers, virtualization and cloud: OpenStack.

   b. **Prerequisites:** None

   c. **Selected Elective** for CCE students

6. **Educational objectives for the course**
   a. **Specific outcomes of instruction:**
      - Understand the concept of virtualization and its fundamental principles.
      - Analyze the advantages and disadvantages of virtualization in various computing environments.
      - Identify the role and components of a hypervisor in hardware virtualization.
      - Differentiate between various types of virtualization, including full virtualization, paravirtualization, hardware-assisted virtualization, and containerization.
      - Evaluate different virtualization solutions such as Xen, ESXi, KVM, and OpenVz based on their features and suitability for specific use cases.
      - Examine the concepts of network function virtualization (NFV) and software-defined networking (SDN) in the context of virtualized networks.
      - Explore the virtualization of storage and storage area networks (SANs) and their implications for data management and accessibility.
      - Compare and contrast software-based virtualization with containerization, understanding their respective advantages and use cases.
      - Analyze the integration of virtualization technologies with cloud computing platforms, with a focus on OpenStack as a popular open-source cloud infrastructure solution.

b. PI addressed by the course:

PI	1.2	1.3	6.3	6.4
Covered	x	x	x	x
Assessed	x	x	x	x

7. Brief list of topics to be covered

- Introduction to virtualization and its principles
- Advantages and disadvantages of virtualization
- Hardware virtualization: role and components of a hypervisor
- Types of virtualization: full, paravirtualization, hardware-assisted, partitioning
- Review of virtualization solutions: Xen, ESXi, KVM, OpenVz, etc.
- Network virtualization: NFV (Network Function Virtualization) and SDN (Software-Defined Networking)
- Storage virtualization and SAN (Storage Area Network)
- Software virtualization and containers
- Virtualization and cloud computing, focusing on OpenStack