Network Routing and Switching

1. **Course number and name:** 020RCOES2 Network Routing and Switching

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

3. **Name(s) of instructor(s) or course coordinator(s):** Nathalie Aouad Rehayem

4. **Instructional materials:** Course handouts, Cisco CCNA online material, lab experiments, slides

5. **Specific course information**
    a. **Catalog description:**
    Concepts of network switching – Hardware architecture of routers and switches – Virtual Local Area Networks (VLANs) – Inter-VLAN routing and switching – Redundancy in networks – Spanning Tree Protocol (STP) – Routing Concepts – Static Routing – Static vs. dynamic routing – Dynamic routing – RIP protocol – EIGRP Protocol – OSPF protocol –Semester 2 of CCNA Routing & Switching certification program (CCNA2).

    b. **Prerequisites:** 020RESES1 Introduction to Data Networks

    c. **Required** for CCE students

6. **Educational objectives for the course**
    a. **Specific outcomes of instruction:**
    – Review the basic configuration commands for Cisco routers and switches.
    – Examine the internal hardware structure of Cisco routers and switches.
    – Implement Virtual Local Area Networks (VLANs) and compare VLAN interconnection methods.
    – Analyze LAN redundancy with STP protocol and compare the different releases of STP.
    – Implement and troubleshoot static routing. Configure default static routes.
    – Static vs. dynamic routing.
    – Implement, test, and compare dynamic routing protocols (RIPv2, EIGRP, and OSPF).
    – Introduce external routing (BGP).

    b. **PI addressed by the course:**

PI	2.1	2.2	2.3	2.4	2.5	6.2	7.1
Covered	x	x	x	x	x		
Assessed	x	x		x	x	x	x

7. **Brief list of topics to be covered**
   – Routing and Switching Review: Overview of the basic memory components included in Cisco routers and switches Review of the basic configuration commands for routers and switches using Cisco Packet Tracer simulation program (3 lectures)
   – Switching concepts: Explanation of the switch forwarding methods such as Store-and-Forward, cut through and fragment-free Comparison between the pros and cons of each of these methods (1 lecture)
   – VLANs: Discussion of the limitations of implementing a network without VLANs Benefits of VLANs The ability of VLANs to span across multiple physical switches through trunk links Implementation of VLANs (3 lectures)
   – Inter-VLAN Routing: Explanation of the 3 methods of inter-VLAN routing Comparison between these methods in terms of complexity, efficiency and cost Legacy routing, Router on a Stick and Routed switch ports Demonstration of how to implement and configure each of these methods (3 lectures)
   – Practical session: VLAN and inter-VLAN routing implementation scenario using Cisco Packet Tracer (1 lecture)
   – STP: Discussion of the problems related to introducing Layer 2 redundancy in the local network Spanning Tree Protocol is the solution to stop Layer 2 loops in the local networks Detailed explanation of the basic IEEE STP protocol Introduction to the enhancements for the IEEE STP protocol such as RSTP and MSTP Finally, this topic includes discussion of the Cisco PVST protocol (3 lectures)
   – Practical session: STP scenario using Cisco Packet Tracer demonstrating in detail how STP works Different cases are then discussed by disconnecting part of the network and verifying how STP responds to network failure (1 lecture)
   – Routing: Introduction to main routing concepts and the terminologies used in routing: Static, dynamic, classful, classless, gateway of last resort, route summarization, administrative distance, etc (3 lectures)
   – Static Routing: configuration and troubleshooting of static routing through different scenarios (1 lecture)
   – Dynamic Routing: introduction to the 3 main dynamic routing protocols, distance vector vs link state routing, metric calculation in each routing protocol, ability to choose the most adequate routing protocol given each network environment (2 lectures)
   – RIP: details of the implementation and configuration of RIP protocol (1 lecture)
   – EIGRP: details of the implementation and configuration of EIGRP protocol (1 lecture)
   – OSPF: details of the implementation and configuration of OSPF protocol (2 lectures)
   – Practical session: implementation of a routing scenario using each of the discussed routing protocols using Cisco Packet Tracer (1 lecture)