INTELLIGENT AND PROGRAMMABLE COMMUNICATION NETWORKS AND SERVICES

GENERAL

SCHOOL	ENGINEERING		
DEPARTMENT	INFORMATICS AND COMPUTER ENGINEERING		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE		**SEMESTER**	1st
COURSE TITLE	Intelligent and Programmable Communication Networks and Services		

INDEPENDENT TEACHING ACTIVITIES *(In case credits are allocated to distinct parts of the course, e.g., Lectures, Laboratory Exercises, etc. If credits are allocated uniformly to the entire course, state the weekly teaching hours and total credits.)*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	3	8

COURSE CONTENT

The course includes the following teaching modules:

Routing Algorithms and Congestion Control:
Modern and Asynchronous Routing Algorithms, Optimal Routing, Flow and Congestion Control.

Internet Routing:
IGP and EGP Routing Protocols, OSPF and BGP Routing Protocols.

Multicast in the Internet:
Multicast addressing, Internet Group Management Protocol (IGMP), Distance Vector Multicast Routing Protocol (DVMRP), Protocol Independent Multicast (PIM).

Quality of Service Assurance Agreements (QoS SLA):
Introduction to Service Level Agreements, Presentation of the necessity of SLAs, Understanding the role and content of SLAs, Presentation of SLA development methodologies.

Multiprotocol Label Switching (MPLS):
Advantages of MPLS technology, MPLS operating principles, Traffic Engineering, Virtual Private Networks (VPN), Generalized MPLS (GMPLS).

Optical Networks for Metropolitan and Backbone Network Infrastructures:
Wavelength routing, optical circuit switching, modern optical transport protocols, MPLS, Optical Transport Network (OTN).

Software-Defined Networks (SDN):
Key features of SDN technology (data/control planes, operation, devices, software, applications), IETF SDN Framework, Alternative SDN approaches (API, Hypervisor-Based, etc.).

OpenFlow Protocol, Open-source software (Open Daylight/Floodlight Controllers, Mininet, OpenVSwitch), data traffic management (load balancing).
Network Functions Virtualization (NFV):
NFV definitions and terminology, OPNFV, Network Services (NS)/Virtual Network Functions (VNF), differences between SDN and NFV approaches.

Data Centers:

Data center network architectures, Quality of Service (latency, deterministic networks, time-sensitive networks).
Optical architectures for data center networks, resource separation, management, and sharing among multiple users in the Data Center.
- OpenStack, Docker, Kubernetes, VMware, SDN in Data Centers, VLANs, EVPN, VxLAN, NVGRE.

To better understand the theoretical lectures, specialized network simulation software and routing protocol implementation tools will be used (GNS3 - https://www.gns3.com) as well as SDN network implementation using Mininet.