



ITU Centres of Excellence Network for Europe

Faculty of Electrical Engineering and Information Technologies in Skopje

Online Training Course on
NGN Evolution, Future Networks and Ultra-Broadband Internet

28 May – 24 June 2019

COURSE OUTLINE

COURSE DESCRIPTION

Title	NGN Evolution, Future Networks and Ultra-Broadband Internet
Objectives	<p>This course will focus on NGN Evolution, Future Networks and Ultra-Broadband Internet from technology, regulation and business aspects. It will cover the Internet fundamentals, including Internet architectures (client-server, peer-to-peer), protocols (IPv4, IPv6, TCP, UDP), IPv4 and IPv6 addressing, DNS, Internet networking (unicast, multicast), WWW services (Web 2.0, Web 3.0), Internet traffic management and QoS, as well as strategic Internet governance. Further, the course will include ITU's Next Generation Networks (NGN), NGN evolution (NGNe), Future Networks, Software Defined Networking (SDN), QoS for NGN and Future Networks, trusted environment in ICT infrastructures, as well as business and regulatory aspects of Future Networks and trusted ICT infrastructures. Also, it will cover ITU's ultra-broadband xDSL access, cable access (DOCSIS 3.0/3.1), ITU's ultra-broadband optical access (G-PON, XG-PON, NG-PON2), QoS for fixed ultra-broadband access, Carrier Ethernet (Metro, Regional, Global), MPLS and VPN (Virtual Private Networks), SDN control of transport networks, end-to-end QoS, as well as strategic aspects for ultra-broadband on digital economy and society. Finally, the course will incorporate NGN VoIP and IPTV, cloud edge and fog computing, Internet of Things (IoT) based on NGNe, Artificial Intelligence (AI) for ICTs, Big Data, Smart Sustainable Cities (SSC), OTT ultra-broadband services (2k/4k/8k video, AR/VR, voice, messaging, social networking), network neutrality, as well as business and regulatory aspects of ultra-broadband services in the digital era.</p>
Dates	28 May – 24 June 2019
Duration	4 weeks
Registration deadline	27 May 2019
Training fees	USD 150
Course code	19OI24244EUR-E

LEARNING OUTCOMES

Upon completion of this course, participants will be able to:

- Understand Internet architectures and protocols (IPv4, IPv6, TCP, UDP), domain names, Internet networking, Web services, Internet traffic management and QoS, as well as Internet governance;
- Understand NGN evolution, Future Networks and trusted ICT infrastructures;
- Perform technical, business and regulation analysis for evolved NGN and Future Networks based on software virtualization and Quality of Service support;
- Understand ultra-broadband Internet access and transport, including optical networks, MPLS and VPN, as well as Carrier Ethernet;
- Understand NGNe services, cloud, edge and fog computing, IoT, Artificial Intelligence (AI), Big Data, ICTs for Smart Sustainable Cities (SSC), and OTT ultra-broadband services;
- Perform technical, business and regulation analysis of NGNe, cloud computing, IoT, and ultra-broadband Internet services, for development of digital economy and society.

TARGET POPULATION

This course is targeted at managers, engineers and employees from regulators, government organisations, telecommunication companies and academia, who are interested in understanding, implementation and regulation of NGN Evolution, Future Networks and Ultra-Broadband Internet, including technologies, standardization, regulation and content. Other institutions and individuals that are dedicated in building their capacity related to NGN Evolution, Future Networks and Ultra-Broadband Internet are also welcome to participate.

TUTORS/INSTRUCTORS

NAME OF TUTOR(S)/INSTRUCTOR(S)	CONTACT DETAILS
Prof. Dr. Toni Janevski, tutor	tonij@feit.ukim.edu.mk www.feit.ukim.edu.mk
Dr. Marko Porjazoski, tutor's assistant	
Dr. Tomislav Shuminoski, tutor's assistant	

EVALUATION

The evaluation of the participants will be based on 80% from the average Quiz marks (average score from the quizzes) and 20% from the participation with substantive posts in the discussion forums, reflecting both the quantity and the quality of time spent on the course. Overall grade higher than 60% success ratio is required to complete the course and obtain an ITU certificate.

TRAINING SCHEDULE AND CONTENTS

Week	Activity	Exercises and interactions
Week 1	Module 1: Internet fundamentals	<p>Learning topics:</p> <ul style="list-style-type: none"> • Internet architectures (client-server, peer-to-peer) • Internet protocols (IPv4, IPv6, TCP, UDP) • Internet addressing (IPv4 and IPv6) • Domain Name System (DNS) • Internet networking (unicast, multicast) • WWW services (Web 2.0, Web 3.0) • Internet traffic management (voice, video, Web, data) • Internet QoS • Governance of Internet
		Discussion / Forum
		Self test quiz
Week 2	Module 2: NGN evolution, Future Networks and trusted ICT infrastructures	<p>Learning topics:</p> <ul style="list-style-type: none"> • ITU's Next Generation Networks (NGN) • Network Intelligence Capability Enhancement • NGN evolution (NGNe) • Future Networks • Software Defined Networking (SDN) in Future Networks • QoS for NGN and Future Networks • Trusted environment in ICT infrastructures • Trust-based media services • Business and regulatory aspects of Future Networks and trusted ICT infrastructures
		Discussion / Forum
		Self test quiz
Week 3	Module 3: Ultra-broadband Internet access and transport	<p>Learning topics:</p> <ul style="list-style-type: none"> • ITU's ultra-broadband xDSL access • Ultra-broadband cable access (DOCSIS 3.0/3.1) • ITU's ultra-broadband optical access (G-PON, XG-PON, NG-PON2) • QoS for fixed ultra-broadband access • Carrier Ethernet (Metro, Regional, Global) • Multi Protocol Label Switching (MPLS) and VPN (Virtual Private Networks) • ITU architecture for SDN control of transport networks • End-to-end QoS • Strategic aspects for ultra-broadband Internet: development of digital economy and society
		Discussion / Forum
		Self test quiz

Week	Activity	Exercises and interactions
Week 4	Module 4: NGNe, cloud computing, IoT, and ultra-broadband Internet services	Learning topics: <ul style="list-style-type: none"> • NGN-based VoIP and IPTV services • Cloud, edge and fog computing • Internet of Things (IoT) based on NGN evolution • Artificial Intelligence (AI) for ICTs • Big Data • ICTs for Smart Sustainable Cities (SSC) • OTT ultra-broadband services (2k/4k/8k video, AR/VR, voice, messaging, social networking) • Network neutrality vs. specialized services • Business and regulatory aspects of ultra-broadband services in the digital era
		Discussion / Forum
		Self test quiz and Final Evaluation

METHODOLOGY

The course methodology will be as follows:

- Each module will be studied and discussed over a time period of one week;
- Course materials will be made available on a weekly basis;
- Discussion forums will be organized based on discussion topics given on a daily basis, where students are highly encouraged to participate and interact with instructors and other students;
- Quiz tests will be assigned weekly, one per module, at the end of a given course week;
- All announcements for all events (materials, quizzes and forums) will be given in a timely manner (prior to the event) by the course tutor.

COURSE COORDINATION

Course coordinator: Name: Prof. Dr. Toni Janevski Email address: tonij@feit.ukim.edu.mk	ITU coordinator: Name: Ms Rosheen Awotar-Mauree Email address: rosheen.awotar@itu.int ; euregion@itu.int
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REGISTRATION AND PAYMENT

ITU Academy portal account

Registration and payment should be made online at the ITU Academy portal.

To be able to register for the course you **MUST** first create an account in the ITU Academy portal at the following address:

<https://academy.itu.int/index.php/user/register>.

Course registration

When you have an existing account or created a new account, you can register for the course online at the following link:

<https://academy.itu.int/index.php/training-courses/full-catalogue/ngn-evolution-future-networks-and-ultra-broadband-internet>

You can also register by finding your desired course in our training catalogue <https://academy.itu.int/index.php/training-courses/full-catalogue>.

Payment

1. On-line payment

A training fee of USD 150 per participant is applied for this training. Payment should be made via the online system using the link mentioned above for training registration at:

<https://academy.itu.int/index.php/training-courses/full-catalogue/ngn-evolution-future-networks-and-ultra-broadband-internet>

2. Payment by bank transfer

Where it is not possible to make payment via the online system, select the option for offline payment to generate an invoice using the same link as above. Download the invoice to make a bank transfer to the ITU bank account shown below. Then send the proof of payment/copy of bank transfer slip and the invoice copy to Hcbmail@itu.int and copy the course coordinator. **All bank transaction fees must be borne by the payer.**

Failure to submit the above documents may result in the applicant not being registered for the training.

3. Group payment

Should you wish to pay for more than one participant using bank transfer and need one invoice for all of them, create an account as **Institutional Contact**. **Institutional Contacts** are users that represent an organization. Any student can request to be an institutional contact or to belong to any existing organization.

To do this, head to your profile page by clicking on the **“My account”** button in the user menu. At the bottom of this page you should see two buttons:

- a. If you want to **become an institutional contact**, click on the **“Apply to be an Institutional Contact”** button. This will redirect you to a small form that will ask for the organization name. After you fill the name of the organization you want to represent, click on **“continue”** and a request will be created. An ITU Academy manager will manually review this request and accept or deny it accordingly.
- b. If you want to **belong to an existing organization**, click on the **“Request to belong to an Institutional Contact”** button. This will redirect you to a small form that will ask you to select the organization you want to join from an organization list. After you select the correct organization, click on **“continue”**, a request will then be created. The Institutional Contact that represents that organization will manually accept or deny your request to join the organization.

ITU BANK ACCOUNT DETAILS:

Name and Address of Bank:	UBS Switzerland AG Case postale 2600 CH 1211 Geneva 2 Switzerland
Beneficiary:	Union Internationale des Télécommunications
Account number:	240-C8108252.2 (USD)
Swift:	UBSWCHZH80A
IBAN	CH54 0024 0240 C810 8252 2
Amount:	USD 150
Payment Reference:	CoE-19OI24244EUR-E-WBS No. P.40595.1.03

4. Other method of payment

If due to national regulations, there are restrictions that do not allow for payment to be made using options 1 & 2 above, please contact the ITU coordinator for further assistance.

CERTIFICATES

Each fully registered participant who will successfully complete the course, based on the evaluation, will receive an ITU Certificate after the course.