



Training Course Outline

ITU Centres of Excellence Network for Europe

ITU and Faculty of Electrical Engineering and Information Technologies in Skopje

Online Training Course on New Broadband Internet, Cloud Computing, IoT/AI and Future Services

31 May – 27 June 2022

Title	New Broadband Internet, Cloud Computing, IoT/AI and Future Services
Modality	Online Training Course
Dates	31 May - 27 June 2022
Duration	4 weeks
Registration deadline	30 May 2022
Training fees	USD 150
Description	<p>This course will focus on New Broadband Internet, Cloud Computing, IoT/AI and Future Services, including technologies, regulation and business aspects. It will cover broadband fixed and mobile Internet, including open Internet architecture and technologies (IPv4, IPv6, TCP, UDP, DNS), IP transport and IPXs, HTTP 2.0, WWW, KPIs and end-to-end QoS in fixed and mobile broadband, cybersecurity, new Internet 2030, as well as regulatory strategies for broadband Internet. Also, it will include future broadband access and cloud computing, including future metallic and cable access (MG.fast, DOCSIS 4.0), future FTTx optical access (ITU's NG-PONs), submarine cable, future satellite broadband, network slicing for fixed and 5G mobile, ITU's Cloud Computing architectures and service models, edge computing, as well as business and regulatory aspects of future broadband and clouds. Further, it will cover ITU's framework for Internet of Things (IoT), Web-based IoT, Big Data, ITU's framework for Artificial Intelligence (AI) and Machine Learning (ML), Intelligent IoT, Blockchain for IoT data, Quantum Internet, as well as business and regulatory aspects. Finally, the course will also include future telecom services (ITU's Network 2030), future TV and video/VR/AR, cloud native, telecom and OTT edge-cloud/IoT/AI services, future IoT/AI (Industrial IoT, Smart City, smart services), future OTT services (future Web, virtual desktop, cloud gaming, future social media), Open Internet vs. QoS/QoE, new digital economy and markets, as well as regulatory challenges for future telecom, cloud/IoT/AI and OTT services.</p>
Course code	22OI27815EUR-E

1. LEARNING OBJECTIVES

This course will focus on New Broadband Internet, Cloud Computing, IoT/AI and Future Services, including technologies, regulation and business aspects. It consists of 4 Modules, where each module lasts one week. Module 1 will cover broadband fixed and mobile Internet, including open Internet architecture and technologies (IPv4, IPv6, TCP, UDP, DNS), IP transport and IPXs, HTTP 2.0, WWW, KPIs and end-to-end QoS in fixed and mobile broadband, cybersecurity, new Internet 2030, as well as regulatory strategies for broadband Internet. Module 2 will include future broadband access and cloud computing, including future metallic and cable access (MG.fast, DOCSIS 4.0), future FTTH optical access (ITU's NG-PONs), submarine cable, future satellite broadband, network slicing for fixed and 5G mobile, ITU's Cloud Computing architectures and service models, edge computing, as well as business and regulatory aspects of future broadband and clouds. Further, Module 3 will cover ITU's framework for Internet of Things (IoT), Web-based IoT, Big Data, ITU's framework for Artificial Intelligence (AI) and Machine Learning (ML), Intelligent IoT, Blockchain for IoT data, Quantum Internet, as well as business and regulatory aspects. Finally, Module 4 will include future telecom services (ITU's Network 2030), future TV and video/VR/AR, cloud native, telecom and OTT edge-cloud/IoT/AI services, future IoT/AI (Industrial IoT, Smart City, smart services), future OTT services (future Web, virtual desktop, cloud gaming, future social media), Open Internet vs. QoS/QoE, new digital economy and markets, as well as regulatory challenges for future telecom, cloud/IoT/AI and OTT services.

2. LEARNING OUTCOMES

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

- Understand broadband fixed and mobile Internet, including architecture and technologies (IPv4, IPv6, TCP, UDP, DNS), IP transport and IPXs, HTTP 2.0, WWW, KPIs and QoS for fixed and mobile Internet, cybersecurity, and new Internet 2030;
- Understand future broadband access and cloud computing, including future metallic (MG.fast), cable (DOCSIS 4.0) and optical access (NG-PONs), submarine cable, future satellite broadband, ITU's cloud computing and models, and edge computing;
- Perform technical, business and regulatory analysis of future broadband access and cloud computing;
- Understand ITU's Internet of Things (IoT), Web-based IoT, Big Data, ITU's framework for AI/ML, Intelligent IoT, Blockchain for IoT data, and Quantum Internet;
- Understand future telecom services (Network 2030), future TV and video/VR/AR, cloud native, telecom and OTT edge-cloud/IoT/AI services, future IoT/AI, future OTT services, Open Internet vs. QoS/QoE, as well as new digital economy and markets;
- Perform technical, business and regulatory analysis of future telecom, cloud/IoT/AI and OTT services.

3. TARGET POPULATION

This course is targeted at managers, engineers and employees from regulators, government organizations, telecommunication companies and academia, who are interested in understanding, implementation and regulation of New Broadband Internet, Cloud Computing, IoT/AI and Future Services, including technologies, regulatory and business aspects. Other institutions and individuals that are dedicated in building their capacity related to New Broadband Internet, Cloud Computing, IoT/AI and Future Services are also welcome to participate.

4. ENTRY REQUIREMENTS

No prior knowledge or qualification is required to register for this course, considering the given target population.

5. 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	

6. TRAINING COURSE CONTENTS

The training contents are organized in 4 Modules, where each of the Modules is covering a given topic area with given contents, as shown in the table below:

Topic	Contents
Module 1: Broadband fixed and mobile Internet	<ul style="list-style-type: none">• Open Internet architectures• Main Internet technologies (IPv4/IPv6, TCP, UDP, DNS)• IPv6 addressing and implementation• IP transport networks and IP eXchange (IPX)• HTTP 1.1/2.0 and Web technology• KPIs and assessment of end-to-end QoS in fixed and mobile broadband Internet• Cybersecurity and privacy• New Internet 2030 and beyond• Regulatory trends and strategies for broadband Internet
Module 2: Future Broadband Access and Cloud Computing	<ul style="list-style-type: none">• Future metallic and cable access networks (MG.fast, DOCSIS 4.0)• Future FTTH/FTTx optical access (ITU's NG-PONs)• Carrier-grade Ethernet for telecoms• Submarine cable transport networks• Future satellite broadband access• Network slicing for future fixed and 5G mobile broadband• ITU's Cloud Computing architectures and service models (SaaS, PaaS, IaaS, NaaS, MLaaS, BaaS)• Edge computing• Business and regulatory aspects of future broadband and cloud computing

Topic	Contents
Module 3: Internet of Things, Big Data, and Artificial Intelligence	<ul style="list-style-type: none"> • ITU's framework for Internet of Things (IoT) • Web-based IoT • ITU's Big Data architectures and networking • ITU's architectural framework for Artificial Intelligence (AI) and Machine Learning (ML) • Future AI-based network service provisioning • IoT with Artificial Intelligence (Internet of Intelligent Things) • Blockchain for IoT data processing and management • Quantum Key Distribution (QKD) towards Quantum Internet • Business and regulatory/governance aspects of IoT, Big Data and AI
Module 4: Future Telecom, Cloud, IoT/AI and OTT Services	<ul style="list-style-type: none"> • Future Telecom services (ITU's Network 2030) • Future TV and video/VR/AR services • Cloud native telecom applications • Telecom and OTT edge-cloud/IoT/AI services • Future IoT/AI services (Industrial IoT, Smart City, smart services) • Future OTT services (future Web, virtual desktop, cloud gaming, future social media) • Open Internet vs. QoS and QoE • New digital economy and markets • Regulatory challenges for future telecom, cloud/IoT/AI and OTT services

7. TRAINING COURSE SCHEDULE

Week	Topic	Exercises and interactions
Week 1	Module 1: Broadband fixed and mobile Internet	Learning topics from course materials: <ul style="list-style-type: none"> • Open Internet architectures • Main Internet technologies (IPv4/IPv6, TCP, UDP, DNS) • IPv6 addressing and implementation • IP transport networks and IP eXchange (IPX) • HTTP 1.1/2.0 and Web technology • KPIs and assessment of end-to-end QoS in fixed and mobile broadband Internet • Cybersecurity and privacy • New Internet 2030 and beyond • Regulatory trends and strategies for broadband Internet
		Discussion / Forum
		Self test quiz
Week 2	Module 2: Future Broadband Access and Cloud Computing	Learning topics from course materials: <ul style="list-style-type: none"> • Future metallic and cable access networks (MG.fast, DOCSIS 4.0) • Future FTTH/FTTx optical access (ITU's NG-PONs)

Week	Topic	Exercises and interactions
		<ul style="list-style-type: none"> • Carrier-grade Ethernet for telecoms • Submarine cable transport networks • Future satellite broadband access • Network slicing for future fixed and 5G mobile broadband • ITU's Cloud Computing architectures and service models (SaaS, PaaS, IaaS, NaaS, MLaaS, BaaS) • Edge computing • Business and regulatory aspects of future broadband and cloud computing
		Discussion / Forum
		Self test quiz
Week 3	Module 3: Internet of Things, Big Data, and Artificial Intelligence	Learning topics from course materials: <ul style="list-style-type: none"> • ITU's framework for Internet of Things (IoT) • Web-based IoT • ITU's Big Data architectures and networking • ITU's architectural framework for Machine Learning (ML) • Future AI-based network service provisioning • IoT with Artificial Intelligence (Internet of Intelligent Things) • Blockchain for IoT data processing and management • Quantum Key Distribution (QKD) towards Quantum Internet • Business and regulatory/governance aspects of IoT, Big Data and AI
		Discussion / Forum
		Self test quiz
Week 4	Module 4: Future Telecom, Cloud, IoT/AI and OTT Services	Learning topics from course materials: <ul style="list-style-type: none"> • Future Telecom services (ITU's Network 2030) • Future TV and video/AR/VR services • Cloud native telecom applications • Telecom and OTT edge-cloud/IoT/AI services • Future IoT/AI services (Industrial IoT, Smart City, smart services) • Future OTT services (future Web, virtual desktop, cloud gaming, future social media) • Open Internet vs. QoS and QoE • New digital economy and markets • Regulatory challenges for future telecom, cloud/IoT/AI and OTT services
		Discussion / Forum
		Self test quiz and Final Evaluation

8. METHODOLOGY (Didactic approach)

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.

9. EVALUATION AND GRADING

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.

10. TRAINING COURSE COORDINATION

Course coordinator: Name: Prof. Dr. Toni Janevski Email address: tonij@feit.ukim.edu.mk	ITU coordinator: Name: Elind Sulmina Email address: elind.sulmina@itu.int
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11. 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>

The instructions for course registration and payment are given in a separate file, which accompanies this Training Course Outline.

12. CERTIFICATES

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