ITU CENTRES OF EXCELLENCE NETWORK FOR ASIA PACIFIC REGION

**Face to Face Training Course on
"Fifth Generation (5G) Technology, Opportunities and Challenges"
15-17 October 2019
Kuala Lumpur, Malaysia**

COURSE OUTLINE

COURSE DESCRIPTION

Title	**Fifth Generation (5G) Technology, Opportunities and Challenges**
Method of delivery	Face-to-face
Objectives	This course aims to equip participants with a multi-dimensional view of the IMT-2020, the term standardized in ITU for Fifth Generation telecommunication technology, from the perspective of technology, standards, regulation, policy, economy, society and environment. The specific objectives of the course are • To equip the participants with fundamental understanding of the key requirements, key capabilities and usage scenarios of 5G and the key innovations behind it. • To guide the participants to identify the various opportunities offered by 5G. • To provide awareness about the issues and challenges for 5G deployment.
Dates	15 - 17 October 2019
Duration	Three days
Registration deadline	30 September 2019
Training fees	International Participants: USD 550 per participant Local Participants: MYR 2,300 per participant
Course code	19WS24400ASP-E

LEARNING OUTCOMES

Upon completion of this training course, participants will be able to:
- describe the evolution of mobile communication leading to the introduction of 5G
- explain the key innovations in radio and network
- elaborate the standardisation process and timeline
- identify the spectrum requirements
- discuss key issues and challenges in 5G deployment
- improve awareness of the 5G initiatives and commercial progress
- understand the relationship between 5G and IoT
- analyse the fixed wireless access use case
- discuss the economic, social and environmental impacts.

TARGET POPULATION

Executives, managers, officials, engineers, employees from policy makers, regulators, government organisation, telecom operators, vertical industries, telecom investment companies, academia who are dealing with the planning, developing, and implementing 5G networks. Other institutions and individuals that are dedicated in building their capacity related to 5G Technology are also welcome to participate.

FACILITATOR/EXPERTS

The instructors for the training include Prof. Dr. Tharek Abd Rahman, Assoc. Prof. Dr. Chee Yen (Bruce) Leow, Mr. Tien Han Chua from UTM and industry experts from Ericsson.

EVALUATION

The assessment of the participants shall be based on the - time spent on the training and the following parameters:

Evaluation Parameter	Weightage (in %)
Post-Training Assessment	60 %
Attendance	20 %
Participation in Case Studies and Group Activities	20 %

The minimum passing requirement for certificate is 60%.

Day 1		
Time	**Topics**	**Scope**
8.00-9.00	Registration	
9.00-9.30	Pre-Training Assessment	
9.30-10.30	Evolution of cellular systems	• Evolution from 2G to 3G and 3G to 4G • Circuit Switch to Packet Switch • ITU Standardisation Process • The role of 3GPP in standardization • Evolution of LTE and releases
10.30-11.00	Tea Break	
11.00-12.30	Introduction to 5G	• Motivation for 5G • 5G IMT-2020 Vision and Requirements • Key Capabilities of 5G versus 4G • 5G usage scenario 1: Enhanced Mobile Broadband (EMB) • 5G usage scenario 2: Massive Machine Type Communication (MMTC) • 5G usage scenario 3: Ultra Reliable and Low Latency Communication (URLLC) • 5G Standardisation Timeline & Key Milestones
12.30-14.00	Lunch break	
14.00-15.30	Key Innovations in Radio Access	• Millimetre Wave • Massive MIMO • Waveform • Multiple Access • Cell Densification • Cloud radio access
15.30-16.00	Tea Break	
16.00-17.00	Key Innovations in Core Network	• Concept of Software Defined Networking • Concept of Network Function Virtualisation • Softwarisation and Virtualisation of 5G network • Network slicing to enable 5G verticals

Day 2		
Time	**Topics**	**Scope**
9.00-10.30	Massive Internet of Things	• 5G for Massive Machine Type Communication and Massive IoT • Spectrum and design requirement • Low Power Wide Area Technologies: Licensed and unlicensed. • Evolution of LTE towards NB-IoT and LTE-M • NB-IoT, LoRa, SigFox etc. • Industry adaption and future prospect
10.30-11.00	Tea Break	
11.00-12.30	5G Fixed Wireless Access (FWA)	• Motivation for 5G FWA for last mile • 5G FWA vs Fibre • Prospect of FWA as the 5G Use case • Challenges of 5G FWA • Case Study
12.30-14.00	Lunch Break	
14.00-15.30	Progress of 5G Standardisation	• Progress of international standardization • Role of ITU and 3GPP • 5G Phase 1 and Phase 2 • World Radiocommunication Conferences • Overview of 3GPP 5G non-standalone specification • Overview of 3GPP 5G standalone specification
15.30-16.00	Tea Break	
16.00-17.00	Spectrum Requirements for 5G	• Motivation for New Spectrum • mmWave Spectrum • Need of Low band, mid band and high band • Compatibility Studies • Standardisation of 5G Bands • WRC-19 and regional preparations • Spectrum licensing development worldwide
19.00-21.00	Social Event	• Group Dinner • Kuala Lumpur iconic landmarks sightseeing

Day 3		
Time	**Topics**	**Scope**
9.00-10.30	5G Initiatives and Key Issues to be Considered by Policy Makers	• Government-led 5G initiatives • 5G Initiatives in Malaysia • 5G Testbeds, trials, and use cases. • Investment Case • 4G network strategy and migration choices for 5G • Spectrum • Fibre investment and tax break • Access/Sharing of passive infrastructure • Access costs • Wayleave agreement
10.30-11.00	Tea Break	
11.00-12.00	Progress of Commercial 5G	• Commercial-led 5G initiatives • Pilot Trials and World Records • Pre-standard 5G network deployments around the world • 5G roll-out timeline: international & regional • Chipset and Device Ecosystem • Commercial 5G use cases
12.00-13.00	Guided tour to UTM-Ericsson Innovation Centre for 5G	Live show cases of 5G Enhanced Broadband, Massive IoT and Mission Critical applications @ Innovation Centre for 5G (IC5G)
13.00-14.00	Lunch Break	
14.00-15.00	Key Challenges in Rolling Out 5G	• Backhaul availability • Small Cell deployment challenges • Device availability • Spectrum • Coordination of industry verticals • Group Discussion and Case Study
15.00-15.30	Economy, Social and Environmental Impact of 5G	• Global Trends • Forecast of 5G economic values. • Social and environmental impact. • 5G as the enabler for industry revolution 4.0. • Estimated infrastructure roll out costs
15.30-16.00	Tea Break	
16.00-16.30	Conclusion	• Summary of 5G Technologies, Opportunities, and Challenges • Preview of research beyond 5G.
16.30-17.00	Post-Training Assessment	
End of Training Programme		

METHODOLOGY

The face-to-face training course will include:
- Instructor-led presentations,
- Case studies,
- Group discussions,
- Demonstrations

COURSE COORDINATION

ITU coordinator:

Mr. Ashish Narayan,
Program Coordinator, ITU Regional Office for Asia & the Pacific, 5th Floor, Thailand Post Training Centre,111 Chaengwattana Road, Laksi Bangkok 10210,Thailand
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Universiti Teknologi Malaysia's Coordinator

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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.

Training 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/fifth-generation-5g-technology-state-art-opportunities-and-challenges

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 550** per participant is applied for this training. Payments should be made via the online system using the link mentioned above for training registration at (https://academy.itu.int).

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 550
Payment Reference:	CoE-ASP- 19WS24400ASP-E- P.40593.1.10

4. Other Method of Payment

For local participants who would like to pay in local currency, training fee of **MYR 2,300** can be made directly to Universiti Teknologi Malaysia bank account as follow,

1.	Account Name: BENDAHARI UTM
2.	Account no: 8006053536
3.	Bank Name: CIMB Bank Berhad
4.	Payment Reference: Invoice Number (Kindly request local invoice from UTM secretariat).