

LONG TERM EVOLUTION (LTE) TECHNOLOGY SHORT COURSE SERIES

2015

1. LONG TERM EVOLUTION TECHNOLOGY (LTE)

17 to 20 MARCH 2015 | PROF. DR. THAREK & DR. BRUCE LEOW

2. LONG TERM EVOLUTION TECHNOLOGY – ADVANCED (LTA)

24 to 25 MARCH 2015 | PROF. DR. THAREK & DR. BRUCE LEOW

3. LTE RADIO FREQUENCY PLANNING & OPTIMISATION (RPO)

06 to 10 APRIL 2015 | PROF. DR. THAREK & MR. CHUA TIEN HAN

Registration CLOSING Date: **27 February 2015**

Official Training Venue:

Wireless Communication Centre (WCC-KL Branch),
Universiti Teknologi Malaysia,
Jalan Semarak, 54100 Kuala Lumpur

Jointly Organised by:

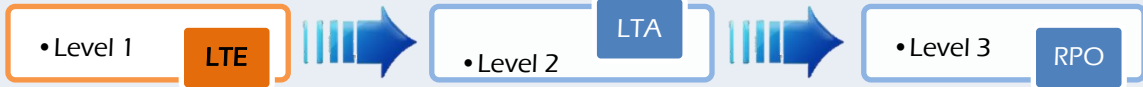


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LTE TECHNOLOGY COURSE OUTLINE

TITLE (CODE)	Long Term Evolution (LTE) Technology (LTE)
Programme Description	The programme focuses on 3GPP LTE Release-8 in terms of system architecture, air interface, MIMO, physical layer operation, radio protocol and connection life cycle. In addition to theories, participants will be exposed to live demonstrations to give the participants a better understanding of the state-of-the-art LTE technology.
Prerequisites	None – Recommendation 
Programme Objectives	The programme objectives are; I. To transfer the knowledge of current LTE technology to local telecommunications industry and academia II. To increase the technical competitiveness of engineers, researchers, managers, etc working in field of telecommunications.
Learning Objectives	At the end of the programme, participants are expected to be able; I. To explain the basic concept of cellular mobile system and LTE system. II. To understand the cellular system evolution from 2G to 4G
Targeted Audience	Engineers, researchers related to wireless communication technology and those in design, test, sales, marketing, system engineering, deployment and regulatory groups. (Maximum 25 participants only)
Programme Dates & Duration	17 to 20 March 2015 (4 Days)
Programme Fees	RM1000.00 per pax

LTE TECHNOLOGY COURSE OUTLINE

TIME	DAY 1	DAY 2	DAY 3	DAY 4
0830-0900	Registration	Registration	Registration	Registration
0900-1030	Session 1 - Introduction (Prof Dr Tharek Abd Rahman)	Session 5 - LTE Air Interface 2/2 (Prof Dr Tharek Abd Rahman)	Session 9 - LTE MIMO Antenna Systems (Prof Dr Tharek Abd Rahman)	Session 13 -LTE Radio Protocol Operation (Dr Leow Chee Yen)
1030-1100	Break			
1100-1300	Session 2 - Background on LTE (Prof Dr Tharek Abd Rahman)	Session 6 -Coexistence between LTE and other Wireless Technologies (Prof Dr Tharek Abd Rahman)	Session 10 - LTE Physical Layer Operation (Dr Leow Chee Yen)	Session 14 - LTE Connection Life Cycle (Dr Leow Chee Yen)
1300-1400	Lunch			
1400-1530	Session 3 - LTE Network Architecture (Prof Dr Tharek Abd Rahman)	Session 7 -LTE Signal Generation and Analysis [Demo 1/2] (Dr Leow Chee Yen)	Session 11 - LTE Physical Layer Operation and Data Rate Analysis [Demo] (Dr Leow Chee Yen)	Session 15 - Introduction to LTE Advanced Conclusions, Summary and Q&A (Prof Dr Tharek Abd Rahman)
1530-1600	Break			
1600-1730	Session 4 – LTE Air Interface 1/2 (Prof Dr Tharek Abd Rahman)	Session 8 - LTE Signal Generation and Analysis [Demo 2/2] (Dr Leow Chee Yen)	Session 12 - LTE MIMO and Physical Layer Operation Simulation [Demo] (Dr Leow Chee Yen)	Session 16 - Post Training Assessment (Prof Dr Tharek Abd Rahman and Dr Leow Chee Yen)
1730	Day 1 ends	Day 2 ends	Day 3 ends	Day 4 ends

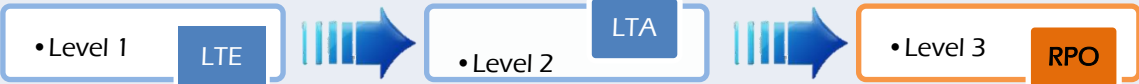
LTE TECHNOLOGY ADVANCED COURSE OUTLINE

TITLE (CODE)	Long Term Evolution (LTE) Technology – Advanced (LTA)
Programme Description	The short course focuses on the major enhancements of LTE technology specified in 3GPP LTE Release-10. Topics to be presented include higher-order MIMO, carrier aggregation, relaying, cooperative multi-point transmission and reception, and heterogeneous network.
Prerequisites	None – Recommendation 
Programme Objectives	The objective of the course is to; I. to transfer the knowledge of latest LTE-A technology to local telecommunication industry and academia. II. to increase the technical competitiveness of engineers, researchers, managers, etc working in the field of telecommunications.
Learning Objectives	At the end of the course, the participants are expected; I. to be able to explain the major enhancements of LTE technology II. to compare the differences between LTE and LTE-A
Targeted Audience	Engineers, researchers related to wireless communication technology and those in design, test, sales, marketing, system engineering, deployment and regulatory groups. (Maximum 25 participants only)
Programme Dates & Duration	24 to 25 April 2015 (2 Days)
Programme Fees	RM500.00 per pax

LTE TECHNOLOGY ADVANCED COURSE OUTLINE

TIME	DAY 1	DAY 2
0830-0900	Registration	Registration
0900-1030	Session 1 - Review of LTE Release 8 and 9 (Prof. Dr. Tharek Abd Rahman)	Session 5 - Carrier Aggregation Prof. Dr. Tharek Abd Rahman
1030-1100	Break	
1100-1300	Session 2 - Introduction to LTE Advanced and IMT-Advanced (Prof. Dr. Tharek Abd Rahman)	Session 6 - Relaying Dr. Leow Chee Yen
1300-1400	Lunch	
1400-1530	Session 3 - Architectural Enhancements: Home eNBs and HetNets Prof. Dr. Tharek Abd Rahman	Session 7 - Cooperative Multipoint Transmission and Reception Dr. Leow Chee Yen
1530-1600	Break	
1600-1730	Session 4 - Higher Order MIMO Prof. Dr. Tharek Abd Rahman	Session 8 – 5G Overview, Conclusions and Post-Training Assessment Prof. Dr. Tharek Abd Rahman and Dr. Leow Chee Yen
1730	Day 1 ends	Day 2 ends

LTE RADIO FREQUENCY PLANNING AND OPTIMISATION

TITLE (CODE)	Long Term Evolution (LTE) Radio Frequency Planning & Optimisation (RPO)
Programme Description	<p>This short course delivers the concepts and intensive hands-on training on radio frequency (RF) planning and optimization for 4G Long Term Evolution (LTE) network.</p> <p>The areas covered in the course include revision of LTE technology, concept and life cycle of RF planning and optimisation, digital cartography for RF planning, propagation mechanisms and propagation models, LTE coverage planning and coverage optimisation, LTE capacity planning and capacity optimisation, LTE frequency planning and frequency assignment, frequency reuse strategies, model tuning using measurement data, interference prediction, interference analyses and mitigation, and technology coexistence issues between LTE and other technologies. Propagation environment to be studied includes outdoor and indoor scenarios at rural and urban areas.</p> <p>The course will be conducted through classroom lectures & demonstrations, case studies discussion and hands-on exercises. The hands-on training sessions will be conducted using state-of-the-art commercial RF planning and optimisation software. Each participant will have their dedicated training workstation throughout the training. The participants will also have the opportunity to explore and try a wide range of high quality 3D (up to 2m resolution) and 2D (up to 5m resolution) digital cartography models.</p>
Prerequisites	<p>None – Recommendation;</p>  <pre> graph LR L1[•Level 1 LTE] --> L2[•Level 2 LTA] L2 --> L3[•Level 3 RPO] </pre>
Programme Objectives	<p>The objective of the course is to develop the participant's basic skills in LTE RF planning and optimization.</p>
Learning Objectives	<p>Upon completion of the training, the participant is expected to be able to:</p> <ol style="list-style-type: none"> describe the concept, requirements and , basic steps involved in RF planning and optimization for LTE network identify suitable digital cartography resolution and propagation model based on targeted propagation environment design and simulate basic LTE mobile network using RF planning and optimisation software perform basic analyses and troubleshooting on issues related to interference, network traffic, and technology coexistence
Targeted Audience	<p>RF network planner, Telecommunication engineers, Spectrum regulators, Researchers related to wireless communication technology. (Maximum 15 participants only)</p>
Programme Dates & Duration	<p>06 to 10 April 2015 (5 Days)</p>
Programme Fees	<p>RM1325.00 per pax (RM1250.00 + 6% GST)</p>

LTE TECHNOLOGY COURSE OUTLINE

TIME	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
0830-0900	Registration				
0900-1030	Session 1 – Radio Spectrum and Standards / Principles of Cellular Mobile Radio Network (Prof Dr Tharek Abd Rahman)	Session 5 – Principles of Radio Propagation / Propagation Mechanisms (Prof Dr Tharek Abd Rahman)	Session 9 – LTE Coverage Planning and Optimisation [Hands-On] (Chua Tien Han)	Session 13 – LTE Coexistence with other Technologies [Case Studies] (Prof Dr Tharek Abd Rahman)	Session 17 – Frequency Planning & Assignment [Hands-on] (Chua Tien Han)
1030-1045	Break				
1045-1300	Session 2 – Evolution of Cellular Mobile Radio System/ Revision on LTE Technology (Prof Dr Tharek Abd Rahman)	Session 6 – Propagation Mechanisms / Outdoor Propagation / Propagation Models for LTE [Hands-On] (Chua Tien Han)	Session 10 – LTE Coverage Planning and Optimisation [Hands-On] (Chua Tien Han)	Session 14 – Interference Prediction and Analyses for LTE [Hands-On] (Chua Tien Han)	Session 18 – Frequency Planning & Assignment [Hands-on] (Chua Tien Han)
1300-1400	Lunch				
1400-1530	Session 3 – Principles of RF Planning and Optimisation/ Digital Cartography for RF Planning (Chua Tien Han)	Session 7 – Antenna System for LTE (Prof Dr Tharek Abd Rahman)	Session 11 – LTE Coverage Planning and Optimisation [Hands-On] (Chua Tien Han)	Session 15 – Interference Prediction and Analyses for LTE [Hands-On] (Chua Tien Han)	Session 19 – Introduction to 5G (Prof Dr Tharek Abd Rahman)
1530-1545	Break				
1545-1730	Session 4 – Introduction to RF Planning Tool / Selecting and using Digital Cartography for RF Planning [Hands-On] (Chua Tien Han)	Session 8 – Antenna System for LTE / Indoor Propagation for LTE (Chua Tien Han)	Session 12 – LTE Coverage Planning and Optimisation [Hands-On] (Chua Tien Han)	Session 16 – LTE Capacity Planning and Optimisation [Hands-On] (Chua Tien Han)	Session 20 – Post-Training Assessment [Hands-On] (Chua Tien Han)
1730	Day 1 ends	Day 2 ends	Day 3 ends	Day 4 ends	Day 5 ends (End of Programme)

PROGRAMME LEADERS



Prof. Dr. Tharek A. Rahman currently is a professor in wireless communication at faculty of electrical engineering, Universiti Teknologi Malaysia. He obtained his BSc (Hons) (Electrical Engineering) from University of Strathclyde in UK, MSc in Communication Engineering from UMIST, Manchester in UK and PhD in Mobile Communication from University of Bristol, UK.

He is the Director of Wireless Communication Centre (WCC), Faculty of Electrical Engineering, Universiti Teknologi Malaysia and currently conducting research related to 4G for mobile communications, satellite communications, antenna and propagation. He has also conducted various short courses related to mobile and satellite communication to the telecommunication industry and government agencies since 1988. Prof. Tharek has published more than 200 scientific papers in journals and conferences and obtained many national and international awards. He is also a consultant for many communication companies and an active member in several research academic entities.

Prof. Dr. Tharek may be contacted at tharek@fke.utm.my



Dr. Leow Chee Yen, Bruce obtained his B.Eng. degree in Computer Engineering from Universiti Teknologi Malaysia (UTM) in 2007. Since July 2007, he has been an academic staff in the Faculty of Electrical Engineering, UTM. In 2011, he obtained a Ph.D. degree from Imperial College London.

He is currently a senior lecturer in the faculty and a member of the Wireless Communication Centre (WCC), UTM. His research interest includes but not limited to wireless relaying, MIMO, linear precoding, multi-user networks, physical layer security, convex optimisation, communications theory and Long-Term Evolution.

Dr. Bruce Leow may be contacted at bruceleow@fke.utm.my



Mr. Chua Tien Han received both the B.Sc. (Honours) degree in Electrical Engineering (First Class) and the Master of Engineering in Wireless Engineering from the Universiti Teknologi Malaysia (UTM) in 2003 and 2007, respectively.

Tien Han was a Tutor (2005-2007) and then a Lecturer (2007- present) at the Wireless Communication Centre, Faculty of Electrical Engineering, Universiti Teknologi Malaysia. He is currently pursuing his PhD degree at the Computer Laboratory, University of Cambridge, UK. His research interests include broadband fixed wireless access systems, radio propagation, channel modelling and measurement.

Mr. Chua may be contacted at thchua@fke.utm.my