

# **MASTER OF ENGINEERING (WIRELESS COMMUNICATION AND NETWORK)**

## **PROGRAMME SPECIFICATIONS**

This programme aims to produce professionals with advanced knowledge and skills in the field of Wireless Communication and Network in line with the development of today's communications technology. The program will also provide exposure in entrepreneurship and sustainability in technology and engineering to further contribute to the generation of talent and transformation leaders according to the current needs of the country. In addition, there are opportunities for students to pursue studies leading to a Ph.D. degree in the field relevant to this programme.

### **Program Educational Objectives (PEO)**

- PEO1 Mastery of knowledge and competency in advanced areas of Wireless Communication and Network engineering field.
- PEO2 Professionalism and high standards of ethical conducts within organization and society.
- PEO3 Responsive to changing situations by continuously acquiring new knowledge and skills.

### **Program Learning Outcomes (PLO)**

- PLO1 Attain advanced knowledge on theories, methods and applications related to Wireless Communication and Network engineering field.
- PLO2 Demonstrate mastery in conducting research independently in solving problems related to Wireless Communication and Network Engineering through relevant analytical methods, simulations and/or experiments.
- PLO3 Synthesize engineering knowledge through design and development.
- PLO4 Plan and perform research undertakings responsibly, professionally and ethically.
- PLO5 Communicate and express knowledge and ideas effectively.
- PLO6 Continue life-long learning and apply technology for the betterment of humanity.

## GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the course are not allowed to graduate.

NO.	CODE	COURSE	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (✓) IF PASSED
<b>MASTER OF ENGINEERING (WIRELESS COMMUNICATION AND NETWORK )</b>					
<b>SCHOOL COMPULSORY-15 CREDITS (5 COURSES)</b>					
1	MKET 1513	Sustainable Design, Engineering & Management	3	3	
2	MKET 1523	Internet of Things Technologies	3	3	
3	MKET 1423	Wireless Communication Systems	3	3	
4	MKET 1313	Communication and Computer Networks	3	3	
5	MKET 1433	RF/Microwave and Antenna Design	3	3	
<b>SCHOOL ELECTIVES-9 CREDITS (3 COURSES)</b>					
6	MKET 1323	Broadband Multimedia Networks	3	3	
7	MKET 1383	Satellite Communication	3	3	
8	MKET 1393	Network Modeling & Performance	3	3	
9	MKET 1413	Advanced Digital Communications	3	3	
10	MKET 1533	Computer and Network Forensics	3	3	
11	MKET 1543	Advanced Antenna Design	3	3	
12	MKET 1553	Microwave and Millimeter Wave System Design	3	3	
13	MKET 1563	Advanced Optical Fiber Communication	3	3	
14	MKET 1573	Optical Communication Networks	3	3	
15	MKET 1583	Entrepreneurship for Telecommunication Industry	3	3	
<b>FREE ELECTIVES FROM MKEL/MKEM/MKEP/MKET-3 CREDITS (1 COURSE)</b>					
16	MKEEx 1xxx		3	3	
<b>MASTER'S PROJECT-10 CREDITS (2 COURSES)</b>					
17	MKET 1814	Research Project Proposal	4	4	
18	MKET 1826	Research Project Report	6	6	
<b>TOTAL CREDIT OF ELECTRICAL ENGINEERING COURSES (a)</b>			<b>37</b>	<b>37</b>	
<b>SCHOOL/UNIVERSITY COMPULSORY- 6 CREDITS (2 COURSES)</b>					
19	MKEU 0013	Introduction to Research Methodology in Electrical Engineering	3	3	
20	Uxxx xxx3	Non-technical subject	3	3	
<b>TOTAL CREDIT OF SCHOOL/UNIVERSITY COMPULSORY COURSES (b)</b>			<b>6</b>	<b>6</b>	
<b>TOTAL CREDIT TO GRADUATE (a + b)</b>			<b>43</b>	<b>43</b>	

## **COURSE SYNOPSIS**

### **CORE COURSES**

#### **MKET 1313 - Communication and Computer Networks**

This course will enhance the students' knowledge on communication and computer network. It explains the advance concept of network layers, protocols, interfacing and inter-working between computer networks and network devices in telecommunication systems. The students will be taught with the various possible techniques to understand the modern networks for wired and wireless services.

#### **MKET 1423 - Wireless Communication Systems**

This course introduces students to introductory and advanced level of wireless communication technologies. In the beginning students will be presented with the concept of wireless communication systems and mobile radio propagation. Students will then be illuminated on MIMO technology in mobile communication. Next, the course will describe on cellular concepts that will include small cell networks. This is followed by details on the overall evolution of mobile communication system. Finally, this course will cover on different multiple access techniques used in wireless communication systems.

#### **MKET 1433 - RF/Microwave and Antenna Design**

This course introduces students to the concept and advanced level of RF/Microwave passive and antenna circuit designs. In the beginning students will be introduced to the concept of transmission line and S Parameter in RF/Microwave Engineering. The analysis of the circuit design is based on the S parameter concept. The matching technique of the RF/Microwave design is based on the Smith Chart. Then, the design of each passive components such as matching network, coupler, divider and filter will be introduced and the analysis of this design will be using the RF simulation tools. The properties of the antenna will be introduced in the next section. The design of microstrip and microwave antenna will be discussed and analyzed through RF simulation tools.

#### **MKET 1513 - Sustainable Design, Engineering & Management**

The aim is to give students an insight and understanding of the environmental and sustainability challenges that are facing by Communication Engineers and how these have given rise to the practice of Sustainable Design, Engineering and Management. The objective of this course is to provide a comprehensive overview of the nature and causes of the major environmental problems facing our planet, with a particular focus on energy, Life Cycle Assessment (LCA) and green technology. Students will also experience conducting case studies and project-based learning encompassing four themes in sustainability which are connecting, conceptualizing, valuing and implementing.

#### **MKET 1523 - Internet of Things Technologies**

The course provides students with a technical background to the Internet of Things (IoT) which includes its concept, architecture and applications. It also gives the underlying communication protocols and technologies. The course has a significant practical element that will be delivered during lab sessions in which students are expected to complete exercises involving system design, device programming and cloud development.

## **ELECTIVE COURSES**

### **MKET 1323 Broadband Multimedia Networks**

This course introduces the basics of multimedia communication systems and services. Students will be familiarized with the underlying theory, concepts and principles of multimedia communication system and the practicality in the current and future IP based network. The topics include the introduction to the concept of multimedia communication model and elements of multimedia communication systems. An overview of the recent trend in multimedia communication system development will be given. The students will be given a comprehensive understanding on multimedia processing in communication, distributed multimedia systems, multimedia communication standards and multimedia communications across networks. The emphasis will be on multimedia communication on next generation IP based network. Finally, the students will be exposed with the various multimedia applications including VOIP, VOD, IPTV etc.

### **MKET 1383 Satellite Communication**

This course introduces students to introductory and advanced level of satellite communication. In the beginning students will be introduced to the concept of satellite communication systems. Then the orbit mechanic concepts which include look angle and orbit determination. This topic will be extended to the satellite subsystems, link design and propagation effects. The topic of satellite system will include VSATS, satellite broadcasting for TV and radio and Global Position System.

### **MKET 1393 Network Modeling & Performance**

Network performance and modeling is important in estimating the performance of a particular event in a network. This course introduces the students to the techniques in network modeling and discrete event simulation. Students will also learn queuing analysis and telecommunication system.

### **MKET 1413 Advanced Digital Communications**

This course provides fundamental concepts in the analysis and design of digital communication system. Main topics to be covered are introduction to information theory, signal space analysis, digital modulation/demodulation over AWGN channel, baseband transmission over bandlimited channel, channel coding, error control coding. Finally, the system trade-off in designing a digital communication system in AWGN channel is explored.

### **MKET 1533 Computer and Network Forensics**

The knowledge of computer and network forensics has become essential in securing today's network-centric computing environment. This course will give the students both the fundamental knowledge and hands-on practice on computer and network forensics. Upon completing this course, the students are expected to understand the basics of computer and network forensics, to be well-trained as next-generation cyber-crime investigators, and to be prepared for active research at the forefront of these areas.

### **MKET 1543 Advanced Antenna Design**

This course introduces students to the concept and advanced level of antenna design. In the beginning students will be introduced to the fundamental concept of antenna. The properties and the analysis of the antenna will be introduced. The design of filtering antenna,

reconfigurable antenna, smart antenna and metamaterial antenna will be introduced and thoroughly discussed. Finally, the antenna measurement setup is explained.

### **MKET 1553 Microwave and Millimeter Wave System Design**

The aim of this course is to introduce the theories, concepts and design of microwave and millimeterwave system. The properties of the devices will be discussed including substrate materials, surface wave phenomena and analytical methods for discontinuity effect. Design of devices concerning front-end system such beam-forming network utilizing three different technologies, which are planar, waveguide and substrate integrated waveguide (SIW). In RF MEMS, switches for millimeterwave will be covered. Fabrication technique will be then introduced as well as analysis and measurement.

### **MKET 1563 Advanced Optical Fiber Communication**

The aim of this course is to equip students with knowledge on advanced optical fiber communications. It starts with an extensive introduction to the development history of optical communications. The main components and modules required for the implementation of optical communication network is then explored. The course then explores the theoretical and practical aspect of signal propagation through an optical fiber. Factors affecting the signal quality along the optical fiber are then covered which include studying the various noise sources and the way they affect the signal quality. Advanced modulation techniques and detection system employed for achieving high spectral efficiency will be covered next. The course will be concluded looking at the recent trends in advanced optical network.

### **MKET 1573 Optical Communication Networks**

This course offers students the essential aspects of optical networking which is the key for today's high-speed data transportation technology. It commences with the underlying fiber optic link design and the basic optical components needed for point-to-point links and interchange nodes. The basic principles of operation of optical transmitters, detectors, amplifiers, multiplexers, filters, couplers, isolators, wavelength converters and optical cross connects will be described. The remainder of this course will emphasis on the transport/networking protocols that are run on optical layer such as SONET/SDH, IP, ATM, Storage Area Networks and Gigabit Ethernet. Other topics that will be covered include network design, control and management, and network deployment in various network domains from access to metro and core networks. At the end of the course, students should be able to critically design an optical network at given specification using suitable programming software.

### **MKET 1583 Entrepreneurship for Telecommunication Industry**

The course entrepreneurship for telecommunication engineers is an integrative course on the basics of entrepreneurship in the telecommunication engineering industry. The importance of the telecommunications sector in the domestic and global economy has dramatically increased in recent years and is expected to grow further. This unique course offers students the opportunity to bring telecommunication engineering knowledge and idea into the business setting. It commences with the concepts and practices of entrepreneurial thinking and entrepreneurship. It also focuses on the in-depth understanding of aspects as idea generation, forming start-up, business plan, marketing and markets, and entrepreneurial finance. Using lectures, guest lecturers, case studies, business plans and presentations, the course teaches the skills in entrepreneurial that can be used in starting telecommunication companies or executing R&D projects in companies. Topics include on national and international

communication networks, policies and regulations, and global trends in technology and market reforms of telecommunication industry.