Module Name: Network Planning and Operations

Module Acronym: NPO

Module Manager: Andy Valdar

Course Summary:
This module investigates how modern communication networks – both fixed and mobile – are planned and operated. This begins with considering the network strategy at a long-term strategic then medium-term level. Emphasis is placed on the multilevel nature of today’s communications networks and the interconnection between constituent networks. The process for creating the necessary investment programmes for networks is examined, including considering the forecasting and dimensioning of Access, Core and Mobile networks. Then, the operational aspects of running networks are considered in terms of management, network performance and customer-perceived quality of service. The module includes a number of real-life network planning and operations case studies using visiting speakers from the industry.

Learning Outcomes:
At the end of the course, students should be able to:

- Analyse modern large scale network into their component networks;
- Determine the most appropriate forecasting technique for particular types of service and market conditions.
- Develop a network strategy for upgrading an existing network or the build of a new network, taking due consideration of the company’s objectives, service, and operational requirements.
- Judge the optimum balance between cost and network performance recognising service requirements.
- Devise the optimum network conversion strategy for the introduction of new networks, like NGN.
- Select the appropriate technology for broadband deployment in the Access Network.
- Outline the process and techniques for planning the deployment of a mobile network, including coverage and capacity planning;
- Describe the principles of design and dimensioning of circuit-switched networks, and the core transmission network.
- Describe the principles of data network planning.
- Construct a plan for the management of the operations of a modern communications network.
Identify the main drivers of subscriber-perceived quality of service (QoS) and show the linkage between network structures, technology and the achieved QoS.

**Course Content**

**Introduction to Networks**  
Principles of telecoms networks  
Call routeing  
Teletraffic for circuit switched and packet networks  
The various telecoms networks  
Multi-network models

**Network Strategy & Planning**  
Network Vision;  
Architecture;  
Technology strategy  
Network strategy  
The planning process  
The multi-layered network model  
Network planning and programmes  
Simple example of planning & dimensioning  
Implementation of new networks & conversion strategies

**Forecasting**  
Need for forecasting;  
Forecasting techniques  
Strengths & weaknesses of different techniques

**Access Network Planning and Evolution**  
The nature of the Access network  
Access network requirements - service and physical  
Key service requirements for Broadband  
Copper access network structure  
Copper access network planning  
Optical fibre access systems  
Radio access systems

**Core Transport Planning**  
Transport network technologies  
Transport networks architectures  
Transport network resilience (MS-SPRings),  
Transport network planning

**Mobile Network Planning**  
Cellular network concepts
Architecture of GSM
Radio planning
Coverage and propagation modelling
Traffic dimensioning
Capacity planning
W-CDMA dimensioning and planning

**Data Network Planning**
Need for data platforms,
The Internet
Planning aspects of data platforms:
Planning IP networks

**Network Performance Planning**
Introduction to performance planning
Apportionment of impairments (loudness, stability, echo, delay, error, noise, availability)
Network interconnect aspects
Packet network performance
Network integrity
Network resilience

**Basics of Quality & Quality of Service**
Definition of QOS and relationship to network performance
Model of customer perception
Frameworks and methods for establishing the required QoS parameters for individual services.
Effect of the move to data platforms

**Network Operations**
The range of network operations
The commercial management of operations
Call centres
Managing technician field forces
Network management centres
Operation support systems

**Assessment:**
By assignment; students will have between 5 to 6 weeks after the lectures to research and produce an independent assignment. The topic for the assignment will usually reflect current
challenges facing the development modern communications networks for tomorrow’s rapidly evolving ICT market place. It is expected that the research and write up of the assignment report will take around 75 hours.

**Tutorials/Workshops:**
A two-hour tutorial to focus the material and concepts studied towards the assessment and to provide an understanding of the assessment requirements through eg outline worked examples.

**Guest Speakers:**
Where possible, guest speakers from the industry are invited to give practical insight into aspects of the planning and operations roles for a network operator.