






Diploma in Routing (111) – Introduction to Telecommunications

Prerequisites: Knowledge in Windows operating system.	Corequisites: A pass or higher in Certificate in Networking or equivalence.
<p>Aim: This course is aimed at high calibre candidates wishing to pursue a career in telecommunication industry . This prestigious programme is strongly linked to industrial requirements and graduates of this course are highly regarded in the Telecommunications industry. There is exceptionally strong industry demand for engineers with telecommunications knowledge, yet there is a clear shortage of supply. The course deals with systems related to telecommunications, communications technology and the next generation of IP support networks, the transmission of voice, video and digital data through wired and wireless technology. The course provides an in-depth investigation of fundamental telecommunications concepts and terminology. It also reviews the physical layer concepts used for voice and data communications common to all modern telecommunication networks. This is followed by application of these concepts to the structure and operation of communication systems. Topics range from the structure and operation of such telecommunication systems as the Internet, the PSTN and wireless systems to fundamental terminology and technical concepts in telecommunications. Focus is on decibels, noise analysis, link budgets, AM modulation, angle modulation, line coding, digital modulation and similar physical layer concepts. Systems for analysis include CATV, cellular wireless, WLAN, satellite systems, internet networking and related voice and data networks. Telecommunications technicians service and install equipment for Internet, telephone, wireless and television service in homes and businesses. Due to constantly changing technology, telecommunications technicians need to continually learn new skills and technologies. Telecommunication technicians install, repair and maintain wired and wireless networks for residential and commercial clients. These networks can include Internet, television and voice systems. Telecommunication engineers design, develop, test and maintain computer software programs, computer networks, wireless networks, satellite systems, telephone systems and Internet fiber optic systems.</p>	
Required Materials: Recommended Learning Resources.	Supplementary Materials: Lecture notes and tutor extra reading recommendations.
<p>Special Requirements: The course requires a combination of lectures, demonstrations, discussions, and hands-on labs.</p>	
<p>Intended Learning Outcomes:</p> <ol style="list-style-type: none"> Demonstrate how telecommunications technologies including development of the PSTN, Cable, Mobile and Internet worlds are leveraged into business opportunities. Describe the standards specific to the reliable delivery and management of telecommunications and the protocols and processes that mediate exchange of information. Demonstrate what is network communication entails, the meaning, the attributes of network communication, its advantages and 	<p>Assessment Criteria:</p> <ol style="list-style-type: none"> 1.1 Explore ATM basics 1.2 Analyse ATM physical characteristics 1.3 Outline E carrier telecommunication system 1.4 Describe ISDN standards and services 1.5 Describe VOIP technology, protocols, advantages and how it operates 1.6 Outline fibre optic data transmission communications 2.1 Define Erlang unit 2.2 Explore the IP Multimedia Subsystem (IMS) architecture 2.3 Describe Mobile IP applications 2.4 Describe functions of Session Initiation Protocol (SIP) 3.1 Outline Ethernet network topologies 3.2 Explore the RS232 serial interface communications standards

disadvantages	3.3	Describe the RS422 specification
	3.4	Describe the RS449 data communication standards
	3.5	Explore RS485 standard applications
	3.6	Describe the USB evolution and standards
	3.7	Explore the 20mA current loop technology
	4.1	Define the PSTN, subscriber and phone companies
4. Describe the network of telephone lines, fiber optic cables, microwave transmission links, cellular networks, communications satellites, and undersea telephone cables, all inter-connected by switching centers, thus allowing any telephone in the world to communicate with any other.	4.2	Outline PSTN customer premise equipment
	4.3	Outline PSTN central office equipment
	4.4	Analyse PSTN calling areas and exchange
	4.5	Discuss the history of PSTN technology
	4.6	Define Switched Multi-Megabit Data Services (SMDS) specifications
	4.7	Outline X.25 technology
	4.8	Outline Frame Relay technology
	4.9	Compare and contrast Plesiosynchronous Digital Hierarchy (PDH) vs Synchronous Digital Hierarchy (SDH)
	4.10	Discuss Signalling System 7 (SS7/C7)
5. Describe the family of technologies that provide internet access by transmitting digital data over the wires of a local telephone network.	5.1	Define Digital Subscriber Lines (DSL)
	5.2	Outline xDSL system reference model
	5.3	Explore xDSL types
	5.4	Describe ADSL standards and features
6. Describe a set of protocols which allow Ethernet traffic to be carried over synchronous digital hierarchy networks in an efficient and flexible way.	6.1	Discuss Ethernet history
	6.2	Explore HDLC
	6.3	Describe PPP
	6.4	Define SONET/SDH
	6.5	Describe Virtual Concatenation (VCAT)
	6.6	Explore Link Capacity Adjustment Scheme (LCAS) standard
	6.7	Outline Packet over Sonet (POS) architecture
	6.8	Describe Link Access Protocol over SDH technology
	6.9	Explore Generic Frame Procedure (GFP) architecture
7. Demonstrate how the functional elements defined by ITU-T G.805 allow a description of circuit switched network connections through a multi-layer network.	7.1	Define network modes
	7.2	Explore characteristics information
	7.3	Describe network connection types
8. Describe how Layer 2 switching and Layer 3 routing have combined the internetworking infrastructure to form the powerful Layer 3 switching architecture. Analyse Layer 3 switching from both a functional and an operational perspective.	8.1	Describe IP routing
	8.2	Explore IPv4 header
	8.3	Identify router functions
	8.4	Describe IP forwarding algorithm
	8.5	Explore lookup table algorithm
	8.6	Define Multiple Protocol Label Switching (MPLS)
	8.7	Explore MPLS forwarding methodology
	8.8	Analyse MPLS control procedures
	8.9	Outline MPLS applications

	8.10	Describe Quality of Service (QoS)
	8.11	Outline Operations Administration and Maintenance (OAM) tools
	8.12	Define automatic protection switching
9. Explore the development of a variety of high-speed optical transmission systems for implementing ring networks that meet the needs of large-capacity backbone networks.	9.1	Outline Passive Optical Network (PON) architecture
	9.2	Outline PON types
	9.3	Describe types of fibre optic
	9.4	Define Synchronous Optical Network (SONET)
	9.5	Outline SONET architecture
	9.6	Describe Time Division Multiplex (TDM) technology
10. Demonstrate how Voice over Packet (VOP) application meets the challenges of combining legacy voice networks and packet networks by allowing both voice and signaling information to be transported over the packet network.	10.1	Explore voice Digital Signal Processor (DSP)
	10.2	Analyse speech compression
	10.3	Explore speech recognition tasks
	10.4	Analyse VoX
	10.5	Describe how the consolidation of separate voice and data networks offers an opportunity for significant savings.
	10.6	Demonstrate how Voice over Packet provides the Interworking Function (IWF)
11. Describe how different technologies such as GSM, CDMA, TDMA, and I-Den. GSM and CDMA are supported by most carriers.	11.1	Explore 3G High Speed Packet Access (HSPA)
	11.2	Outline 3G Long Term Evolution (LTE)
	11.3	Discuss 4G Long Term Evolution
	11.4	Explore Assisted Global Positioning System (A-GPS) technology
	11.5	Outline concepts of Mobile Phone and Cellular Telecommunication technologies
	11.6	Explore Code Division Multiple Access (CDMA) protocol
	11.7	Identify cellular phone conformance testing techniques
	11.8	Analyse wireless cellular signal booster aspects
	11.9	Outline General Packet Radio Service (GPRS)
	11.10	Compare and contrast GSM vs EDGE vs CDMA vs TDMA
	11.11	Explore video for mobile phones
	11.12	Analyse Ultra Mobile Broadband technology

**Recommended Learning Resources:
Introduction to Telecommunications**

Text Books	<ul style="list-style-type: none">• Fundamentals of Telecommunications by Roger L. Freeman ISBN-10: 0471296996• Fundamentals of Telecommunication Networks by Tarek N. Saadawi and Mostafa H. Ammar ISBN-10: 0471515825• Fundamentals of Telecommunications Network Management by Lakshmi G. Raman ISBN-10: 0780334663
Study Manuals 	BCE produced study packs
CD ROM 	Power-point slides
Software 	None

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