Level 5 Diploma in Routing (111) 141 Credits

Unit: Introduction to Telecommunications **Exam Paper No.:** 5	**Guided Learning Hours:** 220 **Number of Credits:** 22
Prerequisites: Knowledge in Windows operating system.	**Corequisites:** A pass or higher in Certificate in Networking or equivalence.
Aim: As networking and telecommunications are very much inter-related; this unit is aimed at high calibre learners wishing to make the most and be distinguishable by incorporating these emerging technologies. This prestigious topic is strongly linked to industrial requirements and holders of this unit 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 unit 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 unit 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 fibre optic systems and television service in homes and businesses.	
Required Materials: Recommended Learning Resources.	**Supplementary Materials:** Lecture notes and tutor extra reading recommendations.
Special Requirements: The unit requires a combination of lectures, demonstrations, discussions, and hands-on labs.	

Intended Learning Outcomes:	**Assessment Criteria:**
1. How telecommunications technologies including development of the PSTN, Cable, Mobile and Internet worlds are leveraged into business opportunities.	1.1 Define and describe ATM network structure 1.2 Analyse ATM physical characteristics 1.3 Outline E carrier telecommunication system 1.4 Describe ISDN standards and broadband services 1.5 Describe VOIP technology, protocols, advantages and how it operates 1.6 Outline fibre optic data transmission communications
2. The standards specific to the reliable delivery; management of telecommunications; the protocols and processes that mediate exchange of information.	2.1 Define Erlang unit 2.2 Examine and describe the IP Multimedia Subsystem (IMS) architecture 2.3 Describe Mobile IP applications 2.4 Describe functions of Session Initiation Protocol (SIP)
3. What network communication entails, the meaning, the attributes of network communication, its advantages and disadvantages.	3.1 Outline Ethernet network topologies 3.2 Describe the RS232 serial interface communications standards 3.3 Describe the RS422 specification 3.4 Describe the RS449 data communication standards 3.5 Outline RS485 standard applications 3.6 Describe the USB evolution and standards 3.7 Describe the 20mA current loop technology
4. Examining 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	4.1 Define the PSTN, subscriber and phone companies 4.2 Outline PSTN customer premise equipment 4.3 Outline PSTN central office equipment 4.4 Analyse PSTN calling areas and exchange 4.5 Analyse the history of PSTN technology

telephone in the world to communicate with any other.	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 Describe Signalling System 7 (SS7/C7)
5. Understand 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 Describe xDSL types 5.4 Describe ADSL standards and features 5.5 Describe set of protocols which allow Ethernet traffic to be carried over synchronous digital hierarchy networks in an efficient and flexible way 5.6 Discuss Ethernet history 5.7 Define and describe HDLC 5.8 Describe PPP 5.9 Define SONET/SDH 5.10 Describe Virtual Concatenation (VCAT) 5.11 Explore Link Capacity Adjustment Scheme (LCAS) standard 5.12 Outline Packet over Sonet (POS) architecture 5.13 Describe Link Access Protocol over SDH technology 5.14 Describe the Generic Frame Procedure (GFP) architecture
6. How the functional elements defined by ITU-T G.805 allow a description of circuit switched network connections through a multi-layer network.	6.1 Define network modes 6.2 Explain characteristics of information 6.3 Describe network connection types 6.4 Describe the functional architecture of transport networks 6.5 Explain SDH layer network 6.6 Analyse architectural features used to enhance availability of a transport network
7. Layer 2 switching and Layer 3 routing have combined the internetworking infrastructure to form the powerful Layer 3 switching architecture.	7.1 Describe IP routing 7.2 Outline and identify IPv4/IPv6 header 7.3 Identify router functions 7.4 Describe IP forwarding algorithm 7.5 Examine and evaluate lookup table algorithm 7.6 Define Multiple Protocol Label Switching (MPLS) 7.7 Describe MPLS forwarding methodology 7.8 Analyse MPLS control procedures 7.9 Outline MPLS applications 7.10 Describe Quality of Service (QoS) 7.11 Outline Operations Administration and Maintenance (OAM) tools 7.12 Define automatic protection switching 7.13 Analyse Layer 3 switching from both a functional and an operational perspective.
8. Understand the development of a variety of high-speed optical transmission systems for implementing ring networks that meet the needs of large-capacity backbone networks.	8.1 Outline Passive Optical Network (PON) architecture 8.2 Outline PON types 8.3 Describe types of fibre optic 8.4 Define Synchronous Optical Network (SONET) 8.5 Outline SONET architecture 8.6 Describe Time Division Multiplex (TDM) technology

9. 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.	9.1 Describe voice Digital Signal Processor (DSP) 9.2 Analyse speech compression 9.3 Describe speech recognition tasks 9.4 Analyse VoP architecture 9.5 Describe how the consolidation of separate voice and data networks offers an opportunity for significant savings. 9.6 Demonstrate how Voice over Packet provides the Interworking Function (IWF)
10. How different technologies such as GSM, CDMA, TDMA, and I-Den. GSM and CDMA are supported by most carriers.	10.1 Define and describe 3G High Speed Packet Access (HSPA) 10.2 Outline 3G Long Term Evolution (LTE) 10.3 Discuss 4G Long Term Evolution 10.4 Describe Assisted Global Positioning System (A-GPS) technology 10.5 Outline concepts of Mobile Phone and Cellular Telecommunication technologies 10.6 Describe Code Division Multiple Access (CDMA) protocol 10.7 Identify cellular phone conformance testing techniques 10.8 Analyse wireless cellular signal booster aspects 10.9 Outline General Packet Radio Service (GPRS) 10.10 Compare and contrast GMS vs EDGE; CDMA vs TDMA 10.11 Analyse and identify video for mobile phones 10.12 Analyse Ultra Mobile Broadband technology
Methods of Evaluation: A 2½-hour written examination paper with five essay questions, each carrying 20 marks. Candidates are required to answer all questions. Candidates also undertake project/coursework in Introduction to Telecommunications with a weighting of 100%.	

Recommended Learning Resources: Introduction to Telecommunications

Text Books	• 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