

# Broadband Technologies Instructor Matrix

The following matrix illustrates the relationships among the following types of content:

- *CCNT Broadband Technologies Student Guide*
- *CCNT Broadband Technologies ComputerPREP 2Go Web Series*
- *CCNT Broadband Technologies Online Test*

<i>CCNT Broadband Technologies Student Guide</i>	<i>CCNT Broadband Technologies ComputerPREP 2Go Web Series</i>	<i>CCNT Broadband Technologies Online Test</i>	<i>CCNT Broadband Technologies Course/Test Objectives</i>
When teaching these lessons	Use these WBT units	Use these test sections as pre-study assessment	
<b>Lesson 1: Overview</b>	<b>Section 1: Overview</b>	<b>Broadband Technologies Test: Section 1</b>	What Is Broadband? <ul style="list-style-type: none"> <li>• Define broadband.</li> <li>• Define modem.</li> <li>• Define baud.</li> <li>• Describe the evolution of broadband.</li> </ul>
			Time-Division Multiplexing <ul style="list-style-type: none"> <li>• Define time-division multiplexing.</li> <li>• Describe the digital hierarchy.</li> <li>• Identify the significance of DS0.</li> </ul>
			Packet-Switching <ul style="list-style-type: none"> <li>• Define packet-switching.</li> <li>• Define PAD.</li> <li>• Identify challenges of packet-switching for voice and video.</li> </ul>

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			<p>Network Topologies</p> <ul style="list-style-type: none"> <li>• Describe hierarchical network operation.</li> <li>• Define host.</li> <li>• Describe client/server network operation.</li> </ul> <p>Applications and Computing Power</p> <ul style="list-style-type: none"> <li>• Identify single, simple voice network applications.</li> <li>• Identify multimedia applications.</li> <li>• Describe the change in processing power and storage needs.</li> </ul> <p>Categories and Requirements</p> <ul style="list-style-type: none"> <li>• Identify the five categories of broadband technologies.</li> <li>• Define xDSL.</li> <li>• Define cable modem.</li> <li>• Define digital TV.</li> <li>• Define satellite.</li> <li>• Define wireless broadband.</li> <li>• Differentiate between one-way and two-way transmissions.</li> <li>• Identify user requirements for broadband.</li> </ul>

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			<p>LAN/WAN</p> <ul style="list-style-type: none"> <li>• Define token ring.</li> <li>• Define ethernet.</li> <li>• Define wide area network (WAN).</li> <li>• Identify methods for linking LANs.</li> <li>• Define bridge.</li> <li>• Define backbone LAN.</li> <li>• Define metropolitan area network (MAN).</li> <li>• Describe FDDI backbone operation in a MAN.</li> <li>• Describe SONET ring operation in a MAN.</li> <li>• Identify the role and function of routers in a WAN.</li> <li>• Identify bandwidth requirements of enterprise networks.</li> <li>• Identify sources of delay in enterprise networks.</li> </ul> <p>IP and Convergence</p> <ul style="list-style-type: none"> <li>• Define TCP/IP.</li> <li>• Identify the function of TCP/IP.</li> <li>• Describe the role of IP services in convergence.</li> </ul>

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<b>Lesson 2: SONET</b>	<b>Section 2: SONET</b>	<b>Broadband Technologies Test: Section 2</b>	SONET Standards and Purposes <ul style="list-style-type: none"> <li>• Define SONET.</li> <li>• Identify the goals of SONET.</li> </ul>
			SONET Rates <ul style="list-style-type: none"> <li>• Define STS-N.</li> <li>• Define OC-N.</li> <li>• Describe characteristics and significance of STS-1.</li> </ul>
			SONET Transport Structure <ul style="list-style-type: none"> <li>• Describe the structure of an STS-1 frame.</li> <li>• Define transport overhead.</li> <li>• Define synchronous payload envelope (SPE).</li> </ul>
			SONET Mapping <ul style="list-style-type: none"> <li>• Define mapping.</li> <li>• Identify and define mapping types.</li> <li>• Define concatenated bandwidth.</li> </ul>

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			<p>SONET Network Elements</p> <ul style="list-style-type: none"> <li>• Identify SONET network elements.</li> <li>• Define line terminating equipment (LTE).</li> <li>• Define add/drop multiplexer.</li> <li>• Define digital crossconnect (DXC).</li> <li>• Define line regenerating equipment (LRE).</li> </ul> <p>SONET Switching</p> <ul style="list-style-type: none"> <li>• Differentiate between path-switched and line-switched ring architecture.</li> </ul> <p>SONET Ring Concepts</p> <ul style="list-style-type: none"> <li>• Define ring protection switching.</li> <li>• Describe ring operation in SONET.</li> </ul> <p>SONET Operations</p> <ul style="list-style-type: none"> <li>• Define OAM&amp;P.</li> </ul>

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			<p>BISDN</p> <ul style="list-style-type: none"> <li>• Define BISDN.</li> <li>• Describe the layers of a BISDN network.</li> <li>• Define circuit-switching.</li> <li>• Define virtual circuits.</li> <li>• Define virtual channels.</li> <li>• Define virtual paths.</li> <li>• Define connection-oriented service.</li> <li>• Identify the advantages of virtual transmissions.</li> <li>• Identify channel rates for BISDN.</li> <li>• Define interactive services and subclasses.</li> <li>• Define distribution services and subclasses.</li> </ul> <hr/> <p>Wave-Division Multiplexing</p> <ul style="list-style-type: none"> <li>• Define dense wave-division multiplexing.</li> </ul>

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<b>Lesson 3: SS7</b>	<b>Section 3: SS7</b>	<b>Broadband Technologies Test: Section 3</b>	<p>Broadband Backbone Networks</p> <ul style="list-style-type: none"> <li>• Describe the change in the traditional telephone network to accommodate data transmission.</li> <li>• Define the next generation network (NGN).</li> </ul> <hr/> <p>Signal System 7</p> <ul style="list-style-type: none"> <li>• Define signal system 7 (SS7).</li> <li>• Define common channel signal system 7 (CCSS7).</li> <li>• Identify the benefits of out-of-band signaling.</li> </ul> <hr/> <p>Signal Points</p> <ul style="list-style-type: none"> <li>• Identify the types of signal points in SS7 networks.</li> <li>• Define point code (PC).</li> <li>• Define service switching point (SSP).</li> <li>• Define service transfer point (STP).</li> <li>• Define service control point (SCP).</li> </ul> <hr/> <p>Signaling Links</p> <ul style="list-style-type: none"> <li>• Define signaling links.</li> <li>• Identify the purpose of establishing pairs of SCPs, STPs, and SS7 links.</li> <li>• Identify the types of signaling links.</li> </ul>

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			<p>Signaling Units</p> <ul style="list-style-type: none"> <li>• Define signaling units.</li> <li>• Define link status signal unit (LSSU).</li> <li>• Define fill-in signaling unit (FISU).</li> <li>• Define message signaling unit (MSU).</li> </ul> <hr/> <p>Protocol Stack</p> <ul style="list-style-type: none"> <li>• Describe the SS7 protocol stack.</li> <li>• Define message transfer part (MTP).</li> <li>• Define MTP Level 1.</li> <li>• Define MTP Level 2.</li> <li>• Define MTP Level 3.</li> <li>• Define signaling connection control part (SCCP).</li> <li>• Define telephone user part (TUP).</li> <li>• Define integrated services digital network user part (ISUP).</li> <li>• Define transaction capabilities application part (TCAP).</li> </ul>

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			<p>Softswitches</p> <ul style="list-style-type: none"> <li>• Define softswitches.</li> <li>• Identify the role of the softswitch on the NGN.</li> <li>• Define signaling gateway.</li> <li>• Define service management platform.</li> <li>• Identify the benefits of softswitches.</li> </ul>
			<p>Media Gateway Components</p> <ul style="list-style-type: none"> <li>• Define media gateway.</li> <li>• Define media gateway controller.</li> <li>• Identify the functions of the media gateways and gateway controller in the NGN.</li> <li>• Identify the benefits of media gateways.</li> </ul>
<b>Lesson 4: Frame Relay</b>	<b>Section 4: Frame Relay</b>	<b>Broadband Technologies Test: Section 4</b>	<p>Protocol and Speed</p> <ul style="list-style-type: none"> <li>• Define frame relay.</li> <li>• Describe frame relay transmissions.</li> <li>• Describe error detection in frame relay.</li> </ul>

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			<p>Frame Relay and Voice</p> <ul style="list-style-type: none"> <li>• Identify challenges of frame relay for voice transmissions.</li> <li>• Define constant bit rate.</li> <li>• Identify sources of delay in packet networks.</li> <li>• Identify methods of improving voice transmission over frame relay.</li> </ul> <hr/> <p>Frame Relay Terminology</p> <ul style="list-style-type: none"> <li>• Define access circuits.</li> <li>• Define data link connection identifier (DLCI).</li> <li>• Define virtual circuits.</li> <li>• Differentiate between permanent and switched virtual circuits.</li> <li>• Describe committed information rate (CIR) calculations.</li> <li>• Define oversubscription.</li> <li>• Define bursting.</li> <li>• Define encapsulation.</li> <li>• Define discard eligibility (DE).</li> <li>• Describe explicit congestion notification types and processes.</li> <li>• Identify network interface types.</li> </ul>

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			<p>Routers, Bridges, and FRADs</p> <ul style="list-style-type: none"> <li>• Identify elements involved in frame relay access.</li> <li>• Identify types of CPE.</li> <li>• Define router.</li> <li>• Identify functions of routers.</li> <li>• Define bridge.</li> <li>• Define frame relay access drive.</li> </ul>
<b>Lesson 5: Cell Relay</b>	<b>Section 5: Cell Relay</b>	<b>Broadband Technologies Test: Section 5</b>	<p>What Is Cell Relay?</p> <ul style="list-style-type: none"> <li>• Define cell relay.</li> <li>• Identify the characteristics of a cell relay frame.</li> <li>• Describe the transmission of a cell relay frame.</li> <li>• Identify the advantages of a small cell size.</li> </ul>
			<p>Cell Relay and ATM</p> <ul style="list-style-type: none"> <li>• Define ATM.</li> <li>• Identify the components of the header in ATM.</li> </ul>
			<p>Cell Relay and SMDS</p> <ul style="list-style-type: none"> <li>• Define SMDS interface protocol.</li> <li>• Describe the process used by SIP to transport data packets.</li> <li>• Define L3PDU.</li> <li>• Define L2PDU.</li> </ul>

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<b>Lesson 6: SMDS</b>	<b>Section 6: SMDS</b>	<b>Broadband Technologies Test: Section 6</b>	SMDS Overview <ul style="list-style-type: none"> <li>Define switched multi-megabit data service (SMDS).</li> </ul>
			SMDS and Voice <ul style="list-style-type: none"> <li>Identify the advantage of SMDS over other packet technologies for voice.</li> </ul>
			Connection vs. Connectionless <ul style="list-style-type: none"> <li>Define connection-oriented.</li> <li>Define connectionless-oriented.</li> </ul>
			SMDS and Virtual LAN <ul style="list-style-type: none"> <li>Define virtual LAN.</li> </ul>
<b>Lesson 7: ATM</b>	<b>Section 7: ATM</b>	<b>Broadband Technologies Test: Section 7</b>	ATM Protocols and Speeds <ul style="list-style-type: none"> <li>Define asynchronous transfer mode (ATM).</li> </ul>
			ATM and Voice <ul style="list-style-type: none"> <li>Define QoS parameters for ATM.</li> <li>Identify how ATM reduces delay to benefit voice and video transmission.</li> </ul>

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			<p>ATM Terminology</p> <ul style="list-style-type: none"> <li>• Define virtual channel identifiers.</li> <li>• Define virtual path identifiers.</li> <li>• Identify bit rates used in ATM.</li> </ul>
			<p>ATM Applications</p> <ul style="list-style-type: none"> <li>• Identify applications for ATM.</li> <li>• Define ATM campus backbone.</li> <li>• Define ATM LANE.</li> <li>• Define ATM enterprise network consolidation.</li> </ul>
<b>Lesson 8: DSL</b>	<b>Section 8: DSL</b>	<b>Broadband Technologies Test: Section 8</b>	<p>Local Broadband Access</p> <ul style="list-style-type: none"> <li>• Define local loop.</li> <li>• Define user portals.</li> </ul>
			<p>DSL History</p> <ul style="list-style-type: none"> <li>• Define DSL.</li> <li>• Define ISDN.</li> <li>• Describe the projected future for DSL.</li> </ul>

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			<p>Classes of DSL Service</p> <ul style="list-style-type: none"> <li>• Define xDSL.</li> <li>• Identify classes of DSL service.</li> <li>• Describe voice applications for DSL.</li> <li>• Define splitterless DSL.</li> </ul> <hr/> <p>DSL Access Multiplexer</p> <ul style="list-style-type: none"> <li>• Define DSLam.</li> <li>• Identify applications for DSLam.</li> <li>• Define bridge tap.</li> <li>• Define loading coils.</li> <li>• Define echo suppressors and echo cancellers.</li> <li>• Identify loop length restrictions for DSLam.</li> </ul> <hr/> <p>DSL and Voice</p> <ul style="list-style-type: none"> <li>• Define VoDSL.</li> <li>• Define integrated access device (IAD).</li> <li>• Identify requirements for VoDSL.</li> </ul> <hr/> <p>What Is ADSL?</p> <ul style="list-style-type: none"> <li>• Define ADSL.</li> <li>• Describe ADSL transmissions.</li> <li>• Identify requirements for ADSL.</li> </ul>

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			<p>What Is SDSL?</p> <ul style="list-style-type: none"> <li>• Define SDSL.</li> <li>• Define symmetric.</li> <li>• Identify requirements for SDSL.</li> <li>• Define 2B1Q line coding.</li> <li>• Identify applications for SDSL.</li> <li>• Differentiate between ADSL and SDSL.</li> </ul>
<b>Lesson 9: Wireless Broadband</b>	<b>Section 9: Wireless Broadband</b>	<b>Broadband Technologies Test: Section 9</b>	<p>Generations of Wireless</p> <ul style="list-style-type: none"> <li>• Define first-generation wireless technologies.</li> <li>• Define second-generation wireless technologies.</li> <li>• Define third-generation wireless technologies.</li> </ul>
			<p>LMDS Basics</p> <ul style="list-style-type: none"> <li>• Define LMDS.</li> <li>• Identify characteristics of LMDS signals.</li> <li>• Identify benefits of LMDS.</li> </ul>
			<p>MMDS Basics</p> <ul style="list-style-type: none"> <li>• Define MMDS.</li> <li>• Identify characteristics of MMDS signals.</li> </ul>

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<b>Lesson 10: VPN</b>	<b>Section 10: VPN</b>	<b>Broadband Technologies Test: Section 10</b>	<p>VPN Overview</p> <ul style="list-style-type: none"> <li>• Define VPN.</li> <li>• Define tunneling.</li> <li>• Describe the need for VPN.</li> <li>• Identify the main features of VPN.</li> </ul> <hr/> <p>VPN vs. Traditional WAN</p> <ul style="list-style-type: none"> <li>• Identify the differences between traditional WAN and VPN.</li> <li>• Identify applications for VPN.</li> <li>• Define intranet VPN.</li> <li>• Define extranet VPN.</li> <li>• Define remote access VPN.</li> </ul> <hr/> <p>VPN Components</p> <ul style="list-style-type: none"> <li>• Identify the main considerations in implementing VPN.</li> <li>• Define network security protocols.</li> <li>• Define RADIUS.</li> <li>• Define TACACS+.</li> <li>• Define Kerberos.</li> <li>• Define IPsec.</li> <li>• Define digital certificates</li> <li>• Define GRE and L2TP.</li> </ul>

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			<p>VPN Security Threats</p> <ul style="list-style-type: none"> <li>• Define packet sniffing.</li> <li>• Define data theft.</li> <li>• Define information alteration.</li> <li>• Define port scanning.</li> <li>• Define denial-of-service attack.</li> <li>• Define identity spoofing.</li> </ul> <p>VPN Applications</p> <ul style="list-style-type: none"> <li>• Describe how VPN is implemented.</li> <li>• Identify the advantages of VPN over traditional WAN solutions</li> <li>• Describe the security issues related to VPN.</li> </ul>