



San Joaquin County Office of Education

Regional Occupational Centers/Programs

Home Technology Integrator ~ Course Outline

CBEDS#: 5560 ~ Course ID#: 55600

Home Technology Integrator Course Outline

		Classroom	CC
1	Introduction/Safety	15	
	<p>Understand field of home networking design and role of home technology integrator.</p> <ul style="list-style-type: none"> • Explain course structure and how it supports home networking design industry. • Explain role of home technology integrator (HTI). • Discuss emergence of home networking as separate industry with numerous products and services designed for home user. • Discuss basic issues involved in choosing appropriate home/small office computer networking products and wiring options, comparing performance and cost factors. • Discuss impact of wireless networking as economical and practical alternative for home network user. • Demonstrate safe use of tools and equipment. • Practice safety procedures in low and high voltage work areas. • Pass designated safety test with 100 percent accuracy. 		
2	Home/Small Office Local Area Networks (LAN)	40	
	<p>Understand basic design features and standards used in Local Area Networks (LAN).</p> <ul style="list-style-type: none"> • Identify designs for connecting home networks. • Describe network protocols of various organizations. <ul style="list-style-type: none"> ➤ Home Phoneline Networking Alliance (HomePNA) ➤ Home Plug Powerline Alliance (HPLA) • Describe jurisdiction of Institute of Electrical and Electronic Engineers (IEEE). • Describe various IEEE 802.3 Ethernet standards. <ul style="list-style-type: none"> ➤ Half-duplex Ethernet ➤ Fast Ethernet ➤ Full-duplex Ethernet ➤ Gigabit Ethernet • Describe features and benefits of Fast Ethernet. • Describe guidelines and distance limitations of Gigabit Ethernet. • Describe components most frequently used in home or small 		



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	<p>office LAN system.</p> <ul style="list-style-type: none"> ➤ Residential gateways ➤ Hubs ➤ Bridges ➤ Switches ➤ Routers <ul style="list-style-type: none"> • Describe types of network media used in home networks. • Describe benefits and key features of wireless technology. • Describe Universal Plug and Play (UPnP) initiative. • List popular types of network devices found in the home. 		
3	LAN Administration	50	
	<p>Understand administrative tasks associated with establishing a network system.</p> <ul style="list-style-type: none"> • Identify main features of Microsoft products in a small network. • Explain different file systems associated with Microsoft O/S. • Compare and contrast connection-oriented network service with connectionless network service telecommunications system design. • Define the following terms. <ul style="list-style-type: none"> ➤ Host ➤ Node ➤ Socket • Identify in detail the following protocols. <ul style="list-style-type: none"> ➤ Transmission Control Protocol/Internet Protocol (TCP/IP) ➤ Internet Package Exchange/Sequenced Package Exchange (IPX/SPX) ➤ Hypertext Transfer Protocol (HTTP) ➤ File Transfer Protocol (FTP) ➤ Simple Mail Transfer Protocol (SMTP) ➤ Post Office Protocol 3 (POP3) • Identify range of reserve addresses in setting up private home networking systems. • Describe the following functions. <ul style="list-style-type: none"> ➤ Subnet mask ➤ Residential gateway • Define and describe purpose of following in configuring specific network devices. <ul style="list-style-type: none"> ➤ Domain Name System/Service/Server (DNS) ➤ Universal Resource Locator (URL) 		



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	<ul style="list-style-type: none"> ➤ Dynamic Host Configuration Protocol (DHCP) • Describe how Network Address Translation (NAT) functions in a network. • Describe following terms. <ul style="list-style-type: none"> ➤ Firewalls ➤ Encryption and authentication • Explain how virtual private networks are used for remote access computing. • Identify and discuss network-analyzing utilities. 		
4	Broadband Internet Access Technologies	40	
	<p>Understand additional features and design considerations for telecommunication systems for the automated home.</p> <ul style="list-style-type: none"> • Identify five main types of broadband Internet access technologies used in network applications. • Describe advantages and disadvantages of broadband over Power Line (BPL) Internet access service. • List types of Digital Subscriber Line (DSL) technologies available for home technology designs. • Identify location and purpose for installing a DSL splitter. • Describe functions performed by Digital Subscriber Line Access Multiplexer (DSLAM). • Describe basic operation of cable broadband Internet access system. • Describe major system components of a broadband cable system. • Identify parameters associated with Integrated Services Digital network (ISDN) broadband service. • Identify standard for a cable modem. • List advantages and disadvantages of satellite broadband Internet access systems. • Describe impact latency has on satellite broadband Internet service. • Identify system flow diagram for a satellite broadband network. • Discuss federal, state, and local regulations regarding installation of satellites. • Describe types of broadband Internet access that are available from fixed wireless carriers. 		



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5	Residential AC Wiring and Lighting	40	
	<p>Understand basic concept and design considerations in residential high-voltage wiring and home lighting.</p> <ul style="list-style-type: none"> • Describe the scope of the National Electrical Code (NEC). • Describe the following organizations and their jurisdictions. <ul style="list-style-type: none"> ➢ National Fire Protection Association (NFPA) ➢ National Electrical Contractors Association (NECA) ➢ Underwriters Laboratories Inc. (UL) ➢ Electronic Industries Alliance (EIA)/Telecommunications Industry Association (TIA) • Discuss federal, state, and local licensing requirements for installation of wiring and lighting. • Describe basic electrical safety procedures. • Identify and discuss concept of “ampacity” in electrical circuits. • Describe purpose of insulation ratings for various home wiring and cable products. • Describe electrical prints. • Define tasks associated with the electrical installation “rough-in” phase during construction or remodeling. • Draw circuit breaker panel connections for branch circuits. • List electrical wiring problems often encountered with remodeling of older homes. • Identify and discuss purpose of grounding. • Describe functions of ground fault circuit interrupter (GFCI). • Calculate load of various electrical fixtures and appliances. • Calculate kilowatt-hour costs for various home electrical appliances. • Describe difference between volt-ampere and watt ratings for home appliances. • Describe difference between real power and apparent power. • Describe functions of an Uninterruptible Power Supply (UPS). • Describe functions of a surge suppressor. • Draw and identify the proper names and codes for connections to a 120-volt wall outlet. • Identify and discuss various wiring methods. <ul style="list-style-type: none"> ➢ Romex (Nonmetallic –NM- cable) ➢ Flex (Metal-clad –MC- cable) ➢ BX (Armored –AC- cable) ➢ UF (Underground feeder cable) ➢ EMT (Electric metallic tubing) • Identify various lighting types (e.g. incandescent and fluorescent). 		



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	<ul style="list-style-type: none"> Identify various types of lighting controls. Draw a light switch and identify its correct wire color codes. Explain features of power line protocols for managing home lighting. Describe the two common types of outdoor security lighting. 		
6	Low Voltage Structured Wiring	40	
	<p>Understand basic concept and design considerations in “structured wiring” or “structured cabling systems.”</p> <ul style="list-style-type: none"> Identify standards related to residential low-voltage structured wiring design. Describe installation drawings and maintenance plans. Define low-voltage power-limited circuits. Describe features of home-run wiring. Explain difference between Grade 1 and Grade 2 structured wiring requirements. <ul style="list-style-type: none"> ➤ Cabling ➤ Wall outlets ➤ Distribution panels ➤ Termination points Describe composition of bundled cabling. Identify the five types of cabling used in residential structured wiring designs. Describe color codes and termination standards for RJ-45 UDP connectors. Identify the names and uses for the various types of coaxial cable connectors. Describe locations required for the use of conduit and PVC pipe. List minimum bending radius and pull strength for UTP and coaxial cable. Describe physical features of quad-shield coaxial cable. Identify features of the three types of audio wire used to connect sound and equipment in home theater systems. Name the two types of connectors used for coaxial cable. Draw the two telephone line connections for an RJ-11 cable termination. Describe advantages offered by structured wiring in new residential construction. List unique features of Category 6/Category 7 cable compared to Category 5 cable. 		



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7	Telecommunications	40	
	<p>Understand basic features, products, and design concepts for residential telecommunications devices.</p> <ul style="list-style-type: none"> • Explain advantages of digital communications technology over analog transmission systems. • Describe all components of the Public Switched Telephone Network (PSTN). • Identify the following telecommunication products and/or features. <ul style="list-style-type: none"> ➤ Key telephone systems (KTS) ➤ Fax ➤ PBX ➤ Video conferencing ➤ Direct inward dialing (DID) ➤ Centrex • Describe the proper termination pin numbers and wire color codes for the following jacks. <ul style="list-style-type: none"> ➤ RJ-11 jack ➤ RJ-45 jack • Explain rationale for existence of two separate standards for terminating RJ-45 connectors. • List types of cables required for structured wiring home telecommunications system design. • Identify various standard hookups and color codes for RJ-11 telephone type jacks. • Describe features of Insulation Displacement Connection (IDC) terminations for residential telephone cables. • Define Voice over Internet Protocol (VoIP). • Explain three types of connectivity that can be implemented for VoIP telephony. • Identify available residential telephone subscriber services. <ul style="list-style-type: none"> ➤ Voice mail ➤ Intercom ➤ Caller ID ➤ Call blocking ➤ Call waiting • Describe features of both 911 and Wireless Enhanced 911 (E911) service. • Identify purpose of a VoIP gateway. 		



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	<ul style="list-style-type: none"> • Explain scope and purpose of Part 68 of FCC rules as applied to the manufacturing and registration of PBX and KTS telephone systems. 		
8	Home Audio and Video Fundamentals	40	
	<p>Understand basic features, products, and design concepts for home audio and video systems.</p> <ul style="list-style-type: none"> • Describe difference between dedicated and whole-home audio/video system design. • Explain Home Theater-in-a-Box (HTIB) as an entry level product. • Compare HTIB with other home theater systems. • Define middleware. • Identify purpose of the following middleware connectivity software applications. <ul style="list-style-type: none"> ➤ Jini ➤ Home Audio/Video Interoperability (HAVi) ➤ UPnP • Draw diagram of a two-way and a three-way crossover network. • List the basic requirements for installing a satellite antenna. • Identify commercial broadcasting standards used for high-definition television (HDTV). • Explain direct view high definition. • Explain Plasma displays and their advantages and disadvantages. • Describe difference between active/passive matrix flat-panel display technologies. • Describe components contained in a typical whole-home audio/video distribution system design. • Describe various designs used for speaker systems. • Draw diagram showing location for all speakers in a Dolby Digital surround sound home theater design. • Demonstrate speaker mounting locations. • Explain how speakers can be damaged by underpowered amplifier. • Explain difference between home-theater and high end audio with exceptional speakers and advantages of using both. • Describe the features and characteristics of flat-panel display technology. • Identify basic connector types and video formats used when 		



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	<p>interconnecting audio and video components.</p> <ul style="list-style-type: none"> • List most popular video and audio standard formats used in home theater designs. • List characteristics and features of video projection systems. • Discuss types and features of front projection. • Demonstrate front projection. • Identify three display formats available in setting-up and connecting DVD to TV. • Review all connections on rear of three different receivers and connect all components in home-theater room. • Describe difference between interlaced and progressive scan modes for digital TV and DVD players. • Explain audio/video room calibration. • Describe sources of audio and video services. 		
9	Home Security and Access Control Systems	40	
	<p>Understand the rigorous design and installation standards for home security systems.</p> <ul style="list-style-type: none"> • Describe purpose of a home security system. • Explain functional difference between remote access and remote control. • Define zoning. • List advantages for establishing a zoned security system. • Describe purpose of bypass mode with a zoned security system. • List comparative advantages and disadvantages of wired and wireless home security systems. • Describe operational functions that can be performed from the security system keypad. • List various types of sensors and where they are used in a home security system. • Describe how security system phone dialer works with RJ-31X jack. • Explain operational features of electromagnetic and cipher locks. • Describe how a telephone is used for remote entrance into a gated residential community. • Define condition monitoring as applied to a home remote access system. • Explain operation of relay and solenoid as components of remote access equipment. 		



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	<ul style="list-style-type: none"> • Describe features of home closed circuit television (CCTV) camera that are primary cost drivers. • Explain technical features and use of a modulator. • Describe purpose of a quad switcher. • Identify features of garage door infrared sensor. • List installation steps for a garage door infrared sensor. • Explain types of wire permitted for home security system connectivity. • Describe meaning and relevance of lux rating for CCTV cameras. • List major home security system installation specifications and requirements in American National Standards Institute/Telecommunications Industry Association/Electronic Industries Alliance (ANSI/TIA/EIA) 570A addendum 1. 		
10	Heating, Ventilation, and Air Conditioning Management	40	
	<p>Understand various heating, ventilation, and air conditioning (HVAC) design concepts, components, and control systems.</p> <ul style="list-style-type: none"> • Describe features of zoned and non-zoned HVAC designs. • List features of centralized and distributed systems. • Describe purpose of an air handler in an HVAC system. • Explain specifically how motorized dampers are used in a zoned HVAC system. • Describe the types of fuels used in furnaces. • Identify the main components of a gas-fired furnace. • Describe theory of operation of an air conditioner. • Describe purpose of HVAC system programming and time-of-day programming. • Identify operational features of a heat pump. • Describe operational features of a whole-house fan. • Describe purpose of a duct fan. • Identify preferred locations for installing a thermostat. • Describe seasonal maintenance tasks to be performed for an HVAC system. • Explain operational features of a staged thermostat. • Define an air conditioner Energy Efficient Ratio (EER). • Define British Thermal Unit (BTU). • Explain how solar panels are used to reduce energy cost. • Identify problems associated with duct leakage. • Describe components of an oil-fired furnace. 		



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	<ul style="list-style-type: none"> • Explain how HVAC systems can be controlled from a remote location. 		
11	Home Irrigation and Pool Management Systems	40	
	<p>Understand automated water system management tools and components.</p> <ul style="list-style-type: none"> • Describe planning steps required for installing an irrigation system. • Explain concept and purpose for zoned watering system. • Describe difference between constant-pressure and non-pressurized lines. • List steps for obtaining construction permit prior to trenching for irrigation system. • Explain operation of a solenoid control valve. • Describe process of selecting control valve locations. • Explain purpose and operation of backflow prevention valve. • Describe features of automatic timers and irrigation system controllers. • List features and settings recommended for time-of-day programming. • Describe purpose of seasonal presets. • Explain steps required for installing underground PVC irrigation pipes. • Describe operation of a sprinkler head. • Identify differences between rotary impact and gear-driven sprinklers. • List locations appropriate for fixed spray type sprinklers. • Describe type of PVC pipe used for pressure lines. • Describe features of a booster pump. • Show how irrigation control valve wires are installed in the ground. • Describe proper balance for spa and pool water pH. • Describe location and purpose of a sump pump and sensors. • Explain how water alarms are used in a residential setting. 		



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12	Miscellaneous Devices	20	
	<p>Understand basic concepts and design considerations in installing and maintaining miscellaneous devices.</p> <ul style="list-style-type: none"> • Describe home automation control protocols for miscellaneous devices. • Describe how the following operate. <ul style="list-style-type: none"> ➤ Automated cabinetry ➤ Lift systems ➤ Fireplace ignition ➤ Fans ➤ Skylights ➤ Doors ➤ Windows • Window treatments 		
13	Home Automation Systems Integration	40	
	<p>Understand integration, interface, and programming of home controllers and gateways with emphasis on functional interfaces with other home technology devices like keypads, distribution panels, and patch panels.</p> <ul style="list-style-type: none"> • Identify primary differences between home controllers and gateways. • Describe input and output features of a home controller. • List features available for touch screen controller input devices. • List programmable features of a home controller. • Describe programming options available for intelligent remote controls. • Describe how Internet Connection Sharing (ICS) is used in home networks. • Explain difference between ICS and hardware gateways. • Draw connections to a gateway/router in a home network. • List various types of Internet appliances that could work with a residential gateway. • Describe advantages of a patch panel. • Describe basic concepts of using power lines for home network connectivity. • Identify main features of HomePNA network technology. • List features of X-10 control protocol. • Describe characteristics and use of HAVi protocol. 		



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	<ul style="list-style-type: none"> • Describe operational features of CEBus protocol. • Describe features of LonWorks home control protocol. • List characteristics of broadband wireless Internet access services. • Define Broadband over Power Lines (BPL) transmission. • Identify/describe industry standards applying to components of home automation. <ul style="list-style-type: none"> ➤ Low voltage ➤ High voltage ➤ Audio/Video • Telecommunications 		
14	Troubleshooting	40	
	<p>Understand phases required to test, debug, and troubleshoot control protocol problems to the integration and installation of home automation systems in order to complete the turnover of a trouble-free system to the homeowner by the contractor.</p> <ul style="list-style-type: none"> • Identify prime locations for installing low-voltage structured wiring wall outlets. • Describe pull tension limitations for installing UTPP and coaxial cable. • Identify wiring scheme for RJ-45 type eight-position modular jacks wired to ANSI/TIA/EIA 568A and 568B standard. • Describe procedure for terminating UTP 4-pair cable. • List tools used for terminating RG-6 quad-shield coaxial cable. • Describe Category 5 and 6 UTP untwist guidelines. • Identify types of connectors used with RG-6 coaxial cable. • Describe various types of common wiring errors and their impact on network performance. • Identify various types and characteristics of cable testers. • Describe typical problems associated with X-10 protocol in home installations. • Discuss purpose of an X-10 phase coupler. • Identify uses of an X-10 signal strength tester. 		
15	Employability Skills	15	
	<p>Understand the skills necessary to acquire, apply for, gain, and maintain employment.</p> <ul style="list-style-type: none"> • Discuss employment requirements. • Apply learned skills when seeking employment. • Prepare a résumé. 		



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	<ul style="list-style-type: none"> • Explain job specifics. • Discuss qualifications. • Formulate plan for seeking employment. • Identify potential employers. • Describe requirements of filling out job application. <ul style="list-style-type: none"> ➤ Legibility ➤ Correctness ➤ Completeness • Complete sample job application forms correctly. • Discuss importance of punctuality on the job. • Discuss importance of positive attitude on the job. • Discuss importance of enthusiasm on the job. • Discuss importance of appropriate appearance on the job. • Discuss importance of cleanliness and neatness on the job. • Discuss importance of personal responsibility on the job. • Discuss importance of continuous upgrading of job skills. • Discuss importance of appropriate communication with customers. • Discuss customer service as method of building permanent relationships between the organization and the customer. 		
16	Practice and Final Exams Review	15	
	Understand required competencies needed to pass exam for professional servicing career in the automated home industry. <ul style="list-style-type: none"> • Pass the HTI Certification practice test with 90% accuracy. 		
	1st Year – Classroom/CC	540	180
	Total Hours	720	