Florida CTE

# Information Technology (2021): Applied Information Technology

Adopted 2021

**Applied Information Technology (9003400)**

**Information Technology Assistant - Course Number: OTA0040**

0. Demonstrate knowledge, skill, and application of information technology to accomplish job objectives and enhance workplace performance. The student will be able to: ITA.01.0

01. Develop keyboarding skills to enter and manipulate text and data. ITA.01.01

02. Describe and use current computer technology and software to perform personal and business related tasks in the workplace (e.g., e-mail, digital calendars, meetings, appointments). ITA.01.02

03. Differentiate between types of file systems and classify common file extensions based on software application programs used in the workplace environment. ITA.01.03

04. Utilize the Internet to find reliable resources and reference materials (e.g., on-line help, tutorials, manuals). ITA.01.04

05. Apply research strategies to use and evaluate electronic research technologies for valid and reliable information. ITA.01.05

06. Demonstrate basic computer file management skills (e.g., naming, saving, retrieving, and organizing). ITA.01.06

07. Analyze the process of troubleshooting problems with computer hardware peripherals, including input and output devices. ITA.01.07

08. Describe ethical issues and problems associated with computers and information technology (e.g., fair use, privacy, public domain, copyright, piracy, plagiarism). ITA.01.08

09. Explain the history and purpose of various operating systems (e.g., DOS, Windows, Mac, and Unix/Linux). ITA.01.09

0. Develop an awareness of microcomputers. The student will be able to: ITA.02.0

01. Explain the general architecture of a microcomputer system. ITA.02.01

2. Explain the need for and demonstrate proficiency using common peripherals (e.g., printers, mouse, keyboard, external hard drive, flash drive). ITA.02.02

03. Examine the concepts of computer maintenance and upgrades. ITA.02.03

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0. Demonstrate an understanding of networks. The student will be able to: ITA.03.0

01. Differentiate between types of networks and how they work (e.g., clients, servers, Wi-Fi, teleconference) ITA.03.01

02. Identify security needs within a network environment (e.g., antivirus software, passwords). ITA.03.02

03. Distinguish between intranets, extranets and how they relate to the Internet. ITA.03.03

04. Demonstrate basic understanding of cloud computing. ITA.03.04

0. Use word processing applications to enhance the effectiveness of various types of documents and communication. The student will be able to: ITA.04.0

01. Select and use word processing software and accompanying features to create and enhance various written business communications (e.g., memos, reports, block business letters). ITA.04.01

02. Save and export documents in various formats (e.g., pdf, html, blog, hyperlinks). ITA.04.02

03. Format text content in a document (e.g., font, paragraph attributes, spacing, text styles, text boxes). ITA.04.03

04. Manipulate page layout and reusable content (e.g., page setup, themes, templates, page backgrounds, headers and footers). ITA.04.04

05. Perform various image-editing tasks using word-processing software to create and format images, illustrations, shapes, etc. ITA.04.05

06. Proofread and revise documents by validating content through the use of word processing tools (e.g. spell check, thesaurus, find/replace, autocorrect settings). ITA.04.06

07. Insert citations and hyperlinks, create end and footnotes, and create a table of contents in a document. ITA.04.07

08. Perform various mail merge options, macros and tracking revisions. ITA.04.08

09. Demonstrate an understanding of fonts (serif and sans serif) and font styles (bold, italic, etc.) ITA.04.09

0. Use presentation applications to enhance communication skills. The student will be able to: ITA.05.0

01. Manage and configure the presentation software environment (e.g., adjusting views, manipulating slide settings, configuring toolbar and file options). ITA.05.01

02. Use presentation software to format and edit slides (e.g., adding and removing slides, slide layouts, format slide design, insert or format placeholders). ITA.05.02

03. Locate, create and incorporate graphical and multimedia elements, including: shapes, graphics, images, bullets, hyperlinks, video, and audio into a slide presentation. ITA.05.03

1. Enhance overall visual presentation by applying font selection, design themes, color schemes, templates, etc. ITA.05.04

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05. Create and manipulate graphical and multimedia elements using additional styles and effects (e.g., color selections, tone, contrast, shadows, picture styles). ITA.05.05

06. Demonstrate various business-related elements that can be created, embedded and manipulated in a slide presentation, including: charts, graphs, tables, media, spreadsheets, and illustrations. ITA.05.06

07. Customize presentation settings by using appropriate slide transitions and animations (e.g., on click, rehearsed timings) ITA.05.07

08. Demonstrate different delivery methods for slide presentations, including: online delivery and sharing, video projection, printing options. ITA.05.08

0. Use spreadsheet applications to enhance communication skills. The student will be able to: ITA.06.0

01. Manipulate the worksheet by using the ribbon tabs, group settings, importing data/database, manipulating properties, files and folders. ITA.06.01

02. Create cell data and apply auto fill. ITA.06.02

03. Format cells and worksheets (e.g., by applying and manipulating cell formats, styles, merging and splitting cells, create row and column titles, hide and unhide column titles, rows and columns, page setup options, and manipulating views/themes). ITA.06.03

04. Create and analyze formulas and functions (e.g., apply conditional formula logic, name and cell ranges). ITA.06.04

05. Create and modify charts and images. (e.g., pivot tables) ITA.06.05

06. Share worksheet data through various system (e.g., email, external media, cloud storage, mail merge). ITA.06.06

07. Analyze and organize data through filters, sorting and applying conditional formatting. (e.g., macros) ITA.06.07

08. Interpret data on line graphs, pie charts, diagrams, and tables. ITA.06.08

0. Use database applications to store and organize data. The student will be able to: ITA.07.0

01. Create different forms for inputting data into a database application. ITA.07.01

02. Interpret queries for specialized reports using a database application. ITA.07.02

03. Create and modify a database by importing data from other sources ITA.07.03

04. Create and manage database tables by hiding fields, importing data, adding total rows ITA.07.04

05. Modify queries by renaming, adding/removing fields, sorting, formatting, and adding calculated fields ITA.07.05

06. Create and format reports with multiple columns, calculated fields and images. ITA.07.06

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Use electronic mail to enhance communication skills. The student will be able to: ITA.08.0

01. Describe and perform e-mail capabilities and functions (e.g., create, send, & forward messages, organize email folders, manage signature and automated messages, configure message sensitivity, security and delivery options). ITA.08.01

02. Perform e-mail activities (e.g., attach external files, save e-mail attachments, view mailbox details, schedule appointments, create contact groups). ITA.08.02

03. Demonstrate an understanding of the ethical issues associated with electronic correspondences (e.g., employer's ownership of email, public access of government email, appropriate uses in the workplace, phishing attacks, permanence of electronic communications on the internet). ITA.08.03

04. Describe the need for and appropriate use of electronic mailing list software applications (e.g., listserv) ITA.08.04

0. Investigate individual assessment and job/career exploration and individual career planning that reflect the transition from school to work, lifelong learning, and personal and professional goals. The student will be able to: ITA.09.0

01. Analyze personal skills and aptitudes in comparison with various business related job and career options. (i.e., hard and soft skills) ITA.09.01

02. Use career resources to develop and analyze occupations and opportunities for internships, continuing education and on-the-job training. ITA.09.02

03. Exhibit job-seeking skills required for entry-level employment, including resume, online job search, cover letter, online/hard copy application, mock interview, interview thank you letter, and follow-up call. ITA.09.03

04. Design, implement, and evaluate a plan to facilitate growth and skill development related to anticipated job requirements and career expectations. ITA.09.04

05. Demonstrate an awareness of specific job requirements and career paths (e.g., education, certifications, skills, previous experience) in business environments. ITA.09.05

06. Demonstrate an awareness of the potential impact of local and global trends on career plans and life goals. ITA.09.06

07. Describe the importance of building community and mentor relationships in a variety of professional and workplace situations. ITA.09.07

08. Simulate work-based projects in an information technology environment ITA.09.08

0. Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. The student will be able to: ITA.10.0

01. Demonstrate awareness of the following workplace essentials: quality customer service; business ethics; confidentiality of information; copyright violations; accepted workplace rules, regulations, policies, procedures, processes, and workplace safety, and appropriate attire and grooming. ITA.10.01

02. Demonstrate ways of accepting and providing constructive criticism to enhance team projects. ITA.10.02

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03. Apply appropriate strategies to manage and resolve conflicts in work situations. ITA.10.03

04. Demonstrate personal and interpersonal skills appropriate for the workplace (e.g., responsibility, dependability, punctuality, integrity, positive attitude, initiative, respect for self and others, and professional dress). ITA.10.04

0. Demonstrate competence using computer networks, internet and online databases to facilitate collaborative or individual learning and communication. The student will be able to: ITA.11.0

01. Demonstrate how to connect to the Internet and identify and describe web terminology, addresses and how browsers work. ITA.11.01

02. Demonstrate proficiency using basic features of GUI (Graphical User Interface) browsers, including: bookmarks, basic configurations, e-mail configurations, and address books. ITA.11.02

03. Describe appropriate browser security configurations ITA.11.03

04. Describe information technology terminology, including Internet, intranet, ethics, copyright laws, and regulatory control. ITA.11.04

05. Demonstrate proficiency using search engines and search tools (e.g., Boolean search strategies) ITA.11.05

06. Use various web tools, including: downloading files, transfer of files, extensions, PDF, plug-ins, and data compression. ITA.11.06

07. Differentiate between different domain extensions (e.g., .com, .org, .gov, .edu, etc.) ITA.11.07

0. Develop awareness of computer languages, web-based & software applications, and emerging technologies. The student will be able to: ITA.12.0

01. Compare and contrast the appropriate use of various software applications. (e.g., word processing, desktop publishing, graphic design, web browser, e-mail, presentation, database, scheduling, financial management, Java applet, music) ITA.12.01

02. Explain and describe the need for web-based applications (e.g., sharing photos and video clips, messaging, chatting and collaborating. ITA.12.02

03. Express an understanding of basic terminology used in programming (e.g., algorithm, binary, code, block-based, objects, functions) ITA.12.03

04. Compare and contrast emerging technologies and describe how they impact business in the global marketplace (e.g., wireless network, tablets, cell phones, satellite technology, nanotechnology, smart devices, home networks). ITA.12.04

0. Demonstrate an understanding of basic html by creating a simple web page. The student will be able to: ITA.13.0

01. Create a basic web page. ITA.13.01

02. Use basic storyboarding techniques. ITA.13.02

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03. Use basic functions of WYSIWYG editors. ITA.13.03

04. Use basic functions of HTML, DHTML, and XML editors and converters. ITA.13.04

05. Enhance web pages through the addition of images and graphics. ITA.13.05

0. Demonstrate comprehension and communication skills. The student will be able to: ITA.14.0

01. Read and comprehend technical and non-technical reading assignments related to course content (e.g., manuals, books, magazines, electronic sources). ITA.14.01

02. Use verbal and nonverbal skills to communicate effectively with supervisors, co-workers, and customers. ITA.14.02

03. Demonstrate an understanding of the writing process to create business documents (e.g., research methods, paper formatting (MLA/APA)) ITA.14.03

04. Demonstrate an awareness of project management concepts and tools (e.g., timelines, deadlines, resource allocation, time management, delegation of tasks, collaboration). ITA.14.04

0. Use social media to enhance online communication and develop an awareness of a digital footprint. The student will be able to: ITA.15.0

01. Create and develop a professional social media presence (e.g., LinkedIn) to connect with potential employers, follower influencers, enhance networking opportunities, develop soft skills through written communication, and establish a professional business image. ITA.15.01

02. Cultivate and manage awareness of digital identity and reputation. ITA.15.02

03. Develop awareness of the permanence of actions and social awareness in the digital world. ITA.15.03

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**Digital Information Technology - Course Number: 8207310**

0. Demonstrate knowledge, skill, and application of information systems to accomplish job objectives and enhance workplace performance. The student will be able to: AI.DI.01.0

    01. Describe and use current and emerging computer technology and software to perform personal and business related tasks. AI.DI.01.01

    02. Identify and describe communications and networking systems used in workplace environments. AI.DI.01.02

    03. Locate and apply reference materials such as on-line help, vendor bulletin boards, tutorials, and manuals available for application software. AI.DI.01.03

    04. Troubleshoot problems with computer hardware peripherals and other office equipment. AI.DI.01.04

    05. Describe ethical, privacy, and security issues and problems associated with computers and information systems. AI.DI.01.05

    06. Demonstrate proficiency in using the basic features of GUI browsers. AI.DI.01.06

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0. Practice quality performance. The student will be able to: AI.DI.02.0
    01. Assess personal, peer and group performance and identify and implement strategies for improvement (e.g., organizational skills, note taking/outlining, advance organizers, reasoning skills, problem-solving skills, and decision-making skills). AI.DI.02.01
    02. Develop criteria for assessing products and processes that incorporate effective business practices (e.g., time management, productivity, total quality management). AI.DI.02.02
0. Demonstrate knowledge of different operating systems. The student will be able to: AI.DI.03.0
    01. Identify operating system file naming conventions. AI.DI.03.01
    02. Demonstrate proficiency with file management and structure (e.g., folder creation, file creation, backup, copy, delete, open, save). AI.DI.03.02
    03. Demonstrate a working knowledge of standard file formats. AI.DI.03.03
    04. Differentiate between different operating systems and applications. AI.DI.03.04
    05. Compare and contrast open source and proprietary software. AI.DI.03.05
    06. Display understanding of how system utilities help maintain a computer. AI.DI.03.06
0. Develop a familiarity with the information technology industry. The student will be able to: AI.DI.04.0
    01. Explain how information technology impacts the operation and management of business and society. AI.DI.04.01
    02. Identify and describe the various ways of segmenting the IT industry (e.g., hardware vs. software, server vs. client, business vs. entertainment, stable vs. mobile). AI.DI.04.02
    03. Describe how digital technologies (social media) are changing both work and personal lifestyles. AI.DI.04.03
0. Develop an awareness of microprocessors and digital computers. The student will be able to: AI.DI.05.0
    01. Explain software hierarchy and its impact on microprocessors. AI.DI.05.01
    02. Explain the need for and use of peripherals. AI.DI.05.02
    03. Demonstrate proficiency installing and using plug-and-play peripherals. AI.DI.05.03
    04. Identify the basic concepts of computer maintenance and upgrades. AI.DI.05.04

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0. Develop an awareness of programming languages. The student will be able to: AI.DI.06.0
    01. Compare and contrast the various categories of programming languages how they evolved and how they are used (e.g., Assembler, Java, JavaScript and SQL). AI.DI.06.01
    02. Explain the need for and use of compilers. AI.DI.06.02
    03. Identify the three types of programming design approaches (e.g., top-down, structured, object-oriented). AI.DI.06.03
    04. Differentiate among source code, machine code, interpreters, and compilers. AI.DI.06.04
    05. Characterize the major categories of programming languages and how they are used. AI.DI.06.05
    06. Create a model flowchart for a computer program. AI.DI.06.06
    07. Create a simple computer application program using JavaScript and HTML. AI.DI.06.07
    08. Describe the stages in the software development life cycle and explain how to successfully implement them. AI.DI.06.08
0. Develop an awareness of emerging technologies. The student will be able to: AI.DI.07.0
    01. Compare and contrast emerging technologies and describe how they impact business in the global marketplace (e.g., wireless, wireless web, cell phones, portables/handhelds, smart appliances, home networks, peer-to-peer). AI.DI.07.01
    02. Adhere to published best practices for protecting personal identifiable information when using the Internet. AI.DI.07.02
    03. Identify trends related to the use of information technology in people's personal and professional lives. AI.DI.07.03
    04. Characterize how the rapid pace of change in information technology impacts our society. AI.DI.07.04
0. Demonstrate an understanding of the seven layers of the Open Systems Interface (OSI) model. The student will be able to: AI.DI.08.0
    01. Explain the interrelations of the seven layers of the Open Systems Interface (OSI) as it relates to hardware and software. AI.DI.08.01
    02. Describe the purpose of the OSI model and each of its layers. AI.DI.08.02
    03. Explain specific functions belonging to each OSI model layer. AI.DI.08.03
    04. Understand how two network nodes communicate through the OSI model. AI.DI.08.04
    05. Discuss the structure and purpose of data packets and frames. AI.DI.08.05
    06. Describe the two types of addressing covered by the OSI model. AI.DI.08.06

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0. Demonstrate an awareness of specialized software. The student will be able to: AI.DI.09.0

    01. Compare and contrast the appropriate use of specialized software (e.g., OLTP, Computer Aided Design, Computer Aided Manufacturing, 3D animation, process control, materials management). AI.DI.09.01

    02. Research and report on the current state of specialized software (e.g., OLTP, Computer Aided Design, Computer Aided Manufacturing, 3D animation, process control, materials management). AI.DI.09.02

    03. Describe the hardware implications of using specialized software (e.g., RAM, hard drive size, CPU, storage devices). AI.DI.09.03

0. Identify computer components and their functions. The student will be able to: AI.DI.10.0

    01. Identify the internal components of a computer (e.g., power supply, hard drive, mother board, I/O cards/ports, cabling). AI.DI.10.01

    02. Identify generic computer and programming terminology. AI.DI.10.02

0. Demonstrate proficiency using the Internet to locate information. The student will be able to: AI.DI.11.0

    01. Identify and describe web terminology. AI.DI.11.01

    02. Define Universal Resource Locators (URLs) and associated protocols (e.g., http, ftp, telnet, mailto). AI.DI.11.02

    03. Compare and contrast the types of Internet domains (e.g., .com, .org, .edu, .gov, .net, .mil). AI.DI.11.03

    04. Describe and observe Internet/Intranet ethics and copyright laws and regulatory control. AI.DI.11.04

    05. Demonstrate proficiency using search engines, including Boolean search strategies. AI.DI.11.05

    06. Demonstrate proficiency using various web tools (e.g., downloading of files, transfer of files, telnet, PDF). AI.DI.11.06

    07. Compare and contrast the roles of web servers and web browsers. AI.DI.11.07

0. Demonstrate proficiency using common software applications. The student will be able to: AI.DI.12.0

    01. Compare and contrast the appropriate use of various software applications (e.g., word processing, desktop publishing, graphics design, web browser, e-mail, presentation, database, scheduling, financial management, Java applet, music). AI.DI.12.01

    02. Demonstrate proficiency in the use of various software applications (e.g., word processing, desktop publishing, graphics design, web browser, e-mail, presentation, database, scheduling, financial management, Java applet, music). AI.DI.12.02

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0. Develop an awareness of management functions and organizational structures as they relate to today's workplace and employer/employee roles. The student will be able to: AI.DI.13.0
    01. Explore, design, implement, and evaluate organizational structures and cultures. AI.DI.13.01
    02. Explore and demonstrate an awareness of current trends in business and the employee's role in maintaining productive business environments in today's global workplace. AI.DI.13.02
    03. Collaborate with individuals and teams to complete tasks and solve business related problems and demonstrate initiative, courtesy, loyalty, honesty, cooperation, and punctuality as a team member. AI.DI.13.03
0. Perform e-mail activities. The student will be able to: AI.DI.14.0
    01. Describe e-mail capabilities and functions. AI.DI.14.01
    02. Identify components of an e-mail message. AI.DI.14.02
    03. Identify the components of an e-mail address. AI.DI.14.03
    04. Identify when to use different e-mail options. AI.DI.14.04
    05. Attach a file to an e-mail message. AI.DI.14.05
    06. Forward an e-mail message. AI.DI.14.06
    07. Use an address book. AI.DI.14.07
    08. Reply to an e-mail message. AI.DI.14.08
    09. Use the Internet to perform e-mail activities. AI.DI.14.09
    10. Identify the appropriate use of e-mail and demonstrate related e-mail etiquette. AI.DI.14.10
    11. Identify when to include information from an original e-mail message in a response. AI.DI.14.11
    12. Identify common problems associated with widespread use of e-mail. AI.DI.14.12

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0. Demonstrate proficiency in using presentation software and equipment. The student will be able to: AI.DI.15.0
    01. Produce a presentation that includes music, animation, and digital photography and present it using appropriate technologies. AI.DI.15.01
    02. Using presentation software, create a multimedia presentation that incorporates shot and edited video, animation, music, narration and adheres to good design principles, use of transitions, and effective message conveyance. AI.DI.15.02
    03. Demonstrate knowledge of the roles and responsibilities of a multimedia production team (e.g. project manager, creative or design director, content experts, writers, graphic designers, animators, sound designers, videographer, interface designers/programmers). AI.DI.15.03
    04. Collaborate with team members to plan, edit, evaluate, and present a multimedia presentation where individuals on the team function in specific production roles. AI.DI.15.04
    05. Create a self-running presentation with synchronized audio, convert presentation slides (e.g. PowerPoint) into streaming ASF files for use on the web. AI.DI.15.05
0. Perform decision-making activities in a multimedia environment. The student will be able to: AI.DI.16.0
    01. Determine work priorities, the audience, project budgets, project specifications, and the production schedule. AI.DI.16.01
    02. Evaluate and select appropriate software packages and multimedia tools to complete assigned tasks. AI.DI.16.02
    03. Present and defend design projects. AI.DI.16.03
0. Demonstrate language arts knowledge and skills. The student will be able to: AI.DI.17.0
    01. Locate, comprehend and evaluate key elements of oral and written information. AI.DI.17.01
    02. Draft, revise, and edit written documents using correct grammar, punctuation and vocabulary. AI.DI.17.02
    03. Present information formally and informally for specific purposes and audiences. AI.DI.17.03
0. Demonstrate mathematics knowledge and skills. The student will be able to: AI.DI.18.0
    01. Demonstrate knowledge of arithmetic operations. AI.DI.18.01
    02. Analyze and apply data and measurements to solve problems and interpret documents. AI.DI.18.02
    03. Construct charts/tables/graphs using functions and data. AI.DI.18.03

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0. Demonstrate science knowledge and skills. The student will be able to: AI.DI.19.0
    01. Discuss the role of creativity in constructing scientific questions, methods and explanations. AI.DI.19.01
    02. Formulate scientifically investigable questions, construct investigations, collect and evaluate data, and develop scientific recommendations based on findings. AI.DI.19.02
0. Demonstrate an understanding of the implications of storing sensitive information. The student will be able to: AI.DI.20.0
    01. Understand what data should be encrypted. AI.DI.20.01
    02. Explain HIPAA. AI.DI.20.02
    03. List password security vulnerabilities. AI.DI.20.03
    04. Compare and contrast the levels of data classification. (e.g., restricted, confidential/private, public). AI.DI.20.04
    05. Discuss cloud vulnerabilities. AI.DI.20.05

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**Web Technologies - Course Number: 9003420**

0. Demonstrate proficiency on the principles of design. The student will be able to: AI.WT.21.0
    01. Identify industry best practices in visual design (e.g., color schemes, fonts, navigation methods, pagination). AI.WT.21.01
    02. Explain the key concepts of meeting client needs. AI.WT.21.02
    03. Apply the principles of Human Computer Interface (HCI) to design and develop an effective look and feel for a website. AI.WT.21.03
    04. Design and create a webpage for optimal display in multiple browsers. AI.WT.21.04
0. Demonstrate proficiency planning an effective website. The student will be able to: AI.WT.22.0
    01. Compare and contrast site maps and wireframes. AI.WT.22.01
    02. Develop an effective site map for a website. AI.WT.22.02
    03. Create page layout wireframes for a website. AI.WT.22.03
    04. Classify web development tasks according to when they are performed during the web development cycle. AI.WT.22.04
    05. Describe the different types of business requirements that apply to website design. AI.WT.22.05
    06. Design business requirements to help ensure success for a specific website. AI.WT.22.06
    07. Demonstrate ability to use effective designer-client communication skills. AI.WT.22.07

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0. Demonstrate proficiency using web development tools and techniques. The student will be able to: AI.WT.23.0
    01. Compare and contrast writing HTML using a text editor versus using a WYSIWYG editor. AI.WT.23.01
    02. Design and create an effective webpage template. AI.WT.23.02
    03. Create attractive, engaging, and efficient webpages using a WYSIWYG editor. AI.WT.23.03
    04. Create an appropriate directory structure, naming convention protocol, and file organization for a website. AI.WT.23.04
    05. Create DHTML and XML documents using editors or converters. AI.WT.23.05
0. Demonstrate proficiency using specialized web design software. The student will be able to: AI.WT.24.0
    01. Compare and contrast various specialized web design software (e.g., Photoshop, Dreamweaver). AI.WT.24.01
    02. Demonstrate proficiency using various specialized web design software (e.g., Photoshop, Dreamweaver). AI.WT.24.02
0. Demonstrate proficiency gathering, preparing and evaluating web content. The student will be able to: AI.WT.25.0
    01. Characterize effective writing styles and conventions for the web. AI.WT.25.01
    02. Create effective written content for the web. AI.WT.25.02
    03. Prepare various types of graphical content for use on a webpage. AI.WT.25.03
    04. Access and digitize graphics through various resources (e.g., scanner, digital cameras, on-line graphics, clipart, CD-ROMs). AI.WT.25.04
    05. Create and edit images using image or graphic design software. AI.WT.25.05
    06. Compare and contrast static versus dynamic web content. AI.WT.25.06
    07. Evaluate sources for accuracy of content. AI.WT.25.07
0. Demonstrate an awareness of preparing a website for launch. The student will be able to: AI.WT.26.0
    01. Evaluate a website for basic usability and accessibility issues. AI.WT.26.01
    02. List the steps that are necessary to determine when a website is ready to launch. AI.WT.26.02
    03. Develop a User Testing Plan. AI.WT.26.03
    04. Demonstrate the ability to organize and execute a user testing of a website in multiple browsers. AI.WT.26.04

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0. Use oral and written communication skills in creating, expressing and interpreting information and ideas. The student will be able to: AI.WT.27.0
    01. Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace. AI.WT.27.01
    02. Locate, organize and reference written information from various sources. AI.WT.27.02
    03. Design, develop and deliver formal and informal presentations using appropriate media to engage and inform diverse audiences. AI.WT.27.03
    04. Interpret verbal and nonverbal cues/behaviors that enhance communication. AI.WT.27.04
    05. Apply active listening skills to obtain and clarify information. AI.WT.27.05
    06. Develop and interpret tables and charts to support written and oral communications. AI.WT.27.06
    07. Exhibit public relations skills that aid in achieving customer satisfaction. AI.WT.27.07
0. Solve problems using critical thinking skills, creativity and innovation. The student will be able to: AI.WT.28.0
    01. Employ critical thinking skills independently and in teams to solve problems and make decisions. AI.WT.01
    02. Employ critical thinking and interpersonal skills to resolve conflicts. AI.WT.02
    03. Identify and document workplace performance goals and monitor progress toward those goals. AI.WT.03
    04. Conduct technical research to gather information necessary for decision-making. AI.WT.04

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**IT Systems and Applications - Course Number: 9003430**

0. Explain motherboard components, types and features. The student will be able to: AI.SA.29.0
    01. Identify different motherboard form factors (ATX/BTX and micro ATX). AI.SA.29.01
    02. Identify input/output interfaces (e.g. USB, serial and NIC). AI.SA.29.02
    03. Identify the different types of bus slots (e.g. PCI, AGP, PCMCIA). AI.SA.29.03
    04. Identify the BIOS/CMOS/Firmware (e.g. POST, CMOS battery). AI.SA.29.04

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0. Explain the purpose and characteristics of CPUs and their features. The student will be able to: AI.SA.30.0
    01. Identify types of CPUs (e.g., AMD Intel). AI.SA.30.01
    02. Define hyper threading. AI.SA.30.02
    03. Explain multi core (e.g. dual, triple, quad). AI.SA.30.03
    04. Explain the difference between onboard cache (e.g. L1, L2, L3). AI.SA.30.04
    05. Compare and contrast between real and actual speed. AI.SA.30.05
    06. Compare and contrast between 32 bit and 64 bit processing. AI.SA.30.06
0. Perform installation and configuration activities. The student will be able to: AI.SA.31.0
    01. Install and configure software including device drivers. AI.SA.31.01
    02. Install and configure operating system software. AI.SA.31.02
    03. Install and configure application software. AI.SA.31.03
    04. Install and configure peripherals including device drivers (e.g., scanners, cameras, printers). AI.SA.31.04
    05. Supervise the testing of operating system management systems (e.g., registry, INI files). AI.SA.31.05
    06. Prepare the hard disk and related issues for operating system installation (e.g., BIOS, disk controllers). AI.SA.31.06
    07. Format and partition the hard disk. AI.SA.31.07
    08. Verify the proper operation of the system (e.g., physical inspection, tests, utilities). AI.SA.31.08
    09. Compare and contrast memory technologies (e.g., RAM, ROM, virtual memory, memory management). AI.SA.31.09
    10. Demonstrate proficiency using various memory technologies (e.g., RAM, ROM, virtual memory, memory management). AI.SA.31.10
    11. Demonstrate proper use of user interfaces, command utilities, and troubleshooting utilities. AI.SA.31.11
    12. Explain the basics of boot sequences, methods and startup utilities. AI.SA.31.12

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0. Perform the process for problem diagnostics and problem resolution through wireless, infrared, telephone, e-mail, remote access, or direct contact. The student will be able to: AI.SA.32.0
    01. Identify, troubleshoot and propose solutions for configuration problems. AI.SA.32.01
    02. Identify, troubleshoot and propose solutions for software problems. AI.SA.32.02
    03. Identify, troubleshoot and propose solutions for hardware malfunctions. AI.SA.32.03
    04. Identify, troubleshoot and propose solutions for network malfunctions. AI.SA.32.04
    05. Plan and implement a system upgrade and downgrade. AI.SA.32.05
    06. Evaluate data recovery using various techniques (e.g., MBR repair tools, rescue disks, disk image, backup). AI.SA.32.06
    07. Organize and perform system maintenance activities (e.g., management console, SNMP, system monitors, diagnostics, virus management). AI.SA.32.07
    08. Demonstrate corporate interaction proficiency (e.g., responsibility, interaction, communication). AI.SA.32.08
0. Demonstrate knowledge of presentation production issues. The student will be able to: AI.SA.33.0
    01. Demonstrate knowledge of copyright laws including copyright statute, disclaimers, and filing procedure. AI.SA.33.01
    02. Demonstrate an understanding of graphic and other file formats (e.g., EPS, TIFF, JPEG, PNG, ASCII, MPEG, MIDI, AVI, WAV) and knowledge of image size when scanning and saving files for use in different presentation types (web, computer, print). AI.SA.33.02
    03. Identify display device connectors and types. AI.SA.33.03
    04. Define refresh rate, resolution, multi-monitor and Degauss. AI.SA.33.04
    05. Demonstrate knowledge of presentation vocabulary/terms. AI.SA.33.05
    06. Compare and contrast and utilize various audio/video output solutions and devices (e.g., network, web). AI.SA.33.06
    07. Compare and contrast removable storage. AI.SA.33.07

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0. Demonstrate proficiency using computer networks. The student will be able to: AI.SA.34.0
    01. Define networking and describe the purpose of a network. AI.SA.34.01
    02. Describe the conceptual background of digital networks including terminology and basics. AI.SA.34.02
    03. Describe various types of networks and the advantages and disadvantages of each. AI.SA.34.03
    04. Describe the use, advantages, and disadvantages of various network media. AI.SA.34.04
    05. Describe the function of various network devices. AI.SA.34.05
    06. Describe the difference between the internet and intranet. AI.SA.34.06
    07. Compare and contrast IP Version 6 and IP Version 4. AI.SA.34.07
    08. Compare and contrast the different network types. AI.SA.34.08
    09. Compare and contrast various implementation models. AI.SA.34.09
0. Demonstrate proficiency communicating over the Internet. The student will be able to: AI.SA.35.0
    01. Display understanding of how Internet Service Providers (ISP) operates and what role they play in enabling users to connect to the Internet. AI.SA.35.01
    02. Explain how the Internet works and how documents are connected and transferred. AI.SA.35.02
    03. Configure an email client for SMTP and POP3 servers, including port assignment. AI.SA.35.03
    04. Explain how the primary modes of Internet communication are used. AI.SA.35.04
0. Demonstrate proficiency in troubleshooting, repair and maintenance of hardware. The student will be able to: AI.SA.36.0
    01. Determine the troubleshooting methods and tools for peripheral devices. AI.SA.36.01
    02. Explain and interpret common device issues and basic troubleshooting methods. AI.SA.36.02
    03. Integrate common preventative maintenance techniques. AI.SA.36.03
0. Demonstrate proficiency in the basic principles of security concepts and technologies. The student will be able to: AI.SA.37.0
    01. Evaluate encryption technologies, software firewall, authentication technologies, and data security. AI.SA.37.01
    02. Summarize the following security features (e.g., encryption, malicious software protection, BIOS security, password management and biometrics). AI.SA.37.02

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0. Demonstrate proficiency in operational procedures as they relate to computer equipment and components. The student will be able to: AI.SA.38.0
    01. Compare and contrast ESD, EMI, RFI, and electrical safety. AI.SA.38.01
    02. Demonstrate proficiency in the use of state regulations for hazardous materials. AI.SA.38.02
0. Use information technology tools. The student will be able to: AI.SA.39.0
    01. Use personal information management (PIM) applications to increase workplace efficiency. AI.SA.39.01
    02. Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email, and internet applications. AI.SA.39.02
    03. Employ computer operations applications to access, create, manage, integrate, and store information. AI.SA.39.03
    04. Employ collaborative/groupware applications to facilitate group work. AI.SA.39.04
0. Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. The student will be able to: AI.SA.40.0
    01. Describe the nature and types of business organizations. AI.SA.40.01
    02. Explain the effect of key organizational systems on performance and quality. AI.SA.40.02
    03. List and describe quality control systems and/or practices common to the workplace. AI.SA.40.03
    04. Explain the impact of the global economy on business organizations. AI.SA.40.04
0. Describe the importance of professional ethics and legal responsibilities. The student will be able to: AI.SA.41.0
    01. Evaluate and justify decisions based on ethical reasoning. AI.SA.41.01
    02. Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities, and employer policies. AI.SA.41.02
    03. Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace or on social media. AI.SA.41.03
    04. Interpret and explain written organizational policies and procedures. AI.SA.41.04

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**Database Essentials - Course Number: 9003440**

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0. Develop the "big picture" of database design and how best to organize data according to business rules and/or client needs. The student will be able to: AI.DE.42.0
    01. Identify and analyze the phases of the database development process. AI.DE.42.01
    02. Explain what conceptual data modeling and database design involves. AI.DE.42.02
    03. Compare database development process with that of the application development process. AI.DE.42.03
    04. Identify the need for databases and why they are used. AI.DE.42.04
    05. Explain the various types of databases (i.e., flat file, relational) and the appropriate use of each. AI.DE.42.05
    06. Demonstrate proficiency in design methodology by completing appropriate tasks during the appropriate time of the developmental life cycle. AI.DE.42.06
    07. Demonstrate proficiency in design methodology by considering where the database will reside. AI.DE.42.07
0. Develop the process of creating an entity by identifying relationships. The student will be able to: AI.DE.43.0
    01. Identify and model various types of entities. AI.DE.43.01
    02. Identify naming and drawing conventions for entities. AI.DE.43.02
    03. Sequence the steps that are necessary for creation of an entity. AI.DE.43.03
    04. Analyze and model the relationships between entities. AI.DE.43.04
0. Formulate and assemble initial entity relationship by expanding on modeling concepts. The student will be able to: AI.DE.44.0
    01. Analyze and model attributes. AI.DE.44.01
    02. Identify unique identifiers for each entity. AI.DE.44.02
    03. Develop an entity relationship diagram tagging attributes with optionality. AI.DE.44.03
0. Consider the degree and optionality of relationships of entities. The student will be able to: AI.DE.45.0
    01. Create models and entity relationship information requirements and interviews. AI.DE.45.01
    02. Begin to differentiate between one-to-many, many-to-many and one-to-one relationships. AI.DE.45.02
    03. Identify relationship between two entities by reading a given diagram. AI.DE.45.03
    04. Create a relationship between instances of the same entity. AI.DE.45.04
    05. Read an entity relationship model in order to validate it. AI.DE.45.05

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0. Demonstrate proficiency in early construction stages of the data modeling process by using unique identifiers and many-to-many (M:M) relationships for building entity relationship diagrams. The student will be able to: AI.DE.46.0
    01. Identify the significance of an attribute that has more than one value for each entity instance. AI.DE.46.01
    02. Evaluate appropriate methods of storing validation rules for attributes. AI.DE.46.02
    03. Recognize unique identifiers inherited from other entities. AI.DE.46.03
    04. Sequence the steps involved in resolving a many-to-many relationship. AI.DE.46.04
0. Demonstrate proficiency in advanced data constructs by analyzing business requirements and diagramming entities and relationships. The student will be able to: AI.DE.47.0
    01. Validate that an attribute is properly placed based upon its dependence on its entity's unique identifier (UID). AI.DE.47.01
    02. Model advanced data constructs including recursive relationships, subtypes, and exclusive relationships. AI.DE.47.02
    03. Enforce referential integrity. AI.DE.47.03
0. Apply the complex ERM information by fine-tuning entities and the process for relating them. The student will be able to: AI.DE.48.0
    01. Describe a relational database and how it is different from other database systems. AI.DE.48.01
    02. Define primary keys and foreign keys and describe their purpose. AI.DE.48.02
    03. Describe what data integrity refers to and list some constraints. AI.DE.48.03
    04. Explain how database design fits into the database development process. AI.DE.48.04
    05. Translate an entity-relationship model into a relational database design. AI.DE.48.05
0. Apply initial database design and normalization by following the set of house rules that determine how items are stored and retrieved. The student will be able to: AI.DE.49.0
    01. Recognize raw data and evaluate the steps for creating a data group in unnormalized form (UNF). AI.DE.49.01

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0. Manipulate data. The student will be able to: AI.DE.50.0
    01. Determine appropriate data inputs and outputs for an existing database. AI.DE.50.01
    02. Demonstrate proficiency in record management (i.e., entering, editing, finding, selecting, sorting, deleting records). AI.DE.50.02
    03. Change the layout of a datasheet. AI.DE.50.03
    04. Create forms, reports, mailing labels, and charts using a database. AI.DE.50.04
    05. Export data to appropriate software applications. AI.DE.50.05
    06. Demonstrate proficiency in coordinating databases with appropriate software applications. AI.DE.50.06
0. Building and modifying tables. The student will be able to: AI.DE.51.0
    01. Create a database table. AI.DE.51.01
    02. Create table structures and establish table relationships. AI.DE.51.02
    03. Determine fields and assign data types in a database table. AI.DE.51.03
    04. Demonstrate appropriate manipulation of database tables (i.e., enter data, add and delete records). AI.DE.51.04
    05. Modify a database table by adding, deleting, and removing fields. AI.DE.51.05
    06. Demonstrate proficiency in the appropriate use of database wizards. AI.DE.51.06
0. Performing queries and filtering records. The student will be able to: AI.DE.52.0
    01. Design a query and extract specific data from a database table. AI.DE.52.01
    02. Create a calculated field. AI.DE.52.02
    03. Filter data in records by selection and by form. AI.DE.52.03
    04. Modify a saved query. AI.DE.52.04
    05. Explain what a Database Warehouse and its uses. AI.DE.52.05
0. Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to: AI.DE.53.0
    01. Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments. AI.DE.53.01
    02. Explain emergency procedures to follow in response to workplace accidents. AI.DE.53.02
    03. Create a disaster and/or emergency response plan. AI.DE.53.03

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0. Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives. The student will be able to: AI.DE.54.0
    01. Employ leadership skills to accomplish organizational goals and objectives. AI.DE.54.01
    02. Establish and maintain effective working relationships with others in order to accomplish objectives and tasks. AI.DE.54.02
    03. Conduct and participate in meetings to accomplish work tasks. AI.DE.54.03
    04. Employ mentoring skills to inspire and teach others. AI.DE.54.04
0. Explain the importance of employability skill and entrepreneurship skills. The student will be able to: AI.DE.55.0
    01. Identify and demonstrate positive work behaviors needed to be employable. AI.DE.55.01
    02. Develop personal career plan that includes goals, objectives, and strategies. AI.DE.55.02
    03. Examine licensing, certification, and industry credentialing requirements. AI.DE.55.03
    04. Maintain a career portfolio to document knowledge, skills, and experience. AI.DE.55.04
    05. Evaluate and compare employment opportunities that match career goals. AI.DE.55.05
    06. Identify and exhibit traits for retaining employment. AI.DE.55.06
    07. Identify opportunities and research requirements for career advancement. AI.DE.55.07
    08. Research the benefits of ongoing professional development. AI.DE.55.08
    09. Examine and describe entrepreneurship opportunities as a career planning option. AI.DE.55.09
0. Demonstrate personal money-management concepts, procedures, and strategies. The student will be able to: AI.DE.56.0
    01. Identify and describe the services and legal responsibilities of financial institutions. AI.DE.56.01
    02. Describe the effect of money management on personal and career goals. AI.DE.56.02
    03. Develop a personal budget and financial goals. AI.DE.56.03
    04. Complete financial instruments for making deposits and withdrawals. AI.DE.56.04
    05. Maintain financial records. AI.DE.56.05
    06. Read and reconcile financial statements. AI.DE.56.06
    07. Research, compare and contrast investment opportunities. AI.DE.56.07

0. Plan program design. The student will be able to: AI.PE.57.0
    01. Formulate a plan to determine program specifications individually or in groups. AI.PE.57.01
    02. Use a graphical representation or pseudocode to represent the structure in a program or subroutine. AI.PE.57.02
    03. Design programs to meet business needs and requirements using problem-solving strategies. AI.PE.57.03
    04. Prepare proper input/output layout specifications. AI.PE.57.04
    05. Manually trace the execution of programs and verify that programs follow the logic of their design as documented. AI.PE.57.05
    06. Analyze the business needs and requirements. AI.PE.57.06
    07. Determine what kind of information the desired program must process. AI.PE.57.07
    08. Formulate concise descriptions of a program's task and purpose. AI.PE.57.08
    09. Formulate concise descriptions of task and purpose of a program's pieces. AI.PE.57.09
    10. Organize programs according to the problem analysis. AI.PE.57.10
    11. Recognize changes in the problem statement. AI.PE.57.11
    12. Suggest changes in the program organization. AI.PE.57.12
0. Code programs. The student will be able to: AI.PE.58.0
    01. Write programs according to recognized programming standards. AI.PE.58.01
    02. Write internal documentation statements as needed in the program source code. AI.PE.58.02
    03. Code programs using logical statements (e.g., If-Then-Else, Do… While). AI.PE.58.03
    04. Enter and modify source code using a program language editor. AI.PE.58.04
    05. Code routines within programs that validate input data. AI.PE.58.05
    06. Code programs using object-oriented languages (techniques). AI.PE.58.06
    07. Select the essential aspects of a problem statement. AI.PE.58.07
    08. Provide a solution to a problem. AI.PE.58.08
    09. Find solutions to an extended problem statement. AI.PE.58.09
    10. Utilize reference manuals and help systems. AI.PE.58.10
    11. Use pre-defined functions within programs. AI.PE.58.11

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0. Test programs. The student will be able to: AI.PE.59.0
    01. Develop a plan for testing programs. AI.PE.59.01
    02. Develop data for use in program testing. AI.PE.59.02
    03. Perform debugging activities. AI.PE.59.03
    04. Distinguish among the different types of program and design errors. AI.PE.59.04
    05. Evaluate program test results. AI.PE.59.05
    06. Execute programs and subroutines as they relate to the total application. AI.PE.59.06
    07. Develop examples that illustrate the core behavior of each program. AI.PE.59.07
    08. Develop examples that illustrate the core behavior of each program component. AI.PE.59.08
    09. Illustrate the behavior of boundary cases. AI.PE.59.09
    10. Demonstrate an understanding that engineering artifacts requires rigorous and systematic testing. AI.PE.59.10
    11. Use examples to show that the solution meets pre-determined criteria. AI.PE.59.11
    12. Demonstrate understanding that testing can expose problems but not prove the correctness of the design in an absolute sense. AI.PE.59.12
    13. Compile (interpret) and run programs. AI.PE.59.13
0. Perform program maintenance. The student will be able to: AI.PE.60.0
    01. Analyze output to identify and annotate errors or enhancements. AI.PE.60.01
0. Create and maintain documentation. The student will be able to: AI.PE.61.0
    01. Follow established documentation standards. AI.PE.61.01
0. Develop an awareness of software quality assurance. The student will be able to: AI.PE.62.0
    01. Identify the legal and social consequences of errors in software. AI.PE.62.01
    02. Describe copyright and other laws that relate to software theft and misuse. AI.PE.62.02
    03. Describe software security measures to protect computer systems and data from unauthorized use and tampering (e.g., physical security, passwords, encryption, virus protection/prevention). AI.PE.62.03
    04. Develop an awareness of version control systems and Open Source Software. AI.PE.62.04
0. Develop an understanding of programming techniques and concepts. The student will be able to: AI.PE.63.0
    01. Identify the basic constructs used in structured programming. AI.PE.63.01

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0. Design structured programs. The student will be able to: AI.PE.64.0
    01. Design programs that model mathematical relationships from application areas (e.g., accounting, economics, multimedia, programming, science, web). AI.PE.64.01
    02. Design programs that deal with multi-faceted objects (e.g., personnel records, physical objects, attributes of HTML tags). AI.PE.64.02
    03. Design programs that deal with mixed classes of objects (e.g., a class of geometric shapes containing circles, rectangles, triangles, squares, polygons). AI.PE.64.03
    04. Design programs that deal with objects of undetermined size (e.g., shopping lists, family trees, file directories on computers, websites). AI.PE.64.04

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**Web Development Technologies - Course Number: 9003460**

0. Demonstrate proficiency in page design applicable to the WWW. The student will be able to: AI.PE.65.0
    01. Identify and convert graphic formats. AI.PE.65.01
    02. Demonstrate proficiency in adding Java scripts to webpages. AI.PE.65.02
0. Demonstrate proficiency in webpage design applicable to the WWW. The student will be able to: AI.PE.66.0
    01. Determine the objectives and the audience for webpages. AI.PE.66.01
    02. Identify design strategies to reach and keep an audience. AI.PE.66.02
    03. Use storyboarding to plan a website. AI.PE.66.03
    04. Create styles and other design elements (e.g. backgrounds, colors, fonts, buttons). AI.PE.66.04

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0. Demonstrate proficiency in using a WYSIWG editor, web design, or web animation software for webpage design. The student will be able to: AI.PE.67.0
    01. Apply style sheets for consistent website design. AI.PE.67.01
    02. Create and edit images and photographs for webpages using digital imaging software (e.g., ImageReady in Photoshop). AI.PE.67.02
    03. Insert audio files into a webpage. AI.PE.67.03
    04. Create, edit and integrate video files into a webpage. AI.PE.67.04
    05. Create, edit and integrate animation files into a webpage. AI.PE.67.05
    06. Demonstrate an understanding of photograph compression factors such as transmission speed, color reduction, and browser support. AI.PE.67.06
    07. Demonstrate knowledge of image formats related to photos and graphics on the Internet (e.g. Graphic formats (TIFF & EPS), web formats (JPEG, GIF, PNG). AI.PE.67.07
    08. Save and export a photograph to the web in the format best for image quality and file size. AI.PE.67.08
    09. Build, optimize, edit, and test webpages for publication. AI.PE.67.09
    10. Create a webpage that utilizes plug-ins. AI.PE.67.10
    11. Demonstrate an understanding of network and web implementation issues (e.g., bandwidth, compression, streaming). AI.PE.67.11
    12. Compare and contrast various methods by which information may be accessed on the Internet/Intranet (e.g., FTP, telnet, browser). AI.PE.67.12
    13. Demonstrate an understanding of file encryption methods (e.g., secure server, unsecured server). AI.PE.67.13
0. Demonstrate proficiency in using digital photography and digital imaging. The student will be able to: AI.PE.68.0
    01. Demonstrate knowledge of ethics related to digital imaging and legal and consent issues. AI.PE.68.01
    02. Apply effective design principles in digital photography compositions. AI.PE.68.02
    03. Illustrate the essence of an event, quote, or slogan through digital photography/imaging. AI.PE.68.03
    04. Demonstrate skill in using digital imaging software for image manipulation, color correction, and special effects to creatively convey a message or literary interpretation. AI.PE.68.04
    05. Demonstrate skill in scanning and cropping photographs. AI.PE.68.05

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0. Design and create webpages suitable for publishing to the Internet. The student will be able to: AI.PE.69.0
    01. Explain the need for web-based applications. AI.PE.69.01
    02. Evaluate a website for basic usability and accessibility issues. AI.PE.69.02
    03. Display an understanding of the purposes of site maps and wireframes. AI.PE.69.03
    04. Develop an effective site map for a website. AI.PE.69.04
    05. Develop effective wireframes for a website. AI.PE.69.05
    06. Identify industry best practices in visual design. AI.PE.69.06
    07. Explain the key concepts of meeting client needs. AI.PE.69.07
    08. Develop an effective look and feel for a website. AI.PE.69.08
    09. Develop an effective webpage template. AI.PE.69.09
    10. Describe a correct directory structure, naming convention protocol, and file organization for a website. AI.PE.69.10
    11. Characterize effective writing for the web. AI.PE.69.11
    12. Create effective written content for the web. AI.PE.69.12
    13. Decide how to best prepare various types of graphical content for use on a webpage. AI.PE.69.13
    14. Develop a User Testing Plan. AI.PE.69.14
    15. List the steps that are necessary to determine when a website is ready to launch. AI.PE.69.15
    16. Demonstrate the ability to organize and execute a user testing of a website. AI.PE.69.16
0. Describe how website performance is monitored and analyzed. The student will be able to: AI.PE.70.0
    01. Identify issues related to website maintenance. AI.PE.70.01
    02. Use webpage validation tools. AI.PE.70.02
    03. Describe website performance metrics (e.g., visits, time-on-page, time-on-site) and discuss their design implications. AI.PE.70.03
    04. Demonstrate knowledge of accessibility problems and solutions. AI.PE.70.04
    05. Examine indexing, page ranking, basic Search Engine Optimization techniques. AI.PE.70.05
    06. Explore common website analytic tools. AI.PE.70.06
    07. Construct webpages with streaming media content. AI.PE.70.07

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0. Demonstrate proficiency in hosting a website. The student will be able to: AI.PE.71.0
    01. Apply professional guidelines to choose, search for, and register a domain name. AI.PE.71.01
    02. Evaluate criteria upon which to select an appropriate web host. AI.PE.71.02
    03. Make generalizations about optimal download speed for a particular website. AI.PE.71.03
    04. Demonstrate the ability to upload and download files using FTP protocol. AI.PE.71.04
    05. Develop a Maintenance Plan for a client. AI.PE.71.05
0. Demonstrate the ability to attract and track traffic for a website. The student will be able to: AI.PE.72.0
    01. Explain and describe the best practices for attracting traffic to websites. AI.PE.72.01
    02. Evaluate an effective search engine optimization strategy. AI.PE.72.02
    03. Describe tactics for building online credibility. AI.PE.72.03
    04. Explain how to use standard techniques to gather and/or track site statistics. AI.PE.72.04

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**Multimedia Technologies - Course Number: 9003470**

0. Demonstrate knowledge of presentation production issues. The student will be able to: AI.MT.73.0
    01. Identify characteristics of various types of presentations (informing, selling, teaching, entertaining). AI.MT.73.01
    02. Identify presentation materials (e.g. handouts, seminar notebooks, business cards, coupons) and presentation marketing mediums (e.g., print media such as newspaper, magazines; TV; movies; computer presentations; interactive CD ROM; kiosks, webpages). AI.MT.73.02
    03. Identify design characteristics (fonts, size and styles, backgrounds) that are suited for each type of presentation format and material. AI.MT.73.03
    04. Demonstrate knowledge of copyright laws including copyright statute, disclaimers, and filing procedures. AI.MT.73.04
    05. Research and identify skills needed for career positions in multimedia. AI.MT.73.05
    06. Demonstrate an understanding of graphic and other file formats (e.g., EPS, TIFF, JPEG, ASCII, MPEG, MIDI, AVI, WAV) and knowledge of image size when scanning and saving files for use in different presentation types (web, computer, print). AI.MT.73.06
    07. Demonstrate knowledge of presentation vocabulary/terms. AI.MT.73.07

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0. Demonstrate proficiency in using digital photography and digital imaging. The student will be able to: AI.MT.74.0
    01. Demonstrate knowledge of ethics related to digital imaging and legal and consent issues. AI.MT.74.01
    02. Apply effective design principles in digital photography compositions. AI.MT.74.02
    03. Illustrate the essence of an event, quote, or slogan through digital photography/imaging. AI.MT.74.03
    04. Demonstrate skill in using digital imaging software for image manipulation, color correction, and special effects to creatively convey a message or literary interpretation. AI.MT.74.04
    05. Demonstrate skill in scanning and cropping photographs. AI.MT.74.05
    06. Incorporate scanned or digitally taken photographs into documents (poster, brochure, card, photo journalism story, report or book covers, letterhead) that have been designed using desktop publishing software or the desktop publishing features of word processing software. AI.MT.74.06
0. Demonstrate basic video production. The student will be able to: AI.MT.75.0
    01. Use student device or current industry standard production video equipment. AI.MT.75.01
    02. Operate camera in studio and location (field) production environments. AI.MT.75.02
    03. Demonstrate understanding of digital video storage concepts and digital storage media. AI.MT.75.03
    04. Demonstrate knowledge of and the ability to operate digital recording decks, and other digital storage devices. AI.MT.75.04
    05. Identify and select microphones for production needs. AI.MT.75.05
    06. Determine appropriate lighting needs for production settings. AI.MT.75.06
    07. Identify location and studio lighting types, method of use and application. AI.MT.75.07
0. Demonstrate set-up and configuration of a computer for video applications. The student will be able to: AI.MT.76.0
    01. Install basic peripheral devices related to video programs. AI.MT.76.01
    02. Install and configure software related to video programs. AI.MT.76.02
    03. Demonstrate basic knowledge of computer system requirements. AI.MT.76.03
    04. Demonstrate basic knowledge of installing plug-ins or additional audio source material such as beats and or samples. AI.MT.76.04
    05. Understand the signal flow of a digital video workstation. AI.MT.76.05

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0. Demonstrate the basic operation of a video workstation. The student will be able to: AI.MT.77.0
    01. Demonstrate knowledge of the digital video workstation interface. AI.MT.77.01
    02. Demonstrate a working familiarity and understanding of the function and operation of digital video workstations. AI.MT.77.02
    03. Describe a full digital media production cycle. AI.MT.77.03
    04. Demonstrate ability to edit, cut, erase, and insert video utilizing various digital production techniques. AI.MT.77.04
    05. Record video directly to the digital video workstation. AI.MT.77.05
    06. Demonstrate knowledge of editing video according to message. AI.MT.77.06
    07. Demonstrate skill in using video effects and plug-ins. AI.MT.77.07
    08. Describe a first complete run-through of the video production process. AI.MT.77.08
    09. Characterize the qualities of effective communication in a completed video. AI.MT.77.09
    10. Prepare a video project for final compositing and export. AI.MT.77.10
    11. Transfer video files between various video software applications. AI.MT.77.11
    12. Export finished video. AI.MT.77.12
    13. Identify and describe solutions to the challenges and obstacles that arise in a video production. AI.MT.77.13
0. Demonstrate basic audio production. The student will be able to: AI.MT.78.0
    01. Describe digital audio storage concepts and digital storage media. AI.MT.78.01
    02. Operate digital recording decks and other digital storage devices. AI.MT.78.02
    03. Describe the function and operation of digital audio workstations. AI.MT.78.03
    04. Edit, cut, erase, and insert sound utilizing various digital production techniques. AI.MT.78.04
    05. Perform digital noise reduction and noise extraction via spectral display. AI.MT.78.05
0. Set-up and configure a computer for audio applications. The student will be able to: AI.MT.79.0
    01. Install basic peripheral devices related to audio programs. AI.MT.79.01
    02. Install and configure software related to audio programs. AI.MT.79.02
    03. Demonstrate basic knowledge of computer system requirements. AI.MT.79.03
    04. Install plug-ins or additional audio source material such as beats and or samples. AI.MT.79.04
    05. Diagram the signal flow of a digital audio workstation. AI.MT.79.05

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0. Operate an audio workstation. The student will be able to: AI.MT.80.0
    01. Demonstrate knowledge of the digital audio workstation interface. AI.MT.80.01
    02. Create and arrange a multi-track project. AI.MT.80.02
    03. Create interest and effect using editing techniques. AI.MT.80.03
    04. Design and edit audio using a waveform editor. AI.MT.80.04
    05. Record audio directly to the digital audio workstation. AI.MT.80.05
    06. Mix audio. AI.MT.80.06
    07. Demonstrate skill in using audio effects and plug-ins. AI.MT.80.07
    08. Prepare an audio project for finishing and final mix down. AI.MT.80.08
    09. Transfer audio files between various audio software applications. AI.MT.80.09
    10. Demonstrate the understanding of audio file bit depth, bandwidth and dithering and be able to explain when and where these apply in various applications of digital audio production. AI.MT.80.10
    11. Export finished audio. AI.MT.80.11
0. Demonstrate proficiency in using presentation software and equipment. The student will be able to: AI.MT.81.0
    01. Using presentation software, create a multimedia presentation that incorporates shot and edited video, animation, music, narration and adheres to good design principles, use of transitions, and effective message conveyance. AI.MT.81.01
    02. Demonstrate knowledge of the roles and responsibilities of a multimedia production team (e.g., project manager, creative or design director, content experts, writers, graphic designers, animators, sound designers, videographer, interface designers/programmers). AI.MT.81.02
    03. Collaborate with team members to plan, edit, evaluate, and present a multimedia presentation. AI.MT.81.03

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**Computer Networking Fundamentals - Course Number: 9003480**

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0. Demonstrate understanding of network technologies. The student will be able to: AI.CN.82.0

    01. Explain the function of common networking protocols such as TCP,FTP, UDP, TCP/IP suite, DHCP, TFTP, DNS, HTTP(S), ARP, SIP (VoIP), RTP (VoIP), SSH, POP3, NTP, IMAP4, TELNET, SMTP, SNMP 2/3, ICMP, IGMP, TLS. AI.CN.82.01

    02. Identify commonly used TCP and UDP default ports such as TCP ports, FTP – 20, 21, SSH – 22, TELNET – 23, SMTP – 25, DNS – 53, HTTP – 80, POP3 – 110, NTP – 123, IMAP4 – 143, HTTPS – 443, UDP ports TFTP – 69, DNS – 53, BOOTPS/DHCP – 67, SNMP – 161. AI.CN.82.02

    03. Identify the following address formats IPv6, IPv4, and MAC Addressing. AI.CN.82.03

    04. Evaluate the proper use of the following addressing technologies and addressing schemes: Subnetting, Classful vs. classless (e.g. CIDR, Supernetting), NAT, PAT, SNAT, Public vs. private, DHCP (static, dynamic APIPA), Addressing schemes, Unicast, Multicast, Broadcast. AI.CN.82.04

    05. Identify common IPv4 and IPv6 routing protocols - Link state OSPF, IS-IS, Distance vector, RIP, RIPv2, BGP, Hybrid EIGRP. AI.CN.82.05

    06. Explain the purpose and properties of routing such as IGP vs EGP, Static vs dynamic, Next Hop, Understanding routing tables and how they pertain to path selection, and explain convergence (steady state). AI.CN.82.06

    07. Compare the characteristics of wireless communication standards such as 802.11 a/b/g/n, speeds, distance, channels, frequency, authentication and encryption such as WPA, WEP, RADIUS, and TKIP. AI.CN.82.07

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0. Understand, install, and configure network hardware. The student will be able to: AI.CN.83.0

    01. Categorize standard cable types and their properties such as CAT3, CAT5, CAT5e, CAT6, STP, UTP, Multimode fiber, single-mode fiber, coaxial, serial, plenum vs. non-plenum, transmission speeds, distance, duplex, noise immunity (security, EMI), and frequency. AI.CN.83.01

    02. Identify common connector types such as RJ-11, RJ-45, BNC, SC, ST, LC, RS-232. AI.CN.83.02

    03. Identify common physical network topologies such as Star, Mesh, Bus, Ring, Point to Point, Point to Multipoint, and Hybrid. AI.CN.83.03

    04. Differentiate and implement appropriate wiring standards such as 568A, 568 B Straight vs. cross over, rollover, and Loopback. AI.CN.83.04

    05. Categorize Wan technologies types and properties such as Frame Relay, E1/T1, ADSL, SDSL, VDSL, Cable modem, Satellite, E3/T3, Oc-x, Wireless, ATM, SONET, MPLS, ISD Bri, ISDN PRI, POTS, PSTN, Circuit, switch, packet switch, speed, transmission media, and Distance. AI.CN.83.05

    06. Categorize LAN technology types and properties such as Ethernet, 10BaseT, 100BaseTX, 100BaseFX, 1000BaseT, 1000BaseX, 10GbaseSR, 10GBaseLR, 10GBaseER, 10GBaseSW, 10GBaseLW, 10GBaseEW, 10GBaseT and properties of each such as CSMA/CD, Broadcast, Collision, Bonding, Speed, and Distance. AI.CN.83.06

    07. Explain common logical network topologies and their characteristics such as peer to peer, client/server, VPN, VLAN. AI.CN.83.07

    08. Install components of wiring distribution such as Vertical and horizontal cross connects, Patch panels, 66 block, MDFs, IDFs, 25 pair, 100 pair, 110 block, Demarc, Demarc extension, Smart jack, verify wiring installation, and Verify wiring termination. AI.CN.83.08

0. Understand, install and configure networking devices. The student will be able to: AI.CN.84.0

    01. Install, configure and differentiate between common network devices such as hub, repeater, modem, NIC, media converters, basic switch, bridge, wireless access point, basic router, basic firewall, basic DHCP server. AI.CN.84.01

    02. Identify the function of specialized network devices such as multilayer switch, Content switch, IDS/IPS, load balancer, multifunction network devices, DNS server Bandwidth shaper, proxy server, and CSU/DSU. AI.CN.84.02

    03. Explain the advance features of a switch such as PoE, Spanning tree, VLAN, Trunking, Port mirroring, and Port Authentication. AI.CN.84.03

    04. Implement a basic wireless network using the following technologies installed client, access point placement, access point with encryption, access point with configured channels and frequencies, and a set ESSSID and beacon. AI.CN.84.04

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0. Understand, install and configure network management software. The student will be able to: AI.CN.85.0

    01. Explain the function of the OSI layer model such as physical, data link, network, transport, session, presentation, and application. AI.CN.85.01

    02. Identifies types of configuration management documentation such as wiring schematics, physical and logical network diagram, baselines, policies, procedure and configuration and regulations. AI.CN.85.02

    03. Evaluate the network based on configuration management documentation such as compare wiring schematics, physical and logical network diagrams, baselines, policies and procedures, and configurations to network devices and infrastructure, and update wiring schematics, physical and logical network diagrams, configuration and job logs as needed. AI.CN.85.03

    04. Conduct network monitoring to identify performance and connectivity issues using the following: network monitoring utilities (packet sniffers, connectivity software, load testing, throughput testers) and system logs, history, event log. AI.CN.85.04

    05. Conduct network monitoring to identify performance and connectivity issues using the following: network monitoring utilities (packet sniffers, connectivity software, load testing, and throughput testers), system logs, history logs, and event logs. AI.CN.85.05

    06. Explain different methods and rationales for network performance optimization such as QoS, Traffic shaping, Load balancing, high availability, Caching engines, Fault tolerance, Latency sensitivity, High bandwidth applications, VoIP, Video applications, and Uptime. AI.CN.85.06

    07. Implement the following network troubleshooting methodology - Information gathering, identify symptoms and problems, Identify the affected areas of the network, determine if anything has changed, Establish the most probable cause, determine if escalation is necessary, Create an action plan and solution identifying potential effects, Implement and test the solution, Identify the results and effects of the solution, and Document the solution and the entire process. AI.CN.85.07

    08. Troubleshoot common connectivity issues and select an appropriate solution Physical issues: Cross talk, Near End crosstalk, Attenuation, collisions, Shorts Open, Impedance mismatch (echo), and Interference - Logical issues: Port speed, Port duplex mismatch, incorrect VLAN, Incorrect IP address, Wrong gateway, Wrong DNS, Wrong subnet mask, Issues that should be identified but escalated: Switching loop, Routing loop, Route problems, Proxy arp, Broadcast storms, Wireless Issues: Interference (bleed, environmental factors), incorrect encryption, Incorrect channel, Incorrect frequency, ESSID mismatch, Standard mismatch (802.11 a/b/g/n), Distance, Bounce, and Incorrect antenna placement. AI.CN.85.08

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0. Understand, install and configure networking tools. The student will be able to: AI.CN.86.0

    01. Select the appropriate command line interface tool and interpret the output to verify functionality such as Traceroute, Ipconfig, IFconfig, Ping, Arp ping, Arp, Nslookup, Hostname, Dig, Mtr, Route, and Nbtstat. AI.CN.86.01

    02. Explain the purpose of network scanners such as Packet sniffers, Intrusion detection software, Intrusion prevention software, Port scanners. AI.CN.86.02

    03. Utilize the appropriate hardware tools such as Cable testers, Protocol analyzer, Certifiers, TDR, OTDR, Multimeter, Toner probe, Butt set, Punch down tool, Cable stripper, Snips, Voltage event recorder, and Temperature monitor. AI.CN.86.03

0. Install, configure, and manage network security hardware and software devices. The student will be able to: AI.CN.87.0

    01. Explain the function of hardware and software security devices such as Network based firewall, Host based firewall, IDS, IPS, and VPN concentrator. AI.CN.87.01

    02. Explain common features of a firewall for example: Application layer vs. network layer, Stateful vs. stateless, Scanning services, Content filtering, Signature identification, and Zones. AI.CN.87.02

    03. Explain the methods of network access security using the following: Filtering: ACL, MAC filtering, IP filtering, Tunneling and encryption, SSL VPN, VPN, L2TP, PPTP, IPSEC, Remote access, RAS, RDP, PPPoE, PPP, VNC, and ICA. AI.CN.87.03

    04. Explain methods of user authentication using the following methods: PKI, Kerberos, AAA, RADIUS, TACACS+, Network access control, 802.1x, CHAP, MS-CHAP, and EAP. AI.CN.87.04

    05. Explain issues that affect device security such as the Physical security, Restricting local and remote access, Secure methods vs. unsecure methods, SSH, HTTPS, SNMPv3, SFTP, SCP, and TELNET, HTTP, FTP, RSH, RCP, SNMPv1/2. AI.CN.87.05

    06. Identify common security threats and mitigation techniques such as Security threats, DoS, Viruses, Worms, Attackers, Man in the middle, murf, Rogue access points, Social engineering (phishing), Mitigation techniques, Policies and procedures, User training, Patches and updates. AI.CN.87.06

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**Cybersecurity Fundamentals - Course Number: 9003490**

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0. Demonstrate an understanding of cybersecurity, the terminology used, its history and culture, and trends. The student will be able to: AI.CF.88.0
    01. Describe the history of cybersecurity, including the evolution of a hacker culture. AI.CF.88.01
    02. Discuss the trends and national initiatives related to cybersecurity. AI.CF.88.02
    03. Distinguish between information assurance and cybersecurity. AI.CF.88.03
    04. Describe the concepts of confidentiality as it relates to user and data impact. AI.CF.88.04
    05. Explain authentication and the concept of non-repudiation. AI.CF.88.05
    06. Describe the concept of "Hacking - The Human Element" and elaborate on its implications to cybersecurity. AI.CF.88.06
0. Recognize the following types of malicious code and specify the appropriate actions to take to mitigate vulnerability and risk. The student will be able to: AI.CF.89.0
    01. Describe viruses. AI.CF.89.01
    02. Identify Trojan Horses. AI.CF.89.02
    03. Explain Logic Bombs. AI.CF.89.03
    04. Describe worms. AI.CF.89.04
    05. Explain exploit kits. AI.CF.89.05
    06. Identify kill chains. AI.CF.89.06
0. Recognize and be able to differentiate and explain the following access control models. The student will be able to: AI.CF.90.0
    01. Define MAC (Mandatory Access Control). AI.CF.90.01
    02. Define DAC (Discretionary Access Control). AI.CF.90.02
    03. Define RBAC (Role Based Access Control). AI.CF.90.03
0. Compare and contrast methods of authentication. The student will be able to: AI.CF.91.0
    01. Identify Kerberos. AI.CF.91.01
    02. Explain CHAP (Challenge Handshake Authentication Protocol). AI.CF.91.02
    03. Define certificates. AI.CF.91.03
    04. Apply username / password. AI.CF.91.04
    05. Identify tokens. AI.CF.91.05
    06. Describe multi-factor. AI.CF.91.06
    07. Define mutual. AI.CF.91.07
    08. Define biometrics. AI.CF.91.08

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0. Recognize the following attacks and specify the appropriate actions to take to mitigate vulnerability and risk. The student will be able to: AI.CF.92.0
    01. Explain DOS/DDOS (Denial of Service/Distributed Denial of Service). AI.CF.92.01
    02. Explain Back Door. AI.CF.92.02
    03. Identify spoofing. AI.CF.92.03
    04. Describe Man in the Middle. AI.CF.92.04
    05. Describe replay. AI.CF.92.05
    06. Explain TCP/IP Hijacking. AI.CF.92.06
    07. List Weak Keys. AI.CF.92.07
    08. Design password security measures to eliminate guessing (e.g., Brute Force, Dictionary, Mathematical, Social Engineering, Birthday). AI.CF.92.08
    09. Describe Software Exploitation. AI.CF.92.09
0. Demonstrate an understanding of the processes and risks associated with the following security concerns and tasks. The student will be able to: AI.CF.93.0
    01. Identify non-essential services and protocols and know what actions to take to reduce the risks of those services and protocols. AI.CF.93.01
    02. Understand the concept of and know how reduce the risks of social engineering. AI.CF.93.02
    03. Understand the concept and significance of auditing, logging and system scanning. AI.CF.93.03
    04. Identify and be able to differentiate different cryptographic standards and protocols. AI.CF.93.04
0. Demonstrate an understanding of the administration of the following types of remote access technologies. The student will be able to: AI.CF.94.0
    01. Recognize 802.1x. AI.CF.94.01
    02. Understand VPN (Virtual Private Network). AI.CF.94.02
    03. Discuss RADIUS (Remote Authentication Dial-In User Service). AI.CF.94.03
    04. Describe TACACS (Terminal Access Controller Access Control System). AI.CF.94.04
    05. Generalize L2TP/PPTP (Layer Two Tunneling Protocol/Point to Point Tunneling Protocol). AI.CF.94.05
    06. Define SSH (Secure Shell). AI.CF.94.06
    07. Give examples of IPSEC (Internet Protocol Security). AI.CF.94.07
    08. List security vulnerabilities. AI.CF.94.08

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0. Demonstrate an understanding of the administration of the following email security concepts. The student will be able to: AI.CF.95.0
    01. Explain S/MIME (Secure Multipurpose Internet Mail Extensions). AI.CF.95.01
    02. Describe PGP (Pretty Good Privacy) like technologies. AI.CF.95.02
    03. List security vulnerabilities. AI.CF.95.03
    04. Identify SPAM. AI.CF.95.04
    05. Analyze hoaxes. AI.CF.95.05
    06. Track SMTP headers. AI.CF.95.06
0. Demonstrate an understanding of the administration of the following Internet security concepts. The student will be able to: AI.CF.96.0
    01. Recognize SSL/TLS (Secure Sockets Layer/Transport Layer Security). AI.CF.96.01
    02. Understand HTTP/S (Hypertext Transfer Protocol/Hypertext Transfer Protocol over Secure Sockets Layer). AI.CF.96.02
    03. List security vulnerabilities. AI.CF.96.03
0. Demonstrate an understanding of the administration of the following vulnerabilities. The student will be able to: AI.CF.97.0
    01. Discuss Java Script. AI.CF.97.01
    02. Explain ActiveX. AI.CF.97.02
    03. Identify Buffer Overflows. AI.CF.97.03
    04. Understand Cookies. AI.CF.97.04
    05. Explain Signed Applets. AI.CF.97.05
    06. Identify CGI (Common Gateway Interface). AI.CF.97.06
    07. Describe SMTP (Simple Mail Transfer Protocol) Relay. AI.CF.97.07
0. Demonstrate an understanding of the administration of the following directory security concepts. The student will be able to: AI.CF.98.0
    01. Recognize SSL/TLS (Secure Sockets Layer/Transport Layer Security). AI.CF.98.01
    02. Recognize LDAP (Lightweight Directory Access Protocol). AI.CF.98.02
0. Demonstrate an understanding of the administration of the following file transfer protocols and concepts. The student will be able to: AI.CF.99.0
    01. Identify S/FTP (File Transfer Protocol). AI.CF.99.01
    02. Identify Blind FTP (File Transfer Protocol)/Anonymous. AI.CF.99.02
    03. Understand File Sharing. AI.CF.99.03
    04. List security vulnerabilities. AI.CF.99.04

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0. Demonstrate an understanding of the administration of the following wireless technologies and concepts. The student will be able to: AI.CF.100.0
    01. Recognize WTLS (Wireless Transport Layer Security). AI.CF.100.01
    02. Recognize 802.11 and 802.11x. AI.CF.100.02
    03. Recognize WEP/WAP (Wired Equivalent Privacy/Wireless Application Protocol). AI.CF.100.03
    04. List security vulnerabilities. AI.CF.100.04
0. Compare and contrast the following types of intrusion detection in terms of implementation and configuration. The student will be able to: AI.CF.101.0
    01. Discuss Network Based – Active and Passive. AI.CF.101.01
    02. Discuss Host Based – Active and Passive. AI.CF.101.02
    03. Explain Honey Pots. AI.CF.101.03
    04. Describe Incident Response. AI.CF.101.04
0. Identify and explain the following different kinds of cryptographic algorithms. The student will be able to: AI.CF.102.0
    01. Explain Hashing. AI.CF.102.01
    02. Explain Symmetric. AI.CF.102.02
    03. Explain Asymmetric. AI.CF.102.03
0. Understand how cryptography and digital signatures address the following security concepts. The student will be able to: AI.CF.103.0
    01. Discuss confidentiality. AI.CF.103.01
    02. Evaluate integrity. AI.CF.103.02
    03. Determine authentication. AI.CF.103.03
    04. Ensure non-repudiation. AI.CF.103.04
    05. Evaluate access control. AI.CF.103.05
0. Understand the following concepts of PKI (Public Key Infrastructure). The student will be able to: AI.CF.104.0
    01. Explain certificates (e.g., policies, practice statements). AI.CF.104.01
    02. Discuss revocation. AI.CF.104.02
    03. Identify trust models. AI.CF.104.03

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0. Understand the following concepts of Key Management and Certificate Lifecycles. The student will be able to: AI.CF.105.0
    01. Compare and contrast centralized versus decentralized. AI.CF.105.01
    02. Compare and contrast hardware versus software key storage. AI.CF.105.02
    03. Explain private key storage. AI.CF.105.03
    04. Identify escrow. AI.CF.105.04
    05. Explain expiration. AI.CF.105.05
    06. Compare and contrast revocation versus suspension (e.g., status checking). AI.CF.105.06
    07. Interpret recovery authorization schema (e.g., M-of-N Control - Of M appropriate individuals, N must be present to authorize recovery). AI.CF.105.07
    08. Explain renewal. AI.CF.105.08
    09. Give examples of destruction. AI.CF.105.09
    10. Discuss key usage. AI.CF.105.10
    11. Compare and contrast multiple key pairs (Single, Dual). AI.CF.105.11

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**Cloud Computing & Virtualization (Y100400)**

**Information Technology Assistant - Course Number: OTA0040**

0. Demonstrate knowledge, skill, and application of information technology to accomplish job objectives and enhance workplace performance. The student will be able to: CC.IT.01.0
    01. Develop keyboarding skills to enter and manipulate text and data. CC.IT.01.01
    02. Describe and use current computer technology and software to perform personal and business related tasks in the workplace (e.g., e-mail, digital calendars, meetings, appointments). CC.IT.01.02
    03. Differentiate between types of file systems and classify common file extensions based on software application programs used in the workplace environment. CC.IT.01.03
    04. Utilize the Internet to find reliable resources and reference materials (e.g., on-line help, tutorials, manuals). CC.IT.01.04
    05. Apply research strategies to use and evaluate electronic research technologies for valid and reliable information. CC.IT.01.05
    06. Demonstrate basic computer file management skills (e.g., naming, saving, retrieving, and organizing). CC.IT.01.06
    07. Analyze the process of troubleshooting problems with computer hardware peripherals, including input and output devices. CC.IT.01.07
    08. Describe ethical issues and problems associated with computers and information technology (e.g., fair use, privacy, public domain, copyright, piracy, plagiarism). CC.IT.01.08
    09. Explain the history and purpose of various operating systems (e.g., DOS, Windows, Mac, and Unix/Linux). CC.IT.01.09

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0. Develop an awareness of microcomputers. The student will be able to: CC.IT.02.0
    01. Explain the general architecture of a microcomputer system. CC.IT.02.01
    02. Explain the need for and demonstrate proficiency using common peripherals (e.g., printers, mouse, keyboard, external hard drive, flash drive). CC.IT.02.02
    03. Examine the concepts of computer maintenance and upgrades. CC.IT.02.03
0. Demonstrate an understanding of networks. The student will be able to: CC.IT.03.0
    01. Differentiate between types of networks and how they work (e.g., clients, servers, Wi-Fi, teleconference) CC.IT.03.01
    02. Identify security needs within a network environment (e.g., antivirus software, passwords). CC.IT.03.02
    03. Distinguish between intranets, extranets and how they relate to the Internet. CC.IT.03.03
    04. Demonstrate basic understanding of cloud computing. CC.IT.03.04
0. Use word processing applications to enhance the effectiveness of various types of documents and communication. The student will be able to: CC.IT.04.0
    01. Select and use word processing software and accompanying features to create and enhance various written business communications (e.g., memos, reports, block business letters). CC.IT.04.01
    02. Save and export documents in various formats (e.g., pdf, html, blog, hyperlinks). CC.IT.04.02
    03. Format text content in a document (e.g., font, paragraph attributes, spacing, text styles, text boxes). CC.IT.04.03
    04. Manipulate page layout and reusable content (e.g., page setup, themes, templates, page backgrounds, headers and footers). CC.IT.04.04
    05. Perform various image-editing tasks using word-processing software to create and format images, illustrations, shapes, etc. CC.IT.04.05
    06. Proofread and revise documents by validating content through the use of word processing tools (e.g. spell check, thesaurus, find/replace, autocorrect settings). CC.IT.04.06
    07. Insert citations and hyperlinks, create end and footnotes, and create a table of contents in a document. CC.IT.04.07
    08. Perform various mail merge options, macros and tracking revisions. CC.IT.04.08
    09. Demonstrate an understanding of fonts (serif and sans serif) and font styles (bold, italic, etc.) CC.IT.04.09

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0. Use presentation applications to enhance communication skills. The student will be able to: CC.IT.05.0
    01. Manage and configure the presentation software environment (e.g., adjusting views, manipulating slide settings, configuring toolbar and file options). CC.IT.05.01
    02. Use presentation software to format and edit slides (e.g., adding and removing slides, slide layouts, format slide design, insert or format placeholders). CC.IT.05.02
    03. Locate, create and incorporate graphical and multimedia elements, including: shapes, graphics, images, bullets, hyperlinks, video, and audio into a slide presentation. CC.IT.05.03
    04. Enhance overall visual presentation by applying font selection, design themes, color schemes, templates, etc. CC.IT.05.04
    05. Create and manipulate graphical and multimedia elements using additional styles and effects (e.g., color selections, tone, contrast, shadows, picture styles). CC.IT.05.05
    06. Demonstrate various business-related elements that can be created, embedded and manipulated in a slide presentation, including: charts, graphs, tables, media, spreadsheets, and illustrations. CC.IT.05.06
    07. Customize presentation settings by using appropriate slide transitions and animations (e.g., on click, rehearsed timings) CC.IT.05.07
    08. Demonstrate different delivery methods for slide presentations, including: online delivery and sharing, video projection, printing options. CC.IT.05.08
0. Use spreadsheet applications to enhance communication skills. The student will be able to: CC.IT.06.0
    01. Manipulate the worksheet by using the ribbon tabs, group settings, importing data/database, manipulating properties, files and folders. CC.IT.06.01
    02. Create cell data and apply auto fill. CC.IT.06.02
    03. Format cells and worksheets (e.g., by applying and manipulating cell formats, styles, merging and splitting cells, create row and column titles, hide and unhide column titles, rows and columns, page setup options, and manipulating views/themes). CC.IT.06.03
    04. Create and analyze formulas and functions (e.g., apply conditional formula logic, name and cell ranges). CC.IT.06.04
    05. Create and modify charts and images. (e.g., pivot tables) CC.IT.06.05
    06. Share worksheet data through various system (e.g., email, external media, cloud storage, mail merge). CC.IT.06.06
    07. Analyze and organize data through filters, sorting and applying conditional formatting. (e.g., macros) CC.IT.06.07
    08. Interpret data on line graphs, pie charts, diagrams, and tables. CC.IT.06.08

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0. Use database applications to store and organize data. The student will be able to: CC.IT.07.0
    01. Create different forms for inputting data into a database application. CC.IT.07.01
    02. Interpret queries for specialized reports using a database application. CC.IT.07.02
    03. Create and modify a database by importing data from other sources CC.IT.07.03
    04. Create and manage database tables by hiding fields, importing data, adding total rows CC.IT.07.04
    05. Modify queries by renaming, adding/removing fields, sorting, formatting, and adding calculated fields CC.IT.07.05
    06. Create and format reports with multiple columns, calculated fields and images. CC.IT.07.06
0. Use electronic mail to enhance communication skills. The student will be able to: CC.IT.08.0
    01. Describe and perform e-mail capabilities and functions (e.g., create, send, & forward messages, organize email folders, manage signature and automated messages, configure message sensitivity, security and delivery options). CC.IT.08.01
    02. Perform e-mail activities (e.g., attach external files, save e-mail attachments, view mailbox details, schedule appointments, create contact groups). CC.IT.08.02
    03. Demonstrate an understanding of the ethical issues associated with electronic correspondences (e.g., employer's ownership of email, public access of government email, appropriate uses in the workplace, phishing attacks, permanence of electronic communications on the internet). CC.IT.08.03
    04. Describe the need for and appropriate use of electronic mailing list software applications (e.g., listserv) CC.IT.08.04

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0. Investigate individual assessment and job/career exploration and individual career planning that reflect the transition from school to work, lifelong learning, and personal and professional goals. The student will be able to: CC.IT.09.0

    01. Analyze personal skills and aptitudes in comparison with various business related job and career options. (i.e., hard and soft skills) CC.IT.09.01

    02. Use career resources to develop and analyze occupations and opportunities for internships, continuing education and on-the-job training. CC.IT.09.02

    03. Exhibit job-seeking skills required for entry-level employment, including resume, online job search, cover letter, online/hard copy application, mock interview, interview thank you letter, and follow-up call. CC.IT.09.03

    04. Design, implement, and evaluate a plan to facilitate growth and skill development related to anticipated job requirements and career expectations. CC.IT.09.04

    05. Demonstrate an awareness of specific job requirements and career paths (e.g., education, certifications, skills, previous experience) in business environments. CC.IT.09.05

    06. Demonstrate an awareness of the potential impact of local and global trends on career plans and life goals. CC.IT.09.06

    07. Describe the importance of building community and mentor relationships in a variety of professional and workplace situations. CC.IT.09.07

    08. Simulate work-based projects in an information technology environment CC.IT.09.08

0. Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. The student will be able to: CC.IT.10.0

    01. Demonstrate awareness of the following workplace essentials: quality customer service; business ethics; confidentiality of information; copyright violations; accepted workplace rules, regulations, policies, procedures, processes, and workplace safety, and appropriate attire and grooming. CC.IT.10.01

    02. Demonstrate ways of accepting and providing constructive criticism to enhance team projects. CC.IT.10.02

    03. Apply appropriate strategies to manage and resolve conflicts in work situations. CC.IT.10.03

    04. Demonstrate personal and interpersonal skills appropriate for the workplace (e.g., responsibility, dependability, punctuality, integrity, positive attitude, initiative, respect for self and others, and professional dress). CC.IT.10.04

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0. Demonstrate competence using computer networks, internet and online databases to facilitate collaborative or individual learning and communication. The student will be able to: CC.IT.11.0

    01. Demonstrate how to connect to the Internet and identify and describe web terminology, addresses and how browsers work. CC.IT.11.01

    02. Demonstrate proficiency using basic features of GUI (Graphical User Interface) browsers, including: bookmarks, basic configurations, e-mail configurations, and address books. CC.IT.11.02

    03. Describe appropriate browser security configurations CC.IT.11.03

    04. Describe information technology terminology, including Internet, intranet, ethics, copyright laws, and regulatory control. CC.IT.11.04

    05. Demonstrate proficiency using search engines and search tools (e.g., Boolean search strategies) CC.IT.11.05

    06. Use various web tools, including: downloading files, transfer of files, extensions, PDF, plug-ins, and data compression. CC.IT.11.06

    07. Differentiate between different domain extensions (e.g., .com, .org, .gov, .edu, etc.) CC.IT.11.07

0. Develop awareness of computer languages, web-based & software applications, and emerging technologies. The student will be able to: CC.IT.12.0

    01. Compare and contrast the appropriate use of various software applications. (e.g., word processing, desktop publishing, graphic design, web browser, e-mail, presentation, database, scheduling, financial management, Java applet, music) CC.IT.12.01

    02. Explain and describe the need for web-based applications (e.g., sharing photos and video clips, messaging, chatting and collaborating. CC.IT.12.02

    03. Express an understanding of basic terminology used in programming (e.g., algorithm, binary, code, block-based, objects, functions) CC.IT.12.03

    04. Compare and contrast emerging technologies and describe how they impact business in the global marketplace (e.g., wireless network, tablets, cell phones, satellite technology, nanotechnology, smart devices, home networks). CC.IT.12.04

0. Demonstrate an understanding of basic html by creating a simple web page. The student will be able to: CC.IT.13.0

    01. Create a basic web page. CC.IT.13.01

    02. Use basic storyboarding techniques. CC.IT.13.02

    03. Use basic functions of WYSIWYG editors. CC.IT.13.03

    04. Use basic functions of HTML, DHTML, and XML editors and converters. CC.IT.13.04

    05. Enhance web pages through the addition of images and graphics. CC.IT.13.05

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0. Demonstrate comprehension and communication skills. The student will be able to: CC.IT.14.0
    01. Read and comprehend technical and non-technical reading assignments related to course content (e.g., manuals, books, magazines, electronic sources). CC.IT.14.01
    02. Use verbal and nonverbal skills to communicate effectively with supervisors, co-workers, and customers. CC.IT.14.02
    03. Demonstrate an understanding of the writing process to create business documents (e.g., research methods, paper formatting (MLA/APA)) CC.IT.14.03
    04. Demonstrate an awareness of project management concepts and tools (e.g., timelines, deadlines, resource allocation, time management, delegation of tasks, collaboration). CC.IT.14.04
0. Use social media to enhance online communication and develop an awareness of a digital footprint. The student will be able to: CC.IT.15.0
    01. Create and develop a professional social media presence (e.g., LinkedIn) to connect with potential employers, follower influencers, enhance networking opportunities, develop soft skills through written communication, and establish a professional business image. CC.IT.15.01
    02. Cultivate and manage awareness of digital identity and reputation. CC.IT.15.02
    03. Develop awareness of the permanence of actions and social awareness in the digital world. CC.IT.15.03

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**Computer Support Assistant - Course Number: EEV0504**

0. Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. The student will be able to: CC.IT.16.0
    01. Develop strategies for resolving customer conflicts. CC.IT.16.01

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0. Identify, install, configure, and upgrade desktop and server computer modules and peripherals, following established basic procedures for system assembly and disassembly of field replaceable modules. The student will be able to: CC.IT.17.0
    01. Identify and describe the functions of main processing boards (e.g., CPUs, RAM, ROM, bus architecture). CC.IT.17.01
    02. Identify and describe the functions of communication ports (e.g., serial and parallel ports). CC.IT.17.02
    03. Identify and describe the functions of peripheral devices (e.g., scanners, modems, hard drives, printers). CC.IT.17.03
    04. Identify and describe the components of portable systems (e.g., battery, LCD, AC adapter, PDAs). CC.IT.17.04
    05. Troubleshoot, install and upgrade computers and peripherals. CC.IT.17.05
    06. Perform system hardware setup Demonstrate an understanding of input/output devices. CC.IT.17.06
    07. Install and configure of applications software, hardware, and device drivers. CC.IT.17.07
    08. Demonstrate an understanding of the operation and purpose of hardware components. CC.IT.17.08
    09. Install operating system software. CC.IT.17.09
    10. Customize operating systems. CC.IT.17.10
    11. Install application software. CC.IT.17.11
    12. Perform storage formatting and preparation activities. CC.IT.17.12
    13. Identify data measurement (e.g., bits, bytes, kilobytes). CC.IT.17.13
    14. Install and configure RAID. CC.IT.17.14
    15. Recognize and report on server room environmental issues (temperature, humidity/ESD/power surges, back-up). CC.IT.17.15
0. Diagnose and troubleshoot common module problems and system malfunctions of computer software, hardware, peripherals, and other office equipment. The student will be able to: 18.0
    01. Troubleshoot a personal computer system. CC.IT.18.01
    02. Identify configuration problems. CC.IT.18.02
    03. Identify software problems. CC.IT.18.03
    04. Identify hardware malfunctions. CC.IT.18.04
    05. Identify network malfunctions. CC.IT.18.05
    06. Resolve computer error messages. CC.IT.18.06
    07. Understand and troubleshoot memory and cache systems. CC.IT.18.07
    08. Verify that drives are the appropriate type. CC.IT.18.08
    09. Describe knowledge database search procedures used to identify possible solutions when troubleshooting software and hardware problems. CC.IT.18.09

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0. Identify issues, procedures and devices for protection within the computing environment, including people, hardware and the surrounding workspace. The student will be able to: CC.IT.19.0

    01. Apply basic rules for hardware safety. CC.IT.19.01

    02. Demonstrate proficiency in basic preventative hardware maintenance. CC.IT.19.02

    03. Apply special disposal procedures that comply with environmental guidelines for batteries, CRTs, toner kits/cartridges, chemical solvents and cans, and MSDS. CC.IT.19.03

    04. Apply ergonomic principles applicable to the configuration of computer workstations. CC.IT.19.04

    05. Describe ethical issues and problems associated with computers and information systems. CC.IT.19.05

0. Identify specific terminology, facts, ways and means of dealing with classifications, categories and principles of motherboards, processors and memory in desktop and server computer systems. The student will be able to: CC.IT.20.0

    01. Identify EDO RAM, DRAM, SRAM, RIMM, VRAM, SDRAM, and WRAM. CC.IT.20.01

    02. Identify memory banks, memory chips (8-bit, 16-bit, and 32-bit), SIMMS (Single In-line Memory Module), DIMMS (Dual In-line Memory Module), parity chips versus non-parity chips. CC.IT.20.02

    03. Identify printer parallel port, COM/serial port, floppy drive, hard drive, Memory, and Boot sequence. CC.IT.20.03

0. Demonstrate knowledge of basic types of printers, basic concepts, printer components, how they work, how they print onto a page, paper path, care and service techniques, and common problems. The student will be able to: CC.IT.21.0

    01. Identify types of printers—Laser, Inkjet, Dot Matrix. CC.IT.21.01

    02. Identify care and service techniques and common problems with primary printer types. CC.IT.21.02

    03. Implement and manage printing on a network. CC.IT.21.03

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0. Identify and describe basic network concepts and terminology, ability to determine whether a computer is networked, knowledge of procedures for swapping and configuring network interface cards, and knowledge of the ramifications of repairs when a computer is networked. The student will be able to: CC.IT.22.0
    01. Define networking and describe the purpose of a network. CC.IT.22.01
    02. Identify the purposes and interrelationships among the major components of networks (e.g., servers, clients, transmission media, network operating system, network boards). CC.IT.22.02
    03. Describe the various types of network topologies. CC.IT.22.03
    04. Identify and describe the purpose of standards, protocols, and the Open Systems Interconnection (OSI) reference model. CC.IT.22.04
    05. Configure network and verify network connectivity. CC.IT.22.05
    06. Discuss the responsibilities of the network administrator (e.g., rights and responsibilities). CC.IT.22.06
    07. Develop user logon procedures. CC.IT.22.07
    08. Utilize network management infrastructures (e.g., network monitoring, alerting, security) to perform administrative tasks. CC.IT.22.08
    09. Identify common backup strategies and procedures. CC.IT.22.09
    10. Select and use appropriate electronic communications software and hardware for specific tasks. CC.IT.22.10
    11. Compare and contrast Internet software and protocols. CC.IT.22.11
    12. Diagnose and resolve electronic communications operational problems. CC.IT.22.12
    13. Design and implement directory tree structures. CC.IT.22.13
    14. Install services tools (SNMP, backup software). CC.IT.22.14
    15. Perform full backup and verify backup. CC.IT.22.15
    16. Identify bottlenecks (e.g., processor, bus transfer, I/O, disk I/O, network I/O, memory). CC.IT.22.16
    17. Use the concepts of fault tolerance/fault recovery to create a disaster recovery plan. CC.IT.22.17
    18. Document and test disaster recovery plan regularly, and update as needed. CC.IT.22.18
0. Perform end user support and assistance by troubleshooting and diagnosing through telephone, e-mail, internet, remote access, or direct contact. The student will be able to: CC.IT.23.0
    01. Apply call center vocabulary. CC.IT.23.01
    02. Listen and input information simultaneously. CC.IT.23.02
    03. Apply first response assistance for minor repair work. CC.IT.23.03

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0. Demonstrate proficiency using graphical user interface (GUI) operating systems. The student will be able to: CC.IT.24.0
    01. Identify parts of GUI windows. CC.IT.24.01
    02. Create and use icons. CC.IT.24.02
    03. Demonstrate proficiency in using menu systems. CC.IT.24.03
    04. Demonstrate proficiency in using pointing and selection devices. CC.IT.24.04
    05. Identify keyboard shortcuts and special function keys. CC.IT.24.05
    06. Demonstrate proficiency in manipulating windows. CC.IT.24.06
    07. Utilize help systems and hypertext links. CC.IT.24.07
    08. Create, organize, and maintain file system directories. CC.IT.24.08
    09. Organize desktop objects. CC.IT.24.09
    10. Run multiple applications. CC.IT.24.10
0. Demonstrate language arts knowledge and skills. The student will be able to CC.IT.25.0
    01. Locate, comprehend and evaluate key elements of oral and written information. CC.IT.25.01
    02. Draft, revise, and edit written documents using correct grammar, punctuation and vocabulary. CC.IT.25.02
    03. Present information formally and informally for specific purposes and audiences. CC.IT.25.03
0. Demonstrate mathematics knowledge and skills. The student will be able to CC.IT.26.0
    01. Demonstrate knowledge of arithmetic operations. CC.IT.26.01
    02. Analyze and apply data and measurements to solve problems and interpret documents. CC.IT.26.02
    03. Construct charts/tables/graphs using functions and data. CC.IT.26.03

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**Network Support Technician – Course Number: CTS0026**

0. Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. The student will be able to: 26.0
    01. Develop diplomatic methods to communicate with customers. 26.01
0. Participate in work-based learning experiences. The student will be able to: 27.0
    01. Participate in work-based learning experiences in a network support services environment. 27.01
    02. Discuss the use of technology in a network environment. 27.02

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0. Perform end user support and assistance by troubleshooting and diagnosing through telephone, e-mail, remote access, or direct contact. The student will be able to: 28.0
    01. Apply first response assistance for minor repair work. 28.01
0. Perform installation and configuration activities. The student will be able to: 29.0
    01. Configure the operating system environment. 29.01
    02. Connect client workstation running similar operating system to the network. 29.02
    03. Configure Internet access for a network. 29.03
    04. Configure a web server. 29.04
    05. Use remote server to deploy operating system. 29.05
    06. Troubleshoot failed installations. 29.06
    07. Install and configure network services for interoperability. 29.07
    08. Monitor, configure, troubleshoot and control access to printers. 29.08
    09. Monitor, configure, troubleshoot and control access to files, folders, and shared folders. 29.09
    10. Monitor, configure, troubleshoot and control access to websites. 29.10
0. Demonstrate proficiency using computer networks. The student will be able to: 30.0
    01. Identify and describe the purpose of standards; protocols; and the Open Systems Interconnection (ISO) reference model. 30.01
0. Demonstrate proficiency in configuring and troubleshooting hardware devices and drivers. The student will be able to: 31.0
    01. Configure hardware devices. 31.01
    02. Configure driver signing options. 31.02
    03. Update device drivers. 31.03
    04. Troubleshoot problems with hardware. 31.04
0. Demonstrate proficiency in managing, monitoring, and optimizing system performance, reliability and availability. The student will be able to: 32.0
    01. Monitor and optimize usage of system resources. 32.01
    02. Manage processes. 32.02
    03. Optimize disk performance. 32.03
    04. Manage and optimize availability of system data and user data. 32.04
    05. Recover systems and user data. 32.05

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0. Demonstrate proficiency in managing, configuring and troubleshooting storage use. The student will be able to: 33.0
    01. Configure and manage user profiles. 33.01
    02. Monitor, configure and troubleshoot disks and volumes. 33.02
    03. Configure data compression. 33.03
    04. Monitor and configure disk quotas. 33.04
    05. Recover from disk failures. 33.05
0. Demonstrate proficiency in configuring and troubleshooting network connections. The student will be able to: 34.0
    01. Install, configure and troubleshoot shared access. 34.01
    02. Install, configure and troubleshoot a virtual private network. 34.02
    03. Install, configure and troubleshoot network protocols. 34.03
    04. Install and configure network services. 34.04
    05. Configure, monitor and troubleshoot remote access. 34.05
    06. Install, configure, monitor and troubleshoot Terminal Services. 34.06
    07. Configure the properties of a connection. 34.07
    08. Install, configure and troubleshoot network adapters and drivers. 34.08
0. Demonstrate proficiency in implementing, monitoring, and troubleshooting security. The student will be able to: 35.0
    01. Encrypt data on a hard disk by using Encrypting File System. 35.01
    02. Implement, configure, manage and troubleshoot policies in an operating system environment. 35.02
    03. Implement, configure, manage and troubleshoot auditing. 35.03
    04. Implement, configure, manage and troubleshoot local accounts. 35.04
    05. Implement, configure, manage and troubleshoot account policy. 35.05
    06. Implement, configure, manage and troubleshoot security by using the Security Configuration Tool Set. 35.06

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**Cloud Analyst – Course Number: CTS0054**

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0. Evaluate an analyze cloud principles used in cloud computing. The student will be able to: 36.0
    01. Demonstrate and understanding of the evolution of cloud computing. 36.01
    02. Compare and contrast drivers and limitations of cloud computing. 36.02
    03. Compare and contrast the four main deployment models for cloud computing, public, private, community, and hybrid. 36.03
    04. Describe the three main service models for cloud computing (SaaS, Paas, and Oaas). 36.04
    05. Describe the role of the Internet and virtualization in cloud computing. 36.05
    06. Understand and identify managed services in cloud computing. 36.06
0. Identify the components of cloud based services. The student will be able to: 37.0
    01. Demonstrate proficiency in accessing web applications through web browser. 37.01
    02. Describe, identify and use thin clients to complete business tasks. 37.02
    03. Describe, identify and use thick clients to complete business tasks. 37.03
    04. Describe, identify and use mobile clients to complete business tasks. 37.04
    05. Demonstrate an awareness application hosting. 37.05
    06. Demonstrate an awareness of multipurpose architecture. 37.06
0. Evaluate cloud based services. The student will be able to: 38.0
    01. Perform calculations to identify the costs and saving of different cloud based models for an organization. 38.01
    02. Compare and contrast cloud based services used in industry. 38.02
    03. Identify the impacts to current and future staffing and operational needs. 38.03
    04. Evaluate performance of cloud-based solutions using performance indicators. 38.04
0. Use cloud-based services. The student will be able to: 39.0
    01. Compare and contrast outsourcing and cloud computing as alternatives for business. 39.01
    02. Identify and use cloud based services to improve productivity. 39.02
    03. Compare and contrast cloud based services for consumer and business. 39.03
    04. Use cloud based services to perform collaboration online. 39.04
    05. Demonstrate an awareness of the user experience in using a cloud-based service as compared to traditional business model. 39.05

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0. Evaluate and analyze techniques and methods of cloud deployment. The student will be able to: 40.0
    01. Demonstrate an awareness of networking for cloud-based solutions. 40.01
    02. Demonstrate an awareness of the role of automation and self-service in regard to cloud-based solutions. 40.02
    03. Demonstrate an awareness of deployment and management of internal and external cloud services to complete business task. 40.03
    04. Demonstrate an awareness of the role standardization in cloud-based solutions. 40.04
    05. Demonstrate the impact of time to market, distribution over the Internet in cloud deployment. 40.05
0. Evaluate the risks of cloud-based systems. The student will be able to: 41.0
    01. Identify and evaluate compliance risks relating to software and vendors in cloud-based systems. 41.01
    02. Demonstrate an understanding of user privacy rights and privacy risks in cloud-based systems. 41.02
    03. Demonstrate an understanding of legal risks in cloud based systems. 41.03
    04. Understand the role of vendors and dependencies in cloud-based solutions. 41.04
    05. Demonstrate an understating of the risks of hardware independence. 41.05
    06. Identify the main aspects of identity management. 41.06
0. Demonstrate an awareness of cloud implementation. The student will be able to: 42.0
    01. Describe the use of a Virtual Private network access to Local Area Network. 42.01
    02. Describe the risk of connecting a local cloud network to the public Internet. 42.02
    03. Identify and describe the components of cloud environment. 42.03
    04. Demonstrate an understanding of networking topologies in cloud environment. 42.04
    05. Demonstrate an understanding of serves, switches, and routers in cloud-based architecture. 42.05
    06. Demonstrate an understanding of the role of the datacenter in cloud-based architecture. 42.06

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**Cloud Virtualization Specialist – Course Number: CTS0056**

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0. Demonstrate an understanding of virtualization concepts. The student will be able to: 43.0
    01. Demonstrate an understanding of the role of the virtual CPU in virtualization. 43.01
    02. Demonstrate an understanding of the role of virtual memory in virtual component. 43.02
    03. Demonstrate an understanding of system patching for virtual environment. 43.03
    04. Demonstrate an understanding of virtual desktops. 43.04
    05. Evaluate the components of networking topology including (servers, network, storage). 43.05
    06. Compare and contrast traditional desktops and servers to virtual counterpart. 43.06
    07. Demonstrate an understanding of the hardware requirements to create and scale a virtual infrastructure. 43.07
    08. Demonstrate the differences between traditional virtualization and para-virtualization. 43.08
    09. Identify, describe and use guest operating system in a virtualization environment. 43.09
    10. Identify, define and use virtual machine monitor in virtual environment. 43.10
    11. Perform virtual partitioning through the Hypervision. 43.11
    12. Demonstrate an awareness of the bare metal approach for virtualization portioning. 43.12
    13. Demonstrate an awareness of hosted virtualization as a virtualization approach. 43.13
    14. Understand and use industry standards for hardware support for virtualization. 43.14
    15. Demonstrate an understanding of high-level language virtual machines. 43.15
    16. Describe the benefits of server consolidation and containment acquired through migration to virtualization. 43.16
    17. Describe the benefits of test and development optimization gained through virtualization. 43.17
    18. Demonstrate how virtualization reduces cost and complexity of high availability and disaster recovery. 43.18
    19. Demonstrate how virtualization can enhance security in the enterprise. 43.19

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0. Install and configure the virtualization server platform. The student will be able to: 44.0
    01. Demonstrate an understanding of a virtual image and compare that to a golden image. 44.01
    02. Create a virtual image using a virtualization platform using a base operating system. 44.02
    03. Create a virtual template in which the golden image is configured with the software packages and application. 44.03
    04. Configure the virtual template to ensure software settings and organizational polices are implemented. 44.04
    05. Manage inventory objects licenses using the virtual infrastructure ensure to comply with enterprise requirements. 44.05
    06. Demonstrate how a virtual switch is used to create communication between virtual machines. 44.06
    07. Perform communication between two virtual machines through the use of a virtual switch. 44.07
    08. Create, manage and configure virtual switches to enable communication of virtual machines in different hosts. 44.08
    09. Use virtual system management to remotely manage the allocation in a virtual network. 44.09
    10. Perform and manage user roles and permission in a virtual environment. 44.10
    11. Perform server patching on a virtual environment both on traditional servers as well virtual servers. 44.11
    12. Create a patching baseline. 44.12
0. Install, configure and manage virtualized clients. The student will be able to: 45.0
    01. Demonstrate an awareness of peripheral redirection. 45.01
    02. Demonstrate proficiency in configuring virtual client to enable both USB and monitor redirection. 45.02
    03. Compare and contrast the use of peripherals in a traditional and virtual environment. 45.03
    04. Demonstrate an understanding of the types of virtual clients used in a virtualization infrastructure. 45.04
    05. Demonstrate proficiency in performing tasks using thin, thick and mobile virtualization clients. 45.05
    06. Compare and contrast the performance, ease of use and efficiency of different clients in completing business tasks. 45.06
    07. Analyze business tasks that are better aligned to a particular virtualization client type. 45.07
    08. Demonstrate proficiency in managing user sessions and policies of virtual clients. 45.08

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0. Demonstrate proficiency in managing a virtualization infrastructure. The student will be able to: 46.0
    01. Demonstrate an understanding of the process of cloning virtual machines. 46.01
    02. Identify the benefits of cloning in a virtual infrastructure. 46.02
    03. Compare and contrast full clones and linked clones. 46.03
    04. Demonstrate proficiency in identifying situations in which cloning is a proper solution. 46.04
    05. Demonstrate proficiency in deploying virtual machines using cloning. 46.05
    06. Demonstrate an understating of virtual migration. 46.06
    07. Demonstrate an understanding of the situational needs that require a virtual migration. 46.07
    08. Identify the role of network bandwidth and resource allocation needed for virtual migration. 46.08
    09. Demonstrate an understanding of automating migration to the host server. 46.09
    10. Identify the process that migration affect virtual disk storage in particular SANS. 46.10
    11. Demonstrate proficiency in developing action steps to execute a virtual migration. 46.11
0. Demonstrate an understanding of storage technologies and storage configuration. The student will be able to: 47.0
    01. Demonstrate an awareness of the evolution of storage architecture and data center components. 47.01
    02. Describe, identify and use data center elements host, connectivity and storage. 47.02
    03. Identify describe, and use RAID technology in an enterprise environment. 47.03
    04. Identify the impact to application performance based on RAID implementation. 47.04
    05. Demonstrate an awareness of intelligent storage system. 47.05
    06. Compare and contrast storage systems for a virtualization infrastructure. 47.06
    07. Demonstrate an awareness of storage network technologies (Fibre Channel Storage Network FC Scan, IP Scan, Fibre Channel over Ethernet, Network Attached Storage, Object Based, Unified Storage). 47.07
    08. Identify the appropriate storage network solutions based on client requirements. 47.08
    09. Demonstrate proficiency in creating and managing data stores. 47.09
    10. Demonstrate proficiency in configuring and managing resource pools. 47.10

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0. Demonstrate proficiency in network optimization using network protocols, ports, and topologies. The student will be able to: 48.0
    01. Demonstrate an awareness of disaster recovery (business continuity) information availability for virtualized and non-virtualized environments. 48.01
    02. Demonstrate proficiency in backup and recovery in both virtualized and non-virtualized environments. 48.02
    03. Demonstrate an awareness of deduplication technology for backup optimization. 48.03
    04. Demonstrate an awareness of fixed content storage requirements and archival solutions. 48.04
    05. Demonstrate an awareness of continuous data replication and remote replication in virtualized and non-virtualized environments. 48.05
    06. Demonstrate proficiency in integrating Active Directory to a virtual environment. 48.06
    07. Demonstrate proficiency in CPU and memory optimization. 48.07
    08. Demonstrate proficiency using remote desktops and display protocols to optimize network infrastructure. 48.08
    09. Demonstrate an awareness of fault tolerance and acceptable levels tolerated based on the infrastructure. 48.09

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0. Understand security in a virtualized environment. The student will be able to: 49.0
    01. Compare and contrast hosted and Bare-Metal virtualization implementations vulnerability to threats and attacks. 49.01
    02. Demonstrate an awareness of data leakage and malicious code intrusion. 49.02
    03. Demonstrate proficiency in securing data between guest and host environments. 49.03
    04. Demonstrate proficiency in managing resource allocation in a virtualized environment to reduce system crash. 49.04
    05. Demonstrate proficiency in creating images that are secure for client deployment. 49.05
    06. Demonstrate an awareness of software security levels and digital signatures. 49.06
    07. Demonstrate proficiency in using, configuring and managing host firewall in a virtualized infrastructure. 49.07
    08. Demonstrate proficiency in using command line to configure and manage the host firewall. 49.08
    09. Demonstrate proficiency in using logging tools to monitor activity in the virtual environment. 49.09
    10. Identify, describe and provide solutions to threats based on scalability and high availability. 49.10
    11. Demonstrate proficiency in securing mobile, thin and thick clients. 49.11
    12. Demonstrate an awareness of threats to network authentication in a virtualized environment. 49.12

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**Computer Systems & Information Technology (Y100200)**

**Information Technology Assistant - Course Number: OTA0040**

0. Demonstrate knowledge, skill, and application of information technology to accomplish job objectives and enhance workplace performance. The student will be able to: ITA.01.0
    01. Develop keyboarding skills to enter and manipulate text and data. ITA.01.01
    02. Describe and use current computer technology and software to perform personal and business related tasks in the workplace (e.g., e-mail, digital calendars, meetings, appointments). ITA.01.02
    03. Differentiate between types of file systems and classify common file extensions based on software application programs used in the workplace environment. ITA.01.03
    04. Utilize the Internet to find reliable resources and reference materials (e.g., on-line help, tutorials, manuals). ITA.01.04
    05. Apply research strategies to use and evaluate electronic research technologies for valid and reliable information. ITA.01.05
    06. Demonstrate basic computer file management skills (e.g., naming, saving, retrieving, and organizing). ITA.01.06

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07. Analyze the process of troubleshooting problems with computer hardware peripherals, including input and output devices. ITA.01.07

08. Describe ethical issues and problems associated with computers and information technology (e.g., fair use, privacy, public domain, copyright, piracy, plagiarism). ITA.01.08

09. Explain the history and purpose of various operating systems (e.g., DOS, Windows, Mac, and Unix/Linux). ITA.01.09

0. Develop an awareness of microcomputers. The student will be able to: ITA.02.0

01. Explain the general architecture of a microcomputer system. ITA.02.01

02. Explain the need for and demonstrate proficiency using common peripherals (e.g., printers, mouse, keyboard, external hard drive, flash drive). ITA.02.02

03. Examine the concepts of computer maintenance and upgrades. ITA.02.03

0. Demonstrate an understanding of networks. The student will be able to: ITA.03.0

01. Differentiate between types of networks and how they work (e.g., clients, servers, Wi-Fi, teleconference) ITA.03.01

02. Identify security needs within a network environment (e.g., antivirus software, passwords). ITA.03.02

03. Distinguish between intranets, extranets and how they relate to the Internet. ITA.03.03

04. Demonstrate basic understanding of cloud computing. ITA.03.04

0. Use word processing applications to enhance the effectiveness of various types of documents and communication. The student will be able to: ITA.04.0

01. Select and use word processing software and accompanying features to create and enhance various written business communications (e.g., memos, reports, block business letters). ITA.04.01

02. Save and export documents in various formats (e.g., pdf, html, blog, hyperlinks). ITA.04.02

03. Format text content in a document (e.g., font, paragraph attributes, spacing, text styles, text boxes). ITA.04.03

04. Manipulate page layout and reusable content (e.g., page setup, themes, templates, page backgrounds, headers and footers). ITA.04.04

05. Perform various image-editing tasks using word-processing software to create and format images, illustrations, shapes, etc. ITA.04.05

06. Proofread and revise documents by validating content through the use of word processing tools (e.g. spell check, thesaurus, find/replace, autocorrect settings). ITA.04.06

07. Insert citations and hyperlinks, create end and footnotes, and create a table of contents in a document. ITA.04.07

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08. Perform various mail merge options, macros and tracking revisions. ITA.04.08

09. Demonstrate an understanding of fonts (serif and sans serif) and font styles (bold, italic, etc.) ITA.04.09

0. Use presentation applications to enhance communication skills. The student will be able to: ITA.05.0

01. Manage and configure the presentation software environment (e.g., adjusting views, manipulating slide settings, configuring toolbar and file options). ITA.05.01

02. Use presentation software to format and edit slides (e.g., adding and removing slides, slide layouts, format slide design, insert or format placeholders). ITA.05.02

03. Locate, create and incorporate graphical and multimedia elements, including: shapes, graphics, images, bullets, hyperlinks, video, and audio into a slide presentation. ITA.05.03

04. Enhance overall visual presentation by applying font selection, design themes, color schemes, templates, etc. ITA.05.04

05. Create and manipulate graphical and multimedia elements using additional styles and effects (e.g., color selections, tone, contrast, shadows, picture styles). ITA.05.05

06. Demonstrate various business-related elements that can be created, embedded and manipulated in a slide presentation, including: charts, graphs, tables, media, spreadsheets, and illustrations. ITA.05.06

07. Customize presentation settings by using appropriate slide transitions and animations (e.g., on click, rehearsed timings) ITA.05.07

08. Demonstrate different delivery methods for slide presentations, including: online delivery and sharing, video projection, printing options. ITA.05.08

0. Use spreadsheet applications to enhance communication skills. The student will be able to: ITA.06.0

01. Manipulate the worksheet by using the ribbon tabs, group settings, importing data/database, manipulating properties, files and folders. ITA.06.01

02. Create cell data and apply auto fill. ITA.06.02

03. Format cells and worksheets (e.g., by applying and manipulating cell formats, styles, merging and splitting cells, create row and column titles, hide and unhide column titles, rows and columns, page setup options, and manipulating views/themes). ITA.06.03

04. Create and analyze formulas and functions (e.g., apply conditional formula logic, name and cell ranges). ITA.06.04

05. Create and modify charts and images. (e.g., pivot tables) ITA.06.05

06. Share worksheet data through various system (e.g., email, external media, cloud storage, mail merge). ITA.06.06

07. Analyze and organize data through filters, sorting and applying conditional formatting. (e.g., macros) ITA.06.07

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3. Interpret data on line graphs, pie charts, diagrams, and tables. ITA.06.08

0. Use database applications to store and organize data. The student will be able to: ITA.07.0

01. Create different forms for inputting data into a database application. ITA.07.01

02. Interpret queries for specialized reports using a database application. ITA.07.02

03. Create and modify a database by importing data from other sources ITA.07.03

04. Create and manage database tables by hiding fields, importing data, adding total rows ITA.07.04

05. Modify queries by renaming, adding/removing fields, sorting, formatting, and adding calculated fields ITA.07.05

06. Create and format reports with multiple columns, calculated fields and images. ITA.07.06

0. Use electronic mail to enhance communication skills. The student will be able to: ITA.08.0

01. Describe and perform e-mail capabilities and functions (e.g., create, send, & forward messages, organize email folders, manage signature and automated messages, configure message sensitivity, security and delivery options). ITA.08.01

02. Perform e-mail activities (e.g., attach external files, save e-mail attachments, view mailbox details, schedule appointments, create contact groups). ITA.08.02

03. Demonstrate an understanding of the ethical issues associated with electronic correspondences (e.g., employer's ownership of email, public access of government email, appropriate uses in the workplace, phishing attacks, permanence of electronic communications on the internet). ITA.08.03

04. Describe the need for and appropriate use of electronic mailing list software applications (e.g., listserv) ITA.08.04

0. Investigate individual assessment and job/career exploration and individual career planning that reflect the transition from school to work, lifelong learning, and personal and professional goals. The student will be able to: ITA.09.0

01. Analyze personal skills and aptitudes in comparison with various business related job and career options. (i.e., hard and soft skills) ITA.09.01

02. Use career resources to develop and analyze occupations and opportunities for internships, continuing education and on-the-job training. ITA.09.02

03. Exhibit job-seeking skills required for entry-level employment, including resume, online job search, cover letter, online/hard copy application, mock interview, interview thank you letter, and follow-up call. ITA.09.03

04. Design, implement, and evaluate a plan to facilitate growth and skill development related to anticipated job requirements and career expectations. ITA.09.04

05. Demonstrate an awareness of specific job requirements and career paths (e.g., education, certifications, skills, previous experience) in business environments. ITA.09.05

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06. Demonstrate an awareness of the potential impact of local and global trends on career plans and life goals. ITA.09.06

07. Describe the importance of building community and mentor relationships in a variety of professional and workplace situations. ITA.09.07

08. Simulate work-based projects in an information technology environment ITA.09.08

0. Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. The student will be able to: ITA.10.0

01. Demonstrate awareness of the following workplace essentials: quality customer service; business ethics; confidentiality of information; copyright violations; accepted workplace rules, regulations, policies, procedures, processes, and workplace safety, and appropriate attire and grooming. ITA.10.01

02. Demonstrate ways of accepting and providing constructive criticism to enhance team projects. ITA.10.02

03. Apply appropriate strategies to manage and resolve conflicts in work situations. ITA.10.03

04. Demonstrate personal and interpersonal skills appropriate for the workplace (e.g., responsibility, dependability, punctuality, integrity, positive attitude, initiative, respect for self and others, and professional dress). ITA.10.04

0. Demonstrate competence using computer networks, internet and online databases to facilitate collaborative or individual learning and communication. The student will be able to: ITA.11.0

01. Demonstrate how to connect to the Internet and identify and describe web terminology, addresses and how browsers work. ITA.11.01

02. Demonstrate proficiency using basic features of GUI (Graphical User Interface) browsers, including: bookmarks, basic configurations, e-mail configurations, and address books. ITA.11.02

03. Describe appropriate browser security configurations ITA.11.03

04. Describe information technology terminology, including Internet, intranet, ethics, copyright laws, and regulatory control. ITA.11.04

05. Demonstrate proficiency using search engines and search tools (e.g., Boolean search strategies) ITA.11.05

06. Use various web tools, including: downloading files, transfer of files, extensions, PDF, plug-ins, and data compression. ITA.11.06

07. Differentiate between different domain extensions (e.g., .com, .org, .gov, .edu, etc.) ITA.11.07

0. Develop awareness of computer languages, web-based & software applications, and emerging technologies. The student will be able to: ITA.12.0

01. Compare and contrast the appropriate use of various software applications. (e.g., word processing, desktop publishing, graphic design, web browser, e-mail, presentation, database, scheduling, financial management, Java applet, music) ITA.12.01

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02. Explain and describe the need for web-based applications (e.g., sharing photos and video clips, messaging, chatting and collaborating. ITA.12.02

03. Express an understanding of basic terminology used in programming (e.g., algorithm, binary, code, block-based, objects, functions) ITA.12.03

04. Compare and contrast emerging technologies and describe how they impact business in the global marketplace (e.g., wireless network, tablets, cell phones, satellite technology, nanotechnology, smart devices, home networks). ITA.12.04

0. Demonstrate an understanding of basic html by creating a simple web page. The student will be able to: ITA.13.0

01. Create a basic web page. ITA.13.01

02. Use basic storyboarding techniques. ITA.13.02

03. Use basic functions of WYSIWYG editors. ITA.13.03

04. Use basic functions of HTML, DHTML, and XML editors and converters. ITA.13.04

05. Enhance web pages through the addition of images and graphics. ITA.13.05

0. Demonstrate comprehension and communication skills. The student will be able to: ITA.14.0

01. Read and comprehend technical and non-technical reading assignments related to course content (e.g., manuals, books, magazines, electronic sources). ITA.14.01

02. Use verbal and nonverbal skills to communicate effectively with supervisors, co-workers, and customers. ITA.14.02

03. Demonstrate an understanding of the writing process to create business documents (e.g., research methods, paper formatting (MLA/APA)) ITA.14.03

04. Demonstrate an awareness of project management concepts and tools (e.g., timelines, deadlines, resource allocation, time management, delegation of tasks, collaboration). ITA.14.04

0. Use social media to enhance online communication and develop an awareness of a digital footprint. The student will be able to: ITA.15.0

01. Create and develop a professional social media presence (e.g., LinkedIn) to connect with potential employers, follower influencers, enhance networking opportunities, develop soft skills through written communication, and establish a professional business image. ITA.15.01

02. Cultivate and manage awareness of digital identity and reputation. ITA.15.02

03. Develop awareness of the permanence of actions and social awareness in the digital world. ITA.15.03

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**Computer Systems Technician - Course Number: CTS0082**

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0. Demonstrate proficiency with personal computer hardware. The student will be able to: CSIT.01.0
    01. Categorize storage devices and backup media. CSIT.01.01
    02. Explain motherboard components, types and features. CSIT.01.02
    03. Classify power supplies types and characteristics. CSIT.01.03
    04. Explain the purpose and characteristics of CPUs and their features. CSIT.01.04
    05. Explain cooling methods and devices. CSIT.01.05
    06. Compare and contrast memory types, characteristics and their purpose. CSIT.01.06
    07. Distinguish between the different display devices and their characteristics. CSIT.01.07
    08. Install and configure peripherals and input devices. CSIT.01.08
    09. Summarize the function and types of adapter cards. CSIT.01.09
    10. Install, configure and optimize laptop components and features. CSIT.01.10
    11. Install and configure printers. CSIT.01.11
    12. Explain advantages of using PCIe adapter cards. CSIT.01.12
    13. Configure tablets and mobile phones. CSIT.01.13
    14. Configure network printers using a static IP address. CSIT.01.14
0. Apply troubleshooting, repairing and maintenance techniques. The student will be able to: CSIT.02.0
    01. Explain the troubleshooting theory. CSIT.02.01
    02. Explain and interpret common hardware and operating system symptoms and their causes. CSIT.02.02
    03. Explain and interpret common operating system symptoms and their causes. CSIT.02.03
    04. Determine the troubleshooting methods and tools for printers. CSIT.02.04
    05. Explain and interpret common laptop issues and determine the appropriate basic troubleshooting method. CSIT.02.05
    06. Integrate common preventative maintenance techniques. CSIT.02.06
    07. Explain and interpret common software symptoms and their causes. CSIT.02.07

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0. Understand operating systems and software. The student will be able to: CSIT.03.0
    01. Compare and contrast the different Windows Operating Systems from Windows 7 up and their features. CSIT.03.01
    02. Explain the difference in features of the various Windows versions from Windows 7 through Windows 10. CSIT.03.02
    03. Explain the process and steps to install and configure the Windows OS. CSIT.03.03
    04. Explain the basics of boot sequences, methods and startup utilities, including msconfig. CSIT.03.04
0. Identify and construct a basic network. The student will be able to: CSIT.04.0
    01. Summarize the basics of networking fundamentals, including technologies and devices. CSIT.04.01
    02. Summarize the basics of networking fundamentals, including technologies and protocols. CSIT.04.02
    03. Categorize network cables and connectors and their implementations. CSIT.04.03
    04. Compare and contrast the different network types include SOHO networks. CSIT.04.04
0. Analyze and react to various security threats and vulnerabilities. The student will be able to: CSIT.05.0
    01. Explain the basic principles of security concepts and technologies (physical, software, social engineering). CSIT.05.01
    02. Explain and define security features. CSIT.05.02
0. Explain the basic physical security elements of a network. The student will be able to: CSIT.06.0
    01. Explain the basic software security elements of a network, including firewalls, IDS and IPS. CSIT.06.01
    02. Explain how the human element plays a major role in network security, including social engineering. CSIT.06.02
0. Demonstrate proficiency with operational procedure. The student will be able to: CSIT.07.0
    01. Outline the purpose of appropriate safety and environmental procedures and given a scenario apply them. CSIT.07.01
    02. Given a problem, demonstrate communication and technical skills to escalate the problem for a solution. CSIT.07.02
    03. Explain chain of custody for various scenarios. CSIT.07.03

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0. Demonstrate language arts knowledge and skills. The student will be able to: CSIT.08.0
    01. Locate, comprehend and evaluate key elements of oral and written information. CSIT.08.01
    02. Draft, revise, and edit written documents using correct grammar, punctuation and vocabulary. CSIT.08.02
    03. Present information formally and informally for specific purposes and audiences. CSIT.08.03
0. Demonstrate mathematics knowledge and skills. The student will be able to: CSIT.09.0
    01. Demonstrate knowledge of arithmetic operations. CSIT.09.01
    02. Analyze and apply data and measurements to solve problems and interpret documents. CSIT.09.02
    03. Construct charts/tables/graphs using functions and data. CSIT.09.03
0. Demonstrate proficiency with installing, configuring, and troubleshooting personal computer hardware. The student will be able to: CSIT.10.0
    01. Install, configure and maintain personal computer components. CSIT.10.01
    02. Detect problems, troubleshoot and repair/replace personal computer components. CSIT.10.02
    03. Install, configure, detect problems, troubleshoot and repair/replace laptop components. CSIT.10.03
    04. Explain and demonstrate the use of computer tools. CSIT.10.04
0. Apply techniques to various operating systems. The student will be able to: CSIT.11.0
    01. Select the appropriate commands and options to troubleshoot and resolve problems. CSIT.11.01
    02. Differentiate between Operating System file structures. CSIT.11.02
    03. Given a scenario, select and use system utilities/tools and evaluate the results. CSIT.11.03
    04. Evaluate and resolve common issues. CSIT.11.04
0. Build, secure and troubleshoot medium to large. The student will be able to: CSIT.12.0
    01. Troubleshoot client-side connectivity issues using appropriate tools. CSIT.12.01
    02. Install and configure a small office home office (SOHO) network. CSIT.12.02
    03. Given a scenario, prevent, troubleshoot and remove viruses and malware. CSIT.12.03
    04. Implement security and troubleshoot common issues. CSIT.12.04

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0. Use oral and written communication skills in creating, expressing and interpreting information and ideas. The student will be able to: CSIT.13.0
    01. Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace. CSIT.13.01
    02. Locate, organize and reference written information from various sources. CSIT.13.02
    03. Design, develop and deliver formal and informal presentations using appropriate media to engage and inform diverse audiences. CSIT.13.03
    04. Interpret verbal and nonverbal cues/behaviors that enhance communication. CSIT.13.04
    05. Apply active listening skills to obtain and clarify information. CSIT.13.05
    06. Develop and interpret tables and charts to support written and oral communications. CSIT.13.06
    07. Exhibit public relations skills that aid in achieving customer satisfaction. CSIT.13.07
0. Solve problems using critical thinking skills, creativity and innovation. The student will be able to: CSIT.14.0
    01. Employ critical thinking skills independently and in teams to solve problems and make decisions. CSIT.14.01
    02. Employ critical thinking and interpersonal skills to resolve conflicts. CSIT.14.02
    03. Identify and document workplace performance goals and monitor progress toward those goals. CSIT.14.03
    04. Conduct technical research to gather information necessary for decision-making. CSIT.14.04
0. Use information technology tools. The student will be able to: CSIT.15.0
    01. Use personal information management (PIM) applications to increase workplace efficiency. CSIT.15.01
    02. Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email, and internet applications. CSIT.15.02
    03. Employ computer operations applications to access, create, manage, integrate, and store information. CSIT.15.03
    04. Employ collaborative/groupware applications to facilitate group work. CSIT.15.04

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0. Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. The student will be able to: CSIT.16.0
    01. Describe the nature and types of business organizations. CSIT.16.01
    02. Explain the effect of key organizational systems on performance and quality. CSIT.16.02
    03. List and describe quality control systems and/or practices common to the workplace. CSIT.16.03
    04. Explain the impact of the global economy on business organizations. CSIT.16.04
0. Describe the importance of professional ethics and legal responsibilities. The student will be able to: CSIT.17.0
    01. Evaluate and justify decisions based on ethical reasoning. CSIT.17.01
    02. Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities, and employer policies. CSIT.17.02
    03. Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace. CSIT.17.03
    04. Interpret and explain written organizational policies and procedures. CSIT.17.04
    05. Explain various types of software licensing. CSIT.17.05

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**Computer Network Technician - Course Number: CTS0083**

0. Describe the operation of data networks. The student will be able to: CSIT.18.0
    01. Explain how multiple networks are used in everyday life. CSIT.18.01
    02. Explain the topologies and devices used in a small-to-medium-sized business network. CSIT.18.02
    03. Explain the basic characteristics of a network that supports communication in a small-to-medium-sized business. CSIT.18.03
    04. Explain trends in networking that will affect the use of networks in small-to-medium-sized businesses. CSIT.18.04
    05. Explain the purpose of the IOS. CSIT.18.05
    06. Explain how to access and navigate the IOS to configure network devices. CSIT.18.06
    07. Describe the command structure of the IOS software. CSIT.18.07
    08. Configure hostnames on an IOS device using the CLI. CSIT.18.08
    09. Use IOS commands to limit access to device configurations. CSIT.18.09
    10. Use IOS commands to save the running configuration. CSIT.18.10
    11. Explain how devices communicate across network media. CSIT.18.11
    12. Configure a host device with an IP address. CSIT.18.12

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0. Verify connectivity between two end devices. The student will be able to: CSIT.19.0
    01. Explain how rules are used to facilitate communication. CSIT.19.01
    02. Explain the role of protocols and standards organizations in facilitating interoperability in network communications. CSIT.19.02
    03. Explain how devices on a LAN access resources in a small to medium-sized business network. CSIT.19.03
    04. Identify device connectivity options. CSIT.19.04
    05. Describe the purpose and functions of the physical layer in the network. CSIT.19.05
    06. Describe basic principles of the physical layer standards. CSIT.19.06
    07. Identify the basic characteristics of network cables and connector types. CSIT.19.07
    08. Build and terminate UTP cable used in Ethernet networks. CSIT.19.08
    09. Describe, build and terminate fiber-optic cabling and its main advantages over other media. CSIT.19.09
    10. Describe wireless media. CSIT.19.10
    11. Select the appropriate media for a given requirement and connect devices. CSIT.19.11
    12. Describe the operation of the Ethernet sub layers. CSIT.19.12
    13. Identify the major fields of the Ethernet frame. CSIT.19.13
    14. Describe the purpose and characteristics of the Ethernet MAC address. CSIT.19.14
    15. Describe the purpose of ARP. CSIT.19.15
    16. Explain how ARP requests impact network and host performance. CSIT.19.16
    17. Explain basic switching concepts. CSIT.19.17
    18. Compare fixed configuration and modular switches. CSIT.19.18
0. Configure a Layer 3 switch. The student will be able to: CSIT.20.0
    01. Explain how network layer protocols and services support communications across data networks. CSIT.20.01
    02. Explain how routers enable end-to-end connectivity in a small to medium-sized business network. CSIT.20.02
    03. Determine the appropriate device to route traffic in a small to medium-sized business network. CSIT.20.03

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0. Program a router with basic configurations. The student will be able to: CSIT.21.0
    01. Describe the purpose of the transport layer in managing the transportation of data in end-to-end communication. CSIT.21.01
    02. Describe characteristics of the TCP and UDP protocols, including port numbers and their uses. CSIT.21.02
    03. Explain how TCP session establishment and termination processes facilitate reliable communication. CSIT.21.03
    04. Explain how TCP protocol data units are transmitted and acknowledged to guarantee delivery. CSIT.21.04
    05. Explain the UDP client processes to establish communication with a server. CSIT.21.05
    06. Determine whether high-reliability TCP transmissions, or non-guaranteed UDP transmissions, are best suited for common applications. CSIT.21.06
    07. Describe the structure of an IPv4 address. CSIT.21.07
    08. Describe the purpose of the subnet mask. CSIT.21.08
    09. Compare the characteristics and uses of the unicast, broadcast, and multicast IPv4 addresses. CSIT.21.09
    10. Compare the use of public address space and private address space. CSIT.21.10
    11. Explain the need for IPv6 addressing. CSIT.21.11
    12. Describe the representation of an IPv6 address. CSIT.21.12
    13. Describe types of IPv6 network addresses. CSIT.21.13
    14. Configure global unicast addresses. CSIT.21.14
    15. Describe multicast addresses. CSIT.21.15
    16. Describe the role of ICMP in an IP network. (Include IPv4 and IPv6). CSIT.21.16
    17. Use ping and trace route utilities to test network connectivity. CSIT.21.17
    18. Explain why routing is necessary for hosts on different networks to communicate. CSIT.21.18
    19. Describe IP as a communication protocol used to identify a single device on a network. CSIT.21.19
    20. Given a network and a subnet mask, calculate the number of host addresses available. CSIT.21.20
    21. Calculate the necessary subnet mask in order to accommodate the requirements of a network. CSIT.21.21
    22. Describe the benefits of variable length subnet masking (VLSM). CSIT.21.22

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0. Explain how IPv6 address assignments are implemented in a business network. The student will be able to: CSIT.22.0
    01. Explain how the functions of the application layer, session layer, and presentation layer work together to provide network services to end user applications. CSIT.22.01
    02. Describe how common application layer protocols interact with end user applications. CSIT.22.02
    03. Describe, at a high level, common application layer protocols that provide Internet services to end-users, including WWW services and email. CSIT.22.03
    04. Describe application layer protocols that provide IP addressing services. CSIT.22.04
    05. Describe the features and operation of well-known application layer protocols that allow for file sharing services. CSIT.22.05
0. Explain how data is moved across the network, from opening an application, to receiving data. The student will be able to: CSIT.23.0
    01. Identify the devices and protocols used in a small network. CSIT.23.01
    02. Explain how a small network serves as the basis of larger networks. CSIT.23.02
    03. Describe the need for basic security measures on network devices. CSIT.23.03
    04. Identify security vulnerabilities and general mitigation techniques. CSIT.23.04
    05. Configure network devices with device hardening features to mitigate security threats. CSIT.23.05
    06. Use the output of ping and trace commands to establish relative network performance. CSIT.23.06
0. Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to: CSIT.24.0
    01. Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments. CSIT.24.01
    02. Explain emergency procedures to follow in response to workplace accidents. CSIT.24.02
    03. Create a disaster and/or emergency response plan. CSIT.24.03
0. Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives. The student will be able to: CSIT.25.0
    01. Employ leadership skills to accomplish organizational goals and objectives. CSIT.25.01
    02. Establish and maintain effective working relationships with others in order to accomplish objectives and tasks. CSIT.25.02
    03. Conduct and participate in meetings to accomplish work tasks. CSIT.25.03
    04. Employ mentoring skills to inspire and teach others. CSIT.25.04

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0. Explain the importance of employability skill and entrepreneurship skills. The student will be able to: CSIT.26.0
    01. Identify and demonstrate positive work behaviors needed to be employable. CSIT.26.01
    02. Develop personal career plan that includes goals, objectives, and strategies. CSIT.26.02
    03. Examine licensing, certification, and industry credentialing requirements. CSIT.26.03
    04. Maintain a career portfolio to document knowledge, skills, and experience. CSIT.26.04
    05. Evaluate and compare employment opportunities that match career goals. CSIT.26.05
    06. Identify and exhibit traits for retaining employment. CSIT.26.06
    07. Identify opportunities and research requirements for career advancement. CSIT.26.07
    08. Research the benefits of ongoing professional development. CSIT.26.08
    09. Examine and describe entrepreneurship opportunities as a career planning option. CSIT.26.09

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**Database Application Development & Programming (Y700300)**

**Information Technology Assistant - Course Number: OTA0040**

0. Demonstrate knowledge, skill, and application of information technology to accomplish job objectives and enhance workplace performance. DB.ITA.01.0
0. Develop an awareness of microcomputers. DB.ITA.02.0
0. Demonstrate an understanding of networks. DB.ITA.03.0
0. Use word processing applications to enhance the effectiveness of various types of documents and communication. DB.ITA.04.0
0. Use presentation applications to enhance communication skills. DB.ITA.05.0
0. Use spreadsheet applications to enhance communication skills. DB.ITA.06.0
0. Use database applications to store and organize data. DB.ITA.07.0
0. Use electronic mail to enhance communication skills. DB.ITA.08.0
0. Investigate individual assessment and job/career exploration and individual career planning that reflect the transition from school to work, lifelong learning, and personal and professional goals. DB.ITA.09.0
0. Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. DB.ITA.10.0
0. Demonstrate competence using computer networks, internet and online databases to facilitate collaborative or individual learning and communication. DB.ITA.11.0

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Develop awareness of computer languages, web-based & software applications, and emerging technologies. DB.ITA.12.0

0. Demonstrate an understanding of basic html by creating a simple web page. DB.ITA.13.0
0. Demonstrate comprehension and communication skills. DB.ITA.14.0
0. Use social media to enhance online communication and develop an awareness of a digital footprint. DB.ITA.15.0
0. Use oral and written communication skills in creating, expressing and interpreting information and ideas. DB.ITA.16.0
0. Explore the characteristics, tasks, work attributes, options, and tools associated with a career in software development. DB.ITA.17.0
0. Demonstrate an understanding of the characteristics, use, and selection of numerical, non-numerical, and logical data types. DB.ITA.18.0
0. Distinguish between iterative and non-iterative program control structures. DB.ITA.19.0
0. Differentiate among high level, low level, procedural, object-oriented, compiled, interpreted, and translated programming languages. DB.ITA.20.0
0. Describe the processes, methods, and conventions for software development and maintenance. DB.ITA.21.0
0. Explain the types, uses, and limitations of testing for ensuring quality control. DB.ITA.22.0
0. Create a program design document using Unified Modeling Language (UML) or other common design tool. DB.ITA.23.0
0. Solve problems using critical thinking skills, creativity and innovation. DB.ITA.24.0
0. Use information technology tools. DB.ITA.25.0
0. Describe the importance of security and privacy information sharing, ownership, licensure and copyright. DB.ITA.26.0
0. Design a computer program to meet specific physical, operational, and interaction criteria. DB.ITA.27.0
0. Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types. DB.ITA.28.0
0. Create and document an interactive computer program that employs functions, subroutines, or methods to receive, validate, and process user input. DB.ITA.29.0
0. Effectively communicate and collaborate. DB.ITA.30.0
0. Demonstrate responsible use of technology and information. DB.ITA.31.0
0. Explain key concepts that distinguish object-oriented programming from procedural programming. DB.ITA.32.0
0. Create a project plan that defines requirements, structural design, time estimates, and testing elements. DB.ITA.33.0
^ Design, document, and create object-oriented computer programs. DB.ITA.34.0

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Design a unit test plan for an object-oriented computer program, test and debug the program, and report the results. DB.ITA.35.0

0. Understand human interactions in intelligence. DB.ITA.36.0
0. Develop an awareness of the changes taking place in the information age and how they fit into an evolving society. DB.ITA.37.0
0. Develop the "big picture" of database design and how to best organize data according to business rules and/or client needs. DB.ITA.38.0
0. Develop the process of creating an entity by identifying relationships. DB.ITA.39.0
0. Formulate and assemble initial entity relationship by expanding on modeling concepts. DB.ITA.40.0
0. Consider the degree and optionality of relationships of entities. DB.ITA.41.0
0. Demonstrate proficiency in early construction stages of the data modeling process by using unique identifiers and many-to-many (M:M) relationships for building entity relationship diagrams. DB.ITA.42.0
0. Demonstrate proficiency in advanced data constructs by analyzing business requirements and diagramming entities and relationships. DB.ITA.43.0
0. Demonstrate proficiency in designing and adding complexity to an entity-relationship model (ERM). DB.ITA.44.0
0. Apply complex ERM information by fine-tuning entities and the process for relating them. DB.ITA.45.0
0. Apply initial database design and normalization by following the set of house rules that determine how items are stored and retrieved. DB.ITA.46.0
0. Demonstrate proficiency in the technique of normalization by labeling and organizing all items in a database in such a way as to prevent any confusion or mistakes. DB.ITA.47.0
0. Demonstrate proficiency in table normalization by combining the techniques of an entity relationship model or a top-down, business approach to data with normalization or a bottom-up mathematical approach to data. DB.ITA.48.0
0. Apply blueprint principles to begin designing a tool for creating a web-based interface access to a database. DB.ITA.49.0
0. Extend the logical model presentation model by normalizing the data and mapping the management system. DB.ITA.50.0
0. Apply techniques for building a storage management system by creating a website using templates and wizards. DB.ITA.51.0
0. Demonstrate design and functionality by constructing a group business presentation. DB.ITA.52.0
0. Demonstrate comprehension of database modeling competency through group presentation. DB.ITA.53.0
0. Demonstrate comprehension that the database management software is a system for organizing the storage unit (or database) according to business needs and rules, through data integrity constraints. DB.ITA.54.0

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0. Demonstrate comprehension of aspects of SQL language interface by writing basic SQL statements. DB.ITA.55.0

0. Demonstrate proficiency working with columns, characters, and rows in SQL. DB.ITA.56.0
0. Demonstrate proficiency in using SQL comparison operators. DB.ITA.57.0
0. Demonstrate proficiency in using logical comparisons and precedence rules. DB.ITA.58.0
0. Demonstrate proficiency using SQL single row functions. DB.ITA.59.0
0. Demonstrate proficiency displaying data from multiple tables. DB.ITA.60.0
0. Demonstrate proficiency aggregating data using group functions. DB.ITA.61.0
0. Demonstrate proficiency utilizing subqueries. DB.ITA.62.0
0. Demonstrate proficiency producing readable output with SQL language interface, reporting tool, and data manipulation language. DB.ITA.63.0
0. Demonstrate proficiency creating and managing database objects. DB.ITA.64.0
0. Demonstrate proficiency altering tables and constraints implementing views. DB.ITA.65.0
0. Demonstrate mastery of creating and implementing views, synonyms, indexes and other database objects. DB.ITA.66.0
0. Demonstrate ability to control user access and SQL language interface and reporting tool. DB.ITA.67.0
0. Demonstrate comprehension of bundling features of SQL. DB.ITA.68.0
0. Demonstrate comprehension working with composite data types by writing executable script files. DB.ITA.69.0
0. Describe the differences between SQL and SQL extension languages. DB.ITA.70.0
0. Create program blocks. DB.ITA.71.0
0. Use variables in program blocks. DB.ITA.72.0
0. Recognize lexical units. DB.ITA.73.0
0. Recognize data types. DB.ITA.74.0
0. Use scalar data types. DB.ITA.75.0
0. Use various types of joins. DB.ITA.76.0
0. Use SQL group functions and subqueries. DB.ITA.77.0
0. Write executable statements. DB.ITA.78.0
0. Use nested blocks and variable scope. DB.ITA.79.0
0. Use good programming practices. DB.ITA.80.0
0. Write DML statements to manipulate data. DB.ITA.81.0
0. Retrieve data. DB.ITA.82.0
0. Manipulate data. DB.ITA.83.0
0. Use transaction control statements DB.ITA.84.0
0. Use IF conditional control statements. DB.ITA.85.0

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0. Use CASE conditional control statements. DB.ITA.86.0
0. Use basic LOOP iterative control statements. DB.ITA.87.0
0. Use WHILE and FOR loop iterative control statements. DB.ITA.88.0
0. Use nested loop iterative control statements. DB.ITA.89.0
0. Use explicit cursors. DB.ITA.90.0
0. Use explicit cursor attributes. DB.ITA.91.0
0. Use cursor FOR loops. DB.ITA.92.0
0. Use cursors with parameters. DB.ITA.93.0
0. Use cursors for update transactions. DB.ITA.94.0
0. Use multiple cursors. DB.ITA.95.0
0. Handle exceptions. DB.ITA.96.0
0. Trap server exceptions. DB.ITA.97.0
0. Trap user-defined exceptions. DB.ITA.98.0
0. Create procedures. DB.ITA.99.0
0. Use parameters in procedures. DB.ITA.100.0
0. Pass parameters. DB.ITA.101.0
0. Create stored functions. DB.ITA.102.0
0. Use functions in SQL statements. DB.ITA.103.0
0. Manage procedures and functions. DB.ITA.104.0
0. Manage object privileges. DB.ITA.105.0
0. Use invoker's rights. DB.ITA.106.0
0. Create packages. DB.ITA.107.0
0. Manage package constructs. DB.ITA.108.0
0. Use advanced package concepts. DB.ITA.109.0
0. Manage persistent state of package variables. DB.ITA.110.0
0. Use vendor-supplied packages. DB.ITA.111.0
0. Understand dynamic SQL. DB.ITA.112.0
0. Understand triggers. DB.ITA.113.0
0. Create DML triggers. DB.ITA.114.0
0. Create DDL and database event triggers. DB.ITA.115.0
0. Manage triggers. DB.ITA.116.0
0. Use large object data types. DB.ITA.117.0
0. Manage binary types. DB.ITA.118.0

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0. Manage indexes. DB.ITA.119.0
0. Manage dependencies. DB.ITA.120.0

0. Demonstrate an understanding of Agile Development. DB.ITA.121.0
0. Program a database application. DB.ITA.122.0
0. Utilize the basic concepts of database design. DB.ITA.123.0
0. Utilize SQL and union queries. DB.ITA.124.0
0. Implement program statements using objects. DB.ITA.125.0
0. Utilize debugging tools and write error handlers. DB.ITA.126.0
0. Demonstrate file I/O. DB.ITA.127.0
0. Create forms and identify all the properties of a form. DB.ITA.128.0
0. Manipulate data using object models. DB.ITA.129.0
0. Develop custom controls. DB.ITA.130.0
0. Utilize API functions. DB.ITA.131.0
0. Demonstrate and implement database replication using programming tools. DB.ITA.132.0
0. Analyze and implement security options. DB.ITA.133.0
0. Implement client/server applications. DB.ITA.134.0
0. Optimize the performance of a database. DB.ITA.135.0
0. Perform application distribution. DB.ITA.136.0
0. Test and debug databases. DB.ITA.137.0
0. Describe the difference between relational and NoSQL databases. DB.ITA.138.0
0. Demonstrate an understanding of Data Science and the concept of Data mining. DB.ITA.139.0

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**Computer Programmer Assistant - Course Number: CTS0041**

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0. Use oral and written communication skills in creating, expressing and interpreting information and ideas. The student will be able to: DB.CP.16.0
    01. Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace. DB.CP.16.01
    02. Locate, organize and reference written information from various sources. DB.CP.16.02
    03. Construct writings and/or communications using developmentally appropriate terminology. DB.CP.16.03
    04. Interpret verbal and nonverbal cues/behaviors that enhance communication. DB.CP.16.04
    05. Analyze the positive and negative impacts of technology on popular culture and personal life. DB.CP.16.05
    06. Discuss how technology has changed the way people build and manage organizations and how technology impacts personal life. DB.CP.16.06
    07. Evaluate ways in which adaptive technologies may assist users with special needs. DB.CP.16.07
    08. Explain how societal and economic factors are affected by access to critical information. DB.CP.16.08
    09. Discuss the challenges (e.g., political, social, and economic) in providing equal access and distribution of technology in a global society. DB.CP.16.09

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0. Explore the characteristics, tasks, work attributes, options, and tools associated with a career in software development. The student will be able to: DB.CP.17.0
    01. Explore a variety of careers to which computing is central. DB.CP.17.01
    02. Compare and contrast appropriate and inappropriate social networking behaviors. DB.CP.17.02
    03. Discuss the impact of computing on business and commerce (e.g., automated inventory processing, financial transactions, e-commerce, virtualization, cloud computing). DB.CP.17.03
    04. Evaluate the impacts of irresponsible use of information (e.g., plagiarism, falsification of data) on collaborative projects. DB.CP.17.04
    05. Identify tasks performed by programmers. DB.CP.17.05
    06. Describe how businesses use computer programming to solve business problems. DB.CP.17.06
    07. Investigate job opportunities in the programming field. DB.CP.17.07
    08. Explain different specializations and the related training in the computer programming field. DB.CP.17.08
    09. Explain the need for continuing education and training of computer programmers. DB.CP.17.09
    10. Understand and identify ways to use technology to support lifelong learning. DB.CP.17.10
    11. Explain enterprise software systems and how they impact business. DB.CP.17.11
    12. Describe ethical responsibilities of computer programmers. DB.CP.17.12
    13. Describe the role of customer support to software program quality. DB.CP.17.13
    14. Identify credentials and certifications that may improve employability for a computer programmer. DB.CP.17.14
    15. Identify devices, tools, and other environments for which programmers may develop software. DB.CP.17.15

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0. Demonstrate an understanding of the characteristics, use, and selection of numerical, non-numerical, and logical data types. The student will be able to: DB.CP.18.0
    01. Identify the characteristics (e.g., size, limits) and uses of different numerical and non-numerical data types. DB.CP.18.01
    02. Explain the types and uses of variables in programs. DB.CP.18.02
    03. Determine the best data type to use for given programming problems. DB.CP.18.03
    04. Compare and contrast simple data structures and their uses. DB.CP.18.04
    05. Identify the types of operations that can be performed on different data types. DB.CP.18.05
    06. Evaluate arithmetic and logical expressions using appropriate operator precedence. DB.CP.18.06
    07. Explain how computers store different data types in memory. DB.CP.18.07
    08. Demonstrate the difference between "data" and "information". DB.CP.18.08
    09. Use different number systems to represent data. DB.CP.18.09
    10. Explain how national and international standards (i.e., ASCII, UNICODE) are used to represent non-numerical data. DB.CP.18.10
    11. Use Boolean logic to perform logical operations. DB.CP.18.11
0. Distinguish between iterative and non-iterative program control structures. The student will be able to: DB.CP.19.0
    01. Create non-iterative programming structures and explain their uses. DB.CP.19.01
    02. Create iterative programming structures and explain their uses. DB.CP.19.02
    03. Explain how sequence, selection, and iteration are building blocks of algorithms. DB.CP.19.03

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0. Differentiate among procedural, object-oriented, compiled, interpreted, and translated programming languages. The student will be able to: DB.CP.20.0
    01. Differentiate between multiple levels of an operating system, translation, and interpretation that support program execution. DB.CP.20.01
    02. Explain the program execution process (by an interpreter and in CPU hardware). DB.CP.20.02
    03. Describe object-oriented concepts. DB.CP.20.03
    04. Explain the characteristics of procedural and object-oriented programming languages. DB.CP.20.04
    05. Compare and contrast programming languages that are compiled, interpreted, and translated. DB.CP.20.05
    06. Classify programming languages by paradigm and application domain (e.g., imperative, functional, logic languages and how well suited they are for certain application domains such as web programming, symbolic processing, data/numerical processing). DB.CP.20.06
0. Describe the processes, methods, and conventions for software development and maintenance. The student will be able to: DB.CP.21.0
    01. Describe a software development process that is used to solve problems at different software development stages. DB.CP.21.01
    02. Describe and demonstrate ethical and responsible use of modern communication media and devices. DB.CP.21.02
    03. Define alternative methods of program development (e.g., rapid prototyping, waterfall, spiral model, peer coding). DB.CP.21.03
    04. List and explain the steps in the program development cycle. DB.CP.21.04
    05. Describe different types of documentation used in the program development cycle (e.g., requirements document, program design documents, test plans). DB.CP.21.05
    06. Describe different methods used to facilitate version control. DB.CP.21.06
0. Explain the types, uses, and limitations of testing for ensuring quality control. The student will be able to: DB.CP.22.0
    01. Explain the uses and limits of testing in ensuring program quality. DB.CP.22.01
    02. Explain testing performed at different stages of the program development cycle (e.g., unit testing, system testing, user acceptance testing). DB.CP.22.02
    03. Describe and identify types of programming errors. DB.CP.22.03
    04. Analyze and manipulate data collected by a variety of data collection techniques. DB.CP.22.04
    05. Explain what tools are applied to provide automated testing environments. DB.CP.22.05

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0. Create a program design document using common design tool. The student will be able to: DB.CP.23.0

    01. Describe different design methodologies and their uses (e.g., object-oriented design, structured design, rapid application development). DB.CP.23.01

    02. Describe tools for developing a program design (e.g., Unified Modeling Language, flowcharts, design documents, pseudocode). DB.CP.23.02

    03. Explain the role of existing libraries and packages in facilitating programmer productivity. DB.CP.23.03

    04. Participate and contribute to a design review of a program design developed using a common program design tool (e.g., UML, flowcharts, design documents, pseudocode). DB.CP.23.04

    05. Write a program design document using standard design methodology. DB.CP.23.05

    06. Define input and output for a program module using standard design methodology. DB.CP.23.06

0. Solve problems using critical thinking skills, creativity and innovation. The student will be able to: DB.CP.24.0

    01. Employ critical thinking skills independently and in teams to solve problems and make decisions. DB.CP.24.01

    02. Employ critical thinking and interpersonal skills to resolve conflicts. DB.CP.24.02

    03. Identify and document workplace performance goals and monitor progress toward those goals. DB.CP.24.03

    04. Conduct technical research to gather information necessary for decision-making. DB.CP.24.04

    05. Discuss digital tools or resources to use for a real-world task based on their efficiency and effectiveness, individually and collaboratively. DB.CP.24.05

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0. Use information technology tools. The student will be able to: DB.CP.25.0
    01. Use personal information management (PIM) applications to increase workplace efficiency. DB.CP.25.01
    02. Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email, and internet applications. DB.CP.25.02
    03. Employ computer applications to access, create, manage, integrate, and store information. DB.CP.25.03
    04. Employ collaborative/groupware applications to facilitate group work. DB.CP.25.04
    05. Use a development process in creating a computational artifact, individually and collaboratively, followed by reflection, analysis, and iteration (e.g., data-set analysis program for science and engineering fair, capstone project that includes a program, term research project based on program data). DB.CP.25.05
0. Describe the importance of security and privacy information sharing, ownership, licensure and copyright. The student will be able to: DB.CP.26.0
    01. Describe security and privacy issues that relate to computer networks including the permanency of data on the Internet, online identity, and privacy. DB.CP.26.01
    02. Discuss the impact of government regulation on privacy and security. DB.CP.26.02
    03. Describe how different types of software licenses (e.g., open source, proprietary licenses) can be used to share and protect intellectual property. DB.CP.26.03
    04. Explain how access to information may not include the right to distribute the information. DB.CP.26.04
    05. Describe differences between open source, freeware, and proprietary software licenses, and how they apply to different types of software. DB.CP.26.05
    06. Discuss security and privacy issues that relate to computer networks. DB.CP.26.06
    07. Identify computer-related laws and analyze their impact on digital privacy, security, intellectual property, network access, contracts, and harassment. DB.CP.26.07

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0. Design a computer program to meet specific physical, operational, and interaction criteria. The student will be able to: DB.CP.27.0

    01. Choose appropriate data types depending on the needs of the program. DB.CP.27.01

    02. Define appropriate user prompts for clarity and usability (e.g., user guidance for data ranges, data types). DB.CP.27.02

    03. Design and develop program for efficiency (e.g., less memory usage, less inputs/outputs, faster processing). DB.CP.27.03

    04. Compare techniques for analyzing massive data collections. DB.CP.27.04

    05. Identify the software environment required for a program to run (e.g., operating system required, mobile, web-based, desktop, delivery method). DB.CP.27.05

    06. Create mobile computing applications and/or dynamic webpages through the use of a variety of design and development tools, programming languages and mobile devices/emulators. DB.CP.27.06

    07. Explain the role of an application programming interface (API) in the development of applications and the distinction between a programming language's syntax and the API. DB.CP.27.07

    08. Identify the tools required to develop a program (e.g., editors, compilers, linkers, integrated development environments, APIs, libraries). DB.CP.27.08

    09. Use an industrial-strength integrated development environment to implement a program. DB.CP.27.09

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0. Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types. The student will be able to: DB.CP.28.0
    01. Use appropriate naming conventions to define program variables and methods. DB.CP.28.01
    02. Use a program editor to write the source code for a program. DB.CP.28.02
    03. Write programs that use selection structures. DB.CP.28.03
    04. Write programs that use repetition structures. DB.CP.28.04
    05. Write programs that use nested structures. DB.CP.28.05
    06. Use internal documentation (e.g., single-line and multi-line comments, program headers, module descriptions, meaningful variable and function/module names) to document a program according to accepted standards. DB.CP.28.06
    07. Compile, run, test and debug programs. DB.CP.28.07
    08. Write programs that use standard arithmetic operators with different numerical data types. DB.CP.28.08
    09. Write programs that use standard logic operators. DB.CP.28.09
    10. Write programs that use a variety of common data types. DB.CP.28.10
    11. Write programs that perform data conversion between standard data types. DB.CP.28.11
    12. Write programs that define, use, search, and sort arrays. DB.CP.28.12
    13. Write programs that use user-defined data types. DB.CP.28.13
    14. Demonstrate understanding and use of appropriate variable scope. DB.CP.28.14
    15. Explain recursive programming structure. DB.CP.28.15
    16. Use global and local scope appropriately in program implementation. DB.CP.28.16

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0. Create and document an interactive computer program that employs functions, subroutines, or methods to receive, validate, and process user input. The student will be able to: DB.CP.29.0
    01. Critically examine classical algorithms and implement an original algorithm. DB.CP.29.01
    02. Write programs that perform user input and output. DB.CP.29.02
    03. Write programs that validate user input (e.g., range checking, data formats, valid/invalid characters). DB.CP.29.03
    04. Write program modules such as functions, subroutines, or methods. DB.CP.29.04
    05. Write program modules that accept arguments. DB.CP.29.05
    06. Write program modules that return values. DB.CP.29.06
    07. Write program modules that validate arguments and return error codes. DB.CP.29.07
    08. Design and implement a simple simulation algorithm to analyze, represent and understand natural phenomena. DB.CP.29.08
    09. Use APIs and libraries to facilitate programming solutions. DB.CP.29.09
    10. Participate in a peer code review to verify program functionality, programming styles, program usability, and adherence to common programming standards. DB.CP.29.10
0. Effectively communicate and collaborate. The student will be able to: DB.CP.30.0
    01. Evaluate modes of communication and collaboration. DB.CP.30.01
    02. Select appropriate tools within a project environment to communicate with project team members. DB.CP.30.02
    03. Utilize project collaboration tools (such as version control systems and integrated development environments) while working on a collaborative software project. DB.CP.30.03
    04. Generate, evaluate, and prioritize questions that can be researched through digital resources and online tool. DB.CP.30.04
    05. Perform advanced searches to locate information and/or design a data-collection approach to gather original data. DB.CP.30.05
    06. Communicate and publish key ideas and details to a variety of audiences using digital tools and media-rich resources. DB.CP.30.06

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0. Demonstrate responsible use of technology and information. The student will be able to: DB.CP.31.0

    01. Explain the principles of cryptography by examining encryption, digital signatures, and authentication methods (e.g. explain why and how certificates are used with https for authentication and encryption). DB.CP.31.01

    02. Implement an encryption, digital signature, or authentication method. DB.CP.31.02

    03. Describe computer security vulnerabilities and methods of attack, and evaluate their social and economic impact on computer systems and people. DB.CP.31.03

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**Java Development & Programming (Y700200)**

**Information Technology Assistant - Course Number: OTA0040**

0. Demonstrate knowledge, skill, and application of information technology to accomplish job objectives and enhance workplace performance. ITA.01.0
0. Develop an awareness of microcomputers. ITA.02.0
0. Demonstrate an understanding of networks. ITA.03.0
0. Use word processing applications to enhance the effectiveness of various types of documents and communication. ITA.04.0
0. Use presentation applications to enhance communication skills. ITA.05.0
0. Use spreadsheet applications to enhance communication skills. ITA.06.0
0. Use database applications to store and organize data. ITA.07.0
0. Use electronic mail to enhance communication skills. ITA.08.0
0. Investigate individual assessment and job/career exploration and individual career planning that reflect the transition from school to work, lifelong learning, and personal and professional goals. ITA.09.0
0. Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. ITA.10.0
0. Demonstrate competence using computer networks, internet and online databases to facilitate collaborative or individual learning and communication. ITA.11.0
0. Develop awareness of computer languages, web-based & software applications, and emerging technologies. ITA.12.0
0. Demonstrate an understanding of basic html by creating a simple web page. ITA.13.0
0. Demonstrate comprehension and communication skills. ITA.14.0
0. Use social media to enhance online communication and develop an awareness of a digital footprint. ITA.15.0
0. Use oral and written communication skills in creating, expressing and interpreting information and ideas. ITA.16.0

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0. Explore the characteristics, tasks, work attributes, options, and tools associated with a career in software development. ITA.17.0
0. Demonstrate an understanding of the characteristics, use, and selection of numerical, non-numerical, and logical data types. ITA.18.0
0. Distinguish between iterative and non-iterative program control structures. ITA.19.0
0. Differentiate among high level, low level, procedural, object-oriented, compiled, interpreted, and translated programming languages. ITA.20.0
0. Describe the processes, methods, and conventions for software development and maintenance. ITA.21.0
0. Explain the types, uses, and limitations of testing for ensuring quality control. ITA.22.0
0. Create a program design document using Unified Modeling Language (UML) or other common design tool. ITA.23.0
0. Solve problems using critical thinking skills, creativity and innovation. ITA.24.0
0. Use information technology tools. ITA.25.0
0. Describe the importance of security and privacy information sharing, ownership, licensure and copyright. ITA.26.0
0. Design a computer program to meet specific physical, operational, and interaction criteria. ITA.27.0
0. Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types. ITA.28.0
0. Create and document an interactive computer program that employs functions, subroutines, or methods to receive, validate, and process user input. ITA.29.0
0. Effectively communicate and collaborate. ITA.30.0
0. Demonstrate responsible use of technology and information. ITA.31.0
0. Explain key concepts that distinguish object-oriented programming from procedural programming. ITA.32.0
0. Create a project plan that defines requirements, structural design, time estimates, and testing elements. ITA.33.0
0. Design, document, and create object-oriented computer programs. ITA.34.0
0. Design a unit test plan for an object-oriented computer program, test and debug the program, and report the results. ITA.35.0
0. Understand human interactions in intelligence. ITA.36.0
0. Construct statements that declare, initialize, and modify different types of variables used in Java programs. ITA.37.0
0. Describe the types and characteristics of lexical units in the Java programming language. ITA.38.0
0. Describe the data types employed in Java programs. ITA.39.0

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0. Construct Java statements that employ the use of various operators. ITA.40.0
0. Write executable statements using Java. ITA.41.0
0. Describe variable scope and its implications in Java programming. ITA.42.0
0. Apply common Java programming style guidelines and conventions. ITA.43.0
0. Demonstrate use of the compiler and interpreter through command line interface. ITA.44.0
0. Construct conditional control statements in Java. ITA.45.0
0. Construct iterative control statements in Java. ITA.46.0
0. Use nested loop iterative control statements in Java. ITA.47.0
0. Produce input and output for Java programs. ITA.48.0
0. Use packages and import statements in a Java program. ITA.49.0
0. Create a Java program that uses methods. ITA.50.0
0. Create a Java program that uses parameters in methods. ITA.51.0
0. Describe and use recursion in a Java program. ITA.52.0
0. Construct Java statements that use the String class to manipulate String data. ITA.53.0
0. Construct Java statements that use Classes. ITA.54.0
0. Manage class relationships. ITA.55.0
0. Construct Java statements that illustrate the use of multiplicities in class relationships. ITA.56.0
0. Use object references. ITA.57.0
0. Describe the types of arrays and construct Java statements that illustrate the use and manipulation of multi-dimensional and jagged arrays. ITA.58.0
0. Construct Java statements that illustrate different ways of using inheritance. ITA.59.0
0. Construct Java statements that use collections. ITA.60.0
0. Write Java code that uses the Iterator and List interfaces. ITA.61.0
0. Create Java code that includes exception handling code. ITA.62.0
0. Create Java code that uses the Object class. ITA.63.0
0. Use standard library classes that comprise the Java API. ITA.64.0
0. Create Java code that uses exceptions to improve program quality. ITA.65.0
0. Describe Java 2 Micro Edition (J2ME) uses, characteristics, and constraints. ITA.66.0
0. Create and convert classes using Unified Modeling Language (UML). ITA.67.0
0. Create programs that use of Remote Method Invocation (RMI) and other server technologies associated with Relational Database Management Systems (RDMS) and Structured Query Language (SQL). ITA.68.0

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0. Demonstrate an understanding of Java Integration APIs, including Java Message Service (JMS), Enterprise JavaBeans (EJB), and Java Naming and Directory Interface (JNDI). ITA.69.0
0. Demonstrate an understanding of Java Client APIs, including the Abstract Window Toolkit (AWT), Swing, and Java applet. ITA.70.0
0. Understand and apply Java 2 Enterprise Edition (J2EE) Server Solutions. ITA.71.0
0. Create a database application using the Java programming language. ITA.72.0
0. Create a graphical user interface application using the Java programming language. ITA.73.0
0. Create a web-based application using the Java programming language. ITA.74.0
0. Write code to perform common and union database queries using SQL and Java. ITA.75.0
0. Implement Java program statements using objects. ITA.76.0
0. Utilize debugging tools and write error handlers. ITA.77.0
0. Demonstrate file I/O. ITA.78.0
0. Utilize API functions. ITA.79.0
0. Test and debug databases. ITA.80.0
0. Successfully work as a member of a software development team. ITA.81.0
0. Manage time according to a plan. ITA.82.0
0. Keep acceptable records of progress, problems and solutions. ITA.83.0
0. Plan, organize and carry out a project plan. ITA.84.0
0. Manage resources. ITA.85.0
0. Use tools, materials, and processes in an appropriate and safe manner. ITA.86.0
0. Demonstrate an understanding of the software development process. ITA.87.0
0. Research content related to the project and document the results. ITA.88.0
0. Use presentation skills, and appropriate media to describe the progress, results and outcome of the experience. ITA.89.0
0. Demonstrate competency in the area of expertise related to developing computer software using the Java programming language. ITA.90.0

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**Computer Programmer Assistant - Course Number: CTS0041**

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0. Use oral and written communication skills in creating, expressing and interpreting information and ideas. The student will be able to: CPA.16.0
    01. Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace. CPA.16.01
    02. Locate, organize and reference written information from various sources. CPA.16.02
    03. Construct writings and/or communications using developmentally appropriate terminology. CPA.16.03
    04. Interpret verbal and nonverbal cues/behaviors that enhance communication. CPA.16.04
    05. Analyze the positive and negative impacts of technology on popular culture and personal life. CPA.16.05
    06. Discuss how technology has changed the way people build and manage organizations and how technology impacts personal life. CPA.16.06
    07. Evaluate ways in which adaptive technologies may assist users with special needs. CPA.16.07
    08. Explain how societal and economic factors are affected by access to critical information. CPA.16.08
    09. Discuss the challenges (e.g., political, social, and economic) in providing equal access and distribution of technology in a global society. CPA.16.09

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0. Explore the characteristics, tasks, work attributes, options, and tools associated with a career in software development. The student will be able to: CPA.17.0
    01. Explore a variety of careers to which computing is central. CPA.17.01
    02. Compare and contrast appropriate and inappropriate social networking behaviors. CPA.17.02
    03. Discuss the impact of computing on business and commerce (e.g., automated inventory processing, financial transactions, e-commerce, virtualization, cloud computing). CPA.17.03
    04. Evaluate the impacts of irresponsible use of information (e.g., plagiarism, falsification of data) on collaborative projects. CPA.17.04
    05. Identify tasks performed by programmers. CPA.17.05
    06. Describe how businesses use computer programming to solve business problems. CPA.17.06
    07. Investigate job opportunities in the programming field. CPA.17.07
    08. Explain different specializations and the related training in the computer programming field. CPA.17.08
    09. Explain the need for continuing education and training of computer programmers. CPA.17.09
    10. Understand and identify ways to use technology to support lifelong learning. CPA.17.10
    11. Explain enterprise software systems and how they impact business. CPA.17.11
    12. Describe ethical responsibilities of computer programmers. CPA.17.12
    13. Describe the role of customer support to software program quality. CPA.17.13
    14. Identify credentials and certifications that may improve employability for a computer programmer. CPA.17.14
    15. Identify devices, tools, and other environments for which programmers may develop software. CPA.17.15

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0. Demonstrate an understanding of the characteristics, use, and selection of numerical, non-numerical, and logical data types. The student will be able to: CPA.18.0
    01. Identify the characteristics (e.g., size, limits) and uses of different numerical and non-numerical data types. CPA.18.01
    02. Explain the types and uses of variables in programs. CPA.18.02
    03. Determine the best data type to use for given programming problems. CPA.18.03
    04. Compare and contrast simple data structures and their uses. CPA.18.04
    05. Identify the types of operations that can be performed on different data types. CPA.18.05
    06. Evaluate arithmetic and logical expressions using appropriate operator precedence. CPA.18.06
    07. Explain how computers store different data types in memory. CPA.18.07
    08. Demonstrate the difference between "data" and "information". CPA.18.08
    09. Use different number systems to represent data. CPA.18.09
    10. Explain how national and international standards (i.e., ASCII, UNICODE) are used to represent non-numerical data. CPA.18.10
    11. Use Boolean logic to perform logical operations. CPA.18.11
0. Distinguish between iterative and non-iterative program control structures. The student will be able to: CPA.19.0
    01. Create non-iterative programming structures and explain their uses. CPA.19.01
    02. Create iterative programming structures and explain their uses. CPA.19.02
    03. Explain how sequence, selection, and iteration are building blocks of algorithms. CPA.19.03
0. Differentiate among procedural, object-oriented, compiled, interpreted, and translated programming languages. The student will be able to: CPA.20.0
    01. Differentiate between multiple levels of an operating system, translation, and interpretation that support program execution. CPA.20.01
    02. Explain the program execution process (by an interpreter and in CPU hardware). CPA.20.02
    03. Describe object-oriented concepts. CPA.20.03
    04. Explain the characteristics of procedural and object-oriented programming languages. CPA.20.04
    05. Compare and contrast programming languages that are compiled, interpreted, and translated. CPA.20.05
    06. Classify programming languages by paradigm and application domain (e.g., imperative, functional, logic languages and how well suited they are for certain application domains such as web programming, symbolic processing, data/numerical processing). CPA.20.06

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0. Describe the processes, methods, and conventions for software development and maintenance. The student will be able to: CPA.21.0
    01. Describe a software development process that is used to solve problems at different software development stages. CPA.21.01
    02. Describe and demonstrate ethical and responsible use of modern communication media and devices. CPA.21.02
    03. Define alternative methods of program development (e.g., rapid prototyping, waterfall, spiral model, peer coding). CPA.21.03
    04. List and explain the steps in the program development cycle. CPA.21.04
    05. Describe different types of documentation used in the program development cycle (e.g., requirements document, program design documents, test plans). CPA.21.05
    06. Describe different methods used to facilitate version control. CPA.21.06
0. Explain the types, uses, and limitations of testing for ensuring quality control. The student will be able to: CPA.22.0
    01. Explain the uses and limits of testing in ensuring program quality. CPA.22.01
    02. Explain testing performed at different stages of the program development cycle (e.g., unit testing, system testing, user acceptance testing). CPA.22.02
    03. Describe and identify types of programming errors. CPA.22.03
    04. Analyze and manipulate data collected by a variety of data collection techniques. CPA.22.04
    05. Explain what tools are applied to provide automated testing environments. CPA.22.05
0. Create a program design document using common design tool. The student will be able to: CPA.23.0
    01. Describe different design methodologies and their uses (e.g., object-oriented design, structured design, rapid application development). CPA.23.01
    02. Describe tools for developing a program design (e.g., Unified Modeling Language, flowcharts, design documents, pseudocode). CPA.23.02
    03. Explain the role of existing libraries and packages in facilitating programmer productivity. CPA.23.03
    04. Participate and contribute to a design review of a program design developed using a common program design tool (e.g., UML, flowcharts, design documents, pseudocode). CPA.23.04
    05. Write a program design document using standard design methodology. CPA.23.05
    06. Define input and output for a program module using standard design methodology. CPA.23.06

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0. Solve problems using critical thinking skills, creativity and innovation. The student will be able to: CPA.24.0
    01. Employ critical thinking skills independently and in teams to solve problems and make decisions. CPA.24.01
    02. Employ critical thinking and interpersonal skills to resolve conflicts. CPA.24.02
    03. Identify and document workplace performance goals and monitor progress toward those goals. CPA.24.03
    04. Conduct technical research to gather information necessary for decision-making. CPA.24.04
    05. Discuss digital tools or resources to use for a real-world task based on their efficiency and effectiveness, individually and collaboratively. CPA.24.05
0. Use information technology tools. The student will be able to: CPA.25.0
    01. Use personal information management (PIM) applications to increase workplace efficiency. CPA.25.01
    02. Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email, and internet applications. CPA.25.02
    03. Employ computer applications to access, create, manage, integrate, and store information. CPA.25.03
    04. Employ collaborative/groupware applications to facilitate group work. CPA.25.04
    05. Use a development process in creating a computational artifact, individually and collaboratively, followed by reflection, analysis, and iteration (e.g., data-set analysis program for science and engineering fair, capstone project that includes a program, term research project based on program data). CPA.25.05
0. Describe the importance of security and privacy information sharing, ownership, licensure and copyright. The student will be able to: CPA.26.0
    01. Describe security and privacy issues that relate to computer networks including the permanency of data on the Internet, online identity, and privacy. CPA.26.01
    02. Discuss the impact of government regulation on privacy and security. CPA.26.02
    03. Describe how different types of software licenses (e.g., open source, proprietary licenses) can be used to share and protect intellectual property. CPA.26.03
    04. Explain how access to information may not include the right to distribute the information. CPA.26.04
    05. Describe differences between open source, freeware, and proprietary software licenses, and how they apply to different types of software. CPA.26.05
    06. Discuss security and privacy issues that relate to computer networks. CPA.26.06
    07. Identify computer-related laws and analyze their impact on digital privacy, security, intellectual property, network access, contracts, and harassment. CPA.26.07

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0. Design a computer program to meet specific physical, operational, and interaction criteria. The student will be able to: CPA.27.0
    01. Choose appropriate data types depending on the needs of the program. CPA.27.01
    02. Define appropriate user prompts for clarity and usability (e.g., user guidance for data ranges, data types). CPA.27.02
    03. Design and develop program for efficiency (e.g., less memory usage, less inputs/outputs, faster processing). CPA.27.03
    04. Compare techniques for analyzing massive data collections. CPA.27.04
    05. Identify the software environment required for a program to run (e.g., operating system required, mobile, web-based, desktop, delivery method). CPA.27.05
    06. Create mobile computing applications and/or dynamic webpages through the use of a variety of design and development tools, programming languages and mobile devices/emulators. CPA.27.06
    07. Explain the role of an application programming interface (API) in the development of applications and the distinction between a programming language's syntax and the API. CPA.27.07
    08. Identify the tools required to develop a program (e.g., editors, compilers, linkers, integrated development environments, APIs, libraries). CPA.27.08
    09. Use an industrial-strength integrated development environment to implement a program. CPA.27.09

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0. Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types. The student will be able to: CPA.28.0

    01. Use appropriate naming conventions to define program variables and methods. CPA.28.01
    02. Use a program editor to write the source code for a program. CPA.28.02
    03. Write programs that use selection structures. CPA.28.03
    04. Write programs that use repetition structures. CPA.28.04
    05. Write programs that use nested structures. CPA.28.05
    06. Use internal documentation (e.g., single-line and multi-line comments, program headers, module descriptions, meaningful variable and function/module names) to document a program according to accepted standards. CPA.28.06
    07. Compile, run, test and debug programs. CPA.28.07
    08. Write programs that use standard arithmetic operators with different numerical data types. CPA.28.08
    09. Write programs that use standard logic operators. CPA.28.09
    10. Write programs that use a variety of common data types. CPA.28.10
    11. Write programs that perform data conversion between standard data types. CPA.28.11
    12. Write programs that define, use, search, and sort arrays. CPA.28.12
    13. Write programs that use user-defined data types. CPA.28.13
    14. Demonstrate understanding and use of appropriate variable scope. CPA.28.14
    15. Explain recursive programming structure. CPA.28.15
    16. Use global and local scope appropriately in program implementation. CPA.28.16

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0. Create and document an interactive computer program that employs functions, subroutines, or methods to receive, validate, and process user input. The student will be able to: CPA.29.0
    01. Critically examine classical algorithms and implement an original algorithm. CPA.29.01
    02. Write programs that perform user input and output. CPA.29.02
    03. Write programs that validate user input (e.g., range checking, data formats, valid/invalid characters). CPA.29.03
    04. Write program modules such as functions, subroutines, or methods. CPA.29.04
    05. Write program modules that accept arguments. CPA.29.05
    06. Write program modules that return values. CPA.29.06
    07. Write program modules that validate arguments and return error codes. CPA.29.07
    08. Design and implement a simple simulation algorithm to analyze, represent and understand natural phenomena. CPA.29.08
    09. Use APIs and libraries to facilitate programming solutions. CPA.29.09
    10. Participate in a peer code review to verify program functionality, programming styles, program usability, and adherence to common programming standards. CPA.29.10
0. Effectively communicate and collaborate. The student will be able to: CPA.30.0
    01. Evaluate modes of communication and collaboration. CPA.30.01
    02. Select appropriate tools within a project environment to communicate with project team members. CPA.30.02
    03. Utilize project collaboration tools (such as version control systems and integrated development environments) while working on a collaborative software project. CPA.30.03
    04. Generate, evaluate, and prioritize questions that can be researched through digital resources and online tool. CPA.30.04
    05. Perform advanced searches to locate information and/or design a data-collection approach to gather original data. CPA.30.05
    06. Communicate and publish key ideas and details to a variety of audiences using digital tools and media-rich resources. CPA.30.06

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0. Demonstrate responsible use of technology and information. The student will be able to: CPA.31.0
    01. Explain the principles of cryptography by examining encryption, digital signatures, and authentication methods (e.g. explain why and how certificates are used with https for authentication and encryption). CPA.31.01
    02. Implement an encryption, digital signature, or authentication method. CPA.31.02
    03. Describe computer security vulnerabilities and methods of attack, and evaluate their social and economic impact on computer systems and people. CPA.31.03

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**Computer Programmer - Course Number: CTS0044**

0. Explain key concepts that distinguish object-oriented programming from procedural programming. The student will be able to: CP.32.0
    01. Demonstrate the understanding and use of classes, objects, attributes, and behaviors. CP.32.01
    02. Demonstrate the understanding and use of inheritance. CP.32.02
    03. Demonstrate the understanding and use of data encapsulation. CP.32.03
    04. Demonstrate the understanding and use of polymorphism. CP.32.04
    05. Use predefined functions and parameters, classes, and methods to divide a complex problem into simpler parts by using the principle of abstraction to manage complexity (e.g., by using searching and sorting as abstractions). CP.32.05
0. Create a project plan for an object-oriented programming project that defines requirements, structural design, time estimates, and testing elements. The student will be able to: CP.33.0
    01. Write a project plan for completion of a project that includes gathering program requirements, developing the program, and testing it. CP.33.01
    02. Write a program requirements document that identifies business purpose, functional requirements, system requirements, and other common components of a requirements document. CP.33.02
    03. Design an object-oriented program using standard design methodology. CP.33.03
    04. Work with other team members to develop a project plan for a program. CP.33.04
    05. Work with other team members to write a design document for a program with multiple functions and shared data. CP.33.05
    06. Participate in design meetings that review program design documents for conformance to program requirements. CP.33.06
    07. Estimate the time to develop a program or module. CP.33.07
    08. Evaluate algorithms by their efficiency, correctness, and clarity (e.g., by analyzing and comparing execution times, testing with multiple inputs or data sets, and by debugging). CP.33.08

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0. Design, document, and create object-oriented computer programs. The student will be able to: CP.34.0
    01. Compare and contrast recursive functions to iterative methods. CP.34.01
    02. Understand the implementation of character strings in the programming language. CP.34.02
    03. Write programs that perform string processing (e.g., manipulating, comparing strings, concatenation). CP.34.03
    04. Write programs that implements user-defined data types. CP.34.04
    05. Decompose a problem by defining new functions and classes. CP.34.05
    06. Write object-oriented programs that implement inheritance. CP.34.06
    07. Write object-oriented programs that implement polymorphism. CP.34.07
    08. Develop class constructors. CP.34.08
    09. Write programs that define and use program constants. CP.34.09
    10. Write programs that perform error handling. CP.34.10
    11. Participate in program code review meetings to evaluate program code for validity, quality, performance, data integrity, and conformance to program design documents. CP.34.11
    12. Describe the concept of parallel processing as a strategy to solve large problems. CP.34.12
    13. Demonstrate concurrency by separating processes into threads of execution and dividing data into parallel streams. CP.34.13
    14. Update a program module to implement enhancements or corrections and demonstrate appropriate documentation (internal and external) related to version control. CP.34.14
    15. Write programs that use complex data structures (e.g., stacks, queues, trees, linked list). CP.34.15
    16. Write programs that are event-driven. CP.34.16
    17. Write programs that perform file input and output (i.e., sequential and random access file input/output). CP.34.17
    18. Explain intractable problems and understand that problems exists that are computationally unsolvable (undecidable) (e.g., classic intractable problems include Towers of Hanoi, TSP). CP.34.18
    19. Explain the value of heuristic algorithms to approximate solutions for intractable problems (e.g., a heuristic solution to TSP). CP.34.19

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0. Design a unit test plan for an object-oriented computer program, test and debug the program, and report the results. The student will be able to: CP.35.0
    01. Develop a test plan for an object-oriented program. CP.35.01
    02. Write test plans for event-driven programs. CP.35.02
    03. Write test plans for programs that perform file input and output. CP.35.03
    04. Perform test and debug activities on object-oriented programs, including those written by someone else. CP.35.04
    05. Perform test and debug activities on an event-driven program. CP.35.05
    06. Perform test and debug activities on programs that perform file input and output and verify the correctness of output files. CP.35.06
    07. Document the findings of testing in a test report. CP.35.07
0. Understand human interactions in intelligence. The student will be able to: CP.36.0
    01. Describe the unique features of computers embedded in mobile devices and vehicles. CP.36.01
    02. Describe the common physical and cognitive challenges faced by users when learning to use software and hardware. CP.36.02
    03. Describe the process of designing software to support specialized forms of human-computer interaction. CP.36.03
    04. Explain the notion of intelligent behavior through computer modeling and robotics. CP.36.04
    05. Describe common measurements of machine intelligence (e.g., Turing test). CP.36.05
    06. Describe a few of the major branches of artificial intelligence (e.g., expert systems, natural language processing, machine perception, machine learning). CP.36.06
    07. Describe major applications of artificial intelligence and robotics, including, but not limited to, the medical, space, and automotive fields. CP.36.07

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**Java Developer - Course Number: CTS0031**

0. Construct statements that declare, initialize, and modify different types of variables used in Java programs. The student will be able to: JD.37.0
    01. Describe how variables are used in programs. JD.37.01
    02. Identify the eight Java primitive data types. JD.37.02
    03. Identify the minimum and maximum ranges of primitive data types. JD.37.03
    04. Identify which data type should be used for a given situation. JD.37.04
    05. Identify the syntax for using variables. JD.37.05
    06. Declare and initialize variables. JD.37.06
    07. Assign new values to variables. JD.37.07
    08. Create and use constant variables. JD.37.08

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0. Describe the types and characteristics of lexical units in the Java programming language. The student will be able to: JD.38.0
    01. Describe the types of lexical units. JD.38.01
    02. Describe identifiers and identify valid and invalid identifiers. JD.38.02
    03. Describe and identify reserved words, delimiters, literals, and comments. JD.38.03
0. Describe the data types employed in Java programs. The student will be able to: JD.39.0
    01. Describe the data type categories. JD.39.01
    02. Give examples of primitives, reference data types. JD.39.02
    03. Identify and use enumerations. JD.39.03
    04. Understand the use of Wrapper Classes in programs. JD.39.04
    05. Describe the difference between real and integer data types. JD.39.05
0. Construct Java statements that employ the use of various operators. The student will be able to: JD.40.0
    01. Construct statements using arithmetic operators. JD.40.01
    02. Construct statements using relational operators. JD.40.02
    03. Construct and use statements using logical operators. JD.40.03
    04. Construct and use statements using assignment operators. JD.40.04
    05. Construct and execute statements using operator precedence. JD.40.05
0. Write executable statements using Java. The student will be able to: JD.41.0
    01. Construct variable assignment statements. JD.41.01
    02. Construct statements using built-in math functions. JD.41.02
    03. Differentiate between implicit and explicit data type conversions. JD.41.03
    04. Describe when implicit data type conversions take place. JD.41.04
    05. List the drawbacks of implicit data type conversions. JD.41.05
    06. Describe the process of autoboxing and promotion. JD.41.06
    07. Construct statements using functions to explicitly convert data types. JD.41.07
0. Describe variable scope and its implications in Java programming. The student will be able to: JD.42.0
    01. Understand the scope and visibility of variables. JD.42.01
    02. Write programs using local variables. JD.42.02
    03. Describe the scope of a variable. JD.42.03
    04. Describe the default value of local, instance, and static scope of variables. JD.42.04
    05. Describe how compiler uses scope to identify variables with the same name. JD.42.05

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0. Apply common Java programming style guidelines and conventions. The student will be able to: JD.43.0
    01. List examples of good programming practices. JD.43.01
    02. Insert comments into code. JD.43.02
    03. Follow formatting guidelines when writing code. JD.43.03
    04. Understand the different types of errors produced by programs. JD.43.04
0. Demonstrate use of the compiler and interpreter through command line interface. The student will be able to: JD.44.0
    01. Describe the use of the Java compiler (javac) and Java interpreter (Java VM). JD.44.01
    02. Demonstrate the use of the - classpath flag and –d flag to the compiler. JD.44.02
    03. Identify the environmental variables of PATH and CLASSPATH. JD.44.03
    04. Describe the process of command line arguments to the program. JD.44.04
    05. Create programs that take in multiple command line arguments. JD.44.05
0. Construct conditional control statements in Java. The student will be able to: JD.45.0
    01. Construct and use an if statement. JD.45.01
    02. Construct and use a switch statement. JD.45.02
    03. Construct and use a while, do while, and for loop. JD.45.03
    04. Construct and use a conditional operator. JD.45.04
0. Construct iterative control statements in Java. The student will be able to: JD.46.0
    01. Describe the types of loop statements and their uses. JD.46.01
    02. Construct and use the while and do while loop. JD.46.02
    03. Construct and use the for loop. JD.46.03
    04. Construct and use the enhanced for loop. JD.46.04
    05. Describe when a while loop is used. JD.46.05
    06. Describe when a for loop is used. JD.46.06
0. Use nested loop iterative control statements in Java. The student will be able to: JD.47.0
    01. Construct and execute a program using nested loops. JD.47.01
    02. Construct and execute a loop using break and continue. JD.47.02
    03. Evaluate a nested loop construct and sentinel value. JD.47.03

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0. Produce input and output for Java programs. The student will be able to: JD.48.0
    01. Describe and use classes (e.g., Scanner, System) to input data into programs. JD.48.01
    02. Demonstrate the use of different ways to input data into programs using Scanner or System class. JD.48.02
    03. Describe and demonstrate the use of the System class to produce output to the console. JD.48.03
    04. Explain the difference between print and println functions in the System class. JD.48.04
    05. Create and use escape sequences. JD.48.05
0. Use packages and import statements in a Java program. The student will be able to: JD.49.0
    01. Describe the use of import statements. JD.49.01
    02. Describe the use of packages. JD.49.02
    03. Create code that uses package statements to avoid class conflict. JD.49.03
    04. Create packages that abide by standard Java naming convention. JD.49.04
    05. Demonstrate the use of Java-API to search for classes and packages. JD.49.05
0. Create a Java program that uses methods. The student will be able to: JD.50.0
    01. Differentiate between anonymous blocks and methods. JD.50.01
    02. Identify the benefits of using methods. JD.50.02
    03. Describe a method signature. JD.50.03
    04. Create a method. JD.50.04
    05. Describe how a method is invoked. JD.50.05
    06. Describe the purpose of overloading methods. JD.50.06
    07. Create overloaded methods in programs. JD.50.07
0. Create a Java program that uses parameters in methods. The student will be able to: JD.51.0
    01. Describe how parameters are passed into functions. JD.51.01
    02. Define a parameter. JD.51.02
    03. Create a method using a parameter. JD.51.03
    04. Invoke a method that has parameters. JD.51.04
    05. Distinguish between formal and actual parameters. JD.51.05
    06. Demonstrate the use of reference parameters in methods. JD.51.06

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0. Describe and use recursion in a Java program. The student will be able to: JD.52.0
    01. Describe the use of recursion in solving problems. JD.52.01
    02. Describe the difference of iterative and recursive methods. JD.52.02
    03. Demonstrate the use of direct recursion. JD.52.03
    04. Demonstrate the use of indirect recursion. JD.52.04
0. Construct Java statements that use the String class to manipulate String data. The student will be able to: JD.53.0
    01. Explain the use of the String class. JD.53.01
    02. Create code to concatenate strings using the concatenation operator. JD.53.02
    03. Demonstrate how to search a string using indexOf method of the String class. JD.53.03
    04. Explain the effect of immutability of Strings. JD.53.04
    05. Create Strings using string literals, and through new keyword. JD.53.05
    06. Demonstrate the use of the following string manipulation methods of the String class: charAt,length, trim, substring, replace, startsWidth and endsWith. JD.53.06
0. Construct Java statements that use Classes. The student will be able to: JD.54.0
    01. Describe and identify abstract data types. JD.54.01
    02. Describe the difference between an object and a class. JD.54.02
    03. Identify class attributes. JD.54.03
    04. Create instance variables for a class. JD.54.04
    05. Use visibility modifiers for attributes. JD.54.05
    06. Identify constructors and describe their use. JD.54.06
    07. Describe encapsulation. JD.54.07
    08. Write class using encapsulation. JD.54.08
    09. Apply data abstraction through the use of accessor or and mutator methods. JD.54.09
    10. Describe the equals method. JD.54.10
    11. Demonstrate the use of classes in methods as both parameters and return types. JD.54.11
    12. Describe the garbage collection process. JD.54.12
    13. Demonstrate reusability and extensibility in class creation. JD.54.13
    14. Demonstrate the use of Comparable interface to compare objects. JD.54.14

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0. Manage class relationships. The student will be able to: JD.55.0
    01. Explain the association relationship among classes. JD.55.01
    02. Explain the direct association relationship among classes. JD.55.02
    03. Explain the composition and aggregation relationship among classes. JD.55.03
    04. Explain the direct association relationship among classes. JD.55.04
    05. Write programs that use composition, association. JD.55.05
    06. Write programs that use direct association. JD.55.06
0. Construct Java statements that illustrate the use of multiplicities in class relationships. The student will be able to: JD.56.0
    01. Describe how multiplicities affect class relationships. JD.56.01
    02. Describe one-to one, one-to-many, and many-to-many relationships. JD.56.02
    03. Write programs that use multiplicities in class relationships. JD.56.03
0. Use object references. The student will be able to: JD.57.0
    01. Identify reference aliases. JD.57.01
    02. Understand and use null reference. JD.57.02
    03. Explain the this reference and its use in class creation. JD.57.03
0. Describe the types of arrays and construct Java statements that illustrate the use and manipulation of multi-dimensional and jagged arrays. The student will be able to: JD.58.0
    01. Declare and initialize and array. JD.58.01
    02. Demonstrate the use of initializer lists. JD.58.02
    03. Demonstrate the use of arrays in methods. JD.58.03
    04. Demonstrate the updating, populating and destroying arrays. JD.58.04
    05. Explain linear and binary searching. JD.58.05
    06. Sort arrays using selection sort, insertion sort, and bubble sort. JD.58.06
    07. Demonstrate the use of multidimensional arrays. JD.58.07
    08. Demonstrate the use of jagged arrays. JD.58.08
    09. Demonstrate basic hashing using arrays. JD.58.09

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0. Construct Java statements that illustrate different ways of using inheritance. The student will be able to: JD.59.0
    01. Explain the purpose and use of inheritance in object oriented programming. JD.59.01
    02. Explain the difference between single and multiple inheritance. JD.59.02
    03. Create parent and child classes. JD.59.03
    04. Create overloaded methods. JD.59.04
    05. Describe the has-a and is-a relationship. JD.59.05
    06. Create class hierarchies. JD.59.06
    07. Explain the process of generalization to specification. JD.59.07
    08. Demonstrate the use of abstract classes. JD.59.08
    09. Explain polymorphism. JD.59.09
    10. Create a program that uses polymorphism. JD.59.10
    11. Demonstrate the use of the instanceof method. JD.59.11
0. Construct Java statements that use collections. The student will be able to: JD.60.0
    01. Describe data structure of linked lists. JD.60.01
    02. Create a linked list manually. JD.60.02
    03. Use the ArrayList class. JD.60.03
    04. Create a stack and Queue manually. JD.60.04
    05. Use the Stack and Queue standard class. JD.60.05
    06. Identify which data structure is best fitted for a situation. JD.60.06
    07. Use iterators with collections. JD.60.07
    08. Identify how to insert, delete, update, and traverse data structures. JD.60.08
0. Write Java code that uses the Iterator and List interfaces. The student will be able to: JD.61.0
    01. Describe the purpose of interfaces. JD.61.01
    02. Create and use interfaces in programs. JD.61.02
    03. Use the Comparable interface. JD.61.03
    04. Use the Iterator interface and List Interface in programs. JD.61.04
    05. Understand the program to the interface principle. JD.61.05
0. Create Java code that includes exception handling code. The student will be able to: JD.62.0
    01. Describe the advantages of including exception handling code. JD.62.01
    02. Describe the purpose of an EXCEPTION section in a program block. JD.62.02
    03. Create code to include an EXCEPTION section. JD.62.03
    04. List the guidelines for exception handling. JD.62.04

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0. Create Java code that uses the Object class. The student will be able to: JD.63.0
    01. Understand the Object class relationship to other classes. JD.63.01
    02. Demonstrate the use of toString method. JD.63.02
    03. Demonstrate the use of clone and finalize methods. JD.63.03
    04. Write program to use Object class functionality. JD.63.04
0. Use standard library classes that comprise the Java API. The student will be able to: JD.64.0
    01. Describe the classes and methods in the basic input/output package. JD.64.01
    02. Describe the classes and methods in the utilities package. JD.64.02
    03. Describe the classes and methods in the utilities package. JD.64.03
    04. Describe the classes and methods in the networking package. JD.64.04
    05. Describe the classes and methods in the AWT and swing package. JD.64.05
    06. Describe the classes and methods in the SQL and SQLX package. JD.64.06
0. Create Java code that uses exceptions to improve program quality. The student will be able to: JD.65.0
    01. Explain how exception handling works in Java. JD.65.01
    02. Trap exceptions using try and catch. JD.65.02
    03. Explain when to use the finally clause. JD.65.03
    04. Demonstrate handling exceptions through throwing and catching. JD.65.04
    05. Create and Exception and manage the exception. JD.65.05
    06. Explain the use of inheritance and exceptions. JD.65.06
0. Describe Java 2 Micro Edition (J2ME) uses, characteristics, and constraints. The student will be able to: JD.66.0
    01. Understand midlets. JD.66.01
    02. Explain CLDC and profiles. JD.66.02
    03. Explain the constraints specific to J2ME programming when compared to J2SE. JD.66.03
    04. Understand the high architectural goal of J2ME. JD.66.04
    05. Create user-defined functions. JD.66.05
0. Create and convert classes using Unified Modeling Language (UML). The student will be able to: JD.67.0
    01. Identify UML elements Classes, abstract Classes, Interfaces. JD.67.01
    02. Identify UML attributes, operators, visibility modifiers and UML associations. JD.67.02
    03. Given a set of classes be able to convert the classes to a UML diagram. JD.67.03
    04. Given a UML diagram be able to create classes. JD.67.04

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0. Create programs that use of Remote Method Invocation (RMI) and other server technologies associated with Relational Database Management Systems (RDMS) and Structured Query Language (SQL). The student will be able to: JD.68.0
    01. Understand and describe RMI. JD.68.01
    02. Write a program to use RMI. JD.68.02
    03. Understand RDMS and SQL technologies. JD.68.03
    04. Use the Java Database Connectivity API to connect and execute SQL statements to RDMS. JD.68.04
0. Demonstrate an understanding of Java Integration APIs, including Java Message Service (JMS), Enterprise JavaBeans (EJB), and Java Naming and Directory Interface (JNDI). The student will be able to: JD.69.0
    01. Understand and describe JMS. JD.69.01
    02. Understand and describe EJB technology. JD.69.02
    03. Understand and describe JNDI technology. JD.69.03
0. Demonstrate an understanding of Java Client APIs, including the Abstract Window Toolkit (AWT), Swing, and Java applet. The student will be able to: JD.70.0
    01. Understand and describe AWT and GUI interface. JD.70.01
    02. Understand and describe the use of Swing components and GUI. JD.70.02
    03. Understand and describe the use of applet technology. JD.70.03
0. Understand and apply Java 2 Enterprise Edition (J2EE) Server Solutions. The student will be able to: JD.71.0
    01. Understand java Web Services. JD.71.01
    02. Underrated and use SMTP and Java Mail technologies. JD.71.02
    03. Understand how to use JSP and Servlets. JD.71.03
0. Create a database application using the Java programming language. The student will be able to: JD.72.0
    01. Utilize loop statements. JD.72.01
    02. Given a scenario, use arithmetic, comparison, and pattern-matching operators. JD.72.02
    03. Create user-defined functions. JD.72.03
    04. Utilize common built-in functions. JD.72.04
    05. Declare variables in modules and procedures. JD.72.05
    06. Declare arrays, and initialize elements of arrays. JD.72.06
    07. Declare and use object variables and collections, and use their associated properties and methods. JD.72.07
    08. Declare symbolic constants, and make them available locally or publicly. JD.72.08
    09. Respond to events. JD.72.09

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0. Create a graphical user interface application using the Java programming language. The student will be able to: JD.73.0
    01. Utilize loop statements. JD.73.01
    02. Given a scenario, use arithmetic, comparison, and pattern-matching operators. JD.73.02
    03. Create user-defined functions. JD.73.03
    04. Utilize common built-in functions. JD.73.04
    05. Declare variables in modules and procedures. JD.73.05
    06. Declare arrays, and initialize elements of arrays. JD.73.06
    07. Declare and use object variables and collections, and use their associated properties and methods. JD.73.07
    08. Declare symbolic constants, and make them available locally or publicly. JD.73.08
    09. Use the Java Event model to handle user inputs from events. JD.73.09
    10. Use JComponents and layout managers to create the GUI. JD.73.10
0. Create a web-based application using the Java programming language. The student will be able to: JD.74.0
    01. Utilize loop statements. JD.74.01
    02. Given a scenario, use arithmetic, comparison, and pattern-matching operators. JD.74.02
    03. Create user-defined functions. JD.74.03
    04. Utilize common built-in functions. JD.74.04
    05. Declare variables in modules and procedures. JD.74.05
    06. Declare arrays, and initialize elements of arrays. JD.74.06
    07. Declare and use object variables and collections, and use their associated properties and methods. JD.74.07
    08. Declare symbolic constants, and make them available locally or publicly. JD.74.08
    09. Write JSP pages to process user input. JD.74.09
    10. Write Servlets to provide input and output processing for the web solution. JD.74.10
0. Write code to perform common and union database queries using SQL and Java. The student will be able to: JD.75.0
    01. Utilize SQL to write common queries. JD.75.01
    02. Refer to objects by using SQL. JD.75.02
    03. Utilize union queries. JD.75.03

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0. Implement Java program statements using objects. The student will be able to: JD.76.0
    01. Determine when to use data access objects. JD.76.01
    02. Differentiate between objects and collections. JD.76.02
    03. Write statements that access and modify database objects, EJB objects. JD.76.03
    04. Select appropriate methods and property settings for use with specified objects. JD.76.04
0. Utilize debugging tools and write error handlers. The student will be able to: JD.77.0
    01. Trap errors. JD.77.01
    02. Utilize debugging tools to suspend program execution, and to examine, step through, and reset execution of code. JD.77.02
    03. Debug code samples. JD.77.03
    04. Utilize the Debugger to monitor variable values. JD.77.04
    05. Write an error handler. JD.77.05
0. Demonstrate file input/output (I/O). The student will be able to: JD.78.0
    01. Read from sequential and random access files. JD.78.01
    02. Write to sequential and random access files. JD.78.02
    03. Use file serialization. JD.78.03
0. Utilize API functions. The student will be able to: JD.79.0
    01. Properly declare functions. JD.79.01
    02. Use the by value and by reference parameters. JD.79.02
0. Test and debug databases. The student will be able to: JD.80.0
    01. Implement error handling. JD.80.01
    02. Test and debug library databases. JD.80.02
0. Successfully work as a member of a software development team. The student will be able to: JD.81.0
    01. Accept responsibility for specific tasks in a given situation. JD.81.01
    02. Document progress, and provide feedback on work accomplished in a timely manner. JD.81.02
    03. Complete assigned tasks in a timely and professional manner. JD.81.03
    04. Reassign responsibilities when the need arises. JD.81.04
    05. Complete daily tasks as assigned on one's own initiative. JD.81.05

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0. Manage time according to a plan. The student will be able to: JD.82.0
    01. Set realistic time frames and schedules. JD.82.01
    02. Keep a written time sheet of work accomplished on a daily basis. JD.82.02
    03. Meet goals and objectives set by the team. JD.82.03
    04. Identify individual priorities. JD.82.04
    05. Complete a weekly evaluation of accomplishments, and reevaluate goals, objectives and priorities as needed. JD.82.05
0. Keep acceptable records of progress problems and solutions. The student will be able to: JD.83.0
    01. Develop a record keeping system in the form of a log book to record daily progress. JD.83.01
    02. Use a project journal to identify problem statement. JD.83.02
    03. Develop a portfolio of work accomplished to include design drawings, flowcharts, drawings and plans, and prototypes. JD.83.03
0. Plan, organize, and carry out a project plan. The student will be able to: JD.84.0
    01. Determine the scope of a project. JD.84.01
    02. Organize the team according to individual strengths. JD.84.02
    03. Assign specific tasks within a team. JD.84.03
    04. Determine project priorities. JD.84.04
    05. Identify required resources. JD.84.05
    06. Plan research, design, development, and evaluation activities as required. JD.84.06
    07. Carry out the project plan to successful completion. JD.84.07
0. Manage resources. The student will be able to: JD.85.0
    01. Identify required resources for each stage of the project plan. JD.85.01
    02. Determine the methods needed to acquire needed resources. JD.85.02
    03. Demonstrate good judgment in the use of resources. JD.85.03
    04. Recycle and reuse resources where appropriate. JD.85.04
    05. Demonstrate an understanding of proper legal and ethical treatment of copyrighted material. JD.85.05
0. Use tools, materials, and processes in an appropriate and safe manner. The student will be able to: JD.86.0
    01. Identify the proper tool for a given job. JD.86.01
    02. Use tools and machines in a safe manner. JD.86.02
    03. Adhere to laboratory or job site safety rules and procedures. JD.86.03
    04. Identify the application of processes appropriate to the task at hand. JD.86.04
    05. Identify materials appropriate to their application. JD.86.05

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0. Demonstrate an understanding of the software development process. The student will be able to: JD.87.0
    01. State the goals of the software application clearly. JD.87.01
    02. Identify and write a plan to achieve each goal. JD.87.02
    03. Develop a list of materials and content required for each goal. JD.87.03
    04. Develop a step by step procedure for developing the application. JD.87.04
    05. Follow a written procedure. JD.87.05
    06. Record data from evaluation activities. JD.87.06
    07. Document conclusions and solutions based on evaluation results, observations and data. JD.87.07
    08. Document progress using a project log. JD.87.08
    09. Write an abstract describing the project plan. JD.87.09
0. Research content related to the project and document the results following industry conventions. The student will be able to: JD.88.0
    01. Identify the basic research needed to develop the project plan. JD.88.01
    02. Identify available resources for completing background research required in the project plan. JD.88.02
    03. Demonstrate the ability to locate resource materials in a library, data base, internet and other research resources. JD.88.03
    04. Demonstrate the ability to organize information retrieval. JD.88.04
    05. Demonstrate the ability to prepare a topic outline. JD.88.05
    06. Write a draft of the research report. JD.88.06
    07. Edit and proof the research report. Use proper form for a bibliography, footnotes, quotations, and references. JD.88.07
    08. Prepare an electronically composed research paper in proper form. JD.88.08
    09. Conduct an alpha and beta evaluation of the project's product. JD.88.09
    10. Write a report on the evaluations, documenting results, data, observations, and design changes based on the results. JD.88.10
0. Use presentation skills, and appropriate media to describe the progress, results and outcomes of the experience. The student will be able to: JD.89.0
    01. Prepare a multi-media presentation on the completed project. JD.89.01
    02. Make an oral presentation, using multi-media materials. JD.89.02
    03. Review the presentation, and make changes in the delivery method(s) to improve presentation skills. JD.89.03

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0. Demonstrate competency in the area of expertise related to developing computer software using the Java programming language. The student will be able to: JD.90.0
    01. Demonstrate a mastery of the content of the selected subject area. JD.90.01
    02. Demonstrate the ability to use related technological tools, materials and processes related to the specific program area. JD.90.02
    03. Demonstrate the ability to apply the knowledge, experience and skill developed in the previous program completion to the successful completion of this demonstration. JD.90.03

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**Network Support Services (B078000)**

**Information Technology Assistant - Course Number: OTA0040**

0. Demonstrate knowledge, skill, and application of information technology to accomplish job objectives and enhance workplace performance. ITA.01.0
0. Develop an awareness of microcomputers. ITA.02.0
0. Demonstrate an understanding of networks. ITA.03.0
0. Use word processing applications to enhance the effectiveness of various types of documents and communication. ITA.04.0
0. Use presentation applications to enhance communication skills. ITA.05.0
0. Use spreadsheet applications to enhance communication skills. ITA.06.0
0. Use database applications to store and organize data. ITA.07.0
0. Use electronic mail to enhance communication skills. ITA.08.0
0. Investigate individual assessment and job/career exploration and individual career planning that reflect the transition from school to work, lifelong learning, and personal and professional goals. ITA.09.0
0. Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. ITA.10.0
0. Demonstrate competence using computer networks, internet and online databases to facilitate collaborative or individual learning and communication. ITA.11.0
0. Develop awareness of computer languages, web-based & software applications, and emerging technologies. ITA.12.0
0. Demonstrate an understanding of basic html by creating a simple web page. ITA.13.0
0. Demonstrate comprehension and communication skills. ITA.14.0
0. Use social media to enhance online communication and develop an awareness of a digital footprint. ITA.15.0
0. Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. ITA.16.0

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0. Identify, install, configure, and upgrade desktop and server computer modules and peripherals, following established basic procedures for system assembly and disassembly of field replaceable modules. ITA.17.0
0. Diagnose and troubleshoot common module problems and system malfunctions of computer software, hardware, peripherals, and other office equipment. ITA.18.0
0. Identify issues, procedures and devices for protection within the computing environment, including people, hardware and the surrounding workspace. ITA.19.0
0. Identify specific terminology, facts, ways and means of dealing with classifications, categories and principles of motherboards, processors and memory in desktop and server computer systems. ITA.20.0
0. Demonstrate knowledge of basic types of printers, basic concepts, printer components, how they work, how they print onto a page, paper path, care and service techniques, and common problems. ITA.21.0
0. Identify and describe basic network concepts and terminology, ability to determine whether a computer is networked, knowledge of procedures for swapping and configuring network interface cards, and knowledge of the ramifications of repairs when a computer is networked. ITA.22.0
0. Perform end user support and assistance by troubleshooting and diagnosing through telephone, e-mail, remote access, or direct contact. ITA.23.0
0. Demonstrate proficiency using graphical user interface (GUI) operating systems. ITA.24.0
0. Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. ITA.25.0
0. Perform end user support and assistance by troubleshooting and diagnosing through telephone, e-mail, remote access, or direct contact. ITA.26.0
0. Understand, describe, and explain internet connections. ITA.27.0
0. Define networking terminology. ITA.28.0
0. Explain how to connect copper media, optical media, and wireless media. ITA.29.0
0. Perform tasks related to the network cable testing and cable making. ITA.30.0
0. Define network topologies, devices and connections. ITA.31.0
0. Define Ethernet fundamentals and operations. ITA.32.0
0. Define and explain the functions of bridges and switches. ITA.33.0
0. Explain the mathematical concepts and protocols behind the internet. ITA.34.0
0. Define and explain the difference between routed and routing protocols. ITA.35.0
0. Recognize, define, and explain functions of the transport layer. ITA.36.0
0. Explain, define, and identify the components of a WAN and router. ITA.37.0
0. Describe and identify an operating system for a router. ITA.38.0
0. Explain how to establish connections between neighboring routers. ITA.39.0

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0. Identify and explain the router boot sequence and file system. ITA.40.0
0. Identify and explain static and dynamic routing protocols. ITA.41.0
0. Describe and configure distance vector protocols. ITA.42.0
0. Perform tasks related to protocol troubleshooting. ITA.43.0
0. Examine and test networks. ITA.44.0
0. Define, explain and describe access lists. ITA.45.0
0. Solve problems using critical thinking skills, creativity and innovation. ITA.46.0
0. Use information technology tools. ITA.47.0
0. Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. ITA.48.0
0. Describe the importance of professional ethics and legal responsibilities. ITA.49.0
0. Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. ITA.50.0
0. Participate in simulated work-based learning experiences. ITA.51.0
0. Provide network support and assistance by troubleshooting and diagnosing through direct contact remote access. ITA.52.0
0. Perform logical and physical network design activities. ITA.53.0
0. Demonstrate proficiency in selecting appropriate various routing protocols and IP routing configuration for various network designs. ITA.54.0
0. Demonstrate proficiency in using network traffic filtering to improve network performance and provide basic levels of security. ITA.55.0
0. Perform network management activities related to documentation, security, performance, administration, troubleshooting and coping with environmental factors. ITA.56.0
0. Identify and describe various van functions, devices, and demonstrate understanding of the wan design process. ITA.57.0
0. Describe the operation and implementation of virtual private networks. ITA.58.0
0. Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. ITA.59.0
0. Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives. ITA.60.0
0. Explain the importance of employability skill and entrepreneurship skills. ITA.61.0
0. Demonstrate personal money-management concepts, procedures, and strategies. ITA.62.0
0. Participate in simulated work-based learning experiences. ITA.63.0

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0. Compare and contrast hierarchical network design models and scalable internetworks. ITA.64.0

0. Discuss advanced IP addressing management. ITA.65.0
0. Demonstrate proficiency in basic router configuration. ITA.66.0
0. Demonstrate proficiency in the use of OSPF. ITA.67.0
0. Understand and discuss multi-area OSPF operation and configuration. ITA.68.0
0. Demonstrate the use of stub and totally stubby areas. ITA.69.0
0. Demonstrate proficiency in route optimization. ITA.70.0
0. Demonstrate proficiency in the use of BGP. ITA.71.0
0. Define and show proficiency in security. ITA.72.0
0. Use lab equipment, demonstrate the setup, configuration, connectivity of routers to create a small WAN. ITA.73.0
0. Configure and monitor DSL and DDR. ITA.74.0
0. Demonstrate the use of scaling IP addresses with NAT. ITA.75.0
0. Demonstrate proficiency using Authentication, Authorization & Accounting AAA to scale access control. ITA.76.0
0. Understand and describe key characteristics of various switching technologies, LAN switching and the hierarchical model of network design, and the 3-tier model. ITA.77.0
0. Understand and describe campus networks, design models, and switching technologies. ITA.78.0
0. Show proficiency configuring a switch. ITA.79.0
0. Demonstrate proficiency configuring VLANS. ITA.80.0
0. Understand and explain spanning tree protocol (STP) and redundant links. ITA.81.0
0. Demonstrate proficiency with multilayer switching. ITA.82.0
0. Demonstrate the use of hot standby routing protocol (HSRP). ITA.83.0
0. Understand and use IGMP and multicasting. ITA.84.0
0. Demonstrate proficiency restricting network access. ITA.85.0
0. Demonstrate proficiency using network troubleshooting tools and basic network management diagnostic tools. ITA.86.0
0. List and define the commonly used protocols, routing techniques, and switching processes. ITA.87.0
0. Demonstrate proficiency troubleshooting TCP/IP, LAN switch environment, VLANS, frame relay, and ISDN. ITA.88.0
0. Participate in simulated work-based learning experiences. ITA.89.0
0. Demonstrate proficiency in applying radio frequency (RF) technologies. ITA.90.0
- Develop an awareness of wireless LAN technologies. ITA.91.0

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Perform implementation and management activities. ITA.92.0

0. Develop an awareness of wireless security systems. ITA.93.0
0. Demonstrate knowledge of wireless industry standards. ITA.94.0
0. Participate in simulated work-based learning experiences. ITA.95.0
0. Demonstrate knowledge of general security concepts. ITA.96.0
0. Develop an awareness of communication security concepts. ITA.97.0
0. Develop an awareness of network infrastructure security. ITA.98.0
0. Develop an awareness of cryptography and its relation to security. ITA.99.0
0. Incorporate organizational and operational security in an appropriate and effective manner. ITA.100.0

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**Computer Support Assistant - Course Number: EEV0504**

0. Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. The student will be able to: CSA.16.0
    01. Develop strategies for resolving customer conflicts. CSA.16.01
0. Identify, install, configure, and upgrade desktop and server computer modules and peripherals, following established basic procedures for system assembly and disassembly of field replaceable modules. The student will be able to: CSA.17.0
    01. Identify and describe the functions of main processing boards. CSA.17.01
    02. Identify and describe the functions of communication ports. CSA.17.02
    03. Identify and describe the functions of peripheral devices. CSA.17.03
    04. Identify and describe the components of portable systems. CSA.17.04
    05. Troubleshoot, install and upgrade computers and peripherals. CSA.17.05
    06. Perform system hardware setup. CSA.17.06
    07. Demonstrate an understanding of input/output devices. CSA.17.07
    08. Installation and configuration of applications software, hardware, and device drivers. CSA.17.08
    09. Demonstrate an understanding of the operation and purpose of hardware components. CSA.17.09
    10. Install operating system software. CSA.17.10
    11. Customize operating systems. CSA.17.11
    12. Install application software. CSA.17.12
    13. Perform storage formatting and preparation activities. CSA.17.13
    14. Identify data measurement. CSA.17.14
    15. Install and configure RAID. CSA.17.15
    16. Recognize and report on server room environmental issues. CSA.17.16

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0. Diagnose and troubleshoot common module problems and system malfunctions of computer software, hardware, peripherals, and other office equipment. The student will be able to: CSA.18.0
    01. Troubleshoot a personal computer system. CSA.18.01
    02. Identify configuration problems. CSA.18.02
    03. Identify software problems. CSA.18.03
    04. Identify hardware malfunctions. CSA.18.04
    05. Identify network malfunctions. CSA.18.05
    06. Resolve computer error messages. CSA.18.06
    07. Understand and troubleshoot memory and cache systems. CSA.18.07
    08. Verify that drives are the appropriate type. CSA.18.08
    09. Describe knowledge database search procedures used to identify possible solutions when troubleshooting software and hardware problems. CSA.18.09
0. Identify issues, procedures and devices for protection within the computing environment, including people, hardware and the surrounding workspace. The student will be able to: CSA.19.0
    01. Apply basic rules for hardware safety. CSA.19.01
    02. Demonstrate proficiency in basic preventative hardware maintenance. CSA.19.02
    03. Special disposal procedures that comply with environmental guidelines for batteries, CRTs, toner kits/cartridges, chemical solvents and cans, and MSDS. CSA.19.03
    04. Apply ergonomic principles applicable to the configuration of computer workstations. CSA.19.04
    05. Describe ethical issues and problems associated with computers and information systems. CSA.19.05
0. Identify specific terminology, facts, ways and means of dealing with classifications, categories and principles of motherboards, processors and memory in desktop and server computer systems. The student will be able to: CSA.20.0
    01. Identify Random Access Memory (RAM) types. CSA.20.01
    02. Identify I/O ports and devices. CSA.20.02
0. Demonstrate knowledge of basic types of printers, basic concepts, printer components, how they work, how they print onto a page, paper path, care and service techniques, and common problems. The student will be able to: CSA.21.0
    01. Identify types of printers. CSA.21.01
    02. Identify care and service techniques and common problems with primary printer types. CSA.21.02
    03. Implement and manage printing on a network. CSA.21.03

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0. Identify and describe basic network concepts and terminology, ability to determine whether a computer is networked, knowledge of procedures for swapping and configuring network interface cards, and knowledge of the ramifications of repairs when a computer is networked. The student will be able to: CSA.22.0
    01. Define networking and describe the purpose of a network. CSA.22.01
    02. Identify the purposes and interrelationships among the major components of networks. CSA.22.02
    03. Describe the various types of network topologies. CSA.22.03
    04. Identify and describe the purpose of standards, protocols, and the Open Systems Interconnection (OSI) reference model. CSA.22.04
    05. Configure network and verify network connectivity. CSA.22.05
    06. Discuss the responsibilities of the network. CSA.22.06
    07. Develop user logon procedures. CSA.22.07
    08. Utilize network management infrastructures to perform administrative tasks. CSA.22.08
    09. Identify common backup strategies and procedures. CSA.22.09
    10. Select and use appropriate electronic communications software and hardware for specific tasks. CSA.22.10
    11. Compare and contrast Internet software and protocols. CSA.22.11
    12. Diagnose and resolve electronic communications operational problems. CSA.22.12
    13. Design and implement directory tree structures. CSA.22.13
    14. Install services tools. CSA.22.14
    15. Perform and verify backups. CSA.22.15
    16. Identify bottlenecks. CSA.22.16
    17. Use the concepts of fault tolerance/fault recovery to create a disaster recovery plan. CSA.22.17
    18. Document and test disaster recovery plan regularly, and update as needed. CSA.22.18
0. Perform end user support and assistance by troubleshooting and diagnosing through verbal or written communication. The student will be able to: CSA.23.0
    01. Apply call center vocabulary. CSA.23.01
    02. Listen and input information simultaneously. CSA.23.02
    02. Listen and input information simultaneously. CSA.23.02
    03. Apply first response assistance for minor repair work. CSA.23.03

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0. Demonstrate proficiency using graphical user interface (GUI) operating systems. The student will be able to: CSA.24.0
    01. Identify parts of GUI windows. CSA.24.01
    02. Demonstrate proficiency in using menu systems. CSA.24.02
    03. Demonstrate proficiency in using pointing and selection devices. CSA.24.03
    04. Identify keyboard shortcuts and special function keys. CSA.24.04
    05. Demonstrate proficiency in manipulating windows. CSA.24.05
    06. Utilize help systems and hypertext links. CSA.24.06
    07. Create, organize, and maintain file system directories. CSA.24.07
    08. Organize desktop objects. CSA.24.08
    09. Run multiple applications. CSA.24.09

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**Network Support Help Desk Assistant - Course Number: CTS0022**

0. Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. The student will be able to: NSH.25.0
    01. Develop diplomatic methods to communicate with customers. NSH.25.01
0. Perform end user support and assistance by troubleshooting and diagnosing through verbal or written communication. The student will be able to: NSH.26.0
    01. Apply first response assistance for minor repair work. NSH.26.01
0. Understand, describe, and explain internet connections. The student will be able to: NSH.27.0
    01. Understand the physical connectivity necessary for a computer to connect to the Internet. NSH.27.01
    02. Recognize the primary components of a computer. NSH.27.02
    03. Install and troubleshoot network interface cards and/or modems. NSH.27.03
    04. Use basic testing procedures to test the Internet connection. NSH.27.04
    05. Demonstrate a basic understanding of the use of web browsers and plug-ins. NSH.27.05

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0. Define networking terminology. The student will be able to: NSH.28.0
    01. Explain the importance of bandwidth in networking. NSH.28.01
    02. Identify bps, kbps, Mbps, and Gbps as units of bandwidth. NSH.28.02
    03. Explain the difference between bandwidth and throughput. NSH.28.03
    04. Explain the development of the Open System Interconnection model (OSI). NSH.28.04
    05. List the advantages of a layered approach. NSH.28.05
    06. Identify each of the seven layers of the OSI model. NSH.28.06
    07. Identify the four layers of the TCP/IP model. NSH.28.07
    08. Describe the similarities and differences between the two models. NSH.28.08
    09. Briefly outline the history of networking. NSH.28.09
    10. Identify devices used in networking. NSH.28.10
    11. Understand the role of protocols in networking. NSH.28.11
    12. Define types of area networks. NSH.28.12
    13. Explain VPNs and their advantages. NSH.28.13
    14. Describe the differences between intranets and extranets. NSH.28.14
0. Explain how to connect copper media, optical media, and wireless media. The student will be able to: NSH.29.0
    01. Discuss the electrical properties of matter. NSH.29.01
    02. Define voltage, resistance, impedance, current, and circuits. NSH.29.02
    03. Describe the specifications and performances of different types of cable. NSH.29.03
    04. Describe coaxial cable and its advantages and disadvantages over other types of cable. NSH.29.04
    05. Describe shielded twisted-pair (STP) cable and unshielded twisted-pair cable (UTP) and its uses. NSH.29.05
    06. Discuss the characteristics of straight-through, crossover, and rollover cables and where each is used. NSH.29.06
    07. Explain the basics of fiber-optic cable. NSH.29.07
    08. Describe how fibers can guide light for long distances. NSH.29.08
    09. Describe multimode and single-mode fiber. NSH.29.09
    10. Describe how fiber is installed. NSH.29.10
    11. Describe the type of connectors and equipment used with fiber-optic cable. NSH.29.11
    12. Explain how fiber is tested to ensure that it will function properly. NSH.29.12
    13. Discuss safety issues dealing with fiber-optics. NSH.29.13

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0. Perform tasks related to network cable testing and cable making. The student will be able to: NSH.30.0
    01. Differentiate between sine waves and square waves. NSH.30.01
    02. Define basic terminology related to time, frequency, and noise. NSH.30.02
    03. Differentiate between digital bandwidth and analog bandwidth. NSH.30.03
    04. Compare and contrast noise levels on various types of cabling. NSH.30.04
    05. Define and describe the effects of attenuation and impedance mismatch. NSH.30.05
    06. Define crosstalk, near-end crosstalk, far-end crosstalk, and power sum near-end crosstalk. NSH.30.06
    07. Describe how crosstalk and twisted pairs help reduce noise. NSH.30.07
    08. Describe the ten copper cable tests defined in TIA/EIA-568-A/B. NSH.30.08
    09. Describe the difference between Category 5 and Category 6 cable. NSH.30.09
0. Define network topologies, devices and connections. The student will be able to: NSH.31.0
    01. Identify characteristics of Ethernet networks. NSH.31.01
    02. Identify straight-through, crossover, and rollover cable. NSH.31.02
    03. Describe various intermediary network devices. NSH.31.03
    04. Describe the function of peer-to-peer networks. NSH.31.04
    05. Describe the function, advantages, and disadvantages of client-server networks. NSH.31.05
    06. Describe and differentiate between serial, digital subscriber line (DSL), and cable modem WAN connections. NSH.31.06
    07. Identify router serial ports and their cable and connectors. NSH.31.07
    08. Identify and describe the placement of equipment used in various WAN configurations. NSH.31.08

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0. Define Ethernet fundamentals and operations. The student will be able to: NSH.32.0
    01. Describe the basics of Ethernet technology. NSH.32.01
    02. Explain naming rules of Ethernet technology. NSH.32.02
    03. Define how Ethernet and the OSI model interact. NSH.32.03
    04. Describe the Ethernet framing process and frame structure. NSH.32.04
    05. List Ethernet frame field names and purposes. NSH.32.05
    06. Identify the characteristics of CSMA/CD. NSH.32.06
    07. Describe the key aspects of Ethernet timing, interframe spacing and backoff time after a collision. NSH.32.07
    08. Define Ethernet errors and collisions. NSH.32.08
    09. Explain the concept of auto-negotiation in relation to speed and duplex. NSH.32.09
0. Define and explain the functions of bridges and switches. The student will be able to: NSH.33.0
    01. Define bridging and switching. NSH.33.01
    02. Define and describe the content-addressable memory (CAM) table. NSH.33.02
    03. Define latency. NSH.33.03
    04. Describe store-and forward and cut-through switching modes. NSH.33.04
    05. Explain Spanning-Tree Protocol (STP). NSH.33.05
    06. Define collisions, broadcasts, collision domains, and broadcast domains. NSH.33.06
    07. Identify the Layer 1, 2, and 3 devices used to create collision domains and broadcast domains. NSH.33.07
    08. Discuss data flow and problems with broadcasts. NSH.33.08
    09. Explain network segmentation and list the devices used to create segments. NSH.33.09

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0. Explain the mathematical concepts and protocols behind the internet. The student will be able to: NSH.34.0
    01. Explain why the Internet was developed and how TCP/IP fits the design of the Internet. NSH.34.01
    02. List the four layers of the TCP/IP model. NSH.34.02
    03. Describe the functions of each layer of the TCP/IP model. NSH.34.03
    04. Compare the OSI model and the TCP/IP model. NSH.34.04
    05. Describe the function and structure of IP addresses. NSH.34.05
    06. Understand why subnetting is necessary. NSH.34.06
    07. Explain the difference between public and private addressing. NSH.34.07
    08. Understand the function of reserved IP addresses. NSH.34.08
    09. Explain the use of static and dynamic addressing for a device. NSH.34.09
    10. Use ARP to obtain the MAC address to send a packet to another device. NSH.34.10
    11. Understand the issues related to addressing between networks. NSH.34.11
    12. Demonstrate proficiency with IPv6. NSH.34.12
0. Define and explain the difference between routed and routing protocols. The student will be able to: NSH.35.0
    01. Describe routed (routable) protocols. NSH.35.01
    02. List the steps of data encapsulation in an internetwork as data is routed to one or more Layer 3 devices. NSH.35.02
    03. Describe connectionless and connection-oriented delivery. NSH.35.03
    04. Name the IP packet fields. NSH.35.04
    05. Describe process of routing. NSH.35.05
    06. Compare and contrast different types of routing protocols. NSH.35.06
    07. List and describe several metrics used by routing protocols. NSH.35.07
    08. List several uses for subnetting. NSH.35.08
    09. Determine the prefix/subnet mask for a given situation. NSH.35.09
    10. Use a prefix/subnet mask to determine the subnet ID. NSH.35.10

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0. Recognize, define, and explain functions of the transport layer. The student will be able to: NSH.36.0
    01. Describe the functions of the TCP/IP transport layer. NSH.36.01
    02. Describe flow control. NSH.36.02
    03. Describe the processes of establishing a connection between peer systems. NSH.36.03
    04. Describe windowing. NSH.36.04
    05. Describe acknowledgment. NSH.36.05
    06. Identify and describe transport layer protocols. NSH.36.06
    07. Describe TCP and UDP header formats. NSH.36.07
    08. Describe TCP and UDP port numbers and ports used for services and clients. NSH.36.08
    09. List the major protocols of the TCP/IP application layer. NSH.36.09
    10. Provide a brief description of the features and operation of well-known TCP/IP applications. NSH.36.10
    11. Describe TCP and UDP with its function. NSH.36.11
    12. Describe TCP synchronization and flow control. NSH.36.12
    13. Describe multiple conversations between hosts. NSH.36.13
    14. Understand the differences and the relationship between MAC addresses, IP addresses, and port numbers. NSH.36.14
0. Explain, define, and identify the components of a WAN and router. The student will be able to: NSH.37.0
    01. Explain the difference between a WAN and LAN and the type of addresses each uses. NSH.37.01
    02. Describe the role of a router in a WAN. NSH.37.02
    03. Identify internal components of the router and describe their functions. NSH.37.03
    04. Describe the physical characteristics of the router. NSH.37.04
    05. Identify common ports on a router. NSH.37.05
    06. Properly connect FastEthernet, serial WAN, and console ports. NSH.37.06

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0. Describe and identify an operating system for a router. The student will be able to: NSH.38.0
    01. Describe the purpose of the router operating system. NSH.38.01
    02. Describe the basic operation of the router operating system. NSH.38.02
    03. Identify various router operating system features. NSH.38.03
    04. Identify the methods to establish a CLI session with the router. NSH.38.04
    05. Establish a terminal emulation session on a router. NSH.38.05
    06. Log into a router. NSH.38.06
    07. Use the help feature in the command line interface. NSH.38.07
    08. Troubleshoot command errors. NSH.38.08
    09. Name a router. NSH.38.09
    10. Set passwords. NSH.38.10
    11. Explore router configuration commands. NSH.38.11
    12. Configure router interface. NSH.38.12
    13. Upgrade router operating system. NSH.38.13
    14. Configure an interface description. NSH.38.14
    15. Configure banner message. NSH.38.15
    16. Understand the importance of version control. NSH.38.16
    17. Save changes to a router. NSH.38.17
0. Explain how to establish connections between neighboring routers. The student will be able to: NSH.39.0
    01. Enable and disable protocols. NSH.39.01
    02. Determine which neighboring devices are connected to which local interfaces. NSH.39.02
    03. Establish, Verify, Disconnect, Suspend a Telnet connection. NSH.39.03
    04. Perform alternative connectivity tests. NSH.39.04
    05. Troubleshoot remote terminal connections. NSH.39.05

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0. Identify and explain the router boot sequence and file system. The student will be able to: NSH.40.0
    01. Identify the stages of the router boot sequence. NSH.40.01
    02. Determine how a router locates and loads its operating system. NSH.40.02
    03. Use the boot system command. NSH.40.03
    04. Identify the configuration register values. NSH.40.04
    05. Briefly describe the files used by the router operating system and their functions. NSH.40.05
    06. List the locations on the router of the different file types. NSH.40.06
    07. Save and restore configuration files using TFTP and copy-and paste. NSH.40.07
    08. Load a router operating system image using TFTP. NSH.40.08
    09. Verify the file system. NSH.40.09
0. Identify and explain static and dynamic routing protocols. The student will be able to: NSH.41.0
    01. Explain the significance of static routing. NSH.41.01
    02. Configure static and default routes. NSH.41.02
    03. Verify and troubleshoot static and default routes. NSH.41.03
    04. Identify routing protocols. NSH.41.04
    05. Identify distance vector routing protocols. NSH.41.05
    06. Identify link-state routing protocols. NSH.41.06
    07. Describe the basic characteristics of common routing protocols. NSH.41.07
    08. Identify interior gateway protocols. NSH.41.08
    09. Identify exterior gateway protocols BGP. NSH.41.09
    10. Enable Routing Information Protocol (RIP) on a router. NSH.41.10
0. Describe and configure distance vector protocols. The student will be able to: NSH.42.0
    01. Describe how routing loops can occur in distance vector routing. NSH.42.01
    02. Describe several methods used by distance vector routing protocols to ensure that routing information is accurate. NSH.42.02
    03. Configure RIP. NSH.42.03

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0. Perform tasks related to protocol troubleshooting. The student will be able to: NSH.43.0
    01. Describe ICMP. NSH.43.01
    02. Describe the ICMP message format and error message types. NSH.43.02
    03. Identify potential causes of specific ICMP error messages. NSH.43.03
    04. Describe ICMP control messages. NSH.43.04
    05. Identify a variety of ICMP control messages used in networks today. NSH.43.05
    06. Determine the causes for ICMP control messages. NSH.43.06
0. Examine and test networks. The student will be able to: NSH.44.0
    01. Use the commands to gather detailed information about the routes installed on the router. NSH.44.01
    02. Configure a default route or default network. NSH.44.02
    03. Understand how a router uses both Layer 2 and Layer addressing to move data through the network. NSH.44.03
0. Define, explain and describe access lists. The student will be able to: NSH.45.0
    01. Describe the differences between standard and extended ACLs. NSH.45.01
    02. Explain the rules for placement of ACLs. NSH.45.02
    03. Create and apply named ACLs. NSH.45.03
    04. Describe the function of firewalls. NSH.45.04
    05. Use ACLs to restrict virtual terminal access. NSH.45.05
0. Solve problems using critical thinking skills, creativity and innovation. The student will be able to: NSH.46.0
    01. Employ critical thinking skills independently and in teams to solve problems and make decisions. NSH.46.01
    02. Employ critical thinking and interpersonal skills to resolve conflicts. NSH.46.02
    03. Identify and document workplace performance goals and monitor progress toward those goals. NSH.46.03
    04. Conduct technical research to gather information necessary for decision-making. NSH.46.04

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0. Use information technology tools. The student will be able to: NSH.47.0
    01. Use personal information management (PIM) applications to increase workplace efficiency. NSH.47.01
    02. Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email, and internet applications. NSH.47.02
    03. Employ computer operations applications to access, create, manage, integrate, and store information. NSH.47.03
    04. Employ collaborative/groupware applications to facilitate group work. NSH.47.04
0. Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. The student will be able to: NSH.48.0
    01. Describe the nature and types of business organizations. NSH.48.01
    02. Explain the effect of key organizational systems on performance and quality. NSH.48.02
    03. List and describe quality control systems and/or practices common to the workplace. NSH.48.03
    04. Explain the impact of the global economy on business organizations. NSH.48.04
0. Describe the importance of professional ethics and legal responsibilities. The student will be able to: NSH.49.0
    01. Evaluate and justify decisions based on ethical reasoning. NSH.49.01
    02. Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities, and employer policies. NSH.49.02
    03. Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace. NSH.49.03
    04. Interpret and explain written organizational policies and procedures such as Sarbanes-Oxley, HIPPA, Gramm-Leach-Bliley. NSH.49.04

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**Network Support Administrator - Course Number: CTS0023**

0. Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. The student will be able to: NSA.50.0
    01. Develop diplomatic methods to communicate with customers. NSA.50.01
0. Participate in simulated work-based learning experiences. The student will be able to: NSA.51.0
    01. Participate in simulated work-based learning experiences in a network support services environment. NSA.51.01
    02. Discuss the use of technology in a network support services environment. NSA.51.02

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0. Provide network support and assistance by troubleshooting and diagnosing through direct contact remote access. The student will be able to: NSA.52.0
    01. Apply appropriate diagnostic techniques to solve network problems. NSA.52.01
    02. Perform local network support using various troubleshooting and diagnostic techniques. NSA.52.02
    03. Perform remote network support using various remote access methods. NSA.52.03
0. Perform logical and physical network design activities. The student will be able to: NSA.53.0
    01. Describe the various LAN communication problems. NSA.53.01
    02. Describe the effects of LAN segmentation with bridges, routers, and switches. NSA.53.02
    03. Describe the operation, characteristics and benefits of VLANS. NSA.53.03
    04. Explain and identify LAN design goals, issues, and methodology. NSA.53.04
    05. Demonstrate the ability to analyze equipment necessary to meet specific design requirement. NSA.53.05
    06. Demonstrate the ability to create physical and logical network implementation documentation. NSA.53.06
0. Demonstrate proficiency in selecting appropriate routing protocols and IP configuration for various network designs. The student will be able to: NSA.54.0
    01. Describe the two parts of network addressing, and then identify the parts in specific protocol address examples. NSA.54.01
    02. Demonstrate proficiency with IP addresses. NSA.54.02
    03. Configure IP addresses. NSA.54.03
    04. Verify IP addresses. NSA.54.04
    05. Identify the functions of the TCP/IP transport-layer protocols. NSA.54.05
    06. Identify the functions of the TCP/IP network-layer protocols. NSA.54.06
    07. Identify the functions performed by ICMP. NSA.54.07
    08. Explain the services of separate and integrated multi-protocol routing. NSA.54.08
    09. List problems that each routing type encounters when dealing with topology changes and describe techniques to reduce the number of these problems. NSA.54.09

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0. Demonstrate proficiency in using network traffic filtering to improve network performance and provide basic levels of security. The student will be able to: NSA.55.0

    01. Define and describe the purpose and operation of network traffic filtering. NSA.55.01

    02. Demonstrate proficiency in using configuration and interface commands to perform and monitor network traffic filtering. NSA.55.02

0. Perform network management activities related to documentation, security, performance, administration, troubleshooting and coping with environmental factors. The student will be able to: NSA.56.0

    01. Perform documentation activities for networks, such as logs, journals, diagrams, labeling schemes, layouts, software listings, user policy, security policy. NSA.56.01

    02. Plan network security measures by establishing security policies and procedures, including user policies, authentication procedures, back-up and data recovery procedures, and redundancy techniques. NSA.56.02

    03. Demonstrate proficiency in using network monitoring software. NSA.56.03

    04. Explain the procedures necessary to monitor, create benchmarks, and plan for improvement of network performance. NSA.56.04

    05. Explain the administrative side of network management, including physical and logical boundaries, costs, error report documentation and the management of human resources. NSA.56.05

0. Identify and describe various WAN functions, devices, and demonstrate understanding of the WAN design process. The student will be able to: NSA.57.0

    01. Describe the major features of WAN technology, including, devices, standards, encapsulation, link options, and packet and circuit switching. NSA.57.01

    02. Perform WAN design activities that require using the necessary steps in WAN design, the three-layered design model, and various other design models. NSA.57.02

0. Describe the operation and implementation of virtual private networks. The student will be able to: NSA.58.0

    01. Describe the virtual private network operation. NSA.58.01

    02. Describe the virtual private network implementation. NSA.58.02

    03. Demonstrate an understanding of tunneling. NSA.58.03

    04. Describe secure VPN's. NSA.58.04

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0. Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to: NSA.59.0
    01. Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments. NSA.59.01
    02. Explain emergency procedures to follow in response to workplace accidents. NSA.59.02
    03. Create a disaster and/or emergency response plan. NSA.59.03
0. Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives. The student will be able to: NSA.60.0
    01. Employ leadership skills to accomplish organizational goals and objectives. NSA.60.01
    02. Establish and maintain effective working relationships with others in order to accomplish objectives and tasks. NSA.60.02
    03. Conduct and participate in meetings to accomplish work tasks. NSA.60.03
    04. Employ mentoring skills to inspire and teach others. NSA.60.04
0. Explain the importance of employability skill and entrepreneurship skills. The student will be able to: NSA.61.0
    01. Identify and demonstrate positive work behaviors needed to be employable. NSA.61.01
    02. Develop personal career plan that includes goals, objectives, and strategies. NSA.61.02
    03. Examine licensing, certification, and industry credentialing requirements. NSA.61.03
    04. Maintain a career portfolio to document knowledge, skills, and experience. NSA.61.04
    05. Evaluate and compare employment opportunities that match career goals. NSA.61.05
    06. Identify and exhibit traits for retaining employment. NSA.61.06
    07. Identify opportunities and research requirements for career advancement. NSA.61.07
    08. Research the benefits of ongoing professional development. NSA.61.08
    09. Examine and describe entrepreneurship opportunities as a career planning option. NSA.61.09

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0. Demonstrate personal money-management concepts, procedures, and strategies. – The student will be able to: NSA.62.0
    01. Identify and describe the services and legal responsibilities of financial institutions. NSA.62.01
    02. Describe the effect of money management on personal and career goals. NSA.62.02
    03. Develop a personal budget and financial goals. NSA.62.03
    04. Complete financial instruments for making deposits and withdrawals. NSA.62.04
    05. Maintain financial records. NSA.62.05
    06. Read and reconcile financial statements. NSA.62.06
    07. Research, compare and contrast investment opportunities. NSA.62.07

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**Senior Network Administrator - Course Number: CTS0024**

0. Participate in simulated work-based learning experiences. The student will be able to: SNA.63.0
    01. Participate in simulated work-based learning experiences in a network support services environment. SNA.63.01
    02. Discuss the use of technology in a network support services environment. SNA.63.02
0. Compare and contrast hierarchical network design models and scalable internetworks. The student will be able to: SNA.64.0
    01. Show proficiency in the use of the three-layer hierarchical design model. SNA.64.01
    02. Describe router functions in the core layer, distribution layer, and access layer. SNA.64.02
    03. Describe key characteristics of making the network reliable, available, responsive, efficient, adaptable, accessible, scalable and secure. SNA.64.03

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0. Discuss advanced IP addressing management. The student will be able to: SNA.65.0
    01. Describe and explain IPv4 addressing, Internet's address architecture, classes of IP addresses, and perform subnet masking. SNA.65.01
    02. Understand and explain Classless Interdomain Routing (CIDR), route aggregation, supernetting and address allocation. SNA.65.02
    03. Discuss and explain Variable-Length Subnet Masks along with classless and classful routing protocols. SNA.65.03
    04. Compare and contrast route summarization and route flapping. SNA.65.04
    05. Describe and discuss Network Address Translation (NAT), private addressing with NAT, private IP addresses (RFC 1918) and discontiguous subnets. SNA.65.05
    06. Describe thefunctions of private addressing and be able to explain the major fetures of and configure NAT, PAT, and DHCP. SNA.65.06
    07. Configure IOS DHCP server, Easy IP and IP helper addresses. SNA.65.07
    08. Discuss IP addressing crisis and solutions with IPv6 address formats. SNA.65.08
0. Demonstrate proficiency in basic router configuration. The student will be able to: SNA.66.0
    01. Configure VLSM using routing fundamentals. SNA.66.01
    02. Configure static routing and dynamic routing using distance-vector routing protocols, link-state routing protocols, and hybrid routing. SNA.66.02
    03. Configure static default routes and default routing with EIGRP using default route caveats and floating static routes. SNA.66.03
    04. Describe and explain convergence issues and route calculation fundamentals. SNA.66.04
    05. Start routing process using various configurations, initiate routing updates and routing metrics. SNA.66.05
0. Demonstrate proficiency in the use of OSPF. The student will be able to: SNA.67.0
    01. Discuss issues addressed by the use OSPF, list and define OSPF terminology, list OSPF states and OSPF network types, describe OSPF Hello protocol and Steps of OSPF operation. SNA.67.01
    02. Establish router adjacencies, elect a DR and a BDR, and discover routes. SNA.67.02
    03. Select appropriate routes and maintain routing information, configuring OSPF on routers within a single area. SNA.67.03
    04. Use optional configuration commands and configure OSPF over NBMA in a lab setting. SNA.67.04
    05. Describe Full-Mesh Frame Relay, Partial-Mesh Frame Relay, Point-to-Multipoint OSPF. SNA.67.05

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0. Understand and discuss multi-area OSPF operation and configuration. The student will be able to: SNA.68.0
    01. Configure OSPF, examining the DR/BDR election process. SNA.68.01
    02. Configure Point-to-Multipoint OSPF over frame relay, create multiple OSPF areas, use OSPF router types, and incorporate OSPF LSA and area types. SNA.68.02
    03. Configuring OSPF operation across multiple areas and flooding LSUs to multiple areas, updating the routing table. SNA.68.03
    04. Configure Multi-area OSPF, using and configuring OSPF multi-area components, and configuring OSPF route summarization. SNA.68.04
    05. Verify OSPF operation, show commands, clear and debug commands. SNA.68.05
0. Demonstrate the use of stub and totally stubby areas. The student will be able to: SNA.69.0
    01. Demonstrate understanding of stub and totally stubby areas. SNA.69.01
    02. Set up an OSPF stub area configuration example. SNA.69.02
    03. Monitor multi-area OSPF, verifying multi-area OSPF operation. SNA.69.03
    04. Create a multi-area OSPF. SNA.69.04
0. Demonstrate proficiency in route optimization. The student will be able to: SNA.70.0
    01. Show how to control routing updates, policy routing, and route redistribution. SNA.70.01
    02. Create a route optimization configuration in lab setting. SNA.70.02
0. Demonstrate proficiency in the use of BGP. The student will be able to: SNA.71.0
    01. Define and explain autonomous systems and basic BGP operations. SNA.71.01
    02. Configure and monitor BGP operations and routing process. SNA.71.02
    03. Define and explain BGP attributes and the BGP decision process. SNA.71.03
    04. Create BGP configuration in lab setting. SNA.71.04
    05. Develop a scaling BGP and route reflectors. SNA.71.05
    06. Set up BGP route filtering and policy routing. SNA.71.06
    07. Explain the community attribute and peer groups. SNA.71.07
    08. Explain redundancy, symmetry, and load balancing. SNA.71.08
    09. Define and explain BGP redistribution. SNA.71.09
    10. Perform scaling BGP lab exercises and configure BGP in a lab setting. SNA.71.10

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0. Define and show proficiency in security. The student will be able to: SNA.72.0
    01. Show proficiency in securing router access using access lists. SNA.72.01
    02. Show proficiency in using dynamic access lists. SNA.72.02
    03. Show proficiency in session filtering. SNA.72.03
    04. Define and explain context-based access control. SNA.72.04
    05. Use an alternative to access lists. SNA.72.05
    06. Configure router security in a lab setting. SNA.72.06
0. Using lab equipment, demonstrate the setup, configuration, and the connectivity of routers to create a small WAN. The student will be able to: SNA.73.0
    01. Demonstrate the use of remote access. SNA.73.01
    02. Select appropriate WAN technologies for different scenarios. SNA.73.02
    03. Select remote access solutions for different technologies. SNA.73.03
    04. Assemble and cable WAN components. SNA.73.04
0. Configure and monitor DSL and DDR. The student will be able to: SNA.74.0
    01. Explain and discuss DSL architecture and DSL protocol layers. SNA.74.01
    02. Configure DSL, static routing and default routing, and DSL PRI. SNA.74.02
    03. Create optional configurations. SNA.74.03
    04. Monitor the DSL interface. SNA.74.04
    05. Create DSL configurations. SNA.74.05
0. Demonstrate the use of scaling IP addresses with NAT. The student will be able to: SNA.75.0
    01. Define and explain NAT concepts and terminology. SNA.75.01
    02. Demonstrate proficiency in configuring, creating and verifying NAT configurations in lab setting. SNA.75.02
0. Demonstrate proficiency using Authentication, Authorization and Accounting (AAA) to scale access control. The student will be able to: SNA.76.0
    01. List and define AAA concepts and terminology. SNA.76.01
    02. Demonstrate proficiency configuring AAA. SNA.76.02
    03. Perform lab exercises using access control configurations. SNA.76.03

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0. Understand and describe key characteristics of various switching technologies, LAN switching and the hierarchical model of network design, and the 3-tier model. The student will be able to: SNA.77.0
    01. Discuss the requirements of the evolving campus structure and the issues with traditional network designs. SNA.77.01
    02. Describe the fundamental campus elements and contributing variables to campus networks. SNA.77.02
    03. Compare and contrast the traditional 80/20 rule of network traffic and the new 20/80 rule of network traffic. SNA.77.03
    04. Discuss switching and the OSI model, layer 2, 3, and 4 switching, and multilayer switching. SNA.77.04
    05. Discuss the core layer, the distribution layer, and the access layer in relation to switching. SNA.77.05
    06. List and describe the advantages and disadvantages of the building-block approach, scaling the switch block, building the core block and layer 2 and 3 backbone scaling. SNA.77.06
0. Understand and describe campus networks, design models, and switching technologies. The student will be able to: SNA.78.0
    01. List and explain key characteristics of various switching technologies. SNA.78.01
    02. Discuss LAN switching and the hierarchical model of network design. SNA.78.02
    03. Show proficiency using the 3-tier model to networking. SNA.78.03
0. Show proficiency configuring a switch. The student will be able to: SNA.79.0
    01. Demonstrate the process for initial connectivity to a switch. SNA.79.01
    02. Show proficiency creating the basic configuration of a switch. SNA.79.02
    03. List and explain important switch operating system features. SNA.79.03
0. Demonstrate proficiency configuring VLANS. The student will be able to: SNA.80.0
    01. Understand and explain VLANs. SNA.80.01
    02. Discuss VLAN basics and VLAN types. SNA.80.02
    03. Configure a VLAN in a lab setting. SNA.80.03
    04. Show use of VLAN identification techniques and VLAN trunking protocol. SNA.80.04
    05. Create VTP configuration and use VTP pruning. SNA.80.05
0. Understand and explain spanning tree protocol (STP) and redundant links. The student will be able to: SNA.81.0
    01. Discuss Basic STP Operations and STP Processes. SNA.81.01
    02. Compare and contrast VLANs and STP. SNA.81.02
    03. Show how STP is used in the Campus Network. SNA.81.03
    04. Demonstrate the resolution of Redundant Links. SNA.81.04

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0. Demonstrate proficiency with multilayer switching. The student will be able to: SNA.82.0
    01. Define and explain MLS Processes. SNA.82.01
    02. Create basic MLS configurations. SNA.82.02
    03. Show proficiency using flow masks. SNA.82.03
0. Demonstrate the use of hot standby routing protocol (HSRP). The student will be able to: SNA.83.0
    01. Define and explain HSRP operations. SNA.83.01
    02. Create HSRP configurations in a lab setting. SNA.83.02
0. Understand and use IGMP and multicasting. The student will be able to: SNA.84.0
    01. Define and explain multicasting. SNA.84.01
    02. Understand and discuss IGMP. SNA.84.02
    03. Show proficiency routing multicast traffic. SNA.84.03
    04. Demonstrate proficiency using multicast routing protocols. SNA.84.04
    05. Configure IP multicast routing in a lab setting. SNA.84.05
    06. List and describe optional IP multicast routing tasks. SNA.84.06
0. Demonstrate proficiency restricting network access. The student will be able to: SNA.85.0
    01. Show proficiency creating networking policies. SNA.85.01
    02. Discuss and explain basic network security techniques. SNA.85.02
    03. Demonstrate execution of policy configurations on a set of routers. SNA.85.03
0. Demonstrate proficiency using network troubleshooting tools and basic network management diagnostic tools. The student will be able to: SNA.86.0
    01. Explain and discuss troubleshooting methodologies and general problem-solving concepts. SNA.86.01
    02. List and define general considerations in troubleshooting. SNA.86.02
    03. Define and explain each component of the general problem-solving model. SNA.86.03
    04. Demonstrate proficiency using common management and diagnostic tools. SNA.86.04
    05. Show proficiency using network management software. SNA.86.05
    06. Demonstrate proficiency using router diagnostic commands. SNA.86.06
    07. Familiarize logging and error message formats. SNA.86.07
    08. Demonstrate proficiency interacting with technical support. SNA.86.08

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0. List and define the commonly used protocols, routing techniques, and switching processes. The student will be able to: SNA.87.0
    01. List and define network services, layer 2 LAN protocols, and layer 2 WAN protocols. SNA.87.01
    02. Trace packets through a router. SNA.87.02
    03. Define and explain packet switching paths. SNA.87.03
    04. Identify performance issues affecting packet switching. SNA.87.04
    05. Define and explain low-level troubleshooting. SNA.87.05
0. Demonstrate proficiency troubleshooting TCP/IP, LAN switch environment, VLANS and frame relay. The student will be able to: SNA.88.0
    01. List, define, and explain theory, concepts, and terminology of TCP/IP, LAN switch environment, spanning tree, VLANs and frame relay. SNA.88.01
    02. List, define, and explain common problems with TCP/IP and LAN switching. SNA.88.02
    03. List, define, and explain common scenarios with VLANs and frame relay. SNA.88.03
    04. Troubleshoot TCP/IP in a Windows environment; use LAN switch troubleshooting tools, explain general VLAN troubleshooting issues; list and explain the steps in frame relay troubleshooting and DSL problem isolation. SNA.88.04
    05. Use show commands to verify LAN switch configuration settings. SNA.88.05
    06. Use show and debug commands for TCP/IP, router VLANs and frame relay. SNA.88.06
    07. Use TCP/IP diagnostic tools. SNA.88.07

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**Wireless Network Administrator (CTS0029)**

0. Participate in simulated work-based learning experiences. The student will be able to: WNA.89.0
    01. Participate in simulated work-based learning experiences in a network support services environment. WNA.89.01
    02. Discuss the use of technology in a network support services environment. WNA.89.02
    03. Discuss the management/supervisory skills needed in a network support service environment. WNA.89.03

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0. Demonstrate proficiency in applying radio frequency (RF) technologies. The student will be able to: WNA.90.0
    01. Define and apply the basic concepts of RF behavior. WNA.90.01
    02. Understand the applications of basic RF antenna concepts. WNA.90.02
    03. Understand and apply the basic components of RF. WNA.90.03
    04. Identify some of the different uses for spread spectrum technologies. WNA.90.04
    05. Comprehend the differences between, and apply the different types of spread spectrum technologies. WNA.90.05
    06. Identify and apply the concepts which make up the functionality of spread spectrum technology. WNA.90.06
    07. Identify the laws set forth by the FCC that govern spread spectrum technology, including power outputs, frequencies, bandwidths, hop times, and dwell times. WNA.90.07
0. Develop an awareness of wireless LAN technologies. The student will be able to: WNA.91.0
    01. Identify and apply the processes involved in authentication and association. WNA.91.01
    02. Recognize the concepts associated with wireless LAN service sets. WNA.91.02
    03. Understand the implications of the following power management features of wireless LANs. WNA.91.03
    04. Specify the modes of operation involved in the movement of data traffic across wireless LANs. WNA.91.04

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0. Perform implementation and management activities. The student will be able to: WNA.92.0
    01. Identify the technology roles for which wireless LAN technology is an appropriate technology application. WNA.92.01
    02. Identify the purpose of infrastructure devices and explain how to install, configure, and manage them. WNA.92.02
    03. Identify the purpose of wireless LAN client devices and explain how to install, configure, and manage them. WNA.92.03
    04. Identify the purpose of wireless LAN gateway devices and explain how to install, configure, and manage them. WNA.92.04
    05. Identify the basic attributes, purpose, and function of types of antennas. WNA.92.05
    06. Describe the proper locations and methods for installing antennas. WNA.92.06
    07. Explain the concepts of polarization, gain, beamwidth, and free-space path loss as they apply to implementing solutions that require antennas. WNA.92.07
    08. Identify the use of wireless LAN accessories and explain how to install, configure, and manage them. WNA.92.08
    09. Identify, understand, correct or compensate for wireless LAN implementation challenges. WNA.92.09
    10. Explain how antenna diversity compensates for multipath. WNA.92.10
    11. Identify and understand the importance and process of conducting a thorough site survey. WNA.92.11
    12. Identify and understand the importance of the necessary tasks involved in preparing to do an RF site survey. WNA.92.12
    13. Identify the necessary equipment involved in performing a site survey. WNA.92.13
    14. Understand the necessary procedures involved in performing a site survey. WNA.92.14
    15. Identify and understand site survey reporting procedures. WNA.92.15

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0. Develop an awareness of wireless security systems. The student will be able to: WNA.93.0
    01. Identify the strengths, weaknesses and appropriate uses of wireless LAN security techniques including the use of WVLAN's. WNA.93.01
    02. Describe types of wireless LAN security attacks, and explain how to identify and prevent them. WNA.93.02
    03. Given a wireless LAN scenario, identify the appropriate security solution from the following available wireless LAN security solutions. WNA.93.03
    04. Explain the uses of corporate security policies and how they are used to secure a wireless LAN. WNA.93.04
    05. Identify how and security precautions are used to secure a wireless LAN. WNA.93.05
0. Demonstrate knowledge of wireless industry standards. The student will be able to: WNA.94.0
    01. Identify, apply and comprehend the differences between wireless LAN standards. WNA.94.01
    02. Understand the roles of organizations in providing direction and accountability within the wireless LAN industry. WNA.94.02
    03. Identify the differences between the ISM and UNII bands. WNA.94.03
    04. Identify and understand the differences between the power output rules for point-to-point and point-to-multipoint links. WNA.94.04

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**Data Communications Analyst (EEV0317)**

0. Participate in simulated work-based learning experiences. The student will be able to: DCA.95.0
    01. Participate in simulated work-based learning experiences in a network support services environment. DCA.95.01
    02. Discuss the use of technology in a network support services environment. DCA.95.02
    03. Discuss the management/supervisors skills needed in a network support services environment. DCA.95.03

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0. Demonstrate a knowledge of general security concepts. The student will be able to: DCA.96.0
    01. Describe access control. DCA.96.01
    02. Describe network authentication. DCA.96.02
    03. Understand the various types of network attacks (backdoors, DOS, spoofing). DCA.96.03
    04. Identify and modify non-essential services and protocols. DCA.96.04
    05. Identify malicious code (virus, worm, Trojan). DCA.96.05
    06. Configure system auditing, logging, and scanning as it relates to security procedures. DCA.96.06
0. Develop an awareness of communication security concepts. The student will be able to: DCA.97.0
    01. Describe remote access protocols (VPN, RADIUS, L2TP). DCA.97.01
    02. Identify E-mail security concerns (hoaxes, spam). DCA.97.02
    03. Identify web (HTML) security concepts and designs (HTTP/S, IM). DCA.97.03
    04. Demonstrate an awareness of file transfer security concerns. DCA.97.04
    05. Describe and identify wireless networking security concerns and vulnerabilities. DCA.97.05
0. Develop an awareness of network infrastructure security. The student will be able to: DCA.98.0
    01. Install and configure network firewalls. DCA.98.01
    02. Identify security concerns with various wiring media (copper, fiber). DCA.98.02
    03. Identify security concerns associated with removable media and storage devices. DCA.98.03
    04. Demonstrate an awareness of security topologies (security zones, Intranets, NAT). DCA.98.04
    05. Configure and use intrusion detection software. DCA.98.05
    06. Establish security baselines (updates, patches, hot fixes, Access Control lists). DCA.98.06
    07. Demonstrate the ability to configure a Virtual Private Network (VPN). DCA.98.07
    08. Describe the function of Network Address Translation (NAT). DCA.98.08
0. Develop an awareness of cryptography and its relation to security. The student will be able to: DCA.99.0
    01. Demonstrate an understanding of security algorithms and encryption. DCA.99.01
    02. Use and apply Public Key Certificates. DCA.99.02
    03. Demonstrate an understanding of standards and protocols in commerce. DCA.99.03

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0. Incorporate organizational and operational security in an appropriate and effective manner. The student will be able to: DCA.100.0
    01. Describe how to establish a network security policy. DCA.100.01
    02. Explain the importance of physical security to protect network resources. DCA.100.02
    03. Identify and use disaster recovery procedures. DCA.100.03
    04. Describe the importance of business continuity and its relationship to network and corporate security. DCA.100.04
    05. Describe security policies and procedures that would be used in a business environment. DCA.100.05
    06. Explain the importance of privilege management (access, password management, sign-on). DCA.100.06
    07. Describe the concept of forensics as it applies to network security (obtaining evidence of security breaches). DCA.100.07
    08. Explain the importance of educating users and supervisors in regard to network security. DCA.100.08
    09. Create documentation that describes standards and guidelines for a network security system. DCA.100.09

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**Network Systems Administration (B079300)**

**Information Technology Assistant - Course Number: OTA0040**

0. Demonstrate knowledge, skill, and application of information technology to accomplish job objectives and enhance workplace performance. The student will be able to: ITA.01.0
01. Develop keyboarding skills to enter and manipulate text and data. ITA.01.01
02. Describe and use current computer technology and software to perform personal and business related tasks in the workplace (e.g., e-mail, digital calendars, meetings, appointments). ITA.01.02
03. Differentiate between types of file systems and classify common file extensions based on software application programs used in the workplace environment. ITA.01.03
04. Utilize the Internet to find reliable resources and reference materials (e.g., on-line help, tutorials, manuals). ITA.01.04
05. Apply research strategies to use and evaluate electronic research technologies for valid and reliable information. ITA.01.05
06. Demonstrate basic computer file management skills (e.g., naming, saving, retrieving, and organizing). ITA.01.06
07. Analyze the process of troubleshooting problems with computer hardware peripherals, including input and output devices. ITA.01.07
08. Describe ethical issues and problems associated with computers and information technology (e.g., fair use, privacy, public domain, copyright, piracy, plagiarism). ITA.01.08

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09. Explain the history and purpose of various operating systems (e.g., DOS, Windows, Mac, and Unix/Linux). ITA.01.09

0. Develop an awareness of microcomputers. The student will be able to: ITA.02.0

01. Explain the general architecture of a microcomputer system. ITA.02.01

02. Explain the need for and demonstrate proficiency using common peripherals (e.g., printers, mouse, keyboard, external hard drive, flash drive). ITA.02.02

03. Examine the concepts of computer maintenance and upgrades. ITA.02.03

0. Demonstrate an understanding of networks. The student will be able to: ITA.03.0

01. Differentiate between types of networks and how they work (e.g., clients, servers, Wi-Fi, teleconference) ITA.03.01

02. Identify security needs within a network environment (e.g., antivirus software, passwords). ITA.03.02

03. Distinguish between intranets, extranets and how they relate to the Internet. ITA.03.03

04. Demonstrate basic understanding of cloud computing. ITA.03.04

0. Use word processing applications to enhance the effectiveness of various types of documents and communication. The student will be able to: ITA.04.0

01. Select and use word processing software and accompanying features to create and enhance various written business communications (e.g., memos, reports, block business letters). ITA.04.01

02. Save and export documents in various formats (e.g., pdf, html, blog, hyperlinks). ITA.04.02

03. Format text content in a document (e.g., font, paragraph attributes, spacing, text styles, text boxes). ITA.04.03

04. Manipulate page layout and reusable content (e.g., page setup, themes, templates, page backgrounds, headers and footers). ITA.04.04

05. Perform various image-editing tasks using word-processing software to create and format images, illustrations, shapes, etc. ITA.04.05

06. Proofread and revise documents by validating content through the use of word processing tools (e.g. spell check, thesaurus, find/replace, autocorrect settings). ITA.04.06

07. Insert citations and hyperlinks, create end and footnotes, and create a table of contents in a document. ITA.04.07

08. Perform various mail merge options, macros and tracking revisions. ITA.04.08

09. Demonstrate an understanding of fonts (serif and sans serif) and font styles (bold, italic, etc.) ITA.04.09

0. Use presentation applications to enhance communication skills. The student will be able to: ITA.05.0

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l. Manage and configure the presentation software environment (e.g., adjusting views, manipulating slide settings, configuring toolbar and file options). ITA.05.01

02. Use presentation software to format and edit slides (e.g., adding and removing slides, slide layouts, format slide design, insert or format placeholders). ITA.05.02

03. Locate, create and incorporate graphical and multimedia elements, including: shapes, graphics, images, bullets, hyperlinks, video, and audio into a slide presentation. ITA.05.03

04. Enhance overall visual presentation by applying font selection, design themes, color schemes, templates, etc. ITA.05.04

05. Create and manipulate graphical and multimedia elements using additional styles and effects (e.g., color selections, tone, contrast, shadows, picture styles). ITA.05.05

06. Demonstrate various business-related elements that can be created, embedded and manipulated in a slide presentation, including: charts, graphs, tables, media, spreadsheets, and illustrations. ITA.05.06

07. Customize presentation settings by using appropriate slide transitions and animations (e.g., on click, rehearsed timings) ITA.05.07

08. Demonstrate different delivery methods for slide presentations, including: online delivery and sharing, video projection, printing options. ITA.05.08

0. Use spreadsheet applications to enhance communication skills. The student will be able to: ITA.06.0

01. Manipulate the worksheet by using the ribbon tabs, group settings, importing data/database, manipulating properties, files and folders. ITA.06.01

02. Create cell data and apply auto fill. ITA.06.02

03. Format cells and worksheets (e.g., by applying and manipulating cell formats, styles, merging and splitting cells, create row and column titles, hide and unhide column titles, rows and columns, page setup options, and manipulating views/themes). ITA.06.03

04. Create and analyze formulas and functions (e.g., apply conditional formula logic, name and cell ranges). ITA.06.04

05. Create and modify charts and images. (e.g., pivot tables) ITA.06.05

06. Share worksheet data through various system (e.g., email, external media, cloud storage, mail merge). ITA.06.06

07. Analyze and organize data through filters, sorting and applying conditional formatting. (e.g., macros) ITA.06.07

08. Interpret data on line graphs, pie charts, diagrams, and tables. ITA.06.08

0. Use database applications to store and organize data. The student will be able to: ITA.07.0

01. Create different forms for inputting data into a database application. ITA.07.01

02. Interpret queries for specialized reports using a database application. ITA.07.02

03. Create and modify a database by importing data from other sources ITA.07.03

04. Create and manage database tables by hiding fields, importing data, adding total rows ITA.07.04

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05. Modify queries by renaming, adding/removing fields, sorting, formatting, and adding calculated fields ITA.07.05

06. Create and format reports with multiple columns, calculated fields and images. ITA.07.06

0. Use electronic mail to enhance communication skills. The student will be able to: ITA.08.0

01. Describe and perform e-mail capabilities and functions (e.g., create, send, & forward messages, organize email folders, manage signature and automated messages, configure message sensitivity, security and delivery options). ITA.08.01

02. Perform e-mail activities (e.g., attach external files, save e-mail attachments, view mailbox details, schedule appointments, create contact groups). ITA.08.02

03. Demonstrate an understanding of the ethical issues associated with electronic correspondences (e.g., employer's ownership of email, public access of government email, appropriate uses in the workplace, phishing attacks, permanence of electronic communications on the internet). ITA.08.03

04. Describe the need for and appropriate use of electronic mailing list software applications (e.g., listserv) ITA.08.04

0. Investigate individual assessment and job/career exploration and individual career planning that reflect the transition from school to work, lifelong learning, and personal and professional goals. The student will be able to: ITA.09.0

01. Analyze personal skills and aptitudes in comparison with various business related job and career options. (i.e., hard and soft skills) ITA.09.01

02. Use career resources to develop and analyze occupations and opportunities for internships, continuing education and on-the-job training. ITA.09.02

03. Exhibit job-seeking skills required for entry-level employment, including resume, online job search, cover letter, online/hard copy application, mock interview, interview thank you letter, and follow-up call. ITA.09.03

04. Design, implement, and evaluate a plan to facilitate growth and skill development related to anticipated job requirements and career expectations. ITA.09.04

05. Demonstrate an awareness of specific job requirements and career paths (e.g., education, certifications, skills, previous experience) in business environments. ITA.09.05

06. Demonstrate an awareness of the potential impact of local and global trends on career plans and life goals. ITA.09.06

07. Describe the importance of building community and mentor relationships in a variety of professional and workplace situations. ITA.09.07

08. Simulate work-based projects in an information technology environment ITA.09.08

0. Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. The student will be able to: ITA.10.0

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01. Demonstrate awareness of the following workplace essentials: quality customer service; business ethics; confidentiality of information; copyright violations; accepted workplace rules, regulations, policies, procedures, processes, and workplace safety, and appropriate attire and grooming. ITA.10.01

02. Demonstrate ways of accepting and providing constructive criticism to enhance team projects. ITA.10.02

03. Apply appropriate strategies to manage and resolve conflicts in work situations. ITA.10.03

04. Demonstrate personal and interpersonal skills appropriate for the workplace (e.g., responsibility, dependability, punctuality, integrity, positive attitude, initiative, respect for self and others, and professional dress). ITA.10.04

0. Demonstrate competence using computer networks, internet and online databases to facilitate collaborative or individual learning and communication. The student will be able to: ITA.11.0

01. Demonstrate how to connect to the Internet and identify and describe web terminology, addresses and how browsers work. ITA.11.01

02. Demonstrate proficiency using basic features of GUI (Graphical User Interface) browsers, including: bookmarks, basic configurations, e-mail configurations, and address books. ITA.11.02

03. Describe appropriate browser security configurations ITA.11.03

04. Describe information technology terminology, including Internet, intranet, ethics, copyright laws, and regulatory control. ITA.11.04

05. Demonstrate proficiency using search engines and search tools (e.g., Boolean search strategies) ITA.11.05

06. Use various web tools, including: downloading files, transfer of files, extensions, PDF, plug-ins, and data compression. ITA.11.06

07. Differentiate between different domain extensions (e.g., .com, .org, .gov, .edu, etc.) ITA.11.07

0. Develop awareness of computer languages, web-based & software applications, and emerging technologies. The student will be able to: ITA.12.0

01. Compare and contrast the appropriate use of various software applications. (e.g., word processing, desktop publishing, graphic design, web browser, e-mail, presentation, database, scheduling, financial management, Java applet, music) ITA.12.01

02. Explain and describe the need for web-based applications (e.g., sharing photos and video clips, messaging, chatting and collaborating. ITA.12.02

03. Express an understanding of basic terminology used in programming (e.g., algorithm, binary, code, block-based, objects, functions) ITA.12.03

04. Compare and contrast emerging technologies and describe how they impact business in the global marketplace (e.g., wireless network, tablets, cell phones, satellite technology, nanotechnology, smart devices, home networks). ITA.12.04

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0. Demonstrate an understanding of basic html by creating a simple web page. The student will be able to: ITA.13.0

01. Create a basic web page. ITA.13.01

02. Use basic storyboarding techniques. ITA.13.02

03. Use basic functions of WYSIWYG editors. ITA.13.03

04. Use basic functions of HTML, DHTML, and XML editors and converters. ITA.13.04

05. Enhance web pages through the addition of images and graphics. ITA.13.05

0. Demonstrate comprehension and communication skills. The student will be able to: ITA.14.0

01. Read and comprehend technical and non-technical reading assignments related to course content (e.g., manuals, books, magazines, electronic sources). ITA.14.01

02. Use verbal and nonverbal skills to communicate effectively with supervisors, co-workers, and customers. ITA.14.02

03. Demonstrate an understanding of the writing process to create business documents (e.g., research methods, paper formatting (MLA/APA)) ITA.14.03

04. Demonstrate an awareness of project management concepts and tools (e.g., timelines, deadlines, resource allocation, time management, delegation of tasks, collaboration). ITA.14.04

0. Use social media to enhance online communication and develop an awareness of a digital footprint. The student will be able to: ITA.15.0

01. Create and develop a professional social media presence (e.g., LinkedIn) to connect with potential employers, follower influencers, enhance networking opportunities, develop soft skills through written communication, and establish a professional business image. ITA.15.01

02. Cultivate and manage awareness of digital identity and reputation. ITA.15.02

03. Develop awareness of the permanence of actions and social awareness in the digital world. ITA.15.03

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**Computer Support Assistant - Course Number: EEV0504**

0. Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. The student will be able to: CS.16.0

    01. Develop strategies for resolving customer conflicts. CS.16.01

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0. Identify, install, configure, and upgrade desktop and server computer modules and peripherals, following established basic procedures for system assembly and disassembly of field replaceable modules. The student will be able to: CS.17.0
    01. Identify and describe the functions of main processing boards. CS.17.01
    02. Identify and describe the functions of communication ports. CS.17.02
    03. Identify and describe the functions of peripheral devices. CS.17.03
    04. Identify and describe the components of portable systems. CS.17.04
    05. Troubleshoot, install and upgrade computers and peripherals. CS.17.05
    06. Perform system hardware setup. CS.17.06
    07. Demonstrate an understanding of input/output devices. CS.17.07
    08. Installation and configuration of applications software, hardware, and device drivers. CS.17.08
    09. Demonstrate an understanding of the operation and purpose of hardware components. CS.17.09
    10. Install operating system software. CS.17.10
    11. Customize operating systems. CS.17.11
    12. Install application software. CS.17.12
    13. Perform storage formatting and preparation activities. CS.17.13
    14. Identify data measurement. CS.17.14
    15. Install and configure RAID. CS.17.15
    16. Recognize and report on server room environmental issues. CS.17.16
0. Diagnose and troubleshoot common module problems and system malfunctions of computer software, hardware, peripherals, and other office equipment. The student will be able to: CS.18.0
    01. Troubleshoot a personal computer system. CS.18.01
    02. Identify configuration problems. CS.18.02
    03. Identify software problems. CS.18.03
    04. Identify hardware malfunctions. CS.18.04
    05. Identify network malfunctions. CS.18.05
    06. Resolve computer error messages. CS.18.06
    07. Understand and troubleshoot memory and cache systems. CS.18.07
    08. Verify that drives are the appropriate type. CS.18.08
    09. Describe knowledge database search procedures used to identify possible solutions when troubleshooting software and hardware problems. CS.18.09

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0. Identify issues, procedures and devices for protection within the computing environment, including people, hardware and the surrounding workspace. The student will be able to: CS.19.0

    01. Apply basic rules for hardware safety. CS.19.01

    02. Demonstrate proficiency in basic preventative hardware maintenance. CS.19.02

    03. Special disposal procedures that comply with environmental guidelines for batteries, CRTs, toner kits/cartridges, chemical solvents and cans, and MSDS. CS.19.03

    04. Apply ergonomic principles applicable to the configuration of computer workstations. CS.19.04

    05. Describe ethical issues and problems associated with computers and information systems. CS.19.05

0. Identify specific terminology, facts, ways and means of dealing with classifications, categories and principles of motherboards, processors and memory in desktop and server computer systems. The student will be able to: CS.20.0

    01. Identify Random Access Memory (RAM) types. CS.20.01

    02. Identify I/O ports and devices. CS.20.02

0. Demonstrate knowledge of basic types of printers, basic concepts, printer components, how they work, how they print onto a page, paper path, care and service techniques, and common problems. The student will be able to: CS.21.0

    01. Identify types of printers. CS.21.01

    02. Identify care and service techniques and common problems with primary printer types. CS.21.02

    03. Implement and manage printing on a network. CS.21.03

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0. Identify and describe basic network concepts and terminology, ability to determine whether a computer is networked, knowledge of procedures for swapping and configuring network interface cards, and knowledge of the ramifications of repairs when a computer is networked. The student will be able to: CS.22.0
    01. Define networking and describe the purpose of a network. CS.22.01
    02. Identify the purposes and interrelationships among the major components of networks. CS.22.02
    03. Describe the various types of network topologies. CS.22.03
    04. Identify and describe the purpose of standards, protocols, and the Open Systems Interconnection (OSI) reference model. CS.22.04
    05. Configure network and verify network connectivity. CS.22.05
    06. Discuss the responsibilities of the network. CS.22.06
    07. Develop user logon procedures. CS.22.07
    08. Utilize network management infrastructures to perform administrative tasks. CS.22.08
    09. Identify common backup strategies and procedures. CS.22.09
    10. Select and use appropriate electronic communications software and hardware for specific tasks. CS.22.10
    11. Compare and contrast Internet software and protocols. CS.22.11
    12. Diagnose and resolve electronic communications operational problems. CS.22.12
    13. Design and implement directory tree structures. CS.22.13
    14. Install services tools. CS.22.14
    15. Perform and verify backups. CS.22.15
    16. Identify bottlenecks. CS.22.16
    17. Use the concepts of fault tolerance/fault recovery to create a disaster recovery plan. CS.22.17
    18. Document and test disaster recovery plan regularly, and update as needed. CS.22.18
0. Perform end user support and assistance by troubleshooting and diagnosing through verbal or written communication. The student will be able to: CS.23.0
    01. Apply call center vocabulary. CS.23.01
    02. Listen and input information simultaneously. CS.23.02
    03. Apply first response assistance for minor repair work. CS.23.03

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0. Demonstrate proficiency using graphical user interface (GUI) operating systems. The student will be able to: CS.24.0
    01. Identify parts of GUI windows. CS.24.01
    02. Demonstrate proficiency in using menu systems. CS.24.02
    03. Demonstrate proficiency in using pointing and selection devices. CS.24.03
    04. Identify keyboard shortcuts and special function keys. CS.24.04
    05. Demonstrate proficiency in manipulating windows. CS.24.05
    06. Utilize help systems and hypertext links. CS.24.06
    07. Create, organize, and maintain file system directories. CS.24.07
    08. Organize desktop objects. CS.24.08
    09. Run multiple applications. CS.24.09

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**Network Support Technician - Course Number: CTS0026**

0. Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. The student will be able to: NST.25.0
    01. Develop diplomatic methods to communicate with customers. NST.25.01
0. Participate in work-based learning experiences. The student will be able to: NST.26.0
    01. Participate in work-based learning experiences in a network support services environment. NST.26.01
    02. Discuss the use of technology in a network environment. NST.26.02
0. Perform end user support and assistance by troubleshooting and diagnosing through telephone, email, remote access, or direct contact. The student will be able to: NST.27.0
    01. Apply first response assistance for minor repair work. NST.27.01

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0. Perform installation and configuration activities. The student will be able to: NST.28.0
    01. Configure the operating system environment. NST.28.01
    02. Connect client workstation running similar operating system to the network. NST.28.02
    03. Configure Internet access for a network. NST.28.03
    04. Configure a web server. NST.28.04
    05. Use remote server to deploy operating system. NST.28.05
    06. Troubleshoot failed installations. NST.28.06
    07. Install and configure network services for interoperability. NST.28.07
    08. Monitor, configure troubleshoot and control access to printers. NST.28.08
    09. Monitor, configure troubleshoot and control access to files, folders, and shared folders. NST.28.09
    10. Monitor, configure troubleshoot and control access to websites. NST.28.10
0. Demonstrate proficiency using computer networks. The student will be able to: NST.29.0
    01. Identify and describe the purpose of standards, protocols, and the Open Systems Interconnection (OSI) reference model. NST.29.01
0. Demonstrate proficiency in configuring and troubleshooting hardware devices and drivers. The student will be able to: NST.30.0
    01. Configure hardware devices. NST.30.01
    02. Configure driver signing options. NST.30.02
    03. Update device drivers. NST.30.03
    04. Troubleshoot problems with hardware. NST.30.04
0. Demonstrate proficiency in managing, monitoring, and optimizing system performance, reliability and availability. The student will be able to: NST.31.0
    01. Monitor and optimize usage of system resources. NST.31.01
    02. Manage processes. NST.31.02
    03. Optimize disk performance. NST.31.03
    04. Manage and optimize availability of system data and user data. NST.31.04
    05. Recover systems and user data. NST.31.05

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0. Demonstrate proficiency in managing, configuring and troubleshooting storage use. The student will be able to: NST.32.0
    01. Configure and manage user profiles. NST.32.01
    02. Monitor, configure and troubleshoot disks and volumes. NST.32.02
    03. Configure data compression. NST.32.03
    04. Monitor and configure disk quotas. NST.32.04
    05. Recover from disk failures. NST.32.05
0. Demonstrate proficiency in configuring and troubleshooting network connections. The student will be able to: NST.33.0
    01. Install, configure and troubleshoot shared access. NST.33.01
    02. Install, configure and troubleshoot a virtual private network. NST.33.02
    03. Install, configure and troubleshoot network protocols. NST.33.03
    04. Install and configure network services. NST.33.04
    05. Configure, monitor and troubleshoot remote access. NST.33.05
    06. Install, configure, monitor, and troubleshoot Terminal Services. NST.33.06
    07. Configure the properties of a connection. NST.33.07
    08. Install, configure, and troubleshoot network adapters and drivers. NST.33.08
0. Demonstrate proficiency in implementing, monitoring, and troubleshooting security. The student will be able to: NST.34.0
    01. Encrypt data on a hard disk by using Encrypting File System. NST.34.01
    02. Implement, configure, manage and troubleshoot policies in an operating system environment. NST.34.02
    03. Implement, configure, manage and troubleshoot auditing. NST.34.03
    04. Implement, configure, manage and troubleshoot local accounts. NST.34.04
    05. Implement, configure, manage and troubleshoot account policy. NST.34.05
    06. Implement, configure, manage and troubleshoot security by using the Security Configuration Tool Set. NST.34.06

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0. Use oral and written communication skills in creating, expressing and interpreting information and ideas. The student will be able to: NST.35.0
    01. Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace. NST.35.01
    02. Locate, organize and reference written information from various sources. NST.35.02
    03. Design, develop and deliver formal and informal presentations using appropriate media to engage and inform diverse audiences. NST.35.03
    04. Interpret verbal and nonverbal cues/behaviors that enhance communication. NST.35.04
    05. Apply active listening skills to obtain and clarify information. NST.35.05
    06. Develop and interpret tables and charts to support written and oral communications. NST.35.06
    07. Exhibit public relations skills that aid in achieving customer satisfaction. NST.35.07
0. Solve problems using critical thinking skills, creativity and innovation. The student will be able to: NST.36.0
    01. Employ critical thinking skills independently and in teams to solve problems and make decisions. NST.36.01
    02. Employ critical thinking and interpersonal skills to resolve conflicts. NST.36.02
    03. Identify and document workplace performance goals and monitor progress toward those goals. NST.36.03
    04. Conduct technical research to gather information necessary for decision-making. NST.36.04
0. Use information technology tools. The student will be able to: NST.37.0
    01. Use personal information management (PIM) applications to increase workplace efficiency. NST.37.01
    02. Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email, and internet applications. NST.37.02
    03. Employ computer operations applications to access, create, manage, integrate, and store information. NST.37.03
    04. Employ collaborative/groupware applications to facilitate group work. NST.37.04

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0. Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. The student will be able to: NST.38.0
    01. Describe the nature and types of business organizations. NST.38.01
    02. Explain the effect of key organizational systems on performance and quality. NST.38.02
    03. List and describe quality control systems and/or practices common to the workplace. NST.38.03
    04. Explain the impact of the global economy on business organizations. NST.38.04
0. Describe the importance of professional ethics and legal responsibilities. The student will be able to: NST.39.0
    01. Evaluate and justify decisions based on ethical reasoning. NST.39.01
    02. Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities, and employer policies. NST.39.02
    03. Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace. NST.39.03
    04. Interpret and explain written organizational policies and procedures. NST.39.04

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**Systems Administrator - Course Number: CTS0027**

0. Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. The student will be able to: SA.40.0
    01. Develop diplomatic methods to communicate with customers, clients, and end-users of information technology services. SA.40.01
    0. Participate in work-based learning experiences. The student will be able to: SA.41.0
    01. Participate in work-based learning experiences in a network support services environment. SA.41.01
    02. Discuss the use of technology in a network support services environment. SA.41.02
    03. Discuss the management/supervisors skills needed in a network support services environment. SA.41.03
0. Administer accounts and resources on computers running server operating system software in a networked environment. The student will be able to: SA.42.0
    01. Describe features of server operating system. SA.42.01
    02. Log on to the server operating system. SA.42.02
    03. Install and configure administrative tools. SA.42.03
    04. Create user accounts. SA.42.04
    05. Create computer accounts. SA.42.05
    06. Create an organizational unit. SA.42.06

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0. Modify user and computer accounts on computers running a server operating system in a networked environment. The student will be able to: SA.43.0
    01. Modify user and computer account properties. SA.43.01
    02. Enable and unlock user and computer accounts. SA.43.02
    03. Create a user account template. SA.43.03
    04. Locate user and computer accounts in a global directory structure. SA.43.04
    05. Save queries. SA.43.05
    06. Reset user and computer accounts. SA.43.06
    07. Move domain objects. SA.43.07
0. Perform various administrative functions using groups. The student will be able to: SA.44.0
    01. Create groups. SA.44.01
    02. Manage group membership. SA.44.02
    03. Apply strategies for using groups. SA.44.03
    04. Modify groups. SA.44.04
    05. Manage default groups. SA.44.05
0. Enable resource access with permissions, manage access to files and folders using permissions, and manage permission inheritance. The student will be able to: SA.45.0
    01. Manage access to resources. SA.45.01
    02. Manage access to shared folders. SA.45.02
    03. Manage access to files and folders by using file system permissions. SA.45.03
    04. Determine effective permissions. SA.45.04
    05. Manage access to shared files by using offline caching. SA.45.05
0. Implement printing in a networked environment utilizing a particular server operating system. The student will be able to: SA.46.0
    01. Install and share printers. SA.46.01
    02. Manage access to printers by using shared printer permissions. SA.46.02
    03. Manage printer drivers. SA.46.03
    04. Implement printer locations. SA.46.04
    05. Change the location of the print spooler. SA.46.05
    06. Set printing priorities. SA.46.06
    07. Schedule printer availability. SA.46.07
    08. Configure a printing tool. SA.46.08

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0. Utilize available permissions for managing access to global directory objects, how to move objects between organizational units in the same domain, and how to delegate control of an organizational unit. The student will be able to: SA.47.0
    01. Identify the role of organizational units. SA.47.01
    02. Modify permissions for global directory objects. SA.47.02
    03. Delegate control of organizational units. SA.47.03
0. Use group policy to configure folder redirection, browser connectivity, and the desktop. The student will be able to: SA.48.0
    01. Configure group policy settings. SA.48.01
    02. Assign scripts with group policy. SA.48.02
    03. Configure folder redirection. SA.48.03
0. Manage computer security in a security in a networking environment. The student will be able to: SA.49.0
    01. Describe the security features a server operating system. SA.49.01
    02. Use security templates to secure computers. SA.49.02
    03. Test computer security policy. SA.49.03
    04. Configure auditing. SA.49.04
    05. Manage security logs. SA.49.05
0. Administer servers remotely. The student will be able to: SA.50.0
    01. Explain the tasks, tools, and rights that are required to administer a server. SA.50.01
    02. Configure remote access for administration and client preferences. SA.50.02
    03. Manage remote desktop connections. SA.50.03
0. Monitor server performance by using performance tools, configure and manage performance logs, configure and manage alerts, and manage system monitor views. The student will be able to: SA.51.0
    01. Establish a performance baseline. SA.51.01
    02. Perform real-time and logged monitoring. SA.51.02
    03. Configure and manage counter logs. SA.51.03
    04. Configure alerts. SA.51.04

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0. Collect performance data by monitoring primary server subsystems and identify system bottlenecks by using the performance monitoring software. The student will be able to: SA.52.0
    01. Explain how the four primary server subsystems affect server performance. SA.52.01
    02. Monitor server memory. SA.52.02
    03. Monitor processor usage. SA.52.03
    04. Monitor disks. SA.52.04
    05. Monitor network usage. SA.52.05
    06. Identify the guidelines for using counters and thresholds. SA.52.06
    07. Describe the best practices for monitoring server performance. SA.52.07
0. Maintain device drivers. The student will be able to: SA.53.0
    01. Configure device driver signing. SA.53.01
    02. Restore the previous version of a device driver. SA.53.02
0. Use software tools to manage and set up disks. The student will be able to: SA.54.0
    01. Initialize and partition a disk. SA.54.01
    02. View and update disk properties. SA.54.02
    03. Manage mounted drives. SA.54.03
    04. Create volumes on a disk. SA.54.04
    05. Convert a disk from basic to dynamic and from dynamic to basic. SA.54.05
    06. Import disks. SA.54.06
0. Use file encryption for security of data. The student will be able to: SA.55.0
    01. Manage disk based file compression. SA.55.01
    02. Configure file encryption. SA.55.02
    03. Implement disk quotas. SA.55.03
0. Plan for a computer disaster and use the features of a server operating system to prevent a disaster or recover when one occurs. The student will be able to: SA.56.0
    01. Prepare for disaster recovery. SA.56.01
    02. Back up data. SA.56.02
    03. Schedule backup jobs. SA.56.03
    04. Restore data. SA.56.04
    05. Configure a shadow copy. SA.56.05
    06. Recover from server failure. SA.56.06
    07. Select a disaster recovery method. SA.56.07

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0. Manage and distribute critical software updates that resolve known security vulnerabilities and other stability issues. The student will be able to: SA.57.0
    01. Install and configure client computers to use receive software updates. SA.57.01
    02. Install and configure servers to use perform software updates. SA.57.02
    03. Manage the Software Update Services infrastructure. SA.57.03
0. Construct and assign IP addresses and isolate addressing issues associated with the IP routing process. The student will be able to: SA.58.0
    01. Convert IP Addresses from decimal to binary. SA.58.01
    02. Calculate a subnet mask. SA.58.02
    03. Create subnets using VLSM and CIDR. SA.58.03
    04. Isolate addressing issues associated with the IP routing process. SA.58.04
0. Configure an internet protocol (IP) address for client computers. The student will be able to: SA.59.0
    01. Configure a client to use a static IP address. SA.59.01
    02. Configure a client to obtain an IP address automatically by using DHCP. SA.59.02
    03. Configure a client to obtain an IP address automatically by using Alternate Configuration. SA.59.03
0. Configure name resolution mechanisms for clients on a network and describe the name resolution process. The student will be able to: SA.60.0
    01. Use ARP to identify client media access control (MAC) addresses. SA.60.01
    02. Describe the function of Network Basic Input/Output System (NetBIOS). SA.60.02
    03. Configure a client to use a static IP address. SA.60.03
    04. Configure a client to use name resolution servers. SA.60.04
0. Isolate common connectivity issues and describe how to use utilities and tools as part of this process. The student will be able to: SA.61.0
    01. Isolate common connectivity issues. SA.61.01
    02. Use a flow chart to isolate a problem. SA.61.02
    03. Use utilities and tools to isolate a problem. SA.61.03
0. Configure a routing solution for a network environment. The student will be able to: SA.62.0
    01. Describe the role of routing in the network infrastructure. SA.62.01
    02. Enable and configure the Routing and Remote Access service. SA.62.02
    03. Configure packet filters. SA.62.03

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0. Allocate IP addressing in a network environment. The student will be able to: SA.63.0
    01. Describe the role of DHCP in the network infrastructure. SA.63.01
    02. Add and authorize a DHCP Server service. SA.63.02
    03. Configure a DHCP scope. SA.63.03
    04. Configure DHCP options. SA.63.04
    05. Configure a DHCP reservation. SA.63.05
    06. Configure a DHCP relay agent. SA.63.06
0. Manage the DHCP service to reflect changing client IP addressing needs and monitor DHCP server performance. The student will be able to: SA.64.0
    01. Manage a DHCP database. SA.64.01
    02. Monitor DHCP. SA.64.02
    03. Apply security guidelines for DHCP. SA.64.03
0. Assign computer names to the IP addresses of the source and destination hosts, and then use the computer name to contact the hosts. The student will be able to: SA.65.0
    01. Describe the name resolution process. SA.65.01
    02. View names on a client. SA.65.02
    03. Configure host name resolution. SA.65.03
0. Resolve host names by using domain name system. The student will be able to: SA.66.0
    01. Describe the role of DNS in the network infrastructure. SA.66.01
    02. Install the DNS Server service. SA.66.02
    03. Configure the properties for the DNS Server service. SA.66.03
    04. Configure the DNS zones. SA.66.04
    05. Configure DNS zone transfers. SA.66.05
    06. Configure dynamic updates. SA.66.06
    07. Configure a DNS client. SA.66.07
    08. Delegate authority for zones. SA.66.08
0. Manage and monitor DNS servers to ensure that they are functioning properly and to optimize network performance. The student will be able to: SA.67.0
    01. Configure the Time-to-Live (TTL) value. SA.67.01
    02. Configure aging and scavenging. SA.67.02
    03. Integrate DNS with WINS. SA.67.03
    04. Test the DNS server configuration. SA.67.04
    05. Monitor DNS server performance. SA.67.05

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0. Configure a server with the routing and remote access service, create appropriate remote access connections on a network access server, and configure users' access rights. The student will be able to: SA.68.0
    01. Describe a network access infrastructure. SA.68.01
    02. Configure a virtual private network (VPN) connection. SA.68.02
    03. Configure a dial-up connection. SA.68.03
    04. Configure a wireless connection. SA.68.04
    05. Control remote user access to a network. SA.68.05
    06. Centralize authentication and policy management for network access by using Internet Authentication Service (IAS). SA.68.06
0. Manage and monitor network access and the network access services. The student will be able to: SA.69.0
    01. Configure logging on the network access server. SA.69.01
    02. Collect and monitor network access data. SA.69.02
0. Perform installation of a network client operating system. The student will be able to: SA.70.0
    01. Plan a client operating system installation. SA.70.01
    02. Install a client operating system. SA.70.02
    03. Upgrade a client operating system from an earlier version. SA.70.03
    04. Automate the installation process for a client operating system. SA.70.04
0. Install and configure hardware devices. The student will be able to: SA.71.0
    01. Configure hardware devices and drivers on a computer running a client OS. SA.71.01
    02. Add and remove devices by using built in utilities and wizards. SA.71.02
    03. Restore device drivers. SA.71.03
0. Configure and manage file systems. The student will be able to: SA.72.0
    01. Work with file systems. SA.72.01
    02. Manage data compression. SA.72.02
    03. Secure data by using EFS. SA.72.03
    04. Configure disk compression. SA.72.04
    05. Secure files by using EFS. SA.72.05

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0. Troubleshoot the boot process and other system issues. The student will be able to: SA.73.0
    01. Examine the boot process. SA.73.01
    02. Control system settings during the boot process. SA.73.02
    03. Change startup behavior. SA.73.03
    04. Use advanced boot options to troubleshoot startup problems. SA.73.04
    05. Restore a computer to a previous state. SA.73.05
    06. Troubleshoot the boot process and other system issues. SA.73.06
0. Configure the desktop. The student will be able to: SA.74.0
    01. Configure user desktop settings. SA.74.01
    02. Customize the desktop environment. SA.74.02
    03. Configure system settings. SA.74.03
    04. Describe how user profiles and group policy affect desktop customization. SA.74.04
0. Configure IP addresses and name resolution. The student will be able to: SA.75.0
    01. Configure IP addresses. SA.75.01
    02. Troubleshoot IP addresses. SA.75.02
    03. Determine TCP/IP name resolution methods. SA.75.03
    04. Configure a DNS and WINS client. SA.75.04
    05. Connect to a remote host. SA.75.05
    06. Configure IP addresses. SA.75.06
    07. Configure the DNS client. SA.75.07
0. Configure the client to work in a network environment. The student will be able to: SA.76.0
    01. Examine workgroups and user accounts. SA.76.01
    02. Create and authenticate local user accounts. SA.76.02
    03. Configure local security. SA.76.03
    04. Configure logon options. SA.76.04
    05. Configure networking. SA.76.05
    06. Join a domain. SA.76.06
    07. Operate in a domain. SA.76.07

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0. Support remote users. The student will be able to: SA.77.0
    01. Establish remote access connections. SA.77.01
    02. Connect to Virtual Private Networks. SA.77.02
    03. Configure inbound connections. SA.77.03
    04. Configure authentication protocols and encryption. SA.77.04
    05. Using remote desktop. SA.77.05
    06. Store user names and passwords to facilitate remote connections. SA.77.06
    07. Configure a VPN connection. SA.77.07
    08. Configure and using remote desktop. SA.77.08
    09. Store user names and passwords. SA.77.09
0. Configure a client OS for mobile computing. The student will be able to: SA.78.0
    01. Configure hardware for mobile computing. SA.78.01
    02. Configure power management options for mobile computing. SA.78.02
    03. Make files, folders, and webpages available for offline use. SA.78.03
0. Monitor resources and performance. The student will be able to: SA.79.0
    01. Determine system information. SA.79.01
    02. Use task manager to monitor system performance. SA.79.02
    03. Use performance and maintenance tools to improve performance. SA.79.03
    04. Monitor event logs. SA.79.04
    05. Configure program compatibility. SA.79.05
0. Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to: SA.80.0
    01. Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments. SA.80.01
    02. Explain emergency procedures to follow in response to workplace accidents. SA.80.02
    03. Create a disaster and/or emergency response plan. SA.80.03
0. Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives. The student will be able to: SA.81.0
    01. Employ leadership skills to accomplish organizational goals and objectives. SA.81.01
    02. Establish and maintain effective working relationships with others in order to accomplish objectives and tasks. SA.81.02
    03. Conduct and participate in meetings to accomplish work tasks. SA.81.03
    04. Employ mentoring skills to inspire and teach others. SA.81.04

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0. Explain the importance of employability skill and entrepreneurship skills. The student will be able to: SA.82.0
    01. Identify and demonstrate positive work behaviors needed to be employable. SA.82.01
    02. Develop personal career plan that includes goals, objectives, and strategies. SA.82.02
    03. Examine licensing, certification, and industry credentialing requirements. SA.82.03
    04. Maintain a career portfolio to document knowledge, skills, and experience. SA.82.04
    05. Evaluate and compare employment opportunities that match career goals. SA.82.05
    06. Identify and exhibit traits for retaining employment. SA.82.06
    07. Identify opportunities and research requirements for career advancement. SA.82.07
    08. Research the benefits of ongoing professional development. SA.82.08
    09. Examine and describe entrepreneurship opportunities as a career planning option. SA.82.09
    10. Research, compare and contrast investment opportunities. SA.82.10

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**Systems Engineer - Course Number: CTS0028**

0. Apply communication skills (reading, writing, speaking, listening, viewing) in a courteous, concise, and correct manner on personal and professional levels. The student will be able to: SE.83.0
    01. Communicate technical information in a concise, understandable manner to a non-technical audience both verbally and in writing. SE.83.01
0. Participate in work-based learning experiences. The student will be able to: SE.84.0
    01. Participate in work-based learning experiences in a network support services environment. SE.84.01
    02. Discuss the use of technology in a network support services environment. SE.84.02
    03. Compare and contrast the software applications used in a network support services environment. SE.84.03
0. Plan a network infrastructure. The student will be able to: SE.85.0
    01. Explain how to plan a network. SE.85.01
    02. Explain how to prepare development and test environments. SE.85.02
    03. Explain the concepts of managing and maintaining a network environment by using specific tools. SE.85.03
    04. Explain the technologies and services implemented in a network. SE.85.04

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0. Plan and optimize a TCP/IP physical and logical network. The student will be able to: SE.86.0
    01. Discuss TCP/IP. SE.86.01
    02. Plan a TCP/IP addressing scheme. SE.86.02
    03. Optimize network performance. SE.86.03
0. Plan and troubleshoot routing. The student will be able to: SE.87.0
    01. Describe how routing works. SE.87.01
    02. Create a secure routing plan. SE.87.02
    03. Identify TCP/IP routing trouble shooting tools. SE.87.03
    04. Troubleshoot TCP/IP routing. SE.87.04
0. Plan a DHCP strategy. The student will be able to: SE.88.0
    01. Demonstrate how DHCP operates in an enterprise environment. SE.88.01
    02. Plan a DHCP strategy. SE.88.02
    03. Secure a DHCP strategy. SE.88.03
0. Plan a DNS strategy. The student will be able to: SE.89.0
    01. Plan a namespace strategy. SE.89.01
    02. Plan zones. SE.89.02
    03. Plan zone replication. SE.89.03
    04. Plan a DNS server implementation. SE.89.04
0. Optimize and troubleshoot DNS. The student will be able to: SE.90.0
    01. Optimize a DNS server. SE.90.01
    02. Optimize the DNS server-to-server communications. SE.90.02
    03. Optimize DNS client support traffic. SE.90.03
    04. Troubleshoot host name resolution. SE.90.04
0. Plan and troubleshoot IPSEC. The student will be able to: SE.91.0
    01. Discuss IPSec. SE.91.01
    02. Understand IPSec default policies, rules, and settings. SE.91.02
    03. Plan IPSec deployment. SE.91.03
    04. Troubleshoot IPSec. SE.91.04
0. Plan a network access. The student will be able to: SE.92.0
    01. Select appropriate connection methods for a network access strategy. SE.92.01
    02. Select a remote access policy strategy. SE.92.02
    03. Select a network access authentication method. SE.92.03
    04. Plan a network access strategy. SE.92.04

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0. Troubleshoot network access. The student will be able to: SE.93.0
    01. Identify network access troubleshooting resources. SE.93.01
    02. Troubleshoot network authentication. SE.93.02
    03. Troubleshoot LAN authentication. SE.93.03
    04. Troubleshoot remote access. SE.93.04
0. Analyze global director infrastructure. The student will be able to: SE.94.0
    01. Describe the architecture of global directory. SE.94.01
    02. Describe the working of global directory. SE.94.02
    03. Use administrative tools to examine the components of global directory. SE.94.03
    04. Describe the global directory design, planning, and implementation processes. SE.94.04
0. Implement a global directory structure and domain structure. The student will be able to: SE.95.0
    01. Create a forest and domain structure. SE.95.01
    02. Configure DNS in a global directory environment. SE.95.02
    03. Raise the functional level of a forest and a domain. SE.95.03
    04. Create trust relationships between domains. SE.95.04
    05. Secure trusts by using SID filtering. SE.95.05
0. Implement an organizational unit structure. The student will be able to: SE.96.0
    01. Create an organizational unit. SE.96.01
    02. Delegate control for an organizational unit. SE.96.02
    03. Plan an organization unit strategy. SE.96.03
0. Implement user, group, and computer accounts. The student will be able to: SE.97.0
    01. Describe the types of global directory accounts and groups. SE.97.01
    02. Create multiple user and computer accounts. SE.97.02
    03. Implement UPN suffixes. SE.97.03
    04. Move objects within a domain and across domains in a global structure. SE.97.04
    05. Plan a strategy for user computer and group accounts. SE.97.05
    06. Plan a global directory audit strategy. SE.97.06

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0. Implement group policy. The student will be able to: SE.98.0
    01. Create and configure group policy objects. SE.98.01
    02. Manage group policy objects. SE.98.02
    03. Verify and troubleshoot group policies. SE.98.03
    04. Delegate administrative control of group policies. SE.98.04
    05. Plan a group policies strategy for the enterprise. SE.98.05
0. Deploy and manage software by using group policies. The student will be able to: SE.99.0
    01. Explain the basic concepts of software deployment by using group policies. SE.99.01
    02. Deploy software by using group policies. SE.99.02
    03. Configure software deployment by using group policies. SE.99.03
    04. Maintain deployed software by using group policies. SE.99.04
    05. Troubleshoot some common problems with software deployment. SE.99.05
    06. Plan a software deployment strategy. SE.99.06
0. Implement sites to manage global directory replication. The student will be able to: SE.100.0
    01. Explain the components and the process of replication. SE.100.01
    02. Create and configure sites. SE.100.02
    03. Manage a global directory site topology. SE.100.03
    04. Monitor and troubleshoot global directory replication failures. SE.100.04
    05. Plan a site strategy. SE.100.05
0. Implement placement of domain controllers. The student will be able to: SE.101.0
    01. Implement a global catalog in a global directory. SE.101.01
    02. Determine the placement of domain controllers in a global directory. SE.101.02
    03. Create a plan for placing domain controllers in a global directory. SE.101.03
0. Use a framework for designing security and create a security design team. The student will be able to: SE.102.0
    01. Describe common elements of security policies and procedures. SE.102.01
    02. Create a security design framework. SE.102.02
    03. Create a security design team. SE.102.03

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0. Recognize and predict common threats by using a threat model. The student will be able to: SE.103.0
    01. Explain common network vulnerabilities and how attackers can exploit them. SE.103.01
    02. Predict threats to security by using the STRIDE (Spoofing, Tampering, Repudiation, Information disclosure, Denial of service, Elevation of privilege) threat model. SE.103.02
0. Apply a framework for planning risk management. The student will be able to: SE.104.0
    01. Explain the purpose and operation of risk management. SE.104.01
    02. Draft the elements of a risk management plan. SE.104.02
0. Design security for physical resources. The student will be able to: SE.105.0
    01. Determine threats and analyze risks to physical resources. SE.105.01
    02. Design security for physical resources. SE.105.02
0. Design security for computers. The student will be able to: SE.106.0
    01. Determine threats and analyze risks to computers. SE.106.01
    02. Design security for computers. SE.106.02
0. Design security for accounts. The student will be able to: SE.107.0
    01. Determine threats and analyze risks to accounts. SE.107.01
    02. Design security for accounts. SE.107.02
0. Design security for authentication. The student will be able to: SE.108.0
    01. Determine threats and analyze risks to authentication. SE.108.01
    02. Design security for authentication. SE.108.02
0. Design security for data. The student will be able to: SE.109.0
    01. Determine threats and analyze risks to data. SE.109.01
    02. Design security for data. SE.109.02
0. Design security for data transmission. The student will be able to: SE.110.0
    01. Determine threats and analyze risks to data transmission. SE.110.01
    02. Design security for data transmission. SE.110.02
0. Design security for network perimeters. The student will be able to: SE.111.0
    01. Determine threats and analyze risks to network perimeters. SE.111.01
    02. Design security for network perimeters. SE.111.02

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0. Design an audit policy and an incident response procedure. The student will be able to: SE.112.0
    01. Explain the importance of auditing and incident response. SE.112.01
    02. Design an auditing policy. SE.112.02
    03. Design an incident response procedure. SE.112.03
0. Linux Foundation. The student will be able to: SE.113.0
    01. Explain the creation history of Linux. SE.113.01
    02. Explain Free and Open Source Software (FOSS). SE.113.02
    03. Explain the concept of a GNU General Public License (GPL). SE.113.03
    04. Explain the concept of a Linux distribution and name some well-known distributions. SE.113.04
    05. Site common uses of Linux and it's roles in global networks. SE.113.05
0. Linux Fundamentals. The student will be able to: SE.114.0
    01. Access and utilize the command line interface shell. SE.114.01
    02. Explain the purpose of and demonstrate the use of the super user and super user do (sudo) command. SE.114.02
    03. Know where to get help and how to use the manual (man) pages. SE.114.03
    04. Use non-graphical text editors such as vi and nano. SE.114.04
    05. Use and create command aliases. SE.114.05
    06. Adjust environmental variables and shell configuration files. SE.114.06
    07. Demonstrate redirection, piping, standard input, standard output, & standard error. SE.114.07
    08. Work with Directories, links, and files. SE.114.08
    09. Describe the most common Filesystem Hierarchy Standard (FHS). SE.114.09
    10. Compress and decompress files using standard Linux utilities. SE.114.10
0. Linux Installation. The student will be able to: SE.115.0
    01. Plan and perform a Linux installation including harddrive partitioning, Logical Volumes (LV), and basic Logical Volume Management (LVM) operation. SE.115.01
    02. Install various distributions of Linux in server and client modes. SE.115.02
    03. Explain the boot loader and describe the most common boot loader, GRUB2. SE.115.03

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0. Linux System Operation. The student will be able to: SE.116.0
    01. Start, display, and kill running processes. SE.116.01
    02. Explain the purpose of the Process ID (PID). SE.116.02
    03. Explain the relationship of parent, child, and zombie processes. SE.116.03
    04. Explain the role of systemd. SE.116.04
    05. Update and upgrade running Linux systems. SE.116.05
    06. Describe the use of shared libraries. SE.116.06
    07. Mount volumes. SE.116.07
0. Linux Users Groups and Permissions. The student will be able to: SE.117.0
    01. Display existing groups and users. SE.117.01
    02. Create users. SE.117.02
    03. Explain the use of the shadow password file. SE.117.03
    04. Create groups. SE.117.04
    05. Assign users to groups. SE.117.05
    06. Explain how Linux uses file and folder ownership and group permissions. SE.117.06
    07. Change ownership and group ownership of files and folders. SE.117.07
    08. Explain the attributes read, write, execute (rwx). SE.117.08
    09. Demonstrate the ability to change attributes using the single, multiple, and binary methods. SE.117.09
    10. Describe the use of special permissions. SE.117.10
0. Linux Basic Security & System Monitoring. The student will be able to: SE.118.0
    01. Configure network interfaces for IPv4 and IPv6. SE.118.01
    02. Display iptables and create a new firewall rule. SE.118.02
    03. Demonstrate the ability to read and manipulate system & security log files using head, tail, cat, less, and more. SE.118.03
    04. Demonstrate the ability to backup system & security logs. SE.118.04
    05. Create basic scripts to automate tasks. SE.118.05
    06. Block logins, disable, and re-enable accounts. SE.118.06
    07. Remove un-needed services and disable unused ports. SE.118.07

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**Wireless Network Administrator - Course Number: CTS0029**

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0. Participate in simulated work-based learning experiences. The student will be able to: WN.119.0
    01. Participate in simulated work-based learning experiences in a network support services environment. WN.119.01
    02. Discuss the use of technology in a network support services environment. WN.119.02
    03. Discuss the management/supervisory skills needed in a network support service environment. WN.119.03
0. Demonstrate proficiency in applying radio frequency (RF) technologies. The student will be able to: WN.120.0
    01. Define and apply the basic concepts of RF behavior. WN.120.01
    02. Understand the applications of basic RF antenna concepts. WN.120.02
    03. Understand and apply the basic components of RF. WN.120.03
    04. Identify some of the different uses for spread spectrum technologies. WN.120.04
    05. Comprehend the differences between, and apply the different types of spread spectrum technologies. WN.120.05
    06. Identify and apply the concepts which make up the functionality of spread spectrum technology. WN.120.06
    07. Identify the laws set forth by the FCC that govern spread spectrum technology, including power outputs, frequencies, bandwidths, hop times, and dwell times. WN.120.07
0. Develop an awareness of wireless LAN technologies. The student will be able to: WN.121.0
    01. Identify and apply the processes involved in authentication and association. WN.121.01
    02. Recognize the concepts associated with wireless LAN service sets. WN.121.02
    03. Understand the implications of the following power management features of wireless LANs. WN.121.03
    04. Specify the modes of operation involved in the movement of data traffic across wireless LANs. WN.121.04

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0. Perform implementation and management activities. The student will be able to: WN.122.0
    01. Identify the technology roles for which wireless LAN technology is an appropriate technology application. WN.122.01
    02. Identify the purpose of infrastructure devices and explain how to install, configure, and manage them. WN.122.02
    03. Identify the purpose of wireless LAN client devices and explain how to install, configure, and manage them. WN.122.03
    04. Identify the purpose of wireless LAN gateway devices and explain how to install, configure, and manage them. WN.122.04
    05. Identify the basic attributes, purpose, and function of types of antennas. WN.122.05
    06. Describe the proper locations and methods for installing antennas. WN.122.06
    07. Explain the concepts of polarization, gain, beamwidth, and free-space path loss as they apply to implementing solutions that require antennas. WN.122.07
    08. Identify the use of wireless LAN accessories and explain how to install, configure, and manage them. WN.122.08
    09. Identify, understand, correct or compensate for wireless LAN implementation challenges. WN.122.09
    10. Explain how antenna diversity compensates for multipath. WN.122.10
    11. Identify and understand the importance and process of conducting a thorough site survey. WN.122.11
    12. Identify and understand the importance of the necessary tasks involved in preparing to do an RF site survey. WN.122.12
    13. Identify the necessary equipment involved in performing a site survey. WN.122.13
    14. Understand the necessary procedures involved in performing a site survey. WN.122.14
    15. Identify and understand site survey reporting procedures. WN.122.15

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0. Develop an awareness of wireless security systems. The student will be able to: WN.123.0
    01. Identify the strengths, weaknesses and appropriate uses of wireless LAN security techniques including the use of WVLAN's. WN.123.01
    02. Describe types of wireless LAN security attacks, and explain how to identify and prevent them. WN.123.02
    03. Given a wireless LAN scenario, identify the appropriate security solution from the following available wireless LAN security solutions. WN.123.03
    04. Explain the uses of corporate security policies and how they are used to secure a wireless LAN. WN.123.04
    05. Identify how and security precautions are used to secure a wireless LAN. WN.123.05
0. Demonstrate knowledge of wireless industry standards. The student will be able to: WN.124.0
    01. Identify, apply and comprehend the differences between wireless LAN standards. WN.124.01
    02. Understand the roles of organizations in providing direction and accountability within the wireless LAN industry. WN.124.02
    03. Identify the differences between the ISM and UNII bands. WN.124.03
    04. Identify and understand the differences between the power output rules for point-to-point and point-to-multipoint links. WN.124.04

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**Data Communications Analyst - Course Number: EEV0317**

0. Participate in simulated work-based learning experiences. The student will be able to: DC.125.0
    01. Participate in simulated work-based learning experiences in a network support services environment. DC.125.01
    02. Discuss the use of technology in a network support services environment. DC.125.02
    03. Discuss the management/supervisors skills needed in a network support services environment. DC.125.03

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0. Demonstrate a knowledge of general security concepts. The student will be able to: DC.126.0
    01. Describe access control. DC.126.01
    02. Describe network authentication. DC.126.02
    03. Understand the various types of network attacks (backdoors, DOS, spoofing). DC.126.03
    04. Identify and modify non-essential services and protocols. DC.126.04
    05. Identify malicious code (virus, worm, Trojan). DC.126.05
    06. Configure system auditing, logging, and scanning as it relates to security procedures. DC.126.06
0. Develop an awareness of communication security concepts. The student will be able to: DC.127.0
    01. Describe remote access protocols (VPN, RADIUS, L2TP). DC.127.01
    02. Identify E-mail security concerns (hoaxes, spam). DC.127.02
    03. Identify web (HTML) security concepts and designs (HTTP/S, IM). DC.127.03
    04. Demonstrate an awareness of file transfer security concerns. DC.127.04
    05. Describe and identify wireless networking security concerns and vulnerabilities. DC.127.05
0. Develop an awareness of network infrastructure security. The student will be able to: DC.128.0
    01. Install and configure network firewalls. DC.128.01
    02. Identify security concerns with various wiring media (copper, fiber). DC.128.02
    03. Identify security concerns associated with removable media and storage devices. DC.128.03
    04. Demonstrate an awareness of security topologies (security zones, Intranets, NAT). DC.128.04
    05. Configure and use intrusion detection software. DC.128.05
    06. Establish security baselines (updates, patches, hot fixes, Access Control lists). DC.128.06
    07. Demonstrate the ability to configure a Virtual Private Network (VPN). DC.128.07
    08. Describe the function of Network Address Translation (NAT). DC.128.08
0. Develop an awareness of cryptography and its relation to security. The student will be able to: DC.129.0
    01. Demonstrate an understanding of security algorithms and encryption. DC.129.01
    02. Use and apply Public Key Certificates. DC.129.02
    03. Demonstrate an understanding of standards and protocols in commerce. DC.129.03

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0. Incorporate organizational and operational security in an appropriate and effective manner. The student will be able to: DC.130.0
    01. Describe how to establish a network security policy. DC.130.01
    02. Explain the importance of physical security to protect network resources. DC.130.02
    03. Identify and use disaster recovery procedures. DC.130.03
    04. Describe the importance of business continuity and its relationship to network and corporate security. DC.130.04
    05. Describe security policies and procedures that would be used in a business environment. DC.130.05
    06. Explain the importance of privilege management (access, password management, sign-on). DC.130.06
    07. Describe the concept of forensics as it applies to network security (obtaining evidence of security breaches). DC.130.07
    08. Explain the importance of educating users and supervisors in regard to network security. DC.130.08
    09. Create documentation that describes standards and guidelines for a network security system. DC.130.09

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**Web Development (Y700100)**

**Information Technology Assistant - Course Number: OTA0040**

0. Demonstrate knowledge, skill, and application of information technology to accomplish job objectives and enhance workplace performance. The student will be able to: ITA.01.0
01. Develop keyboarding skills to enter and manipulate text and data. ITA.01.01
02. Describe and use current computer technology and software to perform personal and business related tasks in the workplace (e.g., e-mail, digital calendars, meetings, appointments). ITA.01.02
03. Differentiate between types of file systems and classify common file extensions based on software application programs used in the workplace environment. ITA.01.03
04. Utilize the Internet to find reliable resources and reference materials (e.g., on-line help, tutorials, manuals). ITA.01.04
05. Apply research strategies to use and evaluate electronic research technologies for valid and reliable information. ITA.01.05
06. Demonstrate basic computer file management skills (e.g., naming, saving, retrieving, and organizing). ITA.01.06
07. Analyze the process of troubleshooting problems with computer hardware peripherals, including input and output devices. ITA.01.07
08. Describe ethical issues and problems associated with computers and information technology (e.g., fair use, privacy, public domain, copyright, piracy, plagiarism). ITA.01.08

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09. Explain the history and purpose of various operating systems (e.g., DOS, Windows, Mac, and Unix/Linux). ITA.01.09

0. Develop an awareness of microcomputers. The student will be able to: ITA.02.0

01. Explain the general architecture of a microcomputer system. ITA.02.01

02. Explain the need for and demonstrate proficiency using common peripherals (e.g., printers, mouse, keyboard, external hard drive, flash drive). ITA.02.02

03. Examine the concepts of computer maintenance and upgrades. ITA.02.03

0. Demonstrate an understanding of networks. The student will be able to: ITA.03.0

01. Differentiate between types of networks and how they work (e.g., clients, servers, Wi-Fi, teleconference) ITA.03.01

02. Identify security needs within a network environment (e.g., antivirus software, passwords). ITA.03.02

03. Distinguish between intranets, extranets and how they relate to the Internet. ITA.03.03

04. Demonstrate basic understanding of cloud computing. ITA.03.04

0. Use word processing applications to enhance the effectiveness of various types of documents and communication. The student will be able to: ITA.04.0

01. Select and use word processing software and accompanying features to create and enhance various written business communications (e.g., memos, reports, block business letters). ITA.04.01

02. Save and export documents in various formats (e.g., pdf, html, blog, hyperlinks). ITA.04.02

03. Format text content in a document (e.g., font, paragraph attributes, spacing, text styles, text boxes). ITA.04.03

04. Manipulate page layout and reusable content (e.g., page setup, themes, templates, page backgrounds, headers and footers). ITA.04.04

05. Perform various image-editing tasks using word-processing software to create and format images, illustrations, shapes, etc. ITA.04.05

06. Proofread and revise documents by validating content through the use of word processing tools (e.g. spell check, thesaurus, find/replace, autocorrect settings). ITA.04.06

07. Insert citations and hyperlinks, create end and footnotes, and create a table of contents in a document. ITA.04.07

08. Perform various mail merge options, macros and tracking revisions. ITA.04.08

09. Demonstrate an understanding of fonts (serif and sans serif) and font styles (bold, italic, etc.) ITA.04.09

0. Use presentation applications to enhance communication skills. The student will be able to: ITA.05.0

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l. Manage and configure the presentation software environment (e.g., adjusting views, manipulating slide settings, configuring toolbar and file options). ITA.05.01

02. Use presentation software to format and edit slides (e.g., adding and removing slides, slide layouts, format slide design, insert or format placeholders). ITA.05.02

03. Locate, create and incorporate graphical and multimedia elements, including: shapes, graphics, images, bullets, hyperlinks, video, and audio into a slide presentation. ITA.05.03

04. Enhance overall visual presentation by applying font selection, design themes, color schemes, templates, etc. ITA.05.04

05. Create and manipulate graphical and multimedia elements using additional styles and effects (e.g., color selections, tone, contrast, shadows, picture styles). ITA.05.05

06. Demonstrate various business-related elements that can be created, embedded and manipulated in a slide presentation, including: charts, graphs, tables, media, spreadsheets, and illustrations. ITA.05.06

07. Customize presentation settings by using appropriate slide transitions and animations (e.g., on click, rehearsed timings) ITA.05.07

08. Demonstrate different delivery methods for slide presentations, including: online delivery and sharing, video projection, printing options. ITA.05.08

0. Use spreadsheet applications to enhance communication skills. The student will be able to: ITA.06.0

01. Manipulate the worksheet by using the ribbon tabs, group settings, importing data/database, manipulating properties, files and folders. ITA.06.01

02. Create cell data and apply auto fill. ITA.06.02

03. Format cells and worksheets (e.g., by applying and manipulating cell formats, styles, merging and splitting cells, create row and column titles, hide and unhide column titles, rows and columns, page setup options, and manipulating views/themes). ITA.06.03

04. Create and analyze formulas and functions (e.g., apply conditional formula logic, name and cell ranges). ITA.06.04

05. Create and modify charts and images. (e.g., pivot tables) ITA.06.05

06. Share worksheet data through various system (e.g., email, external media, cloud storage, mail merge). ITA.06.06

07. Analyze and organize data through filters, sorting and applying conditional formatting. (e.g., macros) ITA.06.07

08. Interpret data on line graphs, pie charts, diagrams, and tables. ITA.06.08

0. Use database applications to store and organize data. The student will be able to: ITA.07.0

01. Create different forms for inputting data into a database application. ITA.07.01

02. Interpret queries for specialized reports using a database application. ITA.07.02

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3. Create and modify a database by importing data from other sources ITA.07.03

4. Create and manage database tables by hiding fields, importing data, adding total rows ITA.07.04

05. Modify queries by renaming, adding/removing fields, sorting, formatting, and adding calculated fields ITA.07.05

06. Create and format reports with multiple columns, calculated fields and images. ITA.07.06

0. Use electronic mail to enhance communication skills. The student will be able to: ITA.08.0

01. Describe and perform e-mail capabilities and functions (e.g., create, send, & forward messages, organize email folders, manage signature and automated messages, configure message sensitivity, security and delivery options). ITA.08.01

02. Perform e-mail activities (e.g., attach external files, save e-mail attachments, view mailbox details, schedule appointments, create contact groups). ITA.08.02

03. Demonstrate an understanding of the ethical issues associated with electronic correspondences (e.g., employer's ownership of email, public access of government email, appropriate uses in the workplace, phishing attacks, permanence of electronic communications on the internet). ITA.08.03

04. Describe the need for and appropriate use of electronic mailing list software applications (e.g., listserv) ITA.08.04

0. Investigate individual assessment and job/career exploration and individual career planning that reflect the transition from school to work, lifelong learning, and personal and professional goals. The student will be able to: ITA.09.0

01. Analyze personal skills and aptitudes in comparison with various business related job and career options. (i.e., hard and soft skills) ITA.09.01

02. Use career resources to develop and analyze occupations and opportunities for internships, continuing education and on-the-job training. ITA.09.02

03. Exhibit job-seeking skills required for entry-level employment, including resume, online job search, cover letter, online/hard copy application, mock interview, interview thank you letter, and follow-up call. ITA.09.03

04. Design, implement, and evaluate a plan to facilitate growth and skill development related to anticipated job requirements and career expectations. ITA.09.04

05. Demonstrate an awareness of specific job requirements and career paths (e.g., education, certifications, skills, previous experience) in business environments. ITA.09.05

06. Demonstrate an awareness of the potential impact of local and global trends on career plans and life goals. ITA.09.06

07. Describe the importance of building community and mentor relationships in a variety of professional and workplace situations. ITA.09.07

08. Simulate work-based projects in an information technology environment ITA.09.08

0. Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. The student will be able to: ITA.10.0

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01. Demonstrate awareness of the following workplace essentials: quality customer service; business ethics; confidentiality of information; copyright violations; accepted workplace rules, regulations, policies, procedures, processes, and workplace safety, and appropriate attire and grooming. ITA.10.01

02. Demonstrate ways of accepting and providing constructive criticism to enhance team projects. ITA.10.02

03. Apply appropriate strategies to manage and resolve conflicts in work situations. ITA.10.03

04. Demonstrate personal and interpersonal skills appropriate for the workplace (e.g., responsibility, dependability, punctuality, integrity, positive attitude, initiative, respect for self and others, and professional dress). ITA.10.04

0. Demonstrate competence using computer networks, internet and online databases to facilitate collaborative or individual learning and communication. The student will be able to: ITA.11.0

01. Demonstrate how to connect to the Internet and identify and describe web terminology, addresses and how browsers work. ITA.11.01

02. Demonstrate proficiency using basic features of GUI (Graphical User Interface) browsers, including: bookmarks, basic configurations, e-mail configurations, and address books. ITA.11.02

03. Describe appropriate browser security configurations ITA.11.03

04. Describe information technology terminology, including Internet, intranet, ethics, copyright laws, and regulatory control. ITA.11.04

05. Demonstrate proficiency using search engines and search tools (e.g., Boolean search strategies) ITA.11.05

06. Use various web tools, including: downloading files, transfer of files, extensions, PDF, plug-ins, and data compression. ITA.11.06

07. Differentiate between different domain extensions (e.g., .com, .org, .gov, .edu, etc.) ITA.11.07

0. Develop awareness of computer languages, web-based & software applications, and emerging technologies. The student will be able to: ITA.12.0

01. Compare and contrast the appropriate use of various software applications. (e.g., word processing, desktop publishing, graphic design, web browser, e-mail, presentation, database, scheduling, financial management, Java applet, music) ITA.12.01

02. Explain and describe the need for web-based applications (e.g., sharing photos and video clips, messaging, chatting and collaborating. ITA.12.02

03. Express an understanding of basic terminology used in programming (e.g., algorithm, binary, code, block-based, objects, functions) ITA.12.03

04. Compare and contrast emerging technologies and describe how they impact business in the global marketplace (e.g., wireless network, tablets, cell phones, satellite technology, nanotechnology, smart devices, home networks). ITA.12.04

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0. Demonstrate an understanding of basic html by creating a simple web page. The student will be able to: ITA.13.0

01. Create a basic web page. ITA.13.01

02. Use basic storyboarding techniques. ITA.13.02

03. Use basic functions of WYSIWYG editors. ITA.13.03

04. Use basic functions of HTML, DHTML, and XML editors and converters. ITA.13.04

05. Enhance web pages through the addition of images and graphics. ITA.13.05

0. Demonstrate comprehension and communication skills. The student will be able to: ITA.14.0

01. Read and comprehend technical and non-technical reading assignments related to course content (e.g., manuals, books, magazines, electronic sources). ITA.14.01

02. Use verbal and nonverbal skills to communicate effectively with supervisors, co-workers, and customers. ITA.14.02

03. Demonstrate an understanding of the writing process to create business documents (e.g., research methods, paper formatting (MLA/APA)) ITA.14.03

04. Demonstrate an awareness of project management concepts and tools (e.g., timelines, deadlines, resource allocation, time management, delegation of tasks, collaboration). ITA.14.04

0. Use social media to enhance online communication and develop an awareness of a digital footprint. The student will be able to: ITA.15.0

01. Create and develop a professional social media presence (e.g., LinkedIn) to connect with potential employers, follower influencers, enhance networking opportunities, develop soft skills through written communication, and establish a professional business image. ITA.15.01

02. Cultivate and manage awareness of digital identity and reputation. ITA.15.02

03. Develop awareness of the permanence of actions and social awareness in the digital world. ITA.15.03

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**Web Design Foundations (Assistant Web Designer) - Course Number: CTS0070**

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0. Demonstrate proficiency setting website project requirements during the design phase and project planning phase of Web development. The student will be able to: WDF.16.0
    01. Define information architecture. WDF.16.01
    02. Discuss the importance of information architecture to web design and development. WDF.16.02
    03. Conduct a client interview to determine the business purpose and needs. WDF.16.03
    04. Conduct a competitive analysis. WDF.16.04
    05. Describe the activities performed during the design phase and project planning phase of website development. WDF.16.05
    06. Demonstrate basic design principles (e.g., use of colors, proximity, rule of thirds, white space in the design of a website). WDF.16.06
    07. Define the site structure by creating a content map, site map, storyboard, associated wireframes, and web design comp for client approval. WDF.16.07
    08. Analyze and evaluate global site maps. WDF.16.08
    09. Discuss the legal and ethical issues (e.g., copyright laws, obtaining permission, public domain, proper citations) related to web design. WDF.16.09
    10. Describe accessibility and its implications on web design. WDF.16.10
    11. Identify the client and target audience needs, as well as the purpose of a website. WDF.16.11
    12. Describe project management responsibilities. WDF.16.12
    13. Define website project scope and scope creep. WDF.16.13
    14. Determine deadlines and deliverables for a website project. WDF.16.14
    15. Discuss Americans with Disabilities Act (ADA) standards for accessibility. WDF.16.15
0. Demonstrate proficiency creating a logical website file structure. The student will be able to: WDF.17.0
    01. Create an efficient, maintainable directory structure for a website, including the site root and subfolders for assets (e.g., images, templates, CSS). WDF.17.01
    02. Demonstrate and use correct file paths for relative, site root relative, and absolute links. WDF.17.02
    03. Apply acceptable and logical website file naming conventions (e.g., index.html, comments.htm, about_us.htm). WDF.17.03
    04. Examine emerging and new markup languages. WDF.17.04
    05. Determine browser or platform compatibility as it relates to webpage design. WDF.17.05
    06. Identify common DOCTYPES (e.g., Strict, Transitional and Frameset, and HTML5) and describe their appropriate use. WDF.17.06

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0. Create basic webpages that meet the industry standards as set forth by the W3C (World Wide Web Consortium). The student will be able to: WDF.18.0
    01. Create basic webpage structures using common markup elements and attributes. WDF.18.01
    02. Incorporate list structures in a webpage (e.g., ordered, unordered, definition). WDF.18.02
    03. Incorporate hyperlinks in a webpage (e.g., external, internal, email, named anchors). WDF.18.03
    04. Describe the influence of the W3C in the web development industry. WDF.18.04
    05. Write proper webpage syntax using tags and attributes that meet the standards set forth by the W3C. WDF.18.05
    06. Incorporate common webpage elements and attributes in a webpage (e.g., title, comment tags, id). WDF.18.06
    07. Differentiate between absolute and relative links used in a webpage. WDF.18.07
    08. Define and incorporate the target attribute for hyperlinks suitable for its purpose. WDF.18.08
    09. Use the HTML AUDIO and VIDEO tags to display a media file on the webpages. WDF.18.09
0. Incorporate images and graphical formatting on a webpage. The student will be able to: WDF.19.0
    01. Describe usage guidelines (e.g., format types, size, relevance) for integrating images and graphics onto a webpage. WDF.19.01
    02. Compare and contrast standard image formats used in webpage design. WDF.19.02
    03. Incorporate graphics into a webpage design. WDF.19.03
    04. Create and incorporate image maps in a webpage. WDF.19.04
    05. Optimize images and graphics for use in a webpage. WDF.19.05
0. Create a basic table structure. The student will be able to: WDF.20.0
    01. Describe how tables are used in web design. WDF.20.01
    02. Discuss the advantages and disadvantages of incorporating tables in a webpage design. WDF.20.02
    03. Define and modify table structures for the presentation of tabular information. WDF.20.03
    04. Create accessible tables using standard table elements and attributes. WDF.20.04

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0. Incorporate form structures in a webpage. The student will be able to: WDF.21.0
    01. Create an accessible form using common elements, including form, fieldset, legend, textarea, select, option, button, labels, and input (radio, checkbox, submit, reset, image, password, hidden). WDF.21.01
    02. Describe and diagram the relationship between HTML forms and server-side technologies. WDF.21.02
    03. Compare and contrast the GET and POST methods for forms handling. WDF.21.03
    04. Define form validation and describe how it is accomplished. WDF.21.04
    05. List popular server-side technologies often used to process content sent from HTML forms. WDF.21.05
    06. Connect a HTML form to a server-side script for processing. WDF.21.06
0. Discuss appropriate use of frame structures and their outdated usage. The student will be able to: WDF.22.0
    01. Discuss using frames and iframe structures and the related security vulnerabilities WDF.22.01
    02. Describe appropriate uses of iframes. WDF.22.02
0. Understand the basic principles of Cascading Style Sheets CSS. The student will be able to: WDF.23.0
    01. Define the purpose of CSS and describe its importance in web design. WDF.23.01
    02. Discuss existing and emerging CSS versions. WDF.23.02
    03. Explain how inheritance and specificity affect CSS rule conflicts. WDF.23.03
    04. Discuss the different placement of CSS (e.g., inline, external, embedded). WDF.23.04
0. Use CSS to create basic webpages based on industry standards. The student will be able to: WDF.24.0
    01. Recognize and use element selectors, ID selectors, class selectors, pseudo-class selectors, and descendant selectors. WDF.24.01
    02. Use inline, internal and external style sheets. WDF.24.02
    03. Use the link and import methods to connect to an external style sheet. WDF.24.03
    04. Apply basic CSS properties (background, border, color, float, font, height, line-height, list-style, margin, overflow, padding, position, text-align, text-indent, width, padding). WDF.24.04
    05. Use CSS to style tables (e.g., borders, width, spacing, alignment, background). WDF.24.05
    06. Use CSS to enhance the appearance and usability of an HTML form. WDF.24.06

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0. Develop website page layout using AP (Absolute Positioning) elements. The student will be able to: WDF.25.0
    01. Compare and contrast positioning types on a webpage. WDF.25.01
    02. Describe the usage of AP elements in a webpage. WDF.25.02
    03. Incorporate AP elements in a webpage layout using appropriate Div tags. WDF.25.03
    04. Discuss the benefits and drawbacks of using AP elements for webpage layouts. WDF.25.04
    05. Determine how the stacking order and z-index impact webpages created with AP elements. WDF.25.05
0. Understand basic web design technology. The student will be able to: WDF.26.0
    01. Discuss client-side and server-side technologies. WDF.26.01
    02. Define e-commerce types and usage. WDF.26.02
    03. Describe database connectivity relative to websites. WDF.26.03
0. Describe the process for publishing a website. The student will be able to: WDF.27.0
    01. Explore domain name selection process. WDF.27.01
    02. Identify process to registering a domain name. WDF.27.02
    03. Compare and contrast hosting providers, features, and selection criteria. WDF.27.03
    04. Describe the various means for uploading website files (e.g., FTP, web-based tools). WDF.27.04
0. Describe how website performance is monitored and analyzed. The student will be able to: WDF.28.0
    01. Identify issues related to website maintenance. WDF.28.01
    02. Use webpage validation tools. WDF.28.02
    03. Describe website performance metrics (e.g., visits, time-on-page, time-on-site) and discuss their design implications. WDF.28.03
    04. Demonstrate knowledge of accessibility problems and solutions. WDF.28.04
    05. Discuss current basic Search Engine Optimization techniques. WDF.28.05
    06. Explore common website analytic tools. WDF.28.06
0. Create an informational website that conforms to industry standards as set forth by the W3C. The student will be able to: WDF.29.0
    01. Use GUI (Graphical User Interface) web authoring software to create a multi-page informational website. WDF.29.01
    02. Use image-editing software to enhance website designs with simple graphics. WDF.29.02
    03. Enhance the website using client-side technologies (navigation bars, rollover images or text, check plug-ins). WDF.29.03

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0. Demonstrate efficient, consistent website development practice (use of templates, snippets). The student will be able to: WDF.30.0
    01. Produce website designs that would work equally well on various operating systems and platforms, browser versions/configurations, and devices. WDF.30.01
    02. Describe various file formats that can be imported onto a website (tabular data, word processing, presentation, PDFs). WDF.30.02
0. Demonstrate language arts knowledge and skills. The student will be able to: WDF.31.0
    01. Locate, comprehend and evaluate key elements of oral and written information. WDF.31.01
    02. Draft, revise, and edit written documents using correct grammar, punctuation and vocabulary. WDF.31.02
    03. Present information formally and informally for specific purposes and audiences. WDF.31.03
0. Demonstrate mathematics knowledge and skills. The student will be able to: WDF.32.0
    01. Demonstrate knowledge of arithmetic operations. WDF.32.01
    02. Analyze and apply data and measurements to solve problems and interpret documents. WDF.32.02
    03. Construct charts/tables/graphs using functions and data. WDF.32.03

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**Web Interface Design (Assistant Web Designer) - Course Number: CTS0071**

0. Incorporate Human Computer Interface (HCI) principles of design. The student will be able to: WI.33.0
    01. Describe the fundamental design principles of human computer interface. WI.33.01
    02. Differentiate between computer and human factors in screen/page design. WI.33.02
    03. Describe what is meant by an "intuitive" interface. WI.33.03
    04. Describe how typography, color scheme, and graphic usage are used to set website feel/tone for various types of websites (e.g., educational, entertainment, ecommerce).Identify and use the following design concepts: contrast, repetition, alignment, proximity, writing style. WI.33.04
    05. Identify and use the following design concepts: contrast, repetition, alignment, proximity, writing style. WI.33.05
    06. Define and establish logo, identity, and branding needed for an effective website. WI.33.06
    07. Evaluate the HCI features included on a webpage storyboard. WI.33.07
    08. Create a series of webpage storyboards that incorporate HCI design principles. WI.33.08

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0. Research and obtain information for use in designing the user interface. The student will be able to: WI.34.0
    01. Identify common user information needs, information gathering models, and methods for gathering user research. WI.34.01
    02. Define the primary audience and customer expectations. WI.34.02
    03. Describe target audience preferences based on demographics (e.g., gender, age, economic status, culture). WI.34.03
    04. Identify and use web analytic tools to shape an information architecture strategy (determine keywords). WI.34.04
    05. Apply the results of research and analytics to the design of a user interface. WI.34.05

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0. Create a user friendly interface using Cascading Style Sheets (CSS). The student will be able to: WI.35.0
    01. Create CSS styles suitable for use on a user friendly webpage interface. WI.35.01
    02. Use element selectors, ID selectors, class selectors, pseudo-class selectors, and descendant selectors to create a table-less webpage design. WI.35.02
    03. Create a series of templates formatted exclusively using CSS. WI.35.03
    04. Use CSS syntax to configure and apply style sheets for multiple media displays (e.g., screen display and print). WI.35.04
    05. Use CSS syntax to implement custom web fonts on a webpage. WI.35.05
    06. Use CSS syntax to implement transitions and transformations to create animations on a webpage. WI.35.06
    07. Use CSS media queries to develop a responsive user interface. WI.35.07
    08. Explore various web authoring software (e.g. text editor or GUI editors). WI.35.08
    09. Create documented CSS style sheets for layout and appearance purposes. WI.35.09
    10. Create a CSS formatted informational website. The student will be able to: WI.35.10
    11. Use GUI (Graphical User Interface) web authoring software to create a multi-page informational website. WI.35.11
    12. Create documented CSS style sheets for layout and appearance purposes. WI.35.12
    13. Incorporate methods used to drive traffic to the website, then engage and retain visitors. WI.35.13
    14. Apply standard search engine optimization (SEO) practices (e.g., keyword proximity; density; relevance; appropriate page titles, URLs, and headings, alt tags) to enhance search engine performance. WI.35.14
    15. Use standard design techniques to create websites and correct display issues using multiple browsers and platforms. WI.35.15
    16. Discuss the pros and cons of using existing and emerging animation software. WI.35.16
    17. Use client-side technologies such as rollovers, check plug-ins, and pop-up windows to enhance the user interface. WI.35.17

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0. Demonstrate proficiency publishing, testing, monitoring, and maintaining a website. The student will be able to: WI.36.0
    01. Recognize the relationship between local and remote site structure. WI.36.01
    02. Identify methods of acquiring a domain name, appropriate hosting, and search engine registry. WI.36.02
    03. Understand and implement strategies to measure website traffic and improve search engine analytics reports. WI.36.03
    04. Describe the use of standard web marketing techniques. WI.36.04
    05. Describe how social media and social networking sites can be used for marketing purposes. WI.36.05
    06. Test websites using common resolutions, browsers, accessibility, and validation techniques. WI.36.06
    07. Use popular Internet browsers and tools as defined by W3C Browser Statistics (e.g., Mozilla Firefox (Web Developer Toolbar, ColorZilla, MeasureIt, Firebug), Internet Explorer 7/8) to display and troubleshoot websites. WI.36.07
    08. Explore standard practices for feedback and usability testing. WI.36.08
    09. Identify and incorporate standard security measures in a website. WI.36.09
    10. Identify and use online validation tools. WI.36.10
    11. Change invalid markup to comply with standards. WI.36.11
    12. Build a webpage that successfully passes the W3C validation test at http://validator.w3.org . WI.36.12
    13. Write markup that facilitates accessibility. WI.36.13
    14. Understand how to publish sites to remote server. WI.36.14
    15. Differentiate between local, testing, and remote website files and storage. WI.36.15

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0. Use oral and written communication skills in creating, expressing and interpreting information and ideas. The student will be able to: WI.37.0
    01. Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace. WI.37.01
    02. Locate, organize and reference written information from various sources. WI.37.02
    03. Design, develop and deliver formal and informal presentations using appropriate media to engage and inform diverse audiences. WI.37.03
    04. Interpret verbal and nonverbal cues/behaviors that enhance communication. WI.37.04
    05. Apply active listening skills to obtain and clarify information. WI.37.05
    06. Develop and interpret tables and charts to support written and oral communications. WI.37.06
    07. Exhibit public relations skills that aid in achieving customer satisfaction. WI.37.07
0. Solve problems using critical thinking skills, creativity and innovation. The student will be able to: WI.38.0
    01. Employ critical thinking skills independently and in teams to solve problems and make decisions. WI.38.01
    02. Employ critical thinking and interpersonal skills to resolve conflicts. WI.38.02
    03. Identify and document workplace performance goals and monitor progress toward those goals. WI.38.03
    04. Conduct technical research to gather information necessary for decision-making. WI.38.04
0. Describe the roles within teams, work units, larger environment as it relates to website project management. The student will be able to: WI.39.0
    01. Describe the types of websites and the major processes that make them successful. WI.39.01
    02. Explain project management and team member key roles. WI.39.02
    03. List and describe project management control systems (i.e., scope, timeframe, deliverables). WI.39.03
    04. Explain the impact of the global economy and cultures on website planning and production. WI.39.04

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0. Describe the importance of professional ethics and legal responsibilities as it relates to website development. The student will be able to: `WI.40.0`
    01. Evaluate and justify decisions based on ethical reasoning. `WI.40.01`
    02. Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities, and employer policies. `WI.40.02`
    03. Identify and explain personal and corporate consequences of unethical or illegal practices in website development. `WI.40.03`
    04. Interpret and explain written organizational policies and procedures. `WI.40.04`

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**Web Scripting (Web Designer) - Course Number: CTS0049**

0. Discuss the differences between server-side and client-side scripting. The student will be able to: `WS.41.0`
    01. Describe the role scripting languages play in the creation of websites. `WS.41.01`
    02. Identify and describe the advantages, disadvantages, and primary uses of popular scripting languages (e.g., JavaScript, VBScript, Perl, PHP, JScript). `WS.41.02`
0. Demonstrate understanding of the Document Object Model (DOM). The student will be able to: `WS.42.0`
    01. Describe the purpose of the Document Object Model (layout, objects, properties, methods). `WS.42.01`
    02. Describe how JavaScript uses the DOM to detect and manipulate elements on a webpage. `WS.42.02`

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0. Design, write, debug, and incorporate a JavaScript client-side script into a webpage. The student will be able to: WS.43.0
    01. Write, analyze and explain JavaScript syntax. WS.43.01
    02. Describe usage of various data types. WS.43.02
    03. Describe how the use of decision-making logic (AND, OR) is employed in a JavaScript program. WS.43.03
    04. Create and use variables, operators, and expressions. WS.43.04
    05. Use common JavaScript events and event handlers (e.g., click, load, onClick, onLoad) to control program flow, appearance, or functionality. WS.43.05
    06. Understand and incorporate JavaScript arrays (e.g., array basics, types, usage, methods, sorting). WS.43.06
    07. Understand and incorporate JavaScript functions (e.g., using the DOM, pass a value, return value, create objects, work with classes, objects). WS.43.07
    08. Understand and incorporate JavaScript loops and conditions (e.g., loop basics, types, usage). WS.43.08
    09. Recognize, isolate, and correct common JavaScript errors (e.g., syntax, function errors, reserved word usage, unsupported DOM). WS.43.09
    10. Apply JavaScript best coding practices (i.e., properly documenting scripts, field naming conventions, writing understandable code). WS.43.10
    11. Use different methods to incorporate JavaScript onto a webpage (e.g., <script> element, JavaScript statement block, external scripts). WS.43.11
    12. Troubleshoot and test incorporated script (i.e., functionality, browser usage, resolve known bugs). WS.43.12
0. Incorporate basic JavaScript form validation and form handling (using pre-built validation scripts or online libraries). The student will be able to: WS.44.0
    01. Identify and use form elements to solicit user input. WS.44.01
    02. Use JavaScript with HTML form controls. WS.44.02
    03. Validate web forms prior to submission. WS.44.03
    04. Use output commands to display processed data in an appropriately formatted form. WS.44.04
0. Use advanced JavaScript techniques. The student will be able to: WS.45.0
    01. Write JavaScript suitable for plug-in detection, image manipulation, and the creation of custom JavaScript objects. WS.45.01
    02. Use JavaScript to incorporate, create, update, and delete cookies. WS.45.02
    03. Describe the common security issues relevant to JavaScript. WS.45.03

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0. Demonstrate understanding of JavaScript accessibility issues. The student will be able to: WS.46.0
    01. Describe the purpose of the Browser Object Model (BOM) and how it relates to JavaScript. WS.46.01
    02. Make webpages accessible and functional when JavaScript is disabled or unsupported. WS.46.02
0. Select and modify appropriate library and pre-built JavaScript to incorporate into webpage. The student will be able to: WS.47.0
    01. Explore common JavaScript libraries and describe the advantages and disadvantages of using libraries. WS.47.01
    02. Analyze pre-built library items to determine functionality. WS.47.02
    03. Explain how a library item achieves desired processing. WS.47.03
    04. Determine if pre-built script provides functionality required in an effective manner. WS.47.04
    05. Incorporate pre-built library items into webpages. WS.47.05
    06. Identify the restrictions related to using pre-built scripts (i.e.; copyright, processing, and length of script). WS.47.06
    07. Modify pre-built scripts to suit functionality requirements. WS.47.07
    08. Test and troubleshoot pre-built scripts and widgets incorporated into webpages. WS.47.08

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**Web Media Integration (Senior Web Designer) - Course Number: CTS0015**

0. Demonstrate understanding of XML vocabularies and documents. The student will be able to: WM.48.0
    01. Understand XML vocabularies. WM.48.01
    02. Define well-formed and valid XML documents. WM.48.02
    03. Describe the basic structure of an XML document. WM.48.03
0. Create and debug an XML Document. The student will be able to: WM.49.0
    01. Create an XML declaration. WM.49.01
    02. Work with XML comments. WM.49.02
    03. Create XML elements and attributes. WM.49.03
    04. Work with character and entity references. WM.49.04
    05. Describe how XML handles character data, parsed character data, and white space. WM.49.05
    06. Work with XML parsers. WM.49.06
    07. Understand how web browsers work with XML documents. WM.49.07
    08. Apply a style sheet to an XML document. WM.49.08

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0. Demonstrate an understanding of Asynchronous JavaScript and XML (AJAX) and its implications for web developers. The student will be able to: WM.50.0
    01. Identify the technologies that comprise AJAX and explain how they interact. WM.50.01
    02. Describe the purpose, advantages, disadvantages, and functions of AJAX. WM.50.02
    03. Describe how AJAX works and how it is used in the creation of websites. WM.50.03
    04. Define appropriate use of AJAX in a web project. WM.50.04
    05. Identify AJAX Usability and Accessibility issues and their workarounds. WM.50.05
    06. Describe AJAX related browser compatibility issues and their workarounds. WM.50.06
    07. Explore popular AJAX applications currently on the Internet (auto-complete (Google), updating user content (Twitter), voting and rating (social bookmarking)). WM.50.07
    08. Describe common security issues associated to AJAX. WM.50.08
    09. Analyze the server-side implications of AJAX applications. WM.50.09
    10. Explore methods for testing and maintaining an AJAX application. WM.50.10
    11. Explore the future of AJAX and its implementation. WM.50.11
0. Plan and implement a multi-page website using AJAX techniques. The student will be able to: WM.51.0
    01. Research AJAX design principles and patterns (e.g., Observer, Command and MVC). WM.51.01
    02. Research and compare popular AJAX frameworks, libraries, and toolkits (e.g., JQuery, DOJO, Prototype). WM.51.02
    03. Identify and implement strategies for progressive enhancement of a webpage. WM.51.03
    04. Update specific areas of a page with data from the server (e.g., server-login updated) without reloading the webpage. WM.51.04
    05. Demonstrate the ability to transmit data in different formats (e.g., XML, JSON, alternatives to JavaScript). WM.51.05
    06. Use AJAX to create form submission and validation (e.g. password strength check, email/URL validation). WM.51.06
    07. Integrate a third party image gallery component. WM.51.07

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0. Incorporate Canvas API methods into a webpage. The student will be able to: WM.52.0
    01. Use the HTML CANVAS tag to create a drawing area on a webpage. WM.52.01
    02. Use JavaScript to write text on a canvas. WM.52.02
    03. Use JavaScript to draw basic shapes (e.g., lines, circles, squares) on a canvas. WM.52.03
    04. Use JavaScript and AJAX to draw charts and graphs on a canvas. WM.52.04
0. Demonstrate an understanding of PHP scripting. The student will be able to: WM.53.0
    01. Define the purpose of PHP and describe its importance in web design. WM.53.01
    02. Discuss existing and emerging PHP versions. WM.53.02
    03. Discuss various configuration options for installing PHP on a server. WM.53.03
0. Design, write, debug, and incorporate a PHP client-side script into a webpage. The student will be able to: WM.54.0
    01. Write, analyze and explain PHP syntax. WM.54.01
    02. Describe usage of various data types. WM.54.02
    03. Describe how the use of decision-making logic (e.g. and, or) is employed in a PHP program. WM.54.03
    04. Create and use variables, operators and expressions. WM.54.04
    05. Understand and incorporate PHP arrays (e.g., array basics, types, usage, methods, sorting). WM.54.05
    06. Understand and incorporate PHP objects (e.g., creation, access). WM.54.06
    07. Understand and incorporate PHP functions (e.g., pass a value, return value). WM.54.07
    08. Understand and incorporate PHP loops and conditions (e.g., loop basics, types, usage). WM.54.08
    09. Recognize, isolate, and correct common PHP errors (e.g., syntax, function errors, reserved word usage). WM.54.09
    10. Apply PHP best coding practices (i.e., properly documenting scripts, field naming conventions, writing understandable code). WM.54.10
    11. Troubleshoot and test incorporated script (i.e., functionality, browser usage, resolve known bugs). WM.54.11
0. Demonstrate an understanding of databases. The student will be able to: WM.55.0
    01. Define the purpose of a database and describe its importance in web design. WM.55.01
    02. Define the purpose of SQL. WM.55.02
    03. Discuss existing database management systems (e.g., MySQL, Oracle, SQL Server). WM.55.03

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0. Incorporate a database into a webpage. The student will be able to: WM.56.0
    01. Create a database to store information for a website. WM.56.01
    02. Understand how to use basic SQL commands (e.g., select, insert, update, delete) to manipulate the information in a database. WM.56.02
    03. Execute SQL commands to manipulate the information in a database using a database management system. WM.56.03
    04. Execute SQL commands to manipulate the information in a database using PHP. WM.56.04

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**Web E-commerce (Senior Web Designer) - Course Number: CTS0016**

0. Demonstrate knowledge and skills necessary to setup a secure E-commerce site. The student will be able to: WEC.57.0
    01. Compare and contrast popular pre-built shopping cart software (e.g., PrestaShop, Zend Cart). WEC.57.01
    02. Compare and contrast hosting options available for use with shopping cart software (i.e., shared hosting or dedicated server). WEC.57.02
    03. Discuss shopping cart vulnerabilities and best-practice preventative measures. WEC.57.03
    04. Identify hardware and software necessary to install and setup pre-built shopping cart software. WEC.57.04
    05. Install and configure necessary software (database, server) to run pre-built shopping cart software. WEC.57.05
    06. Install and configure pre-built shopping cart software. WEC.57.06
    07. Verify database and server connectivity. WEC.57.07
    08. Test and troubleshoot setup/configuration issues. WEC.57.08

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0. Identify security issues associated with E-commerce and discuss methods to mitigate risks. The student will be able to: WEC.58.0
    01. Describe the differences between Transaction Layer Security (TLS) and its predecessor, Secure Sockets Layer (SSL). WEC.58.01
    02. Explain transaction security. WEC.58.02
    03. Identify security and payment processing issues involved in developing a site (e.g., SSL, Digital Certificates, SET Protocol, Cyber Cash). WEC.58.03
    04. Demonstrate understanding of https and htaccess and their usage. WEC.58.04
    05. Explore methods to obtain an SSL certificate and secure transactions. WEC.58.05
    06. Compare and contrast the appropriateness of employing a merchant account or a payment gateway to handle online transactions. WEC.58.06
    07. Discuss the process, advantages, disadvantages, and costs associated with opening a merchant account. WEC.58.07
    08. Describe the process, advantages, disadvantages, and costs associated with using a payment gateway. WEC.58.08
0. Apply skills necessary to setup an E-commerce storefront. The student will be able to: WEC.59.0
    01. Setup and use an FTP (File Transfer Protocol) program to transfer files to a web server. WEC.59.01
    02. Add business specific information to site storefront (e.g., logos, product images, descriptions). WEC.59.02
    03. Setup back-end site administration functions and navigation. WEC.59.03
    04. Setup a schema for incorporating shipping, handling, and processing fees based on carrier, geographical zones, and weight/price range. WEC.59.04
    05. Experiment with various add-ons, themes, and modules available for customization. WEC.59.05
    06. Make simple modifications to a shopping cart to suit client needs (e.g., modify fields, add buttons). WEC.59.06
    07. Customize forms to accommodate client products and/or services. WEC.59.07
    08. Setup Search preferences and functionality for products and/or services. WEC.59.08
    09. Setup customer contact preferences and email notification functionality. WEC.59.09
    10. Apply Search Engine Optimization (SEO) techniques to shopping cart pages. WEC.59.10
    11. Test operation of shopping cart pages in multiple browsers. WEC.59.11
    12. Troubleshoot issues and errors related to browser display and functionality. WEC.59.12

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0. Employ techniques to enhance the value and profitability of an E-commerce website. The student will be able to: WEC.60.0
    01. Determine business goals for the E-commerce site. WEC.60.01
    02. Identify the various types of advertising options in E-commerce (e.g., links, banner ads, affiliate programs, pop-up windows, viral marketing, newsgroup postings). WEC.60.02
    03. Describe affiliate marketing and its implications for E-commerce websites. WEC.60.03
    04. Analyze popular affiliate programs/networks and available payment schemes. WEC.60.04
    05. Explain the differences, advantages, and disadvantages of CPM, PPC, and Pay per Sale/Lead. WEC.60.05
    06. Determine appropriate affiliate program for target audience. WEC.60.06
    07. Identify the method to join an affiliate program/network. WEC.60.07
    08. Identify considerations/requirements of selecting an affiliate program. WEC.60.08
    09. Determine appropriate number of affiliate programs necessary to suit client site. WEC.60.09
    10. Determine the terms and conditions of sale, including warranties, after-sales service, and privacy assurances. WEC.60.10
    11. Determine customer service options (e.g., e-mail, phone, fax). WEC.60.11
    12. Create a site map. WEC.60.12
    13. Create a Frequently Asked Questions (FAQ) page. WEC.60.13
    14. Create a product/version comparison chart, where appropriate. WEC.60.14
    15. Create feedback, review, survey, and recommendation pages. WEC.60.15

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0. Develop evaluation and performance monitoring metrics and target goals for an E-commerce website. The student will be able to: WEC.61.0
    01. Research existing and emerging analytical, usability, SEO tools to improve customer satisfaction and site conversion rates. WEC.61.01
    02. Describe web analytics tools and their features/functions. WEC.61.02
    03. Use web analytics tools to determine optimum site keywords. WEC.61.03
    04. Experiment with using advanced segments to view subsets of data (relating to purchasing habits, website usage, searches). WEC.61.04
    05. Customize analytic reports using appropriate metrics (e.g., average per-visit value, bounce rates, time spent on page). WEC.61.05
    06. Create more concise reports using advanced filters in web analytics tools. WEC.61.06
    07. Use intelligence features of web analytics tools to discover patterns of usage and setup corresponding alerts. WEC.61.07
    08. Research popular mobile analytics tools (e.g., Motally) and their features. WEC.61.08
    09. Interpret analytic report data and optimize website accordingly, if appropriate. WEC.61.09

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**Web Interactivity (Senior Web Designer) - Course Number: CTS0017**

0. Demonstrate an understanding of Content Management Systems (CMS) and their implications for web development. The student will be able to: WIT.62.0
    01. Describe the fundamental operation of a CMS. WIT.62.01
    02. Describe the typical features of a content management system. WIT.62.02
    03. Compare and contrast popular CMS applications (e.g., WordPress, Joomla). WIT.62.03
    04. Describe how a content management system can be used to enhance website interactivity. WIT.62.04
    05. Demonstrate proficiency installing and configuring content management systems and extensions/modules. WIT.62.05

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0. Use CMS features, functions, and extensions/modules to create/enhance a website. The student will be able to: WIT.63.0

    01. Create a basic multipage website using a content management system. WIT.63.01

    02. Enhance a webpage by using a content management system to incorporate images, animations, or video segments. WIT.63.02

    03. Incorporate a blog feature into a website using a content management system. WIT.63.03

    04. Demonstrate proficiency using CMS built-in security for website, password and database backup. WIT.63.04

    05. Demonstrate proficiency using add-on modules, or plug-ins. WIT.63.05

0. Evaluate the suitability for and system requirements for a content management system. The student will be able to: WIT.64.0

    01. Identify business goals and evaluate their suitability for a content management system. WIT.64.01

    02. Determine web hosting system requirements. WIT.64.02

    03. Create a schema for creating, deleting, and managing users and their permissions. WIT.64.03

    04. Discuss the value represented by templates in a content management system development environment. WIT.64.04

0. Demonstrate an understanding of multimedia applications and their implications for web designers. The student will be able to: WIT.65.0

    01. Compare and contrast the leading multimedia development applications for website development (e.g., Adobe Flash, Microsoft Silverlight). WIT.65.01

    02. Describe those circumstances whereby multimedia may be used to add interactivity to a website. WIT.65.02

    03. Describe the limitations of multimedia development applications relative to website development viewed on various platforms (e.g., PCs, tablets, mobile devices). WIT.65.03

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0. Create and incorporate interactive website components. The student will be able to: WIT.66.0
    01. Create buttons, menus, and other components that feature a static, hover, and rollover effect. WIT.66.01
    02. Convert original artwork into an interactive component with associated script behavior. WIT.66.02
    03. Adjust the component properties including opacity, filter, rotation, and action. WIT.66.03
    04. Resize a multi-layer component to ensure uniform resizing of each layer. WIT.66.04
    05. Create scrolling images, panels, and lists for incorporating into a web design. WIT.66.05
    06. Create and incorporate animated banners, headers, and website introduction pages (e.g., Adobe Flash, Microsoft Silverlight). WIT.66.06
0. PDF document usage considerations. The student will be able to: WIT.67.0
    01. Discuss the advantages and disadvantages of using PDF documents in a website. WIT.67.01
    02. Research and discuss PDF document usage best practices. WIT.67.02
    03. Determine when it is appropriate to use PDF documents (e.g., brochure downloads, large reports, catalogs, interactive forms). WIT.67.03
    04. Compare and contrast the functionality of software applications used to create and process PDFs. WIT.67.04
    05. Research and describe search engine optimization considerations related to the use of PDF documents. WIT.67.05
    06. Research and discuss security issues related to PDF document usage in a website (viruses, auto-open). WIT.67.06
    07. Identify accessibility issues related to using PDF documents in a website. WIT.67.07

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0. Create, format, and manipulate PDF documents. The student will be able to: WIT.68.0
    01. List & describe the methods available for creating PDF documents. WIT.68.01
    02. Create a PDF using a variety of software applications, multiple files, and webpages. WIT.68.02
    03. Demonstrate ability to format, modify and enhance a PDF document. WIT.68.03
    04. Describe the differences in PDF standards for document prepress data interchange and long-term archiving. WIT.68.04
    05. Embed images, text, audio, video, and Flash content into a PDF document. WIT.68.05
    06. Create and modify automatically generated and manual bookmarks in a PDF document. WIT.68.06
    07. Add clickable links to a PDF document. WIT.68.07
    08. Incorporate Find and Search methods to locate specific text in a PDF document. WIT.68.08
    09. Describe the method used to search scanned documents (optical character recognition). WIT.68.09
    10. Understand and correct color separation issues. WIT.68.10
    11. Create and modify PDF documents using available tools to meet accessibility requirements (e.g., tags, reading order, forms, supplemental content for multimedia, text-to-speech). WIT.68.11
    12. Export a PDF document in a different format. WIT.68.12
0. Display, distribution, and print considerations for PDF documents. The student will be able to: WIT.69.0
    01. Define file specifications use to generate smaller files for electronic distribution and on-screen display. WIT.69.01
    02. Specify image downsampling and compression settings to generate a PDF file with a smaller file size. WIT.69.02
    03. Identify and correct potential printing issues in a PDF document. WIT.69.03
    04. Ensure a PDF document meets appropriate criteria for print or electronic distribution. WIT.69.04
    05. Demonstrate ability to control flattening of a transparent PDF document and misregistration. WIT.69.05
    06. Demonstrate color management techniques that affect on-screen display and printing. WIT.69.06
    07. Discuss methods and tools used to review a PDF document (email, shared, tracking). WIT.69.07

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0. Create and manage PDF forms. The student will be able to: WIT.70.0
    01. Create an interactive from using fields, form objects, and distribution methods. WIT.70.01
    02. Distribute a form electronically and manage distributed forms. WIT.70.02
    03. Demonstrate ability to redact content in a form to protect sensitive information. WIT.70.03
    04. Preview, test, and modify an interactive form. WIT.70.04
0. Incorporate PDF security in a PDF document. The student will be able to: WIT.71.0
    01. Secure a PDF document using passwords, encryption, digital IDs and signatures. WIT.71.01
    02. Creating Security Policies and Certificates for a PDF document. WIT.71.02
    03. Enable usage rights for Adobe Readers. WIT.71.03
0. Demonstrate proficiency using HTML5 features and functions. The student will be able to: WIT.72.0
    01. Apply HTML5 APIs in webpages for interactivity (e.g., audio/video, drag & drop, drawing canvas). WIT.72.01
    02. Apply HTML5 interactivity elements into webpages (i.e., <canvas>, <embed>, <audio>, <video>, <details> <input>). WIT.72.02
    03. Utilize HTML5 fallback strategies to address browser support issues. WIT.72.03
    04. Utilize HTML5 to define dynamic behaviors using JavaScript. WIT.72.04
    05. Use HTML5 specification to manipulate text and images. WIT.72.05
    06. Use HTML5 to create persistent data and single session storage (HTML 5 Local Offline Storage & Session Storage). WIT.72.06
    07. Use HTML5 for media event handling (audio, video, embed, image). WIT.72.07
    08. Use HTML5 event handling for window, mouse, and form events. WIT.72.08
    09. Use CSS3 to style HTML5 (e.g., transitions, typography enhancements). WIT.72.09