CAREER CLUSTER™: INFORMATION TECHNOLOGY
NM Job Council's 13 Economic Sectors Primary Alignment: Integrated IT and Cyber-technology (non-governmental)

Pathways and related Programs of Study in this career cluster address careers in building linkages in IT occupations for entry level, technical and professional careers related to the design, development, support and management of hardware, software, multimedia and systems integration services.

The Pathways for this Career Cluster™ are:
- Information Support and Services
- Network Systems
- Programming and Software Development
- Web and Digital Communications

	Program Learning Outcomes from the NASDCTE Common Career Technical Core for the Information Technology Cluster: Note: it is expected that a student completing any Program of Studies in this Career Cluster would transition to post secondary college and career being able to know and do each of these Standards, unless otherwise noted.
1.	Demonstrate effective professional communication skills and practices that enable positive customer relationships.
2.	Use product or service design processes and guidelines to produce a quality information technology (IT) product or service.
3.	Demonstrate the use of cross-functional teams in achieving IT project goals.
4.	Demonstrate positive cyber citizenry by applying industry-accepted ethical practices and behaviors.
5.	Explain the implications of IT on business development.
6.	Describe trends in emerging and evolving computer technologies and their influence on IT practices.
7.	Perform standard computer backup and restore procedures to protect IT information.
8.	Recognize and analyze potential IT security threats to develop and maintain security requirements.
9.	Describe quality assurance practices and methods employed in producing and providing quality IT products and services.
10.	Describe the use of computer forensics to prevent and solve information technology crimes and security
11.	Demonstrate knowledge of the hardware components associated with information systems.
12.	Compare key functions and applications of software and determine maintenance strategies for computer systems.

THE CERTIFICATIONS LISTED BELOW ARISE FROM INTERVIEWS, WEBINARS, AND FOCUS GROUPS WITH SECONDARY AND POST SECONDARY EDUCATORS AS WELL AS INPUT FROM INDUSTRY PARTNERS AND REPRESENTATIVES. THE NEXT STEP FOR VALIDATION IS LABOR MARKET DATA AND THE ECONOMIC NEEDS OF BOTH THE STATE OF NEW MEXICO AND THE REGIONS.

Workforce Certification:	
• CompTIA A+ • CompTIA Linux+ • CompTIA Network+ • CompTIA Server+ • O'Reilly Python Certification Level 1 • Cisco Networking	• Sun/Oracle JAVA SE7 Certification • Microsoft Office Specialist (MOS) • Microsoft Certified Professional

Below are the POS's developed by the statewide stakeholders who participated in the development process.

Information Support and Services: Careers in Information Support and Services involve IT deployment, including implementing computer systems and software, providing technical assistance and managing information systems. Successful IT deployment — implementation of computer systems and software, provision of technical assistance, creation of technical documentation and management of information systems — is critical to the success of most 21st century organizations. People with expertise in Information Support and Services are in high demand for a variety of positions in organizations of all sizes and types, doing work such as integrating multiple databases at a global investment company, enabling employees to share information between the New York, Paris and Hong Kong offices and improving service to customers.

Program Learning Outcomes from the NASDCTE Common Career Technical Core for the INFORMATION SUPPORT AND SERVICES PATHWAY: *Note: it is expected that a student completing the Program of Studies listed below would transition to post secondary college and career being able to know and do each of these Standards, unless otherwise noted.*	
1.	Provide technology support to maintain service.
2.	Manage operating systems and software applications, including maintenance of upgrades, patches and service packs.
3.	Apply appropriate troubleshooting techniques in resolving computer hardware, software and configuration problems.
4.	Perform installation, configuration and maintenance of operating systems.
5.	Demonstrate the use of networking concepts to develop a network.
6.	Evaluate the effectiveness of an information system.
7.	Employ system installation and maintenance skills to setup and maintain an information system.
8.	Employ system administration and control skills in support of an information system.
9.	Employ technical writing and documentation skills in support of an information system.
10.	Apply quality assurance processes to maximize information system operation.

PROGRAM OF STUDY COURSE SEQUENCE FOR THE INFORMATION SUPPORT AND SERVICES PATHWAY: *Note: it is expected that a student completing the Program of Studies listed below would transition to post secondary college and career being able to know and do each of these Standards, unless otherwise noted.*				
	9th Grade	10th Grade	11th Grade	12th Grade
Career and Technical Courses and/or Degree Major Courses as Dual Credit	0316 Computing Systems	0317 Computer Technology	323 Computer Science	0397 Computer and Information Sciences Work Site Experiences - Cooperative Education - OJT
GenYes Program	0316 Computing Systems	0320 Computer Technology Assistant I	0321 Computer Technology Assistant II	0322: Computer Technology Assistant III

Program Learning Outcomes Matrix FOR THE INFORMATION SUPPORT AND SERVICES PATHWAY: Note: each dot represents the understanding that the student taking that course would have the best opportunity to know and be able to do the CCTC knowledge and skill standards listed above.												
Courses in the POS		Program Learning Outcomes										
STARS No.	Course Title	1	2	3	4	5	6	7	8	9	10
0316	Computing Systems	X	X	X	X						
0317	Computer Technology										
0323	Computer Science/Programming										
0397	Computer and Information Sciences Work Site Experiences - Cooperative Education - OJT										

STARS No.	Course Descriptions:
0316	Computing Systems Recommended for Students Grades (Need grade levels) - Courses offer a broad exploration of the use of computers in a variety of fields. Course content may have a considerable range, but typically includes; the introduction of robotics and control systems, computer assisted design, computer aided manufacturing systems, and other computer technologies as they relate to industry applications.
0317	Computer Technology Recommended for Students Grades (Need grade levels) Courses introduce students to the features, functions, and design of computer hardware, and provide instruction in the maintenance and repair of computer components and peripheral devices.
0323	Computer Science/Programming Recommended for Students Grades (Need grade levels) - Courses provide the background knowledge and skills to construct computer programs in one or more languages. Computer coding and program structure are often introduced with the BASIC language, but other computer languages such as Pascal or COBOL may be used instead. Initially, students learn to structure, create, document, and debug computer programs. In advanced courses, more emphasis is placed on design, skills to relevant applications such as modeling, data management, graphics, and text processing.
0397	Computer and Information Sciences Work Site Experiences - Cooperative Education – OJT - Recommended for Students Grades (Need grade levels). Through these courses, work experience is gained within either the computer or information sciences fields. Goals will be set cooperatively by the student, teacher, and employer: classroom attendance, related classroom training experience, and related course work are an integral part of the Computer and Information Sciences

Network Systems: Careers in Network Systems involve network analysis, planning and implementation, including design, installation, maintenance and management of network systems. Successful establishment and maintenance of information technology infrastructure is critical to the success of almost every 21st century organization. People with expertise in Network Systems are in high demand for a variety of positions in organizations of all sizes and types, doing work such as creating and maintaining the infrastructure in medical facilities that enables multiple doctors to view the same patient's X-rays in real-time to determine the diagnosis and the best treatment.

Program Learning Outcomes from the NASDCTE Common Career Technical Core for NETWORK SYSTEMS CAREER PATHWAY: *Note: it is expected that a student completing the Program of Studies listed below would transition to post secondary college and career being able to know and do each of these Standards, unless otherwise noted.*	
1.	Analyze customer or organizational network system needs and requirements.
2.	Analyze wired and wireless network systems to determine if they meet specifications (e.g., IEEE, power, security).
3.	Design a network system using technologies, tools and standards.
4.	Perform network system installation and configuration.
5.	Perform network administration, monitoring and support to maintain a network system.

Program of Study Course Sequence for Network Systems Career Pathway: *Note: it is expected that a student completing the Program of Studies listed below would transition to post secondary college and career being able to know and do each of these Standards, unless otherwise noted.*				
	9th Grade	10th Grade	11th Grade	12th Grade
Career and Technical Courses and/or Degree Major Courses as Dual Credit	0317 Computer Technology	0318 Network Technology	0319 Computer Networking II	0397 Computer and Information Sciences Work Site Experiences - Cooperative Education – OJT
Suggestions for Enrichment to POS			0323 Computer Science/Programming 0326 Computer Programming – Other Language 320 Computer Tech Assistant	

Program Learning Outcomes Matrix FOR THE INFORMATION SUPPORT AND SERVICES PATHWAY:
Note: each dot represents the understanding that the student taking that course would have the best opportunity to know and be able to do the CCTC knowledge and skill standards listed above.

Courses in the POS		Program Learning Outcomes				
STARS No.	Course Title	1	2	3	4	5
0317	Computer Technology		X		X	
0318	Network Technology	X	X	X	X	X
0319	Computer Networking II	X	X	X	X	X
0397	Computer and Information Sciences Work Site Experiences - Cooperative Education – OJT					

STARS No.	Course Descriptions:
0317	Computer Technology Recommended for Students Grades (Need grade levels) - Courses introduce students to the features, functions, and design of computer hardware, and provide instruction in the maintenance and repair of computer components and peripheral devices.
0318	Network Technology Recommended for Students Grades (Need grade levels) Courses introduce students to the technology involved in the transmission of data between and among computers through data lines, telephone lines, or other transmission media (such as hard wiring, cable television networks, radio waves, and so on). The course may emphasize the capabilities of networks, network technology itself, or both. Content topics emphasizing network capabilities include electronic mail, public networks and electronic bulletin boards; topics emphasizing the technology include network software, hardware, and peripherals involved in setting up and maintaining a computer network.
0319	Computer Networking II Grades 11-12 – In Computer Networking II the student works more independently and continues to split his/her time between the classroom and in the field, working on the school's local network and supporting Level I students. The student works on a live network as he/she is exposed to the many components of network management. The course is designed to train the student in the implementation of network management tools that support such network issues as security, ethics, software, hardware, and business. The student becomes familiar with: • Software – Microsoft, Symantec, LAN Guard, 3Com, Adobe and more • Hardware – At the systems and component level, Server versus Client • Network systems – Hardware, Software, and Management Tools Network Topology, Protocols and Standards • The Business Side of Network Management (This includes development of a Business Plan.) Methods of Quality Control & Tools
0397	Computer and Information Sciences Work Site Experiences - Cooperative Education – OJT - Recommended for Students Grades (Need grade levels). Through these courses, work experience is gained within either the computer or information sciences fields. Goals will be set cooperatively by the student, teacher, and employer: classroom attendance, related classroom training experience, and related course work are an integral part of the Computer and Information Sciences

Programming and Software Development: Careers in Programming and Software Development involve the design development implementation and maintenance of computer systems and software, requiring knowledge of computer operating systems, programming languages and software development. People with expertise in programming and software development work with cutting-edge technologies to develop tomorrow's products for use by businesses and consumers. While many of the career opportunities in this area are in software companies, large organizations of other types—such as Financial Services and Business—also offer many opportunities. People with expertise in programming and software development are in high demand.

Program Learning Outcomes from the NASDCTE Common Career Technical Core for PROGRAMMING AND SOFTWARE DEVELOPMENT: *Note: it is expected that a student completing the Program of Studies listed below would transition to post secondary college and career being able to know and do each of these Standards, unless otherwise noted.*	
1.	Analyze customer software needs and requirements.
2.	Demonstrate the use of industry-standard strategies and project planning to meet customer specifications.
3.	Analyze system and software requirements to ensure maximum operating efficiency.
4.	Demonstrate the effective use of software development tools to develop software applications.
5.	Apply an appropriate software development process to design a software application.
6.	Program a computer application using the appropriate programming language.
7.	Demonstrate software testing procedures to ensure quality products.
8.	Perform quality assurance tasks as part of the software development cycle.
9.	Perform software maintenance and customer support functions.
10.	Design, create and maintain a database.

PROGRAM OF STUDY COURSE SEQUENCE FOR PROGRAMMING AND SOFTWARE DEVELOPMENT:
Note: it is expected that a student completing the Program of Studies listed below would transition to post secondary college and career being able to know and do each of these Standards, unless otherwise noted.

	9th Grade	10th Grade	11th Grade	12th Grade
Career and Technical Courses and/or Degree Major Courses as Dual Credit	0323: Computer Science/ Programming	0326: Computer Programming - Other Language	*Must be developed by a post secondary institution: Web Programming Development or UNM CS108 (CS4ALL) Or AP Computer Science Principles*	Must be developed by a post secondary institution: *Computer Programming or 327 AP Computer Science A*
CCRB Approved Career Technical Education (CTE) program of study	1615 Science Introduction to Engineering Design	1617 Principles of Engineering TBD Digital Electronics	TBD Computer Science & Software Engineering TBD Environmental Sustainability	1619 Engineering Design & Development

Program Learning Outcomes Matrix for Programming and Software Development: Note: each dot represents the understanding that the student taking that course would have the best opportunity to know and be able to do the CCTC knowledge and skill standards listed above.												
Courses in the POS		Program Learning Outcomes										
STARS No.	Course Title	1	2	3	4	5	6	7	8	9	10
0323	Computer Science/ Programming				X	X	X	X			
0326	Computer Programming - Other Language			X	X	X	X				

STARS No.	Course Descriptions:
0323	Computer Science/Programming Recommended for Students Grades (Need grade levels) Courses provide the background knowledge and skills to construct computer programs in one or more languages. Computer coding and program structure are often introduced with the BASIC language, but other computer languages such as Pascal or COBOL may be used instead. Initially, students learn to structure, create, document, and debug computer programs. In advanced courses, more emphasis is placed on design, skills to relevant applications such as modeling, data management, graphics, and text processing.
0326	Computer Programming - Other Language Recommended for Students Grades (Need grade levels) Courses provide the opportunity to gain expertise in computer programs using languages other than BASIC and Pascal, such as FORTRAN, COBOL, C, and so on. Emphasis is on how to structure and document computer programs, and how to use problem solving techniques. As students advance, they learn to capitalize on the features and strengths of the language being used.
0330	Database Programming with SQL – Oracle Academy Recommended for Students Grades 9 – 12 This is the second portion of the Database Design and Programming with SQL course. In this portion, students implement their database design by creating a physical database using SQL, the industry-standard database programming language. Upon completion of this course, students have the opportunity to sit for the first of two exams required to earn the Oracle Certified Associate.

Web and Digital Communications: Careers in Web and Digital Communications involve creating, designing and producing interactive multimedia products and services, including development of digitally-generated or computer-enhanced media used in business, training, entertainment, communications and marketing. Organizations of all types and sizes use digital media (the World Wide Web, CD-ROM, DVD) to communicate with existing and potential customers, to track transactions, and to collaborate with colleagues. Web and digital communications experts can find employment opportunities in organizations of all sizes and types, doing work such as creating e-business auction Web sites that allow people around the world to buy and sell items in real-time.

Program Learning Outcomes from the NASDCTE Common Career Technical Core for WEB AND DIGITAL COMMUNICATIONS: *Note: it is expected that a student completing the Program of Studies listed below would transition to post secondary college and career being able to know and do each of these Standards, unless otherwise noted.*	
1.	Analyze customer requirements to design and develop a web or digital communication product.
2.	Apply the design and development process to produce user-focused web and digital communications solutions.
3.	Write product specifications that define the scope of work aligned to customer requirements.
4.	Demonstrate the effective use of tools for digital communication production, development and project management.
5.	Develop, administer and maintain web applications.
6.	Design, create and publish a digital communication product based on customer needs.
7.	Evaluate the functionality of a digital communication product using industry accepted techniques and metrics.
8.	Implement quality assurance processes to deliver quality digital communication products and services.
9.	Perform maintenance and customer support functions for digital communication products.
10.	Comply with intellectual property laws, copyright laws and ethical practices when creating web/ digital communications.

POS Course Sequence for Web and Digital Communications for Web and Digital Communications: *Note: it is expected that a student completing the Program of Studies listed below would transition to post secondary college and career being able to know and do each of these Standards, unless otherwise noted.*				
	9th Grade	10th Grade	11th Grade	12th Grade
Career and Technical Courses and/or Degree Major Courses as Dual Credit	304 Computer Applications	0315 Computer Graphics	307 Computer Graphics II	276 Web Page Design

Program Learning Outcomes Matrix for Web and Digital Communications: *Note: each dot represents the understanding that the student taking that course would have the best opportunity to know and be able to do the CCTC knowledge and skill standards listed above.*												
Courses in the POS		Program Learning Outcomes										
STARS No.	Course Title	1	2	3	4	5	6	7	8	9	10	
304	Computer Applications											
315	Computer Graphics	X	X	X	X		X					
307	Computer Graphics II											
276	Web Page Design											

STARS No.	Course Descriptions:
304	Computer Applications Grades 10-12 – In Computer Applications II, the emphasis is on the mastery of advanced computer usage techniques for post high school education and career enhancement. Topics include: language scripting, advanced telecommunications with national and international access, the consolidation of word processing, database and spreadsheet skills into report production, advanced computer graphic manipulation, desktop integration for industry publication, beginning multi-platform network information management, and multimedia presentations.
0307	Computer Graphics II Recommended for Grades 10-12 In Computer Graphics II, the student learns a new medium with which to create art. The student learns the basics of visual design elements and principles, learns to use the computer as a visual design medium and develops skill, confidence, and sensitivity in applying knowledge of art media and techniques to the production of art work. The student receives training in an industry standard bitmap graphics program (e.g., Adobe PhotoShop) in addition to a vector-based (e.g., Illustrator, AppleWorks, FreeHand) graphics program. The production of computer art is applied to various other content areas and acquired skills are related to careers in art and other fields that now require computer graphics capabilities. Areas of study are visual design, conventions and history, technical literacy, visual communication, career awareness, and preparation of work for public display.
0315	Computer Graphics Recommended for Students Grades (Need grade levels) Courses provide students with the opportunity to explore the capability of the computer to produce visual imagery and to apply graphic techniques to various fields, such as advertising, TV/ video, and architecture. Modeling, simulation, animation, and image retouching are possible course topics.
276	Web Page Design Recommended for Students Grades 7 - 12 Course emphasizes skill development that will enable students to author, edit, debug, evaluate and publish web pages on a server. The basics of planning and creating Web Pages, using text editors, and HTML editors, selecting and adding images, choosing background colors, creating active internal and external links, adding lists and testing pages created are also covered