



Delaware Department of Education
 CTE & STEM Office
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DELAWARE CTE PROGRAM OF STUDY APPLICATION

LOCAL EDUCATION AGENCY INFORMATION

Local Education Agency (LEA):

School(s) where the Program of Study will be Located:

Program of Study Start Date:

LEA CTE Coordinator Name:

Phone:

E-Mail Address:

Career Cluster Title:

Information Technology

Career Pathway Title:

Networking Systems

Program of Study Title:

Cisco Networking Academy

CTE Program of Study Course Titles & Sequence:

1. IT Essentials (ITE)
2. To be determined by the Local Education Agency (LEA) – select one of the following courses:
 NDG Linux Essentials (NDG), AP Computer Science Principles (CSP), or AP Computer Science A (CSA)
3. CCNA: Introduction to Networks (IN)
4. CCNA: Routing and Switching Essentials (RSE)
5. CCNA: Scaling Networks (SN)
6. CCNA: Connecting Networks (CN)

CTE Program of Study Request:

- State-model CTE Program of Study
 Local CTE Program of Study

ASSURANCES & SIGNATURES

CTE Program of Study approval and funding is contingent upon the following assurances:

1. The LEA will comply with Delaware Administrative Code, 14 Del.C. §525, Requirements for Career and Technical Education Programs and the Delaware State Plan for the Carl D. Perkins Career and Technical Education Act of 2006;
2. The LEA will submit CTE program data as required by the Delaware Department of Education;
3. All teachers are certified in the appropriate CTE area and participate in program specific professional learning;
4. The LEA will convene and engage a program advisory committee for the purposes of program development, implementation, and continuous improvement;
5. All students have equal access to the program of study as well as early career/early college options;
6. Career and Technical Student Organizations are integral components of the program of study;
7. The LEA will maintain safe facilities and equipment aligned with the program of study goals; and
8. A process for continuous improvement has been established, which includes a model of evaluation and program improvement.

LEA CTE Coordinator Signature:

Date:

LEA Chief School Officer Signature:

Date:

PROGRAM ADVISORY COMMITTEE MEMBER INFORMATION

Complete the list of program advisory committee members. Program of study representatives should include, but are not limited to: CTE and academic teachers, CTE/curriculum district coordinators, school counselors, business and industry representatives, labor representatives, and post-secondary partners. Community stakeholders including parents and students can also be considered. *Attach additional information if applicable.*

Name:	Title:
Affiliation:	
Address:	
Phone:	E-Mail:
Area of Expertise:	
Representing: <input type="checkbox"/> Business/Industry <input type="checkbox"/> Secondary Education <input type="checkbox"/> Post-Secondary Education <input type="checkbox"/> Community/Other	

Name:	Title:
Affiliation:	
Address:	
Phone:	E-Mail:
Area of Expertise:	
Representing: <input type="checkbox"/> Business/Industry <input type="checkbox"/> Secondary Education <input type="checkbox"/> Post-Secondary Education <input type="checkbox"/> Community/Other	

Name:	Title:
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Address:	

Phone:	E-Mail:
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Representing: <input type="checkbox"/> Business/Industry <input type="checkbox"/> Secondary Education <input type="checkbox"/> Post-Secondary Education <input type="checkbox"/> Community/Other	
Name:	Title:
Affiliation:	
Address:	
Phone:	E-Mail:
Area of Expertise:	
Representing: <input type="checkbox"/> Business/Industry <input type="checkbox"/> Secondary Education <input type="checkbox"/> Post-Secondary Education <input type="checkbox"/> Community/Other	
Name:	Title:
Affiliation:	
Address:	
Phone:	E-Mail:
Area of Expertise:	
Representing: <input type="checkbox"/> Business/Industry <input type="checkbox"/> Secondary Education <input type="checkbox"/> Post-Secondary Education <input type="checkbox"/> Community/Other	

LABOR MARKET DEMAND

Certify that a labor market needs analysis has been completed for the proposed CTE program of study.

Attach the [Labor Market Information \(LMI\) Review](#) document.

Access the [Labor Market Information \(LMI\) Review](#) document.

- The LEA certifies that regional, state, and local labor market data have been reviewed to assure a demand exists for the POS occupations and that the number of POS completers will not significantly exceed this demand. Department of Labor data are available and/or documented. Supporting evidence of supply and demand is submitted with this proposal.
- No data exist for POS due to a unique labor market demand. Supporting evidence of demand is submitted with this proposal. Evidence may include, but is not limited to: real-time labor market information, documentation of national, regional, state, or local labor trends, or letters from employers or workforce agencies documenting projected employment specific to the career pathway.

ACADEMIC AND TECHNICAL SKILL STANDARDS

List the academic, technical, and workplace skills and knowledge used to develop the program of study.

Title and source of academic standards:

[Common Core State Standards \(CCSS\)](#)

The Common Core State Standards (CCSS) are national standards that set clear college- and career-ready expectations for kindergarten through 12th grade in English language arts/literacy and Mathematics. The standards help to ensure that students graduating from high school are prepared to take credit bearing introductory courses in two- or four-year college programs and enter the workforce. The standards were developed by the nation's governors and education commissioners, through their representative organizations, the National Governors Association Center for Best Practices (NGA) and the Council of Chief State School Officers (CCSSO). Teachers, parents, school administrators, and experts from across the country provided input into the development of the standards. The implementation of the Common Core, including how the standards are taught, the curriculum developed, and the materials used to support teachers as they help students reach the standards, is led entirely at the state and local levels. For more information on CCSS, please visit the link above.

[Next Generation Science Standards \(NGSS\)](#)

The Next Generation Science Standards (NGSS) are national standards for science that lay out the disciplinary core ideas, science and engineering practices, as well as crosscutting concepts that students should master in preparation for college and careers. The standards were developed through a state-led effort that was managed by Achieve. The development of the NGSS involved the National Research Council (NRC), the National Science Teachers Association (NSTA), the American Association for the Advancement of Science (AAAS), and other critical partners such as K–12 teachers, state science and policy staff, higher education faculty, scientists, engineers, cognitive scientists, and business leaders. For more information on the NGSS, please visit the link above.

The Cisco Networking Academy identifies and develops the skills people and businesses need to thrive in a changing economy. Cisco, along with educators, employers, and technology experts to create courses that prepare students for the future and incorporates aspects of the Common Core State

Standards for English language arts/literacy and Mathematics, the Next Generation Science Standards, and other national standards where appropriate. A standards and objectives alignment tool is available for all courses at: <http://www.cisco.com/web/learning/netacad/us-can/docs/Cisco-Networking-Academy-Alignment-to-STEM-and-Ed-Standards-2013.pdf>.

Title and source of technical skill standards:

[International Technology & Engineering Educators Associate \(ITEEA\) – Standards for Technological Literacy:](#)

The Standards for Technological Literacy (STL) present a vision for what students should know and be able to do in order to be technologically literate. The standards describe what the content of technology education program should be in grades K-12 by setting forth a consistent expectation helping to ensure that all students receive effective instruction about technology. The STL was created under the ITEEA Technology for All Americans Project and was developed with hundreds of educators and professionals. For more information on STL, please visit the link above.

The Cisco Networking Academy is a national Career & Technical Education instructional program that incorporates aspects of the International Technology & Engineering Educators Associate (ITEEA) Standards for Technological Literacy. A standards and objectives alignment tool is available for all courses at:

<http://www.cisco.com/web/learning/netacad/us-can/docs/Cisco-Networking-Academy-Alignment-to-STEM-and-Ed-Standards-2013.pdf>.

[Computer Science Teachers Association Standards \(CSTA\):](#)

The Computer Science Standards provide a comprehensive set of standards for K-12 computer science education designed to strengthen computer science fluency and competency throughout primary and secondary schools. The standards are written in response to the pressing need to provide academic coherence between coursework and the rapid growth of computing and technology in the modern world, alongside the need for an educated public that can utilize and build that technology most effectively for the benefit of society. The standards have been vetted by partners at the national level through the CTSA standards taskforce. For more information on CSTA, please visit the link above.

[International Society for Technology in Education \(ISTE\) Standards:](#)

The ISTE Standards are standards for learning, teaching, and leading in the digital age and are widely recognized and adopted worldwide. The ISTE Standards for Students are used to evaluate the skills and knowledge students need to learn effectively and live productively in an increasingly global and digital world. The standards have been vetted by partners at the national level. For more information on the ISTE standards, please visit the link above.

Each of the courses within the Computer Science program of study have been benchmarked to the CSTA and ISTE standards. To review the standards alignment for the AP Computer Science Principles (CSP) course, please visit: <https://secure-media.collegeboard.org/digitalServices/pdf/ap/comp-sci-principles-draft-cf-final.pdf>. To review the standards alignment for the AP Computer Science A (CSA) course, please visit: <http://research.collegeboard.org/sites/default/files/publications/2012/7/researchreport-2011-8-common-core-state-standards-alignment-advanced-placement.pdf>.

Title and source of workplace or other skill standards, as applicable:

[Common Career Technical Core \(CCTC\)](#)

The Common Career Technical Core (CCTC) are national standards for Career & Technical Education (CTE) that help to inform the establishment of state standards and/or programs of study. The CCTC were developed by educators, school administrators, representatives from business and industry, faculty from higher education, as well as workforce and labor markets economists. The CCTC include a set of standards for each of the sixteen (16) Career Clusters and the corresponding Career Pathways that help to define what students should know and be able to do after completing instruction in a program of study. The CCTC standards for the Information Technology and STEM career clusters have been embedded into each course within the Cisco Networking Academy program of study. For more information on the CCTC, please visit the link above.

[Career Ready Practices \(CRP\)](#)

The Career Ready Practices (CRP) are a component of the CCTC framework and includes twelve (12) statements that address the knowledge, skills, and dispositions that are important to becoming career ready. The CRP describe the career-ready skills that educators should seek to develop in their students. These practices are not exclusive to a Career Pathway, program of study, discipline, or level of education and should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a career pathway. The CRP statements are embedded throughout the Cisco Networking Academy program of study to ensure students display the appropriate soft skills and workplace requirements necessary to be successful in a career. For more information on the CRP, please visit the link above.

[Partnership for 21st Century Skills: Learning and Innovative Skills](#)

The Partnership for 21st Century Skills has developed a unified, collective vision for learning known as the Framework for 21st Century Learning. This Framework describes the skills, knowledge and expertise students must master to succeed in work and life; it is a blend of content knowledge, specific skills, expertise and literacies. Every 21st century skills implementation requires the development of key academic subject knowledge and understanding among all students. Those who can think critically and communicate effectively must build on a base of key academic subject knowledge. Within the context of key knowledge instruction, students must also learn the essential skills for success in today's world, such as critical thinking, problem solving, communication and collaboration.

Learning and innovation skills are increasingly recognized as those that separate students who are prepared for a more and more complex life and work environments in the 21st century, and those who are not. A focus on creativity, critical thinking, communication and collaboration is essential to prepare students for the future.

EARLY CAREER AND EARLY COLLEGE OPPORTUNITIES

Identify CTE program of study early career opportunities, industry-recognized certifications and licenses, options for early college credit, two- and four-year degree and certification program alignment, and the technical skill attainment measures for the program of study. *Attach articulation/dual enrollment agreement(s).*

Describe early career opportunities (i.e. work-based learning experiences and industry-mentored projects):

The Cisco Networking Academy delivers a comprehensive learning experience to help students develop the

foundational information and communication technology (ICT) skills needed to design, build, and manage networks, along with career skills such as problem solving, collaboration, and critical thinking. Students' complete hands-on learning activities and network simulations to develop practical skills that will help them fill a growing need for networking professionals around the world. Work-based learning experiences and industry-mentored projects are included in each course and will be reviewed with the LEA Program Advisory Council (PAC) to further identify opportunities to engage the community.

List industry-recognized certifications and/or licenses, as appropriate (include the partner organization and credential):

- [Linux Essentials Professional Development Certificate:](#)
The Linux Essentials Professional Development Certificate (PDC) indicates the foundational skills and basic knowledge for those working and studying Open Source and various distributions of Linux. It serves as an ideal stepping-stone to the more advanced LPIC Professional Certification track for Linux Systems.
- [CompTIA A+:](#)
The CompTIA A+ certification is a vendor neutral certification that demonstrates competency as a computer technician and covers numerous technologies and operating systems from vendors such as Microsoft, Apple Inc., Novell, and some of the Linux distributions. The exams verify an ability to troubleshoot networking and security issues within these operating systems.
- [Cisco Certified Entry Networking Technician \(CCENT\)](#)
A Cisco Certified Entry Networking Technician (CCENT) credential validates the ability to install, operate and troubleshoot a small enterprise branch network, including basic network security. With a CCENT, a network professional demonstrates the skills required for entry-level network support positions including networking fundamentals, WAN technologies, basic security and wireless concepts, routing and switching fundamentals, and configuring simple networks. CCENT is the first step toward achieving the Cisco Certified Network Associate (CCNA) credential.
- [Cisco Certified Network Assistant \(CCNA\) Routing and Switching:](#)
The Cisco CCNA Routing and Switching certification demonstrates the knowledge and skills required to install, operate, and troubleshoot a small to medium size enterprise branch network. Topics include connecting to WAN, implementing network security, network types and media, routing and switching fundamentals, the TCP/IP and OSI models, IP addressing, WAN technologies, operating and configuring IOS devices, extending switched networks with VLANs, determining IP routes, managing IP traffic with access lists, establishing point-to-point connections, and establishing Frame Relay connections.

Cisco exam information can be found at: www.cisco.com/web/learning/tools/ccna_tools/index.html.

Describe early college credit options (i.e. advanced placement, dual enrollment, transcribed and/or articulated credit, credit by exam, pre-apprenticeship, other) and options for two- and four-year degree and/or certification program alignment (attach articulation/dual enrollment agreement). The partner organization and hours of credit earned should be included, as applicable:

The College Board partners with a broad range of colleges and universities across the country to recognize and reward the great work being accomplished in AP courses. Each college and university will make its own

decisions about awarding credit and placement and most have a written policy earned credit for a given AP Exam, the amount of credit awarded, and how credits are applied. Opportunities for students typically include earned college credit, scholarships, and placement. For more information on the [College Board](#), please visit the link provided.

Districts may offer AP Computer Science Principles or AP Computer Science A as the second course in the program of study. Students receiving a 3 or higher on one of the AP Computer Science College Board examinations may be eligible for college credit upon the approval of the receiving institution.

Delaware students receiving a score of 4 or higher on the AP Computer Science A assessment, who have completed and passed pre-calculus and who have illustrated college readiness in math and ELA can receive advanced credit for CIS120 - Introduction to Programming (4 credits) at **Delaware Technical Community College**. This course is offered in the following AAS degree programs:

- Computer Information Systems
- Computer Network Engineering
- Information Security
- Web Development

Delaware students receiving a passing score on the CCNA certifications and who have illustrated college readiness in math and ELA can receive advanced credit for CNE191 – Router Configuration (3 credits) and CNE192 – Network Administration (4 credits) at **Delaware Technical Community College**. These courses are offered in the following AAS degree program:

- Computer Network Engineering

List technical skill attainment measures for the program of study (i.e. industry recognized certification or license, advanced placement, dual enrollment, transcribed and/or articulated credit, dual enrollment, credit by exam):

Certification/credentialing exam (specify):

[CompTIA A+](#) certification requires student to pass both of the following exams:

[CompTIA A+ 220-801](#)

[CompTIA A+ 220-802](#)

[CCENT](#) certification requires student to pass the following exam:

[ICND1 v 2.0 \(100-101\)](#)

[CCNA Routing and Switching](#) certification requires student to pass the following:

[ICND1 v 2.0 \(100-101\) AND ICND2 v 2.0 \(200-101\)](#)

OR

[CCNA Composite v 2.0 \(200-120\)](#)

Nationally recognized exam (specify):

[Advanced Placement – Computer Science Principles](#)

[Advanced Placement – Computer Science A](#)

Advanced standing (specify):

[Delaware Technical Community College:](#)

CIS120 - Introduction to Programming

CNE191 – Router Configuration

CNE192 – Network Administration

[Delaware State University](#): In Progress

[University of Delaware](#): In Progress

[Wilmington University](#): In Progress

POS OVERVIEW, COURSE DESCRIPTIONS, END-OF-COURSE, AND PROGRAM ASSESSMENTS

Provide a CTE program of study overview that broadly describes the program and student expectations. Identify end-of-program assessment(s) and opportunities for students to participate in early college and early career experiences. List each course title in the CTE program of study. Provide an overview of each course and define what students should know and be able to demonstrate upon completion of each level. Identify appropriate end-of-course assessment(s).

CTE Program of Study Overview:

The Cisco Networking Academy program of study blends the content and experiences of computer networking and computer science to help students develop a well-rounded and adaptable skill base. The program prepares students for continuing education and careers in computer networking and computer science, as well as those that may require skills in both fields. The CTE program consists of six (6) courses including:

- **IT Essentials (ITE)** provides students with an overview of the responsibilities of an Information Technology professional, as well as the fundamentals of computer hardware and software and advanced concepts such as security and networking. Students will complete Comp TIA A+ certification assessment requirements.

The LEA will select one of the following courses: NDG Linux Essentials, AP Computer Science Principles, or AP Computer Science A.

- **NDG Linux Essentials (NDG)** provides students with the fundamentals of the Linux operating system, command line, and open source concepts. The Linux virtual machine is embedded in the course; allowing students to experiment with Linux commands.
- **AP Computer Science Principles (CSP)** allows students to understand the real-world impact of computing applications and programming literacy using a multidisciplinary approach. Students are introduced to creative aspects of programming, using abstractions and algorithms, working with large data sets, understandings of the internet and issues of cybersecurity, as well as impacts of computing that affect different populations. CSP gives students the opportunity to use current technologies to solve problems and create meaningful computational artifacts.
- **AP Computer Science A (CSA)** allows students to solve problems, work with design strategies and methodologies, organize data through data structures, apply data processing techniques, analyze potential solutions, and investigate ethical and social implications of computing. The course emphasizes both object-oriented and imperative problem solving and design using Java language. The CSA course curriculum is compatible with many CS1 courses at the college and university level.

The following four courses are required:

- **CCNA: Introduction to Networks (IN)** provides students the opportunity to learn about the architecture, structure, functions and components of the Internet and other computer networks. Students gain an understanding of how networks operate.
- **CCNA: Routing and Switching Essentials (RSE)** allows students to understand the architecture, components, and operations of routers and switches in a small network. Students learn how to configure a router and switch for basic functionality.
- **CCNA: Scaling Networks (SN)** provides students with an overview of the architecture and operations of routers and switches in large, complex networks. Students will configure and troubleshoot routing and switching technologies and protocols.
- **CCNA: Connecting Networks (CN)** offers students the opportunity to learn WAN technologies and network services employed by converged applications in a complex network. Students will configure and troubleshoot network devices and implement virtual private networks.

The Cisco CCNA curriculum is aligned with the globally recognized Cisco CCENT and CCNA certifications, further validating skills to potential employers. Upon completion of the four required CCNA Routing & Switching courses, students may choose to complete CCENT and/or CCNA certification assessment requirements.

End-of-Program Assessment(s):

- Certification/credentialing exam (specify): [CompTIA A+, CCENT, and CCNA certification exams](#)
- Licensing exam (specify): _____
- Nationally recognized exam (specify): _____
- Other (specify): [Cisco Network Assessments](#)

Course title:

IT Essentials (ITE)

Course description (include prerequisites):

The IT Essentials (ITE) curriculum emphasizes practical experience to help students develop fundamental computer and career skills. ITE helps students prepare for entry-level career opportunities in Information Computer Technology (ICT) and the CompTIA A+ certification. The course also provides a learning pathway to Cisco CCNA. IT Essentials curriculum provides an introduction to the computer hardware and software skills needed to help meet the growing demand for entry-level ICT professionals. The curriculum covers the fundamentals of computer hardware and software as well as advanced concepts such as security, networking, and the responsibilities of an ICT professional.

There are no pre-requisites for this course.

Course knowledge and skills (what students will know and be able to do):

By the end of this course, students will:

1. Identify, describe and operate/replace/repair the internal components of a computer, install an operating system, and trouble shoot using system tools and diagnostic software.
2. Perform a step-by-step assembly of a desktop computer, install and share a printer, connect to the Internet, and share resources in a networked environment.
3. Create a plan to protect people, equipment, and environments from accidents, damage, and contamination and explain the purpose of preventive maintenance and identify the elements of the troubleshooting process.
4. Perform preventive maintenance and advanced troubleshooting, upgrade or replace components of a laptop, and implement basic hardware and software security principles.
5. Install and navigate an operating system, configure computers to connect to an existing network, assess customer needs, analyze possible configurations, and provide solutions or recommendations for hardware, operating systems, networking, and security.

End-of-Course Assessment(s):

- Teacher designed assessment
- LEA designed assessment
- Certification/credentialing exam (specify): [CompTIA A+](#)
- Licensing exam (specify): _____
- Nationally recognized exam (specify): _____
- Other (specify): [Cisco Network Assessments](#)

Course title:

*NDG Linux Essentials (NDG)

Course description (include prerequisites):

The NDG Linux Essentials course provides an introduction to Linux and includes curriculum content, lab exercises, and assessments within an engaging, hands-on learning environment. This course implements a "practice as you read" approach to learning. Each learner has hands-on access to a Linux virtual machine, allowing them to practice and explore at the Linux command line, as they progress through the course. The skills taught in this course are applicable to a wide range of careers including networking, software development, and Linux administration.

There are no prerequisites for this course.

Course knowledge and skills (what students will know and be able to do):

By the end of this course, students will:

1. Describe the pros and cons of using a Linux operating system and explain considerations for choosing an operating system and understand some of the basics of open source software and licensing.
2. Use basic command line skills in Linux as an entry to use of help commands and navigation of help systems.

3. Work with Linux files and directories to search and extract data from files and to create, move, and delete data from Linux systems. Archive files and develop a basic understanding of the concept of scripting.
4. Develop a robust familiarity with the hardware components of desktop and server computers and learn where data is stored on a Linux system.
5. Query vital network settings for a Linux computer on a Local Area Network, identify various types of users and create users and groups and manage file permissions and ownership within a Linux system.

End-of-Course Assessment(s):

- Teacher designed assessment
- LEA designed assessment
- Certification/credentialing exam (specify): [Linux Essentials Professional Development Certificate](#)
- Licensing exam (specify): _____
- Nationally recognized exam (specify): _____
- Other (specify): _____

Course title:

*AP Computer Science Principles (CSP)

Course description (include prerequisites):

The Advanced Placement (AP) Computer Science Principles (CSP) course engages students in the computer science discipline and prepare a pipeline of STEM majors by focusing on the creative aspect of computing and computational thinking. Students will experience how computing impacts their everyday lives by creating artifacts with practical, personal, or societal intent. Further, students will collaborate with others to pose problems, develop projects, implement solutions and evaluate outcomes. The course promotes student innovation and exploration related to computer science.

Course Knowledge and Skills (what students will know and be able to do):

By the end of this course, students will:

1. Identify impacts of computing; describe connections between people and computing; and explain connections between computing concepts to recognize implications for individuals, society, commercial markets, and innovation due to developments in computing.
2. Create an artifact with a practical, personal, or societal intent; select appropriate techniques to develop a computational artifact; and use appropriate algorithmic and information-management principles to design and develop interesting computational artifacts and apply computing techniques to creatively solve problems.
3. Explain how data, information, or knowledge are represented for computational use; explain how abstractions are used in computation or modeling; identify abstractions; and describe modeling in a computational context to develop models and simulations of natural and artificial phenomena, use them to make predictions about the world, and analyze their efficacy and validity.

4. Evaluate a proposed solution to a problem; locate and correct errors; explain how an artifact functions; and justify appropriateness and correctness to design and produce solutions, models, and artifacts, and evaluate and analyze computational work.
5. Explain the meaning of a result in context; describe computation with accurate and precise language, notation, or visualization; and summarize the purpose of a computational artifact to describe computation and the impact of technology and computation, explain and justify the design and appropriateness of computational choices, and analyze and describe both computational artifacts and the results or behaviors of such artifacts.
6. Collaborate with another student in solving a computational problem; collaborate with another student in producing an artifact; share the workload by providing individual contributions to overall collaborative effort; foster a constructive collaborative climate by resolving conflicts and facilitating the contributions of a partner or team member; exchange knowledge and feedback with a partner or a team member; and review and revise work as needed to create a high quality artifact to learn to collaborate effectively including drawing on diverse perspectives, skills, and backgrounds of peers to address complex and open-ended problems.

End-of-Course Assessment(s):

- Teacher designed assessment
- LEA designed assessment
- Certification/credentialing exam (specify): _____
- Licensing exam (specify): _____
- Nationally recognized exam (specify): [College Board Advanced Placement Exam: Computer Science Principles](#)
- Other (specify): _____

Course title:

*AP Computer Science A (CSA)

Course description (include prerequisites):

The Advanced Placement (AP) Computer Science A (CSA) course emphasizes object-oriented programming methodology with a concentration on problem solving and algorithm development. The course includes the study of data structures, design, and abstraction. A large part of the course is built around the development of computer programs that correctly solve a given problem, while developing the use of logic and formal methods of programming.

Prerequisites:

The assumed prerequisites for entering the AP Computer Science A course include knowledge of basic English and algebra. A student in the AP Computer Science A course should be comfortable with functions and the concepts found in the uses of function notation, such as $f(x) = x + 2$ and $f(x) = g(h(x))$. It is important that students and their advisers understand that any significant computer science course builds upon a foundation of mathematical reasoning that should be acquired before attempting such a course.

Course knowledge and skills (what students will know and be able to do):

By the end of this course, students will:

1. Design, implement, and analyze solutions to problems; use and implement commonly used algorithms; and use standard data structures to specify and design a program that is understandable and can be adapted to changing circumstances.
2. Develop and select appropriate algorithms and data structures to solve new problems; and write solutions fluently in an object-oriented paradigm to state solutions in a precise form that invites review and analysis.
3. Write, run, test, and debug solutions in the Java programming language, utilizing standard Java library classes and interfaces from the AP Java subset to implement solutions in a standard programming language to reinforce concepts, allow potential solutions to be tested, to encourage discussion of solutions and alternatives, as well as examine and test programs to determine whether they correctly meet their specifications.
4. Read and understand programs consisting of several classes and interacting objects; and read and understand a description of the design and development process leading to a program to recognize and analyze the structure/function and efficiency of a given program.
5. Investigate legal issues and social and ethical ramifications of computer use to understand the ethical and social implications of computer use.

The goals of the AP Computer Science A course are comparable to those in the introductory course for computer science majors offered in many college and university computer science departments.

End-of-Course Assessment(s):

- Teacher designed assessment
- LEA designed assessment
- Certification/credentialing exam (specify): _____
- Licensing exam (specify): _____
- Nationally recognized exam (specify): [College Board Advanced Placement Exam: Computer Science A](#)
- Other (specify): _____

Course title:

CCNA: Introduction to Networks (IN)

Course description (include prerequisites):

Introduction to Networks introduces the architecture, structure, functions, components, and models of the Internet and other computer networks. The principles and structure of IP addressing and the fundamentals of Ethernet concepts, media, and operations are introduced to provide a foundation for the curriculum. By the end of the course, students will be able to build simple LANs, perform basic configurations for routers and switches, and implement IP addressing schemes.

Prerequisite: IT Essentials

Course knowledge and skills (what students will know and be able to do):

By the end of this course, students will:

1. Understand and describe the devices and services used to support communications in data networks and the Internet and describe the role of protocol layers in data networks.
2. Understand and describe the importance of addressing and naming schemes at various layers of data networks in IPv4 and IPv6 environments and be able to design, calculate, and apply subnet masks and addresses to fulfill given requirements in IPv4 and IPv6 networks.
3. Explain fundamental Ethernet concepts such as media, services and operations and be able to build a simple Ethernet network using routers and switches.
4. Use Cisco command-line interface (CLI) commands to perform basic router and switch configurations and utilize common network utilities to verify small network operations and analyze data traffic.

End-of-Course Assessment(s):

- Teacher designed assessment
- LEA designed assessment
- Certification/credentialing exam (specify): _____
- Licensing exam (specify): _____
- Nationally recognized exam (specify): _____
- Other (specify): Cisco Network Assessments

Course title:

CCNA: Routing and Switching Essentials (RSE)

Course description (include prerequisites):

This course describes the architecture, components, and operations of routers and switches in a small network. Students learn how to configure a router and a switch for basic functionality. By the end of this course, students will be able to configure and troubleshoot routers and switches and resolve common issues with RIPv1, RIPv2, single-area and multi-area OSPF, virtual LANs, and inter-VLAN routing in both IPv4 and IPv6 networks.

Prerequisite: CCNA: Introduction to Networks (IN)

Course knowledge and skills (what students will know and be able to do):

By the end of this course, students will:

1. Demonstrate how a network switch operates and provide an overview of how the convergence of data, voice, and video traffic affects a switched network. Students will also be able to explain the benefits of implementing a switch network based on a hierarchical design.
2. Use Cisco command-line interface (CLI) commands to perform basic router and switch configurations

and utilize common network utilities to verify small network operations and analyze data traffic. Students will also configure inter-VLAN (virtual local area network) routing using multiple interfaces, router-on-a-stick, and a Layer 3 switch.

3. Describe the importance of addressing and naming schemes and be able to implement addresses and labels at various layers of data networks in IPv4 and IPv6 environments. They will also design, calculate, and apply subnet masks and addresses to fulfill given requirements in IPv4 and IPv6 networks.
4. Use Transmission Control Protocol (TCP) segmentation, the three-way handshake and expectational acknowledgements to ensure reliable delivery of data, examine the best-effort delivery mechanism provided by User Datagram Protocol (UDP), and describe when this would be preferred over TCP.
5. Be able to improve network performance by optimally dividing the IP address space based on network requirements using calculations of valid host addresses and the determination of both subnet and subnet broadcast addresses.

End-of-Course Assessment(s):

- Teacher designed assessment
- LEA designed assessment
- Certification/credentialing exam (specify): _____
- Licensing exam (specify): _____
- Nationally recognized exam (specify): _____
- Other (specify): Cisco Network Assessments

Course title:

CCNA: Scaling Networks (SN)

Course description (include prerequisites):

This course describes the architecture, components, and operations of routers and switches in larger and more complex networks. Students learn how to configure routers and switches for advanced functionality. By the end of this course, students will be able to configure and troubleshoot routers and switches and resolve common issues with OSPF, EIGRP, and STP in both IPv4 and IPv6 networks. Students will also develop the knowledge and skills needed to implement a WLAN in a small-to-medium network.

Prerequisite: CCNA: Routing & Switching Essentials (RSE)

Course knowledge and skills (what students will know and be able to do):

By the end of this course, students will:

1. Understand and describe basic switching concepts and the operation of Cisco switches, the purpose, nature, and operations of a router, routing tables, and the route lookup process, how VLANs create logically separate networks and how routing occurs between them, and dynamic routing protocols, distance vector routing protocols, and link-state routing protocols.
2. Configure, verify, and troubleshoot static routing and default routing (RIP and RIPng) and a multi-area

Open Shortest Path First (OSPF) network.

3. Recognize and differentiate between the various Wide Area Network (WAN) options and technologies available for connecting modern networks; two WAN options of specific focus include Point-to-Point connections and Frame Relay.
4. Configure, verify, and troubleshoot access control lists (ACLs) for IPv4 and IPv6 networks, Dynamic Host Configuration Protocol (DHCP) for IPv4 and IPv6 networks and Network Address Translation (NAT) operations.
5. Manage a small network using a variety of tools including syslog, SNMP, and NetFlow. Enlist troubleshooting methodologies and use tools and commands to maintain optimal network efficiency.

End-of-Course Assessment(s):

- Teacher designed assessment
- LEA designed assessment
- Certification/credentialing exam (specify): _____
- Licensing exam (specify): _____
- Nationally recognized exam (specify): _____
- Other (specify): Cisco Network Assessments

Course title:

CCNA: Connecting Networks (CN)

Course description (include prerequisites):

This course discusses the WAN technologies and network services required by converged applications in a complex network. The course enables students to understand the selection criteria of network devices and WAN technologies to meet network requirements. Students learn how to configure and troubleshoot network devices and resolve common issues with data link protocols. Students will also develop the knowledge and skills needed to implement virtual private network (VPN) operations in a complex network.

Prerequisites: CCNA: Scaling Networks (SN)

Course knowledge and skills (what students will know and be able to do):

By the end of this course, students will:

1. Understand, describe, and apply different WAN technologies, virtual private networks (VPNs) and/or tunneling based on the benefits and operations of each and the situation at hand.
2. Understand, configure, and troubleshoot serial connections, broadband connections, tunneling operations, and Network Address Translation (NAT) operations.
3. Determine symptoms and causes of network problems using a layered model while monitoring and troubleshooting network operations using syslog, SNMP, and NetFlow.
4. Understand and describe network architectures such as: borderless networks, data centers and

virtualization, and collaboration technology and solutions.

End-of-Course Assessment(s):

- Teacher designed assessment
- LEA designed assessment
- Certification/credentialing exam (specify): [CCNA Composite v 2.0 \(200-120\)](#) **or** [ICND1 v 2.0 \(100-101\)](#) [AND ICND2 v 2.0 \(200-101\)](#)
- Licensing exam (specify): _____
- Nationally recognized exam (specify): _____
- Other (specify): [Cisco Network Assessments](#)

PROGRAM OF STUDY CURRICULUM

Identify the method of technical and academic curriculum development (adopted, adapted, or developed in accordance with guidance from the program advisory committee).

POS technical and academic curriculum will be:

- Adopted (specify source): [State-model program of study](#)
- Adapted (specify source):
- Developed locally (describe):
- Other (specify):

TEACHER CERTIFICATION

Provide valid teacher certification(s), candidate experience, pre-requisite and requisite licensure or certification requirement(s) for POS teachers.

POS teacher requirements include:

- Teacher certification(s) (list): [Skilled and Technical Sciences \(STS\) in Network Systems](#)
- Candidate experience (describe): [Candidate may have experience as a manager of computer operations and controller of system configurations emanating from a specific site or network hub. A candidate in this field understands computer hardware and software and applications; local area \(LAN\) and wide area \(WAN\) networking; principles of information systems security; disk space and traffic load monitoring; data backup; resource allocation; and setup and takedown procedures. For more information, please see the Bureau of Labor Statistics: Network and computer system administrators.](#)
- Pre-requisite professional licensure or certification requirement(s) (list): [A qualified candidate will have one or more of the following Information Technology certifications or their equivalent: Electronics and CompTIA Network+ Certification, CISCO CCNA Certification, MCSE Certification, CompTIA Server+ Certification, CISCO CCNP Certification, or Microsoft MCSM Certification.](#)
- Requisite professional licensure or certification requirement(s) (list): [Candidates must have credentials aligned with the state program of study to include CCNA or CCNP certification.](#)
- Other (describe):

VALUE-ADDED OPPORTUNITIES

List extended early career and college credit opportunities available during the student's senior year. Document transition services, cooperative learning experiences, additional dual enrollment, or other.

Opportunities for extended and accelerated learning include:

- Cooperative education (describe):

- Structured internship (describe):
- Dual enrollment (list):
- Advanced Placement (list):
- Transition services (describe):
- Other (describe):

CAREER AND TECHNICAL STUDENT ORGANIZATIONS

Indicate the Career and Technical Student Organization (CTSO) affiliation by checking the appropriate box.

- SkillsUSA

PROGRAM OF STUDY MATRIX

Complete the program of study matrix to demonstrate the alignment of academic and technical courses, culminating early career and/or early college experiences. Identify appropriate certification and licensure options, opportunities for obtaining early college credit (courses with articulated or dual enrollment credit agreements should be appropriately designated within the matrix), the post-secondary program sequence, and potential career options. *Attach the Program of Study Matrix.*

Access the [Program of Study Matrix](#).

DEPARTMENT OF EDUCATION PROGRAM OF STUDY APPROVAL

The following section will be completed by staff from the Delaware Department of Education, CTE & STEM Office and reported to the LEA as part of the CTE program of study approval process.

Date Delaware CTE Program of Study Application Received:**Local Education Agency (LEA):**

School(s):

Program of Study Start Date:

LEA CTE Coordinator Name:

Phone:

E-Mail Address:

Career Cluster & Code:

Information Technology / 11

Career Pathway & Code:

Networking Systems / 11.01

Program of Study Title & Code:

Cisco Networking Academy / 11.01802

CTE Program of Study Course Titles, Course Codes, and Funding Levels:

1. IT Essentials (ITE) / 11. 11.0180211 / 3
2. To be determined by the Local Education Agency (LEA) – select one of the following courses:
 - NDG Linux Essentials (NDG) / 11. 11.0180222 / 3
 - AP Computer Science Principles (CSP) / 11.0180232 / 3
 - AP Computer Science A (CSA) / 11. 11.0180242 / 3
3. CCNA: Introduction to Networks (IN) / 11.0180253 / 3
4. CCNA: Routing and Switching Essentials (RSE) / 11.0180264 / 3
5. CCNA: Scaling Networks (SN) / 11.0180275 / 3
6. CCNA: Connecting Networks (CN) / 11.0180286 / 3

CTE Concentrator/Completer Course Titles:

Concentrator Course: CCNA: Introduction to Networks (IN)

Completer Course: CCNA: Connecting Networks (CN)

CTE Program of Study Request: State-model CTE Program of Study Local CTE Program of Study**CTE Program of Study Attachments:** Labor Market Information (LMI) Review; Articulation/Dual Enrollment Agreement(s); and Program of Study Matrix.

DDOE CTE & STEM Director Signature:

Date:

DDOE Chief Academic Officer Signature:

Date: