

Board Approved August 2017

DEPARTMENT: Mathematics

COURSE: Introduction to Computer Networking

Week	Semester
1	Introduction to Networks
2	Network Hardware and Software
3	Network Hardware and Software
4	Cabling and Topology
5	Modern and Basic Ethernet Theory
6	TCP/IP and Installing the Physical Network
7	TCP/IP and Installing the Physical Network
8	Routing
9	Applications of TCP/IP and Network Naming
10	Applications of TCP/IP and Network Naming
11	Network Security
12	Advanced Networking and Remote Connectivity
13	Advanced Networking and Remote Connectivity
14	Wireless Networking
15	Wireless Networking
16	Network Management
17	Net+ Certification Preparation
18	Home/Office Network Design Practical

Introduction to Computer Networking

Time Frame	Block – 4 Days						
Topic							
Introduction to Networks							
Essential Questions							
<ul style="list-style-type: none"> • What is a network technician and how do I become one? • What is the general history of networking? • What is the OSI Model and how does it help me model and understand basic networking? 							
Enduring Understandings							
The definition of a proper Network Technician and how a person becomes one. The history of networking computers from the early 1970's until present day. An in-depth explanation of the OSI Seven Layer Model and how it works in action.							
Alignment to New Jersey Student Learning Standards							
CRP.K-12.CRP4.1 TECH.9-12.8.1.12.A.1							
Key Concepts and Skills							
<ul style="list-style-type: none"> • An idea of the different jobs and positions available to the computer literate. • Defining what it is to be a professional Network Administrator in society. • An understanding of the different tool kits need to perform the various tasks ahead. • An overview of safety and the hazards/pitfalls of working with electronics. • A background on how far society has come in Networking. • A general understanding of the layering system of information and how transportation occurs between these various layers. 							
Learning Activities							
<ul style="list-style-type: none"> • Comprehensive survey to assess skill set and determines aptitude and potential placement. • A research activity to identify the oldest piece of networking technology. • Hands-on look at tools to define their proper use. • Exploration of unsafe work habits with a discovery exercise on how to avoid potential problems. • General exercise on safety setup with electric devices. • An interactive exploration of the OSI layer system as we build a theoretical network cake. 							
Assessments							
<ul style="list-style-type: none"> • Quick quiz assessment on each key concept. • Partner identifying scenario to determine work groups and like habits. • Matching activity and quiz on OSI layers. • Unit Assessment/Test. 							
21st Century Skills							
	Creativity	x	Critical Thinking	x	Communication	x	Collaboration
x	Life & Career Skills		Information Literacy	x	Media Literacy		
Interdisciplinary Connections							
General Work habits for 21 st Century Skills. Science lab safety protocols.							
Technology Integration							
Historical technology and the tool set needed to work on them.							

Introduction to Computer Networking

Time Frame	Block – 9 Days						
Topic							
Network Hardware and Software							
Essential Questions							
<ul style="list-style-type: none"> • How and where do reality and theory intersect in Network Theory? • What is a modern network? • What software and hardware are necessary in modern networking? • Are there essential hardware, software and 3rd party requirements to setting up a network? 							
Enduring Understandings							
A look at how the 7 layer OSI model is represented in reality. A basic understanding of the requirements that need to be present to network two devices together. A comprehensive definition of a modern network and the tools to draw and define a technical sketch of that model.							
Alignment to New Jersey Student Learning Standards							
SCI.9-12..5.1.12.A.1 , SCI.9-12.8.1.12.A.2 TECH.9-12.8.1.12.A.1							
Key Concepts and Skills							
<ul style="list-style-type: none"> • A network is a way to connect and share information between computers. • Basic requirements needed in hardware and software operating systems to achieve a connection between two computers and describe it to others. • A look at service providers and what requirements must be met to fill specific networking needs. 							
Learning Activities							
<ul style="list-style-type: none"> • A layout and definition stage of all the components in a basic household pc network. • Hands-on look at the system software and how we configure it to network with other computers. • Research on major service providers to determine cost and specifications required. • Lecture and discussion to define communication and drawing parameters in order to communicate. • Mathematical look at network theory and how we apply it to the modern computer network. • An individual exercise on drawing a home network sketch. • A group exercise on basic debugging techniques to trouble shoot minor issues with networking. 							
Assessments							
<ul style="list-style-type: none"> • Verbal quiz on basic requirements (home set up and service provider). • Quiz on basic system configuration and new terminology. • Quiz on operating systems and their uses and specifications required. • Verbal trouble shooting scenarios. • Unit Assessment/Test. 							
21st Century Skills							
	Creativity	x	Critical Thinking	x	Communication	x	Collaboration
x	Life & Career Skills	x	Information Literacy	x	Media Literacy		
Interdisciplinary Connections							
Connections to basic technology literacy							
Technology Integration							
Use of internet, pc and various software and hardware resources.							

Introduction to Computer Networking

Time Frame	Block – 5 Days						
Topic							
Cabling and Topology							
Essential Questions							
<ul style="list-style-type: none"> • What are the different wires/cables needed to network computers? • How do I identify the various connector ends of each cable and their pc component jack? • What is topology and how does it apply to networking theory? 							
Enduring Understandings							
The ability to research parameters, identify and build all cables needed in modern networking. The knowledge and core concepts of network design & construction in respect to facility management.							
Alignment to New Jersey Student Learning Standards							
CRP.K-12.CRP.4.1 SCI.9-12.5.1.12.A.1 TEC.9-12.8.1.12.F.1							
Key Concepts and Skills							
<ul style="list-style-type: none"> • The Ethernet cable is our modern network life line. • Each student will be able to identify, test and build all the different cables that go into networking computers. • The skill set to draw a full network diagram for larger than home scenario. 							
Learning Activities							
<ul style="list-style-type: none"> • Hands on look at all of the wires that go into networking. • Hands on learn and grow activity building, testing and analyzing different ethernet cables. • Visual overview of all other connectors/cables and how to identify their power connection and proper placement. • A research project on small business networks, where the student will design their own. 							
Assessments							
<ul style="list-style-type: none"> • Quick quiz assessment on each key concept. • Quiz on component specification. • Hands on assessment on cable building and troubleshooting. • General hands on first design of their own small business network. • Unit Assessment/Test. 							
21st Century Skills							
x	Creativity	x	Critical Thinking	x	Communication	x	Collaboration
x	Life & Career Skills	x	Information Literacy	x	Media Literacy		
Interdisciplinary Connections							
Connection to 21 st century business skills.							
Technology Integration							
Internet, web based resources, document camera, pc and components.							

Time Frame	Block – 6 Days				
Topic					
Modern and Basic Ethernet Theory					
Essential Questions					

Introduction to Computer Networking

- What is and why Ethernet?
- How do I identify data under 10 baseT?
- What are the constraints (length and bandwidth) of Ethernet?
- How many different types of Ethernet are there?

Enduring Understandings

Ethernet cables come in various data sizes. Each size has a specific bandwidth and length it can be run for effective data transfer. The data transferred is sent with a certain packet size and frequency.

Alignment to New Jersey Student Learning Standards

SCI.9-12.5.1.12.A.1, SCI.9-12.5.1.12.A.2 TECH.9-12.8.1.12.F.2

Key Concepts and Skills

- A cable is like a piece of land with trees, the length of the land and the amount of the trees affect the traveling speed going through the land.
- Ethernet is our modern superhighway with very few restrictions.
- The learner will be able to assess his networking needs and select the proper cable for filling those needs.

Learning Activities

- An overview of the history of networking cables to build a speed chart.
- An individual exercise where each student selects a cable and creates a cartoon to describe its bandwidth.
- Hands on activity to demonstrate the speed/limitations of different Ethernet cables.
- Lecture and discussion to nail down the finer points of data transfer (ttl, packet size, and buffer)

Assessments

- Quiz on cable speeds and length calculations.
- Visual inspection of student's cartoon, research and hands on activity.
- Unit Assessment/Test.

21st Century Skills

x	Creativity	x	Critical Thinking	x	Communication	x	Collaboration
x	Life & Career Skills	x	Information Literacy	x	Media Literacy		

Interdisciplinary Connections

Connections to Mathematics standards.

Technology Integration

Use of internet, pc and various software resources.

Time Frame	Block – 7 Days
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Topic

TCP/IP and Installing the Physical Network

Essential Questions

- What is TCP/IP?
- How do I set up a conceptual network?
- What is an IP address and why is it necessary?
- Where on my computer do I find the Physical Network settings?

Enduring Understandings

Introduction to Computer Networking

TCP/IP is a networking protocol that computers must subscribe to in order to connect with each other. An IP address is a number identifying your network locations. The location of the setting for changing network parameters on OSX, Windows OS, and Linux.

Alignment to New Jersey Student Learning Standards

SCI.9-12.5.1.12.A.1 TECH.9-12.8.1.12.A3

Key Concepts and Skills

- The ability to read an ip address and know what all of the numbers mean.
- How to set up multiple computers manually using their system settings.
- The skill set and tools to test the system for statistics on the Physical Network.

Learning Activities

- Lecture, define and discuss TCP/IP and the IP Addressing system.
- Guided example of a basic network and it's addressing system under TCP/IP.
- Hands-on exploration of the three operating systems and how they set up their network information.

Assessments

- Quick quiz assessment on each key concept.
- Live and hands-on network settings debug/troubleshoot.
- Unit Assessment/Test.

21st Century Skills

	Creativity	x			Communication		Collaboration
x	Life & Career Skills	x	Information Literacy	x	Media Literacy		

Interdisciplinary Connections

Connections to Technology Standards.

Technology Integration

Use of internet, pc and various software resources.

Time Frame	Block – 5 Days
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Topic

Routing

Essential Questions

- What is a router and how does it work?
- What is the difference between static and dynamic routing?
- How do we set up a router/bridge?

Enduring Understandings

A router is a device that connects computers to form a modern network. A router uses the IP Addressing system to connect computers together enabling them to share data and resources. The difference between Static(fixed) and Dynamic(logically assigned) IP Addressing.

Alignment to New Jersey Student Learning Standards

SCI.9-12.5.1.12.A.1 TECH.9-12.8.1.12.D.1

Key Concepts and Skills

- The ability to set up a personal computer, so, it can share information and see other shared information.
- The ability to identify the necessary components and set up to achieve networking.
- An idea of what ip addresses are and when to use them in a fixed or assigned manner.

Introduction to Computer Networking

- The ability to select, configure, and install a router between at least two computer systems.

Learning Activities

- Lecture and discussion to define routers.
- Research project on various routers/service providers to compare and contrast.
- Hands-on activity to set up a basic hardwired network and connection to the internet.
- Hands-on activity to choose and install/configure a router between two computers.

Assessments

- Visual quiz on setting up a wired network between two computers.
- Quiz on IP addressing systems.
- Visual quiz on installing and configuring one of the three common routers. Unit Assessment/Test.

21st Century Skills

	Creativity	x	Critical Thinking	x	Communication		Collaboration
x	Life & Career Skills	x	Information Literacy	x	Media Literacy		

Interdisciplinary Connections

Technology standards.

Technology Integration

Use of internet, pc and various software resources.

Time Frame	Block – 11 Days
Topic	
Applications of TCP/IP and Network Naming	
Essential Questions	
<ul style="list-style-type: none"> • What are applications for networking with TCP/IP? • How does the internet work and how it uses DNS? • What is a port? 	
Enduring Understandings	
The Domain Name Service(DNS) is the way we take an ip address and give it an internet name.(ex. google.com) The ability to network computers allows society to take the distance problem out of collaboration.	
Alignment to New Jersey Student Learning Standards	
TECH.9-12.8.1.12.D.1 TECH.9-12.8.1.12.G.1	
Key Concepts and Skills	
<ul style="list-style-type: none"> • A concept of how ip addresses are used to find the actual address behind the dns assigned text. • The skill set and tools needed to acquire statistics on global network values. • The ability to understand how computers use ports like doors to control information traffic. 	
Learning Activities	
<ul style="list-style-type: none"> • Lecture and discuss about all of the various uses of modern networking.(gaming, email, skype...) • Internet research to learn about the DNS server and how it works. • Hands-on use of the command prompt to query the local network for information. • Internet research on ports and an introduction to “Shields Up” website. • Hands-on application of networking group project(port forwarding) 	
Assessments	

Introduction to Computer Networking

- Quick quiz assessment on each key concept.
- Visual quiz DNS research.
- Group demonstration of port forwarding project.
- Unit Assessment/Test.

21st Century Skills

x	Creativity	x	Critical Thinking	x	Communication	x	Collaboration
x	Life & Career Skills	x	Information Literacy	x	Media Literacy		

Interdisciplinary Connections

Connections to technology standards.

Technology Integration

Internet, web based resources, document camera, pc and components.

Time Frame	Block – 5 Days						
Topic							
Network Security							
Essential Questions							
<ul style="list-style-type: none"> • How do we secure a modern network? • What is encryption and authentication? • What are the modern security standards deployed at this time? 							
Enduring Understandings							
Security is necessary when sharing with strangers. A modern network has many different ways to secure itself. Passwords and network security are very similar.							
Alignment to New Jersey Student Learning Standards							
TECH.9-12.8.1.12.A.3 , TECH.9-12.8.1.12.D.1 SCI.9-12.5.1.12.B.3							
Key Concepts and Skills							
<ul style="list-style-type: none"> • The concept of encryption and its various uses will be understood on how it applies to network security. • The ability to secure any network on a variety of levels. • The ability to define what security protocol works for the proper situation. 							
Learning Activities							
<ul style="list-style-type: none"> • Lecture and discuss on the history of encryption and how it is important over time. Also, define all the modern security protocols used at this time. • Encryption research assignment. • Hands-on activity to set up a secure network. 							
Assessments							
<ul style="list-style-type: none"> • Quick quiz assessment on newly defined concepts and terms. • Visual quiz on the security of their network. • Class presentation on encryption research.. • Unit Assessment/Test. 							
21st Century Skills							
	Creativity	x	Critical Thinking		Communication		Collaboration
x	Life & Career Skills	x	Information Literacy	x	Media Literacy		
Interdisciplinary Connections							

Introduction to Computer Networking

Connections to Social Studies standards.

Technology Integration

Internet, web based resources, document camera, pc and components.

Time Frame	Block – 11 Days
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Topic

Advanced Networking and Remote Connectivity

Essential Questions

- What is client server?
- What is a peer to peer network?
- What is VOIP?
- What is a VPN and how do I set one up?
- Will we ever run out of IP addresses?

Enduring Understandings

Client server is a way to describe the ability to house computer resources/information away from the networked local personal computer. Peer to peer is a network connection between two people. VPN is a virtual private network and is a secure connection between computers over the public internet. VOIP is voice over ip and is used for internet phone. IPV6 is the next generation of ip addressing.

Alignment to New Jersey Student Learning Standards

TECH.9-12.8.2.12.B.1 SCI.9-12.5.1.12.A.1

Key Concepts and Skills

- The ability to set-up and join a peer to peer network.
- An understanding on the underbelly of voip.
- The ability to set up and use a vpn on any operating system.

Learning Activities

- Lecture, discuss all concepts in theory before engaging in hands on portion of activity.
- Hands-on activity set up a peer to peer and vpn network between a computer and a designated remote on multiple operating systems.
- Discussion and guided example to display common problems with p2p and vpn.
- Extra: (advanced) Design a use for a p2p network.

Assessments

- Quick quiz assessment on each key concept.
- Visual inspection of each Hands-on activity.
- Unit Assessment/Test.

21st Century Skills

	Creativity	x	Critical Thinking	x	Communication	x	Collaboration
x	Life & Career Skills	x	Information Literacy	x	Media Literacy		

Interdisciplinary Connections

Connection to 21st century skills.

Technology Integration

Use of internet, pc and various software resources. Document camera and web resources.

Introduction to Computer Networking

Time Frame	Block – 13 Days						
Topic							
Wireless Networking							
Essential Questions							
<ul style="list-style-type: none"> • What is the history behind wireless technology? • What are the Wi-Fi Standards? • Is installing a Wi-Fi network any different from my wired network? • How do I set up a Wi-Fi network and secure it? • What is a MAC address? • Are there any other types of wireless communication? 							
Enduring Understandings							
<p>WIFI standards are a set up to be a universal standard of communication protocols. All wireless devices have a machine address to identify on a network. The different standards describe different wave patterns and data transfer speeds. Securing a wireless network is the same a securing a wired network. Encryption and security protocols have a data/speed price in wireless security. Modern wireless communication can be done via cell, bluetooth, wifi, and infrared.</p>							
Alignment to New Jersey Student Learning Standards							
TECH.9-12.8.1.12.D.2 , TECH.9-12.8.1.12.D.3 , TECH.9-12.8.1.12.D.4 SCI.9-12.5.1.12.A.2							
Key Concepts and Skills							
<ul style="list-style-type: none"> • The ability to set up various iterations of a basic home/business wireless network. A conceptual overview of different wireless communication.(cell, Wi-Fi, Bluetooth ,ir) The many uses of a firewall and the mac address. • The future of network security and their problems. • Basic concepts in hacking and online defenses. 							
Learning Activities							
<ul style="list-style-type: none"> • Lecture and discuss the various aspects/theories for home Wi-Fi network/pc security. • Hands-on activity/demonstration on setting up a Wi-Fi router/network. • Hands-on activity/demonstration of basic Wi-Fi network security. • Lecture and discuss about basic wifi hacking and how to defend a pc/network from it. 							
Assessments							
<ul style="list-style-type: none"> • Verbal quiz on Wi-Fi security concepts and wireless technology. • Visual assessment on setting up and securing a Wi-Fi network. • Unit Assessment/Test. 							
21st Century Skills							
	Creativity	x	Critical Thinking		Communication		Collaboration
x	Life & Career Skills	x	Information Literacy		Media Literacy		
Interdisciplinary Connections							
Connections to Science lab work and Technology standards.							
Technology Integration							
Use of internet, pc and various software resources.							

Time Frame	Block – 10 Days				
Topic					
Network Management and Network+ Certification					

Introduction to Computer Networking

Essential Questions

- What are the expectations of a Network Administrator?
- How do I monitor the activity/performance of my network?
- What are some other theories on network configuration?
- What tools and software/hardware will I need to become a Network Administrator? What is Net+ certification?

Enduring Understandings

An understanding of all that is required of a network administrator. An awareness of all the software and hardware tools at the disposal of a network administrator. An overall idea of what is on the Net+ certification test and how to prepare for it.

Alignment to New Jersey Student Learning Standards

TECH.9-12.8.2.12.F.1 , TECH.9-12.8.2.12.G.1 SCI.9-12.5.1.12.A.a

Key Concepts and Skills

- The ability to assess the need of a network and apply the correct software/hardware solution.
- Installation of network computer software/hardware.
- Matching software specifications to hardware specifications so it runs properly.
- The ability to play the part of a network administrator.
- The ability to prepare for the Net+ certification test.

Learning Activities

- Lecture and discuss all of the possible expectations of a network administrator.
- Guided/Hands-on explanation/installation of monitoring software/hardware.
- A review on and practice Net+ assessment.

Assessments

- Quick quiz Net Admin expectations.
- Visual inspection on use of monitoring tools.
- Unit Assessment/Test.

21st Century Skills

	Creativity	x	Critical Thinking		Communication		Collaboration
x	Life & Career Skills	x	Information Literacy	x	Media Literacy		

Interdisciplinary Connections

21st century skills.

Technology Integration

Internet, web based resources, document camera, pc and components.

Time Frame	Block – 3 Days
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Topic

Home/Office Network Design Practical

Essential Questions

Can I research, design, set-up, secure, and monitor my own wired/wireless network?

Enduring Understandings

The overall understanding of how to research, design, set-up, secure, and monitor a wired/wireless network?

Alignment to New Jersey Student Learning Standards

Introduction to Computer Networking

SCI.9-12.5.12.B.2
WORK.9-12.9.1.12.A.1
TECH.9-12.8.2.12.B.2

Key Concepts and Skills

The student will be able to research, design, set-up, secure, and monitor my own wired/wireless network.

Learning Activities

- Short activity to design a network of their choosing.
- Research activity to shop and purchase hardware and software for this network.
- Hand-on activity where the learner assembles and sets up their network.

Assessments

- Review of network design.
- Visual inspection of hardware/software list and budget.
- Assessment of network.
- Unit Assessment/Test.

21st Century Skills

x	Creativity	x	Critical Thinking	x	Communication	x	Collaboration
x	Life & Career Skills	x	Information Literacy	x	Media Literacy		

Interdisciplinary Connections

Connections 21st century standards.

Technology Integration

Use of internet, pc and various software resources.