



### School of Computer Science and Mathematics

#### MSCS560L-231 (Fall 2016)

Class will be held in HC0006 on Tuesdays 3:30-6:15pm.

**Professor:** Robert M. Cannistra  
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**Office Phone:** 845.575.3675  
**Office Hours:** Tuesday: 1:30pm – 3:30pm  
Wednesday: by appointment  
Thursday: 9:30am – 11:00am  
11:00am – 12:30pm (in HC0006)

**Open Lab Hours:** TBD

*The Internetworking Lab (HC0006) will be open for your use throughout the semester during the hours listed above with the exception of the last two weeks of the regular semester.*

#### Catalog Course Description:

This course should give students a background in the basic tenets, current practices, and future directions in the merging of computer and communications technology. The student will consider both the physical and logical transfer of data, and will be introduced to international standards such as the OSI architecture, and various network access and Internet standards. The course will emphasize Internet protocols such as TCP and IP. The topics covered will include an analysis of the problems and limitations imposed by the physical channel, wireless networks, comparative switching techniques, routing, congestion control, and higher-level protocols needed to complete the end-user to end-user exchange.

#### Course Objectives and Purpose:

This course introduces, describes and discusses the architecture, structure, functions, components, operations of routers and switches, 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. Students learn how to configure and troubleshoot routers and switches and resolve common issues with routing protocols, VLANs, inter-VLAN routing and data link protocols in both IPv4 and IPv6 network environments. This course concludes with a look into the emerging networking technologies such as SDN and NFV. By the end of the course, students will possess a deep understanding of computer networks, possess the ability to design and implement medium-sized networks, perform configurations core networking devices, implement IP addressing schemes and troubleshoot various network technologies.

#### Prerequisite:

MSCS501 - Object Oriented Programming, MSCS502 – Advanced Data Structures, CMSC422 – Computer Organization and Architecture or have the approval from the Professor.

**Text(s):**

None. We will be using online resources throughout the semester.

**Optional or Referenced Text(s):**

Stallings, William. Data and Computer Communications, 9/e, Prentice Hall, August 3, 2010, ISBN-10: 0131392050, ISBN-13: 9780131392052

Comer, Douglas E.. Computer Networks and Internets, 5/e, Prentice Hall, April 18, 2008, ISBN-10: 0136061273, ISBN-13: 9780136061274

Comer, Douglas E.. Internetworking with TCP/IP, Vol 1, 5/e, Addison-Wesley, June 30, 2005, ISBN-10: 0131876716, ISBN-13: 9780131876712

Tananbaum, Andrew S.. Computer Networks, 5/e, Prentice Hall, September 27, 2010, ISBN-10: 01321226958, ISBN-13: 9780132126953

Kurose, James F., Ross, Keith W.. Computer Networking: A Top-Down Approach, 6/e, Addison-Wesley, 2013, ISBN-10: 0132856204, ISBN-13: 9780132856201

Peterson, Larry L., Davie, Bruce S.. Computer Networks, 5<sup>th</sup> Edition, Morgan Kaufmann, March 2011, ISBN: 9780123850591

Stevens, W. Richard. TCP/IP Illustrated, Volume 1: The Protocols, 1/e, Addison-Wesley Professional, September 31, 1993, ISBN-10: 0201633469, ISBN-13: 9780201633467

Stevens, W. Richard, Wright, Gary R.. TCP/IP Illustrated, Volume 2: The Implementation, 1/e, Addison-Wesley Professional, January 31, 1995, ISBN-10: 020163354X, ISBN-13: 9780201633542

Stevens, W. Richard. TCP/IP Illustrated, Volume 3: TCP for Transactions, HTTP, NNTP, and the UNIX Domain Protocols, 1/e, Addison-Wesley Professional, January 19, 1996, ISBN-10: 0201634953, ISBN-13: 9780201634952

Zheng, Young, Azhtar, Shakil. Networks for Computer Scientists and Engineers, Oxford, 2002, ISBN: 0195113985

Odom, Wendell. CCNA Routing and Switching 200-125 Official Cert Guide Library, Cisco Press, 2016, ISBN-10: 1587205815, ISBN-13: 9781587205811

Empson, Scott. CCNA Routing and Switching Portable Command Guide, 4<sup>th</sup> Edition, Cisco Press, 2016, ISBN-10: 1587205882, ISBN-13: 9781587205880

**Additional Resources:**

<http://www.cisco.com>  
<http://www.ieee.org>  
<http://www.ietf.org>  
<http://www.iana.org>  
<http://www.tiaonline.org>  
<http://www.ansi.org>  
<http://howstuffworks.com>  
<http://cisco.netacad.com>



<https://e5.onthehub.com/WebStore/Security/Signin.aspx?ws=1f37dd38-c69b-e011-969d-0030487d8897&vsro=8&rurl=%2fWebStore%2fProductsByMajorVersionList.aspx%3fws%3d1f37dd38-c69b-e011-969d-0030487d8897%26vsro%3d8>

### Class Attendance:

Optional! If you feel you do not need to attend class, don't, however you are responsible for ALL material that we cover in class and all assignments that are given. If you miss a quiz, exam or practical there will be NO make-ups and you will receive a grade of ZERO!

Keep in mind if you are not proficient with the material covered by the end of the semester, you will fail this course!

### Evaluation:

Pop Quizzes:	250
Active Learning:	250
Research:	250
Project:	250
<b>Total Points</b>	<b>1000</b>

A	950 – 1000	95% - 100%
A-	900 – 949	90% - 94.9%
B+	870 – 899	87% - 89.9%
B	830 – 869	83% - 86.9%
B-	800 – 829	80% - 82.9%
C+	770 – 799	77% - 79.9%
C	730 – 769	73% - 76.9%
C-	700 – 729	70% - 72.9%
D+	670 – 699	67% - 69.9%
D	630 – 669	63% - 66.9%
F	0 – 629	0% - 62.9%

### Pop Quizzes:

Pop Quizzes will be given throughout the semester on topics taken from your readings, class discussions, active learning and lectures. You should be prepared for every class! If you miss a Pop Quiz due to an absence or tardiness there will not be a chance for a make-up Quiz and you will receive a grade of zero!

### Active Learning:

You will have active learning modules presented to you throughout this semester. This will involve some form of practical design, implementation, analysis, software development/programming, and troubleshooting. Assignments that are turned in late will NOT be accepted and will receive a grade of zero.

### Research:

After the first few weeks of the semester, you will be required to research an emerging technology that pertains to computer networks. After your initial research is complete and you've found a topic that has intrigued you, you will write a proposal stating what your research expectations are, how you will proceed and what your expected timeframe of completion is. Once this is complete, you will submit this for approval. Upon receiving approval, you may begin your active research.

When you've reached this point, your initial proposal is already approved. You will now begin to formally research your topic from scholarly computing journals. You should begin your research as early in the semester as possible. One example of a research paper could consist of finding holes in current Wireless



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Security research. Once you've found the caveat in research, you will document what led you to determine this and what future research may be explored in order to potentially fill the gap. You may proceed in almost any direction at this point and this may not directly correlate to your initial proposal. However, if you've steered far enough away from your initial proposal, you will need to revise your proposal including why you were steered in the direction you were and obtain approval from the faculty member teaching the course. For the end submission, you will submit an abstract and paper with results to turnitin.com.

You may present your research to fellow students. You will also create a powerpoint presentation based upon your research. Your powerpoint presentation will be submitted one week prior to your presentation date which may be prerecorded and posted online depending upon how the semester progresses.

### Project:

You will be presented with a networking scenario. Some of the topics we will have covered throughout the semester, some we will not have covered at all. It is your responsibility to research these topics and design a comprehensive network based upon the scenario presented. This project will consist of a design phase, a programming phase, an implementation phase, an analysis phase and a troubleshooting phase. You may also be asked to create a presentation to share with your classmates. More details will be provided to you toward the end of the semester.

### Academic Dishonesty:

**DON'T cheat or plagiarize! If you are caught cheating or plagiarizing you will receive a grade of F and be immediately expelled from the course.** Studying together to understand the material is fine, but the work you hand in must be your own. Most assignments within this class will be individual assignments. However, some assignments by their nature will have to be done by pairs of students, and such assignments may be submitted jointly, with both names clearly included. There will be No exceptions to this policy!!

Marist College is committed to the fundamental values of preserving academic honesty as defined in the Student Handbook (page 152). The instructor reserves the right to utilize electronic means to help prevent plagiarism. Students agree that by taking this course all assignments are subject to submission for textual similarity review to Turnitin.com. Assignments submitted to Turnitin.com will be included as source documents in Turnitin.com's restricted access database solely for the purpose of detecting plagiarism in such documents. Additional information about this system can be found at <http://www.turnitin.com>.

IMPORTANT: Students are encouraged to review the resources at:

**[http://www.turnitin.com/research\\_site/e\\_home.html](http://www.turnitin.com/research_site/e_home.html)** which will provide you with information on how to properly cite sources and better understand what is meant by plagiarism.

<http://www.academic.marist.edu/turnitin.html>

### Learning Disabilities:

Many students have all types of learning disabilities. It is your responsibility to notify the professor in the beginning of the semester in order to make sure you are successful within this course! If you're unsure whether you have a learning disability, make sure you see Special Services within Donnelly as soon as you suspect your disability!



### Specific Technological Outcomes and Assessment:

At the completion of this course, students will be able to demonstrate the ability:

- To identify each layer of the OSI reference model.
- To identify each layer of the TCP/IP reference model.
- To identify the difference between LANs and WANs.
- Understand and describe the devices and services used to support communications in data networks and the Internet
- Understand and describe the role of protocol layers in data networks
- Understand and describe the importance of addressing and naming schemes at various layers of data networks in IPv4 and IPv6 environments
- Design, calculate, and apply subnet masks and addresses to fulfill given requirements in IPv4 and IPv6 networks
- Explain fundamental Ethernet concepts such as media, services, and operations
- Build a simple Ethernet network using routers and switches
- Use Cisco command-line interface (CLI) commands to perform basic router and switch configurations
- Utilize common network utilities to verify small network operations and analyze data traffic
- Understand and describe basic switching concepts and the operation of switches
- Understand and describe the purpose, nature, and operations of a router, routing tables, and the route lookup process
- Understand and describe dynamic routing protocols, distance vector routing protocols, and link-state routing protocols
- Understand, configure, and troubleshoot first hop redundancy protocols in data center architectures
- Learn about Wireless and Wireless Cloud Architecture
- Understand Netconf and Yang
- Monitor and troubleshoot network operations using syslog and SNMP
- Understand and describe various network architectures
- Learn how SDN is evolving and how it can be utilized within brownfield and greenfield deployments
- Understand virtualization and how it impacts the future of networking with NFV

Students will be assessed by a series of in-class quizzes, online assessments, in-class active learning assignments, labs, a research syntax project and hands-on practical assessments.



### General Learning Outcomes

- **Analytical and Problem Solving**
  - Every student will possess the ability to logically analyze and resolve a problem, considering all possible solutions.
- **Effective Communication**
  - Every student will use multimedia methods including written, oral, and visual using the latest technological methods to convey ideas and knowledge.
- **Technology Expertise**
  - Every student will properly utilize industrial-quality technology appropriate to the field.
  - Every student will adapt to new technology.
  - Every student will integrate existing technology to create new possibilities.
- **Active Learners**
  - Every student will learn independently; continuously seek to acquire new knowledge; acquire relevant knowledge to solve problems individually and in collaborative lab groups.

### Learning Philosophy:

If you do not understand something, read the section in your book, re-read it and then research the topic on the Internet.

This is a practical, hands-on, lab course... try it! Be bold and experiment. That's why you're here; to learn and understand how to design, configure and troubleshoot networks. If you configure something the wrong way, try it a different way until it is right. The worst thing that can happen is that you have to do it again. Don't be afraid to change something around on the configuration and see what the outcome is. That's how you learn!

This material will be understood best when problems occur.

Professors who give students the answers cheat them out of learning for themselves. If the professor is always giving you the answers, then what will you do in corporate America when you encounter a new problem and there's no teacher there to give you the answer? On the other hand, if you learn to solve problems on your own, you will have the confidence to rise up and conquer the next challenge!

If you can't seem to figure it out on your own, seek help from a peer or your professor, but be certain you've exhausted all other possibilities!

Be determined and motivated throughout your life and you will succeed!



### Please Note:

Depending upon the topics covered within each class, this may be altered throughout the course of the semester (due to inclement weather, problems in the lab, etc...).

***We may or may not cover all the topics listed on the “instructional sequence and tentative topic schedule”!***

### Instructional Sequence *and* Dates of Class:

Week	Date	Special Circumstances
01	August 30	
02	September 06	
03	September 13	
04	September 20	
05	September 27	Class will be held in webex this week <i>(details will follow in class)</i>
06	October 04	
07	October 11	Class will be held in webex this week <i>(details will follow in class)</i>
08	October 18	
09	October 25	
10	November 01	
11	November 08	
12	November 15	
13	November 22	<i>Thanksgiving Break - NO CLASS</i>
14	November 29	
15	December 06	Project Submission / Review
16	December 13	Finals Week



**Tentative Topic Outline:**

Topics
Course Introduction
Intro to Networking
Overview of Network Protocols and Network Architecture
Physical Cabling
Introduction to the lab environment
Introduction to IOS CLI
Bridging and Switching
IPv4 Addressing
IPv6 Addressing
Routing
VLSM
Route Summarization
Interior Routing Protocols
Exterior Routing Protocols
Upper Layer Protocols
MPLS
Wireless
Storage
Security
Virtualization
SDN and Network Programmability
NFV
Network Management

Please keep in mind, the above topic outline is tentative. We will be progressing through the TCP/IP stack from a bottom up perspective (for the most part). Once we cover the essential networking fundamentals from a traditional networking perspective, we will move into Software Defined Networking and talk about the new paradigm that is occurring within the networking industry.