Class Meets:

Day: Wednesday  
Time: 4:30 PM to 7:10 PM  
Where: Johnson Center, Room G10C

Instructor: Ben Allen

My Contact Information:

E-mail address: ballen5@gmu.edu.

SMS/Mobile number: 703-296-4443

Office Hours: By Appointment, after class Wednesdays (after 7:10 PM) and Fridays 3-5:00 PM.

Course Materials:

I recommend the O'Reilly book *IOS in a Nutshell* by James Boney for reference, self-study and practice. I will recommend or assign web articles or sites from time to time, but there are no required textbooks for the course.

Most of the coursework we do requires the GNS3 network simulation environment. You will need a laptop or access to a remote system to install and run GNS3 for lab assignments and examinations.

Course Goals:

By the end of this course, you will be able to identify, configure and describe the operation of networking hardware components and data link technologies. You will be able to use this knowledge to craft inter-networks of moderate complexity in both real and simulated network environments. You will also learn to use packet capture and dissection tools to help observe, analyze and describe network protocols and traffic events.
Exam Topics:

OSI and IP Reference Models
- List and Describe the Layers
- Identify Devices and Protocols at each layer

IP Addressing
- Classful Address Ranges, Masks and Uses
- Classless Addressing and Subnetting
  - Network Size
  - Network Sub-Allocation
  - Network Enumeration (ID, first, last, broadcast)
- Special Addresses

Link Layer Packet Forwarding
- Point to Point vs. Multipoint and when is ARP required
- Serial HDLC
- Ethernet
  - Bridge Forwarding Database
  - Default Forwarding Operation

Network Layer Packet Forwarding
- Routing Tables
- Default Forwarding Operation

Dynamic Routing Protocols
- Link State and Distance Vector Algorithms
- Interior and Exterior Gateway Protocols
- Classification and performance of RIP, OSPF and BGP
- Configuration within an END Autonomous System
- Configuration within a TRANSIT Autonomous System
- Routing Between Autonomous Systems

Service Provider Reference Architecture
- P, PE, CE
- MPLS Service Provider Protocols - IGP, LDP, BGP

Link Layer Virtualization
- Frame Relay
- Tagged Ethernet
- MPLS Pseudowire

Network Layer Virtualization
- Virtual Routing and Forwarding Instances (VRFs)
- MPLS-BGP Layer 3 VPNs (Virtual Internetworks)
<table>
<thead>
<tr>
<th>Week 1</th>
<th>Reference Models, IPv4 Addressing, Environment Configuration, Packet Capture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 2</td>
<td>Link and Internetwork Layer Forwarding</td>
</tr>
<tr>
<td>Week 3</td>
<td>Link and Internetwork Layer Forwarding, Dynamic Routing</td>
</tr>
<tr>
<td>Week 4</td>
<td>RIP and OSPF</td>
</tr>
<tr>
<td>Week 5</td>
<td>BGP</td>
</tr>
<tr>
<td>Week 6</td>
<td>BGP, Midterm Review</td>
</tr>
<tr>
<td>Week 7</td>
<td>MIDTERM EXAM</td>
</tr>
<tr>
<td>Week 8</td>
<td>Network Virtualization: Frame Relay, Tagged Ethernet, VRF</td>
</tr>
<tr>
<td>Week 9</td>
<td>Network Virtualization: Frame Relay, Tagged Ethernet, VRF</td>
</tr>
<tr>
<td>Week 10</td>
<td>Network Virtualization with MPLS</td>
</tr>
<tr>
<td>Week 11</td>
<td>Network Virtualization with MPLS</td>
</tr>
<tr>
<td>Week 12</td>
<td>Network Virtualization with MPLS</td>
</tr>
<tr>
<td>Week 13</td>
<td>Review</td>
</tr>
<tr>
<td>Week 14</td>
<td>FINAL EXAM</td>
</tr>
</tbody>
</table>
Laboratory Reports:

Lab scenarios will be posted on Blackboard as assignments. Each scenario will include instructions or procedures for building a topology, running tests, making observations and writing a report. Reports must be submitted via Blackboard in portable document format (pdf) by the due date. The instructor reserves the right not to grade late submissions.

Homework:

Homework may be assigned by the instructor and will include questions and exercises designed to help the student achieve and demonstrate mastery of key material.

There will be both written and practical quizzes to test your mastery of certain topics. Quiz grades are weighted equivalently to homework grades.

Examinations:

There will be one midterm and one final examination. Both will include a written portion and a practical (hands-on) portion.
Attendance Policy:

Students are required to attend all lab sessions. The instructor will take attendance at the beginning of each session. Late arrivals, early departures and absences will lose class participation points. Any absence, planned or otherwise, should be reported in advance to the instructor in person and by email.

Grading:

10%: Class attendance and participation. Everyone who shows up and tries will get full credit. Those who help classmates can earn extra credit. Points will be deducted for disrupting or failing to participate in class. This includes working on projects or assignments from other courses without prior permission from the instructor.

30%: Lab reports, homework and quizzes.

30%: Mid-term examination. Content will depend on the pace of the class and will cover all the material through week 6.

30%: Final Examination. This will be a cumulative examination of all topics covered in the Course.

Disputing Your Grade:

Students are allowed to contest the grading of their own work. Students must demonstrate the correctness of their work by citation of a written reputable source. Reputable sources include published books, articles in industry magazines, academic journals and web articles recommended by the course materials or the Instructor.

Extra Credit:

Students may be given periodic opportunities to earn extra credit. These opportunities include:

- Assisting or correcting the Instructor
- Bonus questions in homework or examinations
- Extra effort in the assistance of classmates

Accessibility and other Accommodations:

If you require accommodations for a learning disability or other condition that affects your ability to participate in class or access course material, please make sure you’ve documented this with the appropriate authority (e.g. Disability Services; SUB I, Rm. 4205; 993-2474; http://ds.gmu.edu). Afterward, please meet with me to discuss your accommodation needs.
Standards of Conduct:

- There is no eating or drinking in the lab.
- Disruptive or disrespectful behavior toward other students or the instructor will not be tolerated. Students will lose class participation points and may be asked to leave the lab. Without prior permission from the instructor, spending lab time and resources on coursework for other classes is considered disruptive behavior.
- During class, you'll be expected to actively participate in the learning process. Please prepare yourselves beforehand, answer questions, participate in exercises and follow instructions. If you have experience with network design and configuration or if you find yourself naturally adept, please help your classmates.
- This is a lab, so experimentation is encouraged. However, please be courteous to others. Always communicate what you're doing as it may impact other groups.
- If you have questions, by all means ask the instructor (after all, that’s why we’re here).