An Undergraduate Major Emphasizing System Administration

Charlie Wiseman

Wentworth Institute of Technology

wisemanc@wit.edu

Bachelor of Science in Computer Networking

- Four year program, run in parallel with a more traditional B.S. in Computer Science

  - ~50 incoming freshman every y

  - ~30 graduates every year

  - 2 required semesters of Co-op

  - ABET accredited (under the Computing Accreditation Commission as a "General Criteria Only" program)

Major Coursework

	Fall	Spring	Summer
Freshman Year	Intro to Networking & Systems, Computer Science I	Routing & Switching, Computer Science II	
Sophomore Year	Object Oriented Programming, Operating Systems	Linux Administration, Database Systems	Optional Co-op
Junior Year	Network Administration, Project Management, Networking Elective	Required Co-op	Web Development, Networking Elective, Security Elective
Senior Year	Required Co-op	Software Engineering, Networking Elective	Senior Project, Networking Seminar, Networking Elective

- Networking Electives: WAN Protocols, Wireless Networking, Cellular Networking, Advanced System Administration, Systems Programming, Database Applications, Computer Science Electives

- Security Electives: Cryptography, Network Security, Web Security

Some Course Details

- **Intro to Networking & Systems**

  » Topics: Linux command line, virtualization, OSI model and basic protocols (TCP/IP stack)

  » Tools: Ubuntu, bash, Virtualbox, Wireshark

- **Routing & Switching**

  » Topics: routing protocols, subnetting, router/switch configuration, VLANs

  » Tools: Packet Tracer, Cisco hardware

Some Course Details

- **Linux Administration**

  - » Topics: scripting, Linux server configuration, packages, account systems, backups, web hosting

  - » Tools: CentOS, bash scripting, regular expressions, Linux server commands, Apache, cron, tcpdump

- **Network Administration**

  - » Topics: DHCP, DNS, NAT, VPNs, IPv6, Windows server configuration

  - » Tools: VMware, Windows Server, Active Directory

Some Course Details

- Advanced System Administration

  » Topics: more scripting, automated installation, network account systems, configuration management, VoIP

  » Tools: perl, python, bind, kickstart, 389-DS, puppet, Asterisk

What Students Really Learn

- **Networking protocols**

  » Packet-level details, packet exchanges

- **Device configuration**

  » Routers, switches, servers, clients

- **Troubleshooting**

  » Working through configurations that aren't quite right to fix them

What Students Really Don't Learn

- **Network Design**

  » Designing/redesigning an environment from scratch

- **Large Scale Deployments**

  » Data center networking, huge enterprises, ISPs

- **Troubleshooting**

  » Jumping into an unknown situation and working out what's wrong

Challenges

- Giving students practical experience with actual production systems at scale

- Keeping the program and courses in line with current technologies and best practices

- Walking the fine line to teach troubleshooting effectively

Solutions...?

- Two required co-ops alleviate some of these problems

  » Two semesters of experience working in production environments is far more valuable than two more semesters of course work

  » Also helps our students get better full time job offers!

- Guest speakers from industry are brought in regularly

  » Helps both students and faculty stay abreast of reality

  » Of course, it doesn't help if we don't update our courses in the long run

Teaching Troubleshooting

- It's hard to do well!

- Try to teach methods and logical problem solving, but that's not enough

- Students need to struggle, get frustrated, and make things worse to learn how to make them better

  » Without getting so frustrated that they give up

- How much detail do we give in assignments?

- Build in failure? Tell them that we do?

Wrap Up

- Our Computer Networking program has a strong central sequence in system and network administration

- Together with the co-op program, our students do very well in the job market right out of school

- They will do even better if we can tackle some of these difficult challenges

?

- Questions?

- Comments?

- Feedback?

- Suggestions?

- Snide remarks?

- Good news?