Carleton University
Department of Systems and Computer Engineering

SYSC 5801 Advanced Network Routing Technologies Winter 2012

Instructor: Chung-Horng Lung

- Office: Mackenzie Building, Room 4248
- Office hours: 11:00-12:30 Tuesdays, Thursdays
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Calendar Description:

The course covers network routing, in-depth issues and technologies in traffic engineering, quality of service (QoS), and high-speed networks. The course addresses the following topics: basic routing, MPLS (Multiprotocol Label Switching) system components and architecture, constraint-based routing, traffic engineering, content distribution networks, network monitoring and measurements, QoS, protection and restoration, virtual private networks, cross layer interworking, and special topics.

Pre-requisites: SYSC4602 Computer Communications or equivalent

Grading Scheme:

Assignments: 20%
Class participation for reading assignments and project presentation: 5%
Project and Presentation: 50%
Final Exam: 25%

Text: No single textbook was found to cover all the different topics discussed in this course. Many papers will be used for the course. The following is a list of suggested references for general network switching and routing technologies.

1. B. Davie and Y. Rekhter, *MPLS Technology and Applications*, 2000, Morgan Kaufmann.
2. J. Minei, *MPLS-Enabled Applications – Emerging Developments and New Technologies*, 2nd edition, Wiley, 2008.
3. E. Osborne and A. Simha, *Traffic Engineering with MPLS*, Cisco Press, 2002.
4. R. Puzmanova, *Routing and Switching Time of Convergence*, Addison-Wesley, 2002.

Week-by-week Description:

- Week 1: Overview of routing and MPLS components and architecture
  - Basic routing
  - MPLS framework
- Week 2 – 3: Traffic Engineering
  - Introduction to traffic engineering
  - Green traffic engineering and communications
  - Network monitoring and measurements

    - Content distribution networks
- Week 4 – 5: Constraint-based routing
    - Constraint-based shorted path first algorithm
    - Label switched path calculation
    - Signalling protocols
    - Label switched path creation
- Week 6: Quality of Service (QoS)
    - QoS models
    - QoS routing and traffic engineering
- Week 7 – 8: Protection and restoration
    - Path protection and segment protection
    - Link and node protection
    - Protection and QoS
    - Protection for multicast
    - P-cycle
    - Network coding
- Week 9: Virtual private networks
    - VPN models
    - Layer 3 BGP/MPLS VPNs
    - Layer 2 VPNs
- Week 10: Special topics
    - XML messages routing and forwarding
    - P2P communications
    - GMPLS
- Week 11 – 12: Project Presentations

Cheating and plagiarism: Suspected cheating or plagiarism will be investigated and will be reported to the Associate Dean, see General Regulation 14.

> Cheating includes (i) submitting someone else's assignment as your own, (ii) allowing someone else to submit your solution as his/her own, and (iii) submitting your own project submitted for another related course.
>
> Plagiarism is "unauthorized use or close imitation of the language and thoughts of another author and the representation of them as one's own original work, as by not crediting the author" (from Dictionary.com).

Health and Safety information: Here is the link to the health and safety manual www.sce.carleton.ca/courses/health-and-safety.pdf.