

RYERSON UNIVERSITY

Ted Rogers School of Information Technology Management
And G. Raymond Chang School of Continuing Education

COURSE OF STUDY 2011-2012

(C)ITM 513 - Advanced Infrastructure Deployment and Management

1.0 PREREQUISITE

The prerequisite for this course is (C)ITM 600 – Data Communications Network Design. Students who do not have the prerequisite will be dropped from the course.

2.0 INSTRUCTOR INFORMATION

- Name:
- Office Phone Number:
- E-mail address:
- Faculty/course web site(s):
- Office Location & Consultation hours:
 - Your instructor is available for personal consultation during scheduled consultation hours which are posted on their office door or on the course Blackboard site. However, you are advised to make an appointment by e-mail or by telephone before coming to ensure that the professor is not unavoidably absent.
- E-mail Usage & Limits:

Students are expected to monitor and retrieve messages and information issued to them by the University via Ryerson online systems on a frequent and consistent basis. ***Ryerson requires that any official or formal electronic communications from students be sent from their official Ryerson E-mail account.*** As such emails from other addresses may not be responded to.

3.0 CALENDAR COURSE DESCRIPTION

This course builds upon the network design concepts that were introduced in ITM 600. This course focuses on understanding industry best practices in the design and deployment of TCP/IP based networks. Specific topics such as: subnetting, route aggregation, IPv6, interior and exterior routing protocols (RIP, OSPF, EIGRP, MPLS, and BGP), and the selection of IP routing protocols will be presented. Other issues such as the deployment of VPN's (Virtual Private Networks) reliability and scalability issues may also be covered depending on the students' interests and the time available.

4.0 COURSE OVERVIEW

This course will expand on the IP Switching and Routing Concepts introduced in ITM600.

In the first section of the course, will be focused on traditional Routing and Switching protocols including: LAN Switching, RIP, OSPF, EIGRP and BGP. The second section of the course will introduce IP switching with MPLS, LDP and RSVP.

Four written assignments will provide students with an opportunity to develop their skills in the Routing and Switching protocols that are presented in class.

5.0 COURSE OBJECTIVES

Upon completion of the course, students will be able to:

- Comprehend and deploy the IP protocol including IP Packet formats, IP addressing and Sub-netting.
- Understand the operation of LAN Switching technologies and protocols
- Select and deploy IP routing Protocols including RIP, OSPF, BGP and EIGRP.
- Understand the operation and deployment of IP switching technologies like MPLS, LDP and RSVP.

6.0 EVALUATION

The grade for this course is composed of the mark received for each of the following components:

| | |
|--|------|
| Mid Term Test: <ul style="list-style-type: none">• 1.5 hour duration scheduled for Week 7• Combination of multiple choice questions and the written part. | 30% |
| Problem Sets and Labs: <ul style="list-style-type: none">• Four assignments will be provided over the course of the term.• They will consist of written answers, descriptive, calculations and analytical analysis. | 20% |
| Total Term weighting | 50% |
| Final Examination: <ul style="list-style-type: none">• 2.5 hours duration• Combination of multiple choice questions and the written part. | 50% |
| Total course weighting | 100% |

NOTE:

- Should a student believe that an assignment, test or exam has not been appropriately graded, the student must review their concerns with the instructor within 10 working days from when the graded work was made available to the students.

In the group project work all group members will receive the same marks for their group presentation and group project report, regardless of contribution (or lack of contribution) of any member of the group

In every course which contains individual assessment (including all tests, quizzes, mid-term/final exam, and assignments), to pass the course, the student must earn a combined average of at least 50% in these particular evaluations (i.e. 25 out of 50).

In addition, in order to pass this course, students must pass the final examination.

7.0 POSTING OF GRADES

- ❖ All grades, on assignments or tests must be posted or made available to students through the return of their work. Grades on final exams must be posted. However, as there may be other consideration in the determination of final grades, students will receive their official final grade in the course only from the Registrar. Final official course grades may not be posted or disclosed anywhere by an instructor.
- ❖ Posting of grades on the Course Management System (Blackboard) is preferred. If grades are posted in hard copy they must be posted numerically sorted by student identification number after at least the **first four digits** have been removed. Instructors must inform students in all course management documentation of the method to be used in the posting of grades. Students who wish not to have their grades posted must inform the instructor in writing.
- ❖ Some graded work will be returned to students prior to the last date to drop a course without academic penalty.

8.0 TOPICS – SEQUENCE & SCHEDULE

| Week | Topic | Content Location |
|------|---|--|
| 1 | Course Introduction Essential Concepts: Routers and Switches, Number Conversions, IP Packets, Data Link Protocols | Kurose : Ch 1: Introduction |
| 2 | Network Organization: Network Hierarchy Network Addressing Internet Protocol (IP) Communications Services IP Datagram IP Options ICMP IGMP IP Version 6 (overview) | Thomas: Ch 1: Introduction Ch 2: The Internet Protocol Kurose: Ch 4.4 IP: Internet Protocol |
| 3 | White Paper (Semaria) IP addressing IP Subnetting VLSM and CIDR Transport Protocols TCP and UDP overview Ports / sockets UDP | Thomas: Ch 3: Transport Protocols Farrel: Ch 7: Transport over IP Kurose: Ch 4.4: Subnets & IP Addressing |

| Week | Topic | Content Location |
|-------------|--|--|
| | Characteristics of reliable delivery Connection oriented protocols TCP Packet format TCPState Machine | |
| 4 | Understanding IP Addressing IP addressing IP Subnetting VLSM CIDR | White Papers: Understanding IP Addressing (Semaria) Farrel: Ch 2: The Internet Protocol |
| 5 | Link State Routing and OSPF Link state routing Neighbors Route Calculations Topology Changes Autonomous Systems OSPF Areas Stub and NSSA Areas OSPF Message Format Advertising Link States | Thomas: Ch 4: Link State Routing and OSPF Kurose : Ch 4.6 Routing in the Internet Farrel: Ch 5.5 OSPF |
| 6 | Distance Vector Routing RIP message Format RIP versus OSPF | Thomas: Ch 5: Distance Vector Routing and RIP Farrel: Ch 5.4 RIP |
| 7 | Mid Term Test Introduction To BGP | Thomas: Ch 6: Path Vector Routing and BGP Farrel: Ch: 5.8 BGP-4 |
| 8 | Path Vector Routing and BGP Implementing Routing Policies Path Vector Routing BGP Operation BGP within an AS (IBGP) BRP Messages Path Attributes | Thomas: Ch 6: Path Vector Routing and BGP Farrel: Ch: 5.8 BGP-4 |
| 9 | EIGRP - Enhanced Interior Gateway Routing Protocol Theory of Operation EIGRP Metrics Feasible Successor Redistribution Query processing Guidelines Designing Large Scale IP Networks Introduction Implementing Routing Protocols EIGRP Design Guidelines | 1) Cisco White Paper on EIGRP 2) Cisco Whitepaper on Designing Large Scale IP Networks |

| Week | Topic | Content Location |
|------|--|--|
| 10 | Designing Large Scale IP Networks (cont) OSPF Design Guidelines BGP Design Guidelines | 1) Cisco White Paper on EIGRP 2) Cisco Whitepaper on Designing Large Scale IP Networks |
| 11 | MPLS Multi-Protocol-Label-Switching MPLS Operations Labels Distributing Labels MPLS Message Formats Generic MPLS MPLS and Frame Relay MPLS and ATM MPLS and ICMP MPLS and BGP | Thomas: Ch 7: MPLS – Multi-Protocol Label Switching Kurose: 5.8 Link virtualization: ATM & MPLS |
| 12 | LDP - Label Distribution Protocol LDP Operation Meeting Neighbors Establishing sessions Exchanging labels Loop detection LDP Message Formats | Thomas: Ch 8: LDP – Label distribution Protocol Farrel: Ch 9.4 LDP |
| 13 | RSVP – TE RSVP Operation Flows Reservations RSVP and Dynamic Networks RSVP Message Formats Path Messages Reservation Requests Diagnostic Messages | Thomas: Ch 9: RSVP – TE Resource Reservation for Traffic Engineering Farrel: Ch 9.7 RSVP-TE |
| 14 | Final Exam | |

9.0 TEACHING METHODS

This course will incorporate the following teaching and learning methods:

- Regular lectures, prescribed weekly readings, problem based assignments, and case study discussions are the main teaching activities that occur in this course.
- Since a major component of this course is problem-based learning the four individual assignments provide the students practice and progressive skill-building that they can apply in real practice.
- The instructor will establish an active learning environment by engaging the students in a Socratic exchange of relevant questions and ideas. Students should expect a frequent and substantive interaction between the instructor and students and among students in every class.

- Those students that actively participate in the learning process will gradually assume ownership of the knowledge contained in the course materials. In addition to ownership of the course content, the students will master a set of skills that they can use to develop communications networks.

10.0 TEXTS & OTHER READING MATERIALS

Title:IP Switching & Essentials: Understanding RIP, OSPF, RGP, MPLS, CR-LDP, and RSVP-TE

Author(s):Stephen A. Thomas

Publisher:Wiley

ISBN: 978-0471034667

Optional Texts:

Title:Computer Networking: A Top-Down Approach

Author(s): James F. Kurose & Keith W. Ross

Publisher:Addison-Wesley

ISBN: 978-013607675

Title:The Internet and Its Protocols: A Comparative Approach - New Edition

Author(s):Adrian Farrel

Publisher:Morgan Kaufmann

ISBN: 978-1558609136

Recommended Texts:

Charles Kozierok, The TCP/IP Guide: A Comprehensive, Illustrated Internet Protocols Reference, No Starch Press, ISBN: 159327047X, Hardcover: 1616 pages, First edition, October 1, 2005 (Contents also available at: http://www.tcpipguide.com/free/t_toc.htm).

Todd Lammle, CCNA: Cisco Certified Network Associate Study Guide: Exam 640-802 (Paperback), Sybex; 6 edition, ISBN-10: 0470110082, ISBN-13: 978-0470110089, August 29, 2007.

William R Parkhurst, Routing First-Step (First-Step), Cisco Press, ISBN: 1587201224, Paperback: 432 pages, September 8, 2004.

Radia Perlman, Interconnections: Bridges, Routers, Switches, and Internetworking Protocols (2nd Edition, Addison-Wesley Professional, ISBN: 0201634481. Hardcover: 537 pages, September 14, 1999.

11.0 VARIATIONS WITHIN A COURSE

All sections of a course (Day and CE sections) will follow the same course outline and will use the same course delivery methods, methods of evaluation, and grading schemes. Any deviations will be posted on Blackboard once approved by the course coordinator.

Except for sections that are comprised entirely of Ted Rogers School of ITM students with notebooks (“notebook-enabled sections”), in most cases, the class will be 2 hours per week, plus a one-hour software lab. Notebook-enabled sections will typically integrate the lab component within a single three-hour time period. Regardless of format, an additional 9 hours will be required each week for independent reading, research, and practice using the software. Please review your course outlines for specific variations for your course.

12.0 OTHER COURSE, DEPARTMENTAL, AND UNIVERSITY POLICIES

- For more information regarding course management and departmental policies, please consult the ‘**Appendix of the Course of Study**’ which is posted on the Ted Rogers School of Information Technology Management website, <http://www.ryerson.ca/itm/pdf/Appendix.pdf>. This appendix covers the following topics:
 - 12..1** Variations within a course
 - 12..2** Attendance & Class Participation
 - 12..3** Email Usage
 - 12..4** Request for Academic Consideration
 - 12..4.1** Ryerson Medical Certificate
 - 12..4.2** Academic Accommodation for Students with Disabilities
 - 12..4.3** Religious, Aboriginal or Spiritual Observance
 - 12..4.4** Re-grading and Recalculation
 - 12..5** Examinations & Tests
 - 12..5.1** Period of Prohibition from Testing
 - 12..5.2** Make-Up of Mid-Term Tests, Assignments and Other Assessments
During the Semester
 - 12..5.3** Make –Up of Final Exams
 - 12..5.4** Missing a Make-Up
 - 12..6** Late Assignments
 - 12..7** Standard of Written Work
 - 12..8** Academic Grading Policy
 - 12..9** Academic Integrity
 - 12..9.1** Turnitin.com
 - 12..10** Student Rights