

# Advanced Network Engineering - Course Outline

## NWEN 403: 2015 Trimester 1

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This document sets out the workload and assessment requirements for NWEN 403. It also provides contact information for staff involved in the course. If the contents of this document are altered during the course, you will be advised of the change by an announcement in lectures and/or on the course web site. A printed copy of this document is held in the School Office.

This course extends the data communications and telecommunication taught in Computer Network Design, concentrating on new developments and network case studies. The course is designed for those aiming for careers that involve networking or network research and enhances the understanding of distributed systems through the applications of distributed systems in network management and Internet infrastructure.

NWEN 403 (Advanced Network Engineering) covers three components:

- network fundamentals - covering some fundamentals such as QoS, not covered in NWEN 302.
- practical skills - building a reliable and secure enterprise network.
- network research - investigating the state of the art in network research.

The main focus of this course is on exposing you to the front-line of network research and exploring your research potential. As such, literature survey and critical / forward thinking are essential in this course.

To make you aware what is going on in industry, industry speakers will be invited to give talks. We have the following confirmed speakers:

- Prasan De Silva (Network Architect, Telecom NZ): Mobile / Cellular Networks
- Josh Bailey (Network Software Engineer, Google): Software Defined Networking (SDN) / OpenFlow

## Objectives

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Advanced Network Engineering is part of the Engineering program at Victoria University of Wellington. BE graduates are expected to exhibit a number of graduate attributes at the completion of the program. This course contributes to the graduate attributes (GA) as indicated below. A full table of these attributes is available at [Graduate Attributes](#).

By the end of the course, students should be able to:

1. design, set up and configure a secure and reliable enterprise network including setting up domain name translation services, switching and routing, monitoring and managing network devices and debugging network setup (GA [3\(a\)](#), [3\(b\)](#), [3\(d\)](#), [3\(e\)](#), [3\(f\)](#)).
2. demonstrate advanced knowledge of network fundamentals (GA [3\(a\)](#), [3\(d\)](#), [3\(e\)](#)).
3. demonstrate the ability to understand and evaluate research papers, and describe research problems in areas such as content centric networking, vehicular networks, cross-layer design and software defined radio, network measurement and advanced transport layer protocols (GA [3\(a\)](#), [3\(d\)](#), [3\(e\)](#)).
4. present and communicate network engineering problems and solutions (GA [2\(b\)](#)).

## Textbook

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NWEN 403 will not use any specific textbook, although some of the material will be based on the NWEN302 text book by Kurose and Ross:

- Computer Networks: A top down approach featuring the Internet, Fifth Edition, Pearson, available from VicBooks.

Other useful books include:

- Andrew Tanenbaum, Computer Networks, 5th edition.
- Dimitri Bertsekas and Robert Gallager, Data Networks, second edition.
- William Stallings, Data and Computer Communications, ninth edition.
- William Stallings, Highspeed Networks and Intranets, second edition.
- Douglas Comer, Computer Networks and Internets, fifth edition
- Jorg Liebeherr and Magda Zarki, Mastering Networks: an Internet lab manual.
- IBM Redbook [TCP/IP Tutorial and Technical Overview](#) (published 2006).

Much of the material within the course is taken from a number of magazine, journal or conference papers published by IEEE, ACM or Springer, or from Internet Drafts/RFCs from IETF. Many of them are available in the library and can be accessed from digital libraries such as:

- [IEEE Explore](#)
- [ACM Digital Library](#)
- [SpringerLink](#)
- [IETF Datatracker](#)
- [CiteSeer](#)
- [Google Scholar](#)

## Lectures, Tutorials, Laboratories, and Practical work

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NWEN 403 is a trimester 1 course. The trimester starts on 2 Mar. The examination period at the end of the course is 12 June - 1 July.

A [schedule](#) of lecture topics, readings, and assignment due dates is available online

Lectures for NWEN 403 are:

Day	Time	Room
Monday	1200-1250	Von Zedlitz 108
Wednesday	1200-1250	Von Zedlitz 108

The lab CO246 is reserved for NWEN 403 students at the following times to work on their lab projects:

Day	Time	Room
Thursday	1300-1700	CO246

Students may use the lab facilities in CO246 at any time, provided other courses are not using this lab or you are not interfering with other courses.

Lecture topics include:

- P2P, BitTorrent, Skype
- Multicasting
- Multimedia Applications & QoS
- Network management
- Software defined networking / OpenFlow
- Mobile networks & MIMO Systems
- IEEE802.11 MAC layer issues, rate adaptation
- Content centric networking
- High performance TCP variants

## Assignments and Projects

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There is one lab project, one survey paper and one presentation for NWEN 403. The lab work will be performed with the network facilities in CO246. All written reports must be submitted through the online submission system.

- The lab project is about building an enterprise network, serving objectives 1 and 2.
- The survey paper is about understanding the state of the art of network research, serving objectives 2 and 3.
- The presentation is for you to present your survey paper, serving objective 4.

All the tasks must be carried out **individually** and **independently**.

## Workload

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In order to maintain satisfactory progress in NWEN 403, you should plan to spend an average of at least *10* hours per week on this paper. The course is 15 points, i.e. 150 hours of effort approximately overall for satisfactory progress. A plausible and approximate breakdown for these hours would be:

- Lectures: 2 hours per week
- Reading and Practical work: 8-12 hours per week

## School of Engineering and Computer Science

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The School office is located on level three of the Cotton Building ([Cotton 358](#)).

## Staff

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The course organiser and lecturer for NWEN 403 is [Qiang Fu](#). The lab instructor is [Radek Hes](#). Their contact details are:

- [Qiang Fu](#)
- [Alan MacDiarmid 414](#)
- +64 4 463 5233x8829
- [qiang.fu@ecs.vuw.ac.nz](mailto:qiang.fu@ecs.vuw.ac.nz)
  
- [Radek Hes](#)
- [Cotton 360](#)
- +64 4 463 6496
- [radek.hes@ecs.vuw.ac.nz](mailto:radek.hes@ecs.vuw.ac.nz)
  
- Office hours: set by appointments

## Announcements and Communication

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The main means of communication outside of lectures will be the NWEN 403 web area at [http://ecs.victoria.ac.nz/Courses/NWEN403\\_2015T1/](http://ecs.victoria.ac.nz/Courses/NWEN403_2015T1/). There you will find, among other things, this document, the [lecture schedule](#) and [assignment handouts](#), and the [NWEN 403 Forum](#). The forum is a web-based bulletin board system. Questions and comments can be posted to the forum, and staff will read these posts and frequently respond to them.

## Assessment

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Your grade for NWEN 403 will be determined based on the following assessment weightings:

Item	Weight	Due
Assignment 1	2.5%	Fri., 23:59, Week 5
Assignment 2	2.5%	Fri., 23:59, Week 09
Lab Project	15%	Fri., 23:59, Week 10
*Interim survey paper	5%	Mon., 23:59, Week 7
*Final survey paper	10%	Fri., 23:59, Week 11
Presentation	5%	Week 12
Final Examination	60%	TBA

\* Note, a lower interim survey paper mark will be boosted to match a higher mark on the final survey paper. We will give feedback on the interim survey paper. We expect that you use the feedback and improve the quality of your final survey paper.

The lab project will be assessed based on your lab performance and the project report.

Late submissions will be penalised by up to one grade boundary per day, and will not be accepted more than five days after the due date. Late submissions will be accepted by prior arrangement with the course coordinator for valid reasons such as medical (doctors note required) and family emergencies.

**Note:** Bachelor of Engineering students should be aware that copies of their assessed work may be retained for inspection by the accreditation panel.

## Final Exam

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The final examination will assess your understanding of the material covered in lectures and labs, but have a focus on the theoretical side of this course.

The [timetable for final examinations](#) will be available from the University web site and will be posted on a notice board outside the faculty office. The final examination will be three hours long. No computers, programmable calculators or similar device will be allowed in the final examination. Paper non-English to English dictionaries will be permitted. The examination period for trimester 1 is 12 June - 1 July.

## Plagiarism

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### Working Together and Plagiarism

We encourage you to discuss the principles of the course and assignments with other students, to help and seek help with programming details, problems involving the lab machines. However, any work you hand in must be your own work.

The [School policy on Plagiarism](#) (claiming other people's work as your own) is available from the course home page. Please read it. We will penalise anyone we find plagiarising, whether from students currently doing the course, or from

other sources. Students who knowingly allow other students to copy their work may also be penalised. If you have had help from someone else (other than a tutor), it is always safe to state the help that you got. For example, if you had help from someone else in writing a component of your code, it is not plagiarism as long as you state (eg, as a comment in the code) who helped you in writing the method.

## Mandatory Requirements

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1. Obtain at least 50% of the total available marks for the assignments, lab project, survey paper and presentation;
2. Obtain a D grade or better in the final exam.

## Passing NWEN 403

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To pass NWEN 403, a student must satisfy mandatory requirements and gain at least a **C-** grade overall.

## Withdrawal

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The last date for withdrawal from NWEN 403 with entitlement to a refund of tuition fees is Friday 13 March 2015. The last date for withdrawal without being regarded as having failed the course is Friday 15 May 2015 -- though later withdrawals may be approved by the Dean in special circumstances.

## Rules & Policies

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Find key dates, explanations of grades and other useful information at <http://www.victoria.ac.nz/home/study>.

Find out about academic progress and restricted enrolment at <http://www.victoria.ac.nz/home/study/academic-progress>.

The University's statutes and policies are available at <http://www.victoria.ac.nz/home/about/policy>, except qualification statutes, which are available via the Calendar webpage at <http://www.victoria.ac.nz/home/study/calendar> (See Section C).

Further information about the University's academic processes can be found on the website of the Assistant Vice-Chancellor (Academic) at <http://www.victoria.ac.nz/home/about/avcacademic>

All students are expected to be familiar with the following regulations and policies, which are available from the school web site:

[Grievances](#)

[Student and Staff Conduct](#)

[Meeting the Needs of Students with Disabilities](#)

[Student Support](#)

[Academic Integrity and Plagiarism](#)

[Dates and Deadlines including Withdrawal dates](#)

[School Laboratory Hours and Rules](#)

[Printing Allocations](#)

[Expectations of Students in ECS courses](#)

The School of Engineering and Computer Science strives to anticipate all problems associated with its courses, laboratories and equipment. We hope you will find that your courses meet your expectations of a quality learning experience.

If you think we have overlooked something or would like to make a suggestion feel free to talk to your course organiser or lecturer.

[Course Outline as PDF](#)

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