Course Staff

Course Convener and Lecturer: Dr. Tim Moors, t.moors@unsw.edu.au

Consultations: You are encouraged to ask questions on the course material, after lectures during class times (if time permits). Another opportunity to ask questions is during consultation times (exact times to be announced on the course web page) in the Lecturer's office, room 741 of building E10.

Email: You can contact the Lecturer about course administration issues through email to t.moors@unsw.edu.au if you include the phrase "tele9752" in the subject line and your student number in the message body. Please do not ask technical questions about the content of this course through email.

Keeping Informed: Announcements may be made during classes, via email (to your student email address, e.g. z1234567@student.unsw.edu.au) and/or via the course web page. Please check these sources at least once per week. Please note that you will be deemed to have received this information, so you should take careful note of all announcements.

Course Resources

Web sites: The course web page http://subjects.ee.unsw.edu.au/tele9752/ is the primary online resource for this course, directly hosting many resources (e.g. schedule, lecture slides and recommended reading) and linking to others, such as the course wiki http://tele9752.wikia.com/ . A condition of editing the wiki is that you agree to license your edits under the Creative Commons Attribution-Share Alike License 3.0 (Unported). This course will also use Moodle for discussion forums and disseminating marks. The Moodle entry page http://moodle.telt.unsw.edu.au gives contact information for UNSW services that can help you access and use Moodle if you have problems. If they fail, then contact the Lecturer.

Textbooks

The recommended book for this course is
        A. Clemm: *Network Management Fundamentals*, Cisco Press
Note that this book is recommended, and not required/prescribed.

Course Summary

Contact Hours

The course consists of 3 hours of lectures each week (except when the mid-session test replaces lectures). Class times and locations are available online http://classutil.unsw.edu.au/TELE_S2.html#TELE9752T2 . Class meetings will include traditional live oral lectures, but perhaps more importantly create an opportunity to interact with the Lecturer and fellow students as they are engaged in the same pursuit of learning. The Lecturer encourages you to participate in these face-to-face meetings by asking and answering questions.

Context and Aims

The aim of TELE9752 is to develop student understanding of how telecommunication networks are operated and controlled. That is, whereas other networking courses focus solely on the technologies that enable users to transfer information across a network (e.g. TELE3118 focuses on network protocols, and TELE9751 focuses on the design of network equipment), this course considers how such technologies can be operated and controlled by people concerned with providing network services (e.g. network administrators).

Indicative Lecture Schedule

Period	Summary of Lecture Program
Week 1	Network Management Systems
Week 2	Revisiting protocol stacks in context of management
Week 3	Structuring & presenting management information (SMI, OIDs, MIBs, ASN.1, BER)
Week 4	Communicating management information (SNMP, syslog)
Week 5	Remote Monitoring (RMON)
Week 6	Consolidation
Week 7	Mid-session exam
Week 8	Security Management
Week 9	Fault Management: Dependability and Event correlation
Week 10	Accounting management
Week 11	Configuration management Performance management
Week 12	Student presentations on advanced topics

The first half of the course focuses on the information and protocols involved in Network Operations and Control, while the second half focuses on the five functional areas of NOC (FCAPS: Fault, Configuration, Accounting, Performance, and Security management).

Assessment dates and weights

	Weighting	Task	Submission date
Required	80%	Examinations 0% background diagnostic 35% mid-session exam 45% final exam	during week 2 class during week 7 class during end-of-semester exam period
	10.00%	Assignment	end of week 12
	10%	Group research presentation	during week 12 class
Optional	+≤10%	Bonus for course improvement	before the final exam

If you choose to perform optional assessment tasks, then your mark for those tasks will supplement your mark from required assessment tasks. The "end of" a week is 11:59pm on the Sunday that follows that week of class.

Course Details

Credits

This is a 6 Units of Credit (UOC) course. "The normal workload expectations of a student are approximately 25 hours per Semester for each UOC" [https://student.unsw.edu.au/uoc] or about 10–12 hours per week throughout the 13 week semester.

Relationship to Other Courses

TELE9752 is part of the Telecommunications Specialisation Area of multiple programs (program codes in parenthesis):
- Master of Engineering (8621)
- Master of Engineering Science (8538)
- Master of Engineering Science Extension (8539)
- Graduate Diploma of Engineering Science (5338)

It may also be chosen as an elective in other programs, e.g. the Bachelor of Engineering in Telecommunications program (code 3643) and the Doctor of Philosophy program (code 1640).

Several other UNSW courses relate to TELE9752:
- Prerequisites: Background from an introductory networking course like UNSW's TELE3118. Such background may be obtained from online courses such as http://media.pearsoncmg.com/ph/streaming/esm/tanenbaum5e_videonotes/tanenbaum_videoNotes.html
- Complementary: TELE3119 covers network security in more depth, whereas this course only covers securing of network management systems and management of security systems. TELE4642 considers network performance in depth. TELE9751 covers the internal design of the devices that this course considers the control of, and TELE9756 considers advanced aspects of networking.
- Following: TELE9752 is not a prerequisite for any other UNSW course, although students may wish to follow TELE9752 with complementary courses.

Pre-requisites and Assumed Knowledge

The pre-requisite for this course is an introductory networking course such as UNSW TELE3118 Network Technologies. It is highly desirable that you be familiar with the roles of various network devices (switches, routers, firewalls, etc) and the main protocols used for network communication before this course is attempted. The following graphic roughly depicts networking terms that you should be familiar with, to the extent that you should be able to describe each term in a sentence, with the size of the term reflecting the frequency with which it is used in TELE9752. The graphic is approximate, e.g. it only lists individual words not multi-word phrases (so "address" is prominent because it occurs in many phrases such as "IP address" and "link layer address"), and is derived from a spreadsheet that is available online that lists the background concepts that are referenced by each slide used in the lectures.

Learning outcomes

After successful completion of this course, you should be able to:

1. Describe the five functional areas of network management in terms of the problems that arise in each functional area and in terms of the technologies that are used to address those problems.
2. Construct Management Information Bases that describe the information used to manage typical network protocols.
3. Describe the main features of significant standards for network operations and control.
4. Access and assess recent developments in network operations and control research.

This course is designed to provide the above learning outcomes which arise from targeted graduate capabilities listed in *Appendix A*. The targeted graduate capabilities broadly support the UNSW and Faculty of Engineering graduate capabilities (listed in *Appendix B*). This course also addresses the Engineers Australia (National Accreditation Body) Stage I competency standard as outlined in *Appendix C*.

Syllabus

This course introduces the principles, techniques, and tools used for the management of modern communication networks such as the Internet. The five major functional areas of network management are discussed: configuration management for configuring the hardware and software on network elements, performance management for measuring and controlling network performance, fault management for detecting and responding to fault conditions in the network, security management for securing and controlling access to resources in the network, and accounting management for tracking and logging network usage.

Teaching Strategies

The design of this course has been informed by the following publications:

- M. Ulema: "Design and implementation of a network management course for undergraduate information systems students", *Information Systems Education Journal*
- B. Elenbogen: "Computer network management: theory and practice", *ACM SIGCSE Bulletin*, 31(1):119-21
- R. Minch and S. Tabor: "Teaching Network Management Hands-On: Experiences with a Student-Run Internet Service Provider", *Decision Line*, 32(3):4-6

Delivery Mode

The teaching in this course aims at establishing a good fundamental understanding of the areas covered using:

- Formal face-to-face lectures, which provide you with a focus on the core analytical material in the course, together with qualitative, alternative explanations to aid your understanding;

- Group research, which will develop your team work and communication skills and equip you with enduring skills for accessing the latest advances in network research.

- In the past we have provided exercises using network equipment, which support the formal lecture material and also provide you with practical construction, measurement and debugging skills, but this is not possible in 2017 due to the refurbishment of the EE&T building.

Learning in this course

You are expected to attend all lectures and exams in order to maximise learning. In addition to the studying the lectures and lecture notes, you should read relevant sections of the course wiki. Reading additional texts will further enhance your learning experience. Group learning is also encouraged. UNSW *assumes* that self-directed study of this kind is undertaken in addition to attending face-to-face classes throughout the course.

Assessment

Examinations

The bulk (80%) of the assessment will take the form of two closed-book examinations. Answers to exam questions should:
- Be self-contained in that it can be fully understood independent of course materials (e.g. lecture notes)
- Demonstrate skills and understanding of knowledge that are covered by the course.

Merely memorising course materials and repeating them as answers to exam questions will likely not demonstrate understanding of the materials and such answers will often not be self-contained.

Mid-Semester Exam

The mid-session exam is intended to give you timely feedback about your individual performance. It will last one hour and be held during lecture time in week 7, i.e. on Thursday September 7, 2017. Questions may be drawn from any course material up to the end of week 6. Marks will be assigned according to the correctness of the responses.

Final Exam

The exam in this course is a standard closed-book 2 hour written exam. The examination tests analytical and critical thinking and general understanding of the course material in a controlled fashion. Questions may be drawn from any aspect of the course covered in weeks 8-12. Marks will be assigned according to the correctness of the responses.

A Final Exam Paper Inspection Session will be held in the second week after results are released. If you wish to inspect your Final Exam paper during this Inspection Session, then you must tell the Lecturer within one week of the release of results.

Assignment

The assignment will give you the opportunity to investigate the selected topic from the course in further depth and to apply and develop your thinking skills in respect to that topic.

Group research

The final 10% of the assessment will be for a group activity about a research paper in the area of Network Operations and Control. The output of the activity will take the form of a presentation to be made in class in week 12 and a wiki page about the research paper. The intention of this assessment item is to develop skills in learning about the latest advances in Network Operations and Control, while also developing group work and communication skills. In week 10 you will receive feedback about how peers in your group value your contribution to the group. Your mark will reflect your own contribution to your group, as well as the output of your group as assessed by both the lecturer and class.

Bonus for course improvement

Students are encouraged to propose realistic ways to improve the course, and may be rewarded for such proposals by receiving a bonus mark (that adds to the 100% potential marks from other assessment tasks) of up to 10%. Such contributions (be they questions, answers, comments, pointers to useful course material, etc) must be made before the Final Exam. You can submit such contributions to the lecturer via email.

Appeals

Frequently when a course runs, some students are fortunate and receive just enough marks to succeed in their own way (e.g. 50PS or 85HD), and some students are unfortunate and receive slightly fewer marks than they seek (e.g. 49FL or 84DN). Close fails (e.g. 49) are particularly difficult for many TELE9752 students because they are often enrolled in MEngSc degrees in which there is no Pass Conceded mechanism, and many students incur high costs, e.g. in terms of visas or tuition fees, for failing a course. While the TELE9752 teaching staff are aware that such circumstances exist, we are only able to award marks on the basis of achievement demonstrated in the assessment tasks. If you are dissatisfied with your overall mark and feel that your circumstances warrant special treatment, then you should appeal to the School's Director of Academic Studies (see http://www.eet.unsw.edu.au/info-about/contact-us/school-contacts for contact details) and not to the TELE9752 teaching staff.

Relationship of Assessment Methods to Learning Outcomes

Assessment	Learning outcomes
	1	2	3	4			
Mid-semester exam	✓	✓	✓	-			
Final exam	✓	-	✓	✓			
Assignment	✓	✓	-	-			
Group research presentation	✓	-	✓	✓			

Other Matters

Academic Honesty and Plagiarism

Plagiarism is the unacknowledged use of other people's work, including the copying of assignment works and laboratory results from other students. Plagiarism is considered a form of academic misconduct, and the University has very strict rules that include some severe penalties. For UNSW policies, penalties and information to help you avoid plagiarism, see https://student.unsw.edu.au/plagiarism . To find out if you understand plagiarism correctly, try this short quiz: https://student.unsw.edu.au/plagiarism-quiz.

Student Responsibilities and Conduct

Students are expected to be familiar with and adhere to all UNSW policies (see https://student.unsw.edu.au/guide), and particular attention is drawn to the following:

Workload

It is expected that you will spend at least **ten to twelve hours per week** studying a 6 UoC course, from Week 1 until the final assessment, including both face-to-face classes and *independent, self-directed study*. In periods where you need to need to complete assignments or prepare for examinations, the workload may be greater. Over-commitment has been a common source of failure for many students. You should take the required workload into account when planning how to balance study with employment and other activities.

Attendance

Regular and punctual attendance at all classes is expected. UNSW regulations state that if students attend less than 80% of scheduled classes they may be refused final assessment.

General Conduct and Behaviour

Consideration and respect for the needs of your fellow students and teaching staff is an expectation. Conduct which unduly disrupts or interferes with a class is not acceptable and students may be asked to leave the class.

Work Health and Safety

UNSW policy requires each person to work safely and responsibly, in order to avoid personal injury and to protect the safety of others.

Special Consideration and Supplementary Examinations

UNSW has "special consideration" policies for "when illness or other circumstances interfere with your assessment performance." [https://student.unsw.edu.au/special-consideration] Pay particular attention to the need to **apply though myUNSW within 3 days of the date of the examination** for which you seek special consideration. You should only apply for special consideration for exceptionally severe/grave conditions, since you may not be granted it for moderate/mild conditions.   Any alternate assessment given to recipients of special consideration may be conducted orally and will be no easier than the original assessment. Any supplementary final exam will likely be held in week 18 (6 weeks after the last week of session), and you should particularly consider this if you are planning to travel. The school policy for offering supplementary exams is described at http://scoff.ee.unsw.edu.au/information/AcademicIssues.htm#Supplementary

Continual Course Improvement

This course is under constant revision in order to improve the learning outcomes for all students. Students are advised that the course is under constant revision in order to improve the learning outcomes for all students. Students are encouraged (in part by the potential for a bonus mark of up to 10%) to forward any feedback (positive or negative) on the course to the Lecturer. You may also forward feedback via the Course and Teaching Evaluation and Improvement Process or to ELSOC who will raise your concerns at student focus group meetings. As a result of previous feedback obtained for this course and in our efforts to provide a rich and meaningful learning experience, we have continued to evaluate and modify our delivery and assessment methods.

Administrative Matters

On issues and procedures regarding such matters as special needs, equity and diversity, occupational health and safety, enrolment, rights, and general expectations of students, please refer to the School and UNSW policies:
http://www.engineering.unsw.edu.au/electrical-engineering/policies-and-procedures
https://student.unsw.edu.au/guide

Appendix A: Targeted Graduate Capabilities

Electrical Engineering and Telecommunications programs are designed to address the following targeted capabilities which were developed by the school in conjunction with the requirements of professional and industry bodies:

- The ability to apply knowledge of basic science and fundamental technologies;
- The skills to communicate effectively, not only with engineers but also with the wider community;
- The capability to undertake challenging analysis and design problems and find optimal solutions;
- Expertise in decomposing a problem into its constituent parts, and in defining the scope of each part;
- A working knowledge of how to locate required information and use information resources to their maximum advantage;
- Proficiency in developing and implementing project plans, investigating alternative solutions, and critically evaluating differing strategies;
- An understanding of the social, cultural and global responsibilities of the professional engineer;
- The ability to work effectively as an individual or in a team;
- An understanding of professional and ethical responsibilities;
- The ability to engage in lifelong independent and reflective learning.

Appendix B: UNSW Graduate Capabilities

The course delivery methods and course content directly or indirectly addresses a number of core UNSW graduate capabilities, as follows:

- Developing scholars who have a deep understanding of their discipline. TELE9752 focuses on the discipline of network operations and control, and its contexts of broader IT and business management, network protocols, and engineering methods.
- Developing rigorous analysis, critique, and reflection, and ability to apply knowledge and skills to solving problems. These will be achieved through examination activities.
- The group research activity will contribute to
  - Developing capable independent and collaborative enquiry, and
  - Developing digital and information literacy and lifelong learning skills through assignment work.

Appendix C: Engineers Australia (EA) Professional Engineer Competency Standard

	Program Intended Learning Outcomes	
PE1: Knowledge and Skill Base	PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals	✓
	PE1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing	✓
	PE1.3 In-depth understanding of specialist bodies of knowledge	✓
	PE1.4 Discernment of knowledge development and research directions	✓
	PE1.5 Knowledge of engineering design practice	✓
	PE1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice	
PE2: Engineering Application Ability	PE2.1 Application of established engineering methods to complex problem solving	✓
	PE2.2 Fluent application of engineering techniques, tools and resources	✓
	PE2.3 Application of systematic engineering synthesis and design processes	
	PE2.4 Application of systematic approaches to the conduct and management of engineering projects	✓
PE3: Professional and Personal Attributes	PE3.1 Ethical conduct and professional accountability	
	PE3.2 Effective oral and written communication (professional and lay domains)	✓
	PE3.3 Creative, innovative and pro-active demeanour	
	PE3.4 Professional use and management of information	✓
	PE3.5 Orderly management of self, and professional conduct	
	PE3.6 Effective team membership and team leadership	✓