GSOE9758
Network Systems Architecture

Course Outline – Semester 2, 2017

Never Stand Still | Faculty of Engineering | School of Electrical Engineering and Telecommunications

Course Staff

Course Convener: Prof. Vijay Sivaraman, Room MSEB-749, vijay@unsw.edu.au

Consultations: You are encouraged to ask questions on the course material, during, before, or after the lecture class times in the first instance, rather than via email. Lecturer consultation times will be advised during lectures. ALL email enquiries should be made from your student email address with "GSOE9758" in the subject line, otherwise they may not be answered.

Keeping Informed: Announcements may be made during classes, via email (to your student email address) and/or via online learning and teaching platforms – in this course, we will be using the course webpage http://subjects.ee.unsw.edu.au/gsoe9758/. Please note that you will be deemed to have received this information, so you should take careful note of all announcements.

Course Summary

Contact Hours

The course consists of 3 hours of lecture each week.

Activity	Day	Time	Location
Lecture	Tuesday	6pm - 9pm	OMB 149

Context and Aims

This course aims to develop an understanding of the process of architecting network systems, at scales ranging from national (e.g. NBN), to enterprise (e.g. campus) and embedded (e.g. in-vehicle) networks. We will try to bridge the gap between business needs and technology solutions, by learning how to: (a) identify and represent high-level goals and requirements, (b) develop broad architectures that best satisfy needs within given constraints, and (c) create design plans ready for implementation. Case-studies will include the Australian National Broadband Network (NBN) and a University campus network. Guest lecturers from Cisco Systems and group projects with practical architecture development will enhance student learning.

Indicative Lecture Schedule

Period	Summary of Lecture Program
Week 1	Introduction and background
Week 2	Architecture processes and frameworks
Week 3	Business models
Week 4	Requirements analysis, NBN and University campus
Week 5	Architecture components

Week 6	**Mid-session test**
Week 7	**Project stage 1 presentation:** requirements
Week 8-9	Guest lectures and project discussion
Week 10	**Project stage 2 presentation:** architecture
Week 11-12	Guest lectures and project discussion
Week 13	**Project stage 3 presentation:** implementation

Assessment

Class presentation	10%
Mid-session test	10%
Final Exam (2 hours)	30%
Project	50%

Course Details

Credits

This is a 6 UoC course and the expected workload is 8 hours per week throughout the 13-week semester. It includes lectures and a project. You will be expected to work on the project outside of designated contact hours.

Relationship to Other Courses

This is a postgraduate elective course in the School of Electrical Engineering and Telecommunications. It may also be taken by undergraduate students of advanced standing.

Pre-requisites and Assumed Knowledge

This course assumes knowledge of the fundamentals of data networking covered in TELE3118 “Network Technologies”, including the functions of the various layers in the TCP/IP protocol stack. Some prior knowledge of network performance, network security, and network management, covered respectively in courses TELE4642 “Network Performance”, TELE3119 “Trusted Networks”, and TELE9752 “Network operations and Control” respectively, will be useful, though is not essential for this course.

Following Courses

The course is not a pre-requisite for other courses in the school or faculty.

Learning outcomes

Upon successful completion of this course, you will be able to:

- Describe the process of architecting a networking system
- Collect and categorise the requirements of the system
- Evaluate architectural components that best meet the requirements
- Analyse the interaction of the components and their trade-offs
- Develop broad design of network systems for specific deployment scenarios

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 aims to develop an understanding of the process of architecting network systems, at scales ranging from national (e.g. NBN), to enterprise (e.g. campus) and embedded (e.g. in-vehicle) networks. We will try to bridge the gap between business needs and technology solutions, by learning how to: (a) identify and represent high-level goals and requirements, (b) develop broad architectures that best satisfy needs within given constraints, and (c) create design plans ready for implementation. Case-studies will include the Australian National Broadband Network (NBN) and a University campus network. Guest lecturers from Cisco Systems and group projects with practical architecture development will enhance student learning.

Teaching Strategies

Delivery Mode

- Lectures – to convey the process of architecture, and the steps in the context of specific case-studies.
- Project – the project will be discussed in-class within a group as well as with the instructor(s), and will be presented to the whole class and documented in the form of a final report. The project will provide you with the opportunity to demonstrate your ability to apply the concept of this course to a real-world situation.
- Mid-session test – will provide feedback on your understanding of the material.
- Final examination – final test of competency.

Learning in this course

You are expected to attend all lectures in order to maximise learning. In addition to the lecture notes, you should read relevant sections of the recommended text. 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

- Class presentation [10%]: Each group will be assigned a specific week for which they have to develop a presentation addressing some of the key questions raised in class, and/or related to business/technology developments in the news. Each group will then present their findings and thoughts in a short in-class presentation. Students will also be marked on their class participation throughout the course.
- Mid-session test [10%]: This course will have an in-class written test of one hour that will evaluate and provide feedback on your understanding of the material in this course. The test will be held in class in week 6 (Tue 29 Aug). Re-tests will not be granted in the event that a student misses the test, unless satisfactory written evidence is presented of adverse conditions that prevented the student from taking the test. In such a case, the course coordinator may, at his discretion, conduct the re-test orally with the individual student, typically within two weeks of the original test date.
- Final exam [30%]: This two-hour final exam scheduled by the University will test your overall competency in the course.
- Project [50%]: A project will require you to architect a real-world networking system from requirements analysis to final design. You will have to present the first stage of your project on requirements and business model in-class in week 7, followed by a second

stage presentation in week 10 on the architecture, and a final presentation in week 13 demonstrating the implementation. Each presentation is worth 10% of the grade, and a final report (worth 20% of the grade) will be due in week 13 that will contain a comprehensive description of the business model, architecture, and implementation of your system. Late submissions will generally not be accepted.

Course Resources

Textbooks

- The recommended (though not required) reference books for this course are: (a) Priscilla Oppenheimer, "Top-Down Network Design", Third Edition, Cisco Press, 2010, and (b) James D. McCabe, "Network Analysis, Architecture, and Design", 3rd Edition, Morgan-Kaufman, 2007.
- Sections from various other books, papers, and other reading material will be used throughout this course; information about these will be posted on the course web-page: https://subjects.ee.unsw.edu.au/gsoe9758/
- Students seeking resources can also obtain assistance from the UNSW Library; please see info.library.unsw.edu.au/web/services/services.html

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 http://www.lc.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://my.unsw.edu.au/student/atoz/ABC.html), 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

You must submit all assignments and attend all examinations scheduled for your course. You should seek assistance early if you suffer illness or misadventure which affects your course progress. All applications for special consideration must be **lodged online through myUNSW within 3 working days of the assessment**, not to course or school staff. For more detail, consult https://my.unsw.edu.au/student/atoz/SpecialConsideration.html.

Continual Course Improvement

This course is under constant revision in order to improve the learning outcomes for all students. Please forward any feedback (positive or negative) on the course to the course convener or via the Course and Teaching Evaluation and Improvement Process. You can also provide feedback 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://my.unsw.edu.au/student/atoz/ABC.html

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 address a number of core UNSW graduate attributes; these include:

- The skills involved in scholarly enquiry: This course develops an attitude towards keeping up to date with the latest methodology and technology.
- An in-depth engagement with the disciplinary knowledge in its inter-disciplinary context: This course will help appreciate the socio-economic context and technological and market advances in other disciplines that shape modern communication network systems.
- The capacity for analytical and critical thinking and for creative problem solving: This course develops the ability to analyse and criticise the design decisions that shape network systems, and to indulge in design problems outside the limits of principles and examples used in teaching.
- The ability to indulge in independent and reflective learning.
- The skills to appropriately locate, evaluate, and use relevant information.
- The capacity to contribute to and work within the international community.
- The skills required for collaborative and multi-disciplinary 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	✓
Professional and Personal	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	✓