ELEN90078 Distributed Systems and Game Theory

Credit Points:	12.5
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	2016, Parkville This subject commences in the following study period/s: Semester 1, Parkville - Taught on campus.
Time Commitment:	Contact Hours: 36 hours of lectures Total Time Commitment: 200 hours
Prerequisites:	None
Corequisites:	None
Recommended Background Knowledge:	Convex optimisation.
Non Allowed Subjects:	None
Core Participation Requirements:	For the purposes of considering request for Reasonable Adjustments under the Disability Standards for Education (Cwth 2005), and Student Support and Engagement Policy, academic requirements for this subject are articulated in the Subject Overview, Learning Outcomes, Assessment and Generic Skills sections of this entry. It is University policy to take all reasonable steps to minimise the impact of disability upon academic study, and reasonable adjustments will be made to enhance a student's participation in the University's programs. Students who feel their disability may impact on meeting the requirements of this subject are encouraged to discuss this matter with a Faculty Student Adviser and Student Equity and Disability Support: http://services.unimelb.edu.au/disability
Coordinator:	Assoc Prof Tansu Alpcan
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Subject Overview:	This subject provides an introduction to the basic principles, analysis, and design of distributed systems and game theory within an engineering context, encompassing fundamental concepts, analytical tools, and algorithms. It focuses on multi-person decision making on distributed systems and game-theoretic approaches to resource allocation. Both static, distributed, and convex optimisation and (non)linear dynamical systems are studied. The concepts and methods discussed are illustrated in multiple application areas including Internet of Things (IoT), smart grid and power systems, cyber-security, and communication networks. The concepts taught in this subject will allow for a better understanding of distributed systems and provide much needed expertise for analysis and design of such systems using game theory. **INDICATIVE CONTENT** Topics covered may include: # A brief overview of convex optimisation and distributed systems # Distributed optimisation and network utility maximisation # Fundamentals of strategic (non-cooperative) games, Nash equilibrium and its distributed computation # Static, dynamic, stochastic, and Bayesian games # Coalition formation games # Security games # Basics of mechanism design, VCG mechanisms # The role of information in distributed systems and strategic games # Analysis of distributed systems using graph abstractions and games over graphs # Applications of distributed algorithms and strategic games to Internet of Things (IoT), smart grid and power systems, cyber-security, and communication networks.

Learning Outcomes:	On completion of this subject, it is expected that the student will: 1. Utilise mathematical tools and methods quantitatively to analyse and design distributed systems and algorithms. 2. Apply fundamental engineering modelling methods to analyse and synthesise strategic games. 3. Describe basic concepts related to game theory, distributed systems, and their relationships and reflect critically on their theory and professional practice. 4. Apply fundamental techniques from distributed systems and game theory to address problems associated with engineering systems and use numerical analysis tools when appropriate. 5. Interpret and communicate on aspects of distributed systems and game theory to specialist and non-specialist audiences.
Assessment:	Assessment of submitted project work completed individually not exceeding 15 pages over the semester [Intended Learning Outcomes: 1,2,4], 10 hours work per studenrt, due Week 4 (10%) Assessment of submitted project work completed in small groups (2-3 students), not exceeding 15 pages over the semester [ILOs: 3,4,5], 25 hours work per student, due Week 8 (20%) Oral presentation of project work, team-based with 2-3 members, of approximately 15-20 mins duration [ILOs: 4,5], 10 hours work per student, due Week 8 (10%) Written examination not exceeding 3 hours [ILOs: 1,2,3,4], held after Week 12 in the examination period (60%)
Prescribed Texts:	None
Breadth Options:	This subject is not available as a breadth subject.
Fees Information:	Subject EFTSL, Level, Discipline & Census Date, http://enrolment.unimelb.edu.au/fees
Generic Skills:	On completion of this subject, it is expected that the student will have developed the following generic skills: # Ability to apply knowledge of basic science and engineering fundamentals # In-depth technical competence in at least one engineering discipline # Ability to undertake problem identification, formulation and solution # Ability to utilise a systems approach to design and operational performance # Capacity for independent critical thought, rational inquiry and self-directed learning # Ability to communicate effectively, with the engineering team and with the community at large