ELEN90003 Network Design and Optimisation

Credit Points:	12.50
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	2011, Parkville This subject commences in the following study period/s: Semester 2, Parkville - Taught on campus.
Time Commitment:	Contact Hours: 36 hours of lectures Total Time Commitment: 120 hours
Prerequisites:	4-year Electrical Engineering degree or equivalent.
Corequisites:	None
Recommended Background Knowledge:	None
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 Students Experiencing Academic Disadvantage Policy, academic requirements for this subject are articulated in the Subject Description, Subject Objectives, Generic Skills and Assessment Requirements of this entry. The University is dedicated to provide support to those with special requirements. Further details on the disability support scheme can be found at the Disability Liaison Unit website: http://www.services.unimelb.edu.au/disability/
Coordinator:	Prof William Shieh
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Subject Overview:	This subject provides knowledge and skills necessary for designing and optimization of telecommunication network. Topics in this subject can be generically applied to wired or wireless networks and are not limited to any specific type, tier or networking layer. More specifically, the subject will include: # Topological modelling of telecommunication network # Capacity planning and design;problems involving flow # Content and data delivery; supply and demand in telecommunication networks # Network cost optimization with flow considerations # Ethernet and its application, collision detection; spanning trees # Routing protocols; shortest path problems # Application of evolutionary computation in network design and optimization # Quality of service and class of service (core network); Multiprotocole Label Switching # Designing for performance, consideration of service level agreements in network design # Survivability, reliability and availability in network design; Designing fault tolerant network; Self healing design techniques; Fault detection mechanisms # Packet loss, delay and buffer size consideration in network design; Application of relevant queuing models
Objectives:	On completion of the subject, students will be equipped with a strong background in application of modelling and analytical techniques to design and optimise practical networking problems. Specifically, students will acquire the following set of skills and knowledge: # Linear programming formulation of network design and optimization problem; Simplex algorithm # Maximum flow problem; Path augmentation and labelling methods Transportation problem; Minimum cost and penalty cost method for finding feasible solution; Modified distribution method for finding minimum cost supply-demand solution # Minimum cost flow problem; Network simplex method # Prim’s and Kruskal’s algorithm for minimum spanning trees # Shortest math problem; Dijkstra algorithm

	# Travelling sales man problem; application of branch and bound # Application of Genetic algorithm, Tabu search and hill climbing in network design and optimization (including cost optimization) # Modelling network redundancies; cost consideration of adding redundancies (as a multiobjective optimization example) # Obtaining availability and reliability figures; application of mean time to failure and mean time to repair and the relevant formulations # Little's formula, Deterministic queuing models; Single server Markov chain models such as M/M/k, M/M/k/k, finite buffer, finite source, state dependent and Markov modulated models; G/G/1 and priority queuing models; Internet traffic models, queuing networks, and telecommunication applications; Recursion of Erlang B and Engset formula.
Assessment:	project report and presentation 30% A final exam of 70%. this final exam is a hurdle. A student must pass the exam to pass the subject.
Prescribed Texts:	None
Recommended Texts:	Additional Reading: # A. Kershenbaum, "Telecommunications Network Design Algorithms", McGraw Hill International Additions, Computer Science Series, 1993. ISBN: 0-07-112518-3. # K.G. Murty, "Linear Combinational Programming", John Wiley and Sons, Inc., New York, 1976. # Other current sources will be recommended on the subject website
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, the students should have developed: # Problem solving and analytical skills, # Critical and creative thinking, with an aptitude for continued self-directed learning; # Sense of intellectual curiosity; # Ability to interpret data and research results; # Ability to learn in a range of ways, including through information and communication technologies; # Capacity to confront unfamiliar problems; # Ability to evaluate and synthesise the research and professional literature; # Ability to develop models of practical applications and evaluate their performance by rigorous analytical means
Related Course(s):	Master of Software Systems Engineering Master of Telecommunications Engineering