ELEN30009 Electrical Network Analysis and Design

Credit Points:	12.50
Level:	3 (Undergraduate)
Dates & Locations:	This subject is not offered in 2014.
Time Commitment:	Contact Hours: 36 hours of lectures (3 one hour lectures per week) and up to 36 hours of workshops Total Time Commitment: 170 hours
Prerequisites:	Prerequisite for this subject is: **Subject** | **Study Period Commencement:** | **Credit Points:** ELEN20005 Foundations of Electrical Networks | January, Semester 2 | 12.50 OR **Subject** | **Study Period Commencement:** | **Credit Points:** BMEN30006 Fundamentals of Biosignals | Semester 1 | 12.50
Corequisites:	None
Recommended Background Knowledge:	Knowledge of the following subject is recommended **Subject** | **Study Period Commencement:** | **Credit Points:** PHYC10004 Physics 2: Physical Science & Technology | Semester 2 | 12.50
Non Allowed Subjects:	ELEN20002(431-210) Electrical Circuits 2
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/
Contact:	Email: **rikky.muller@unimelb.edu.au (mailto:rikky.muller@unimelb.edu.au)**
Subject Overview:	**AIMS** This subject develops a fundamental understanding of linear time-invariant network models for the analysis and design of electrical and electronic systems. Such models arise in the study of systems ranging from large-scale power grids to tiny radio frequency signal amplifiers. This subject is one of four subjects that define the Electrical Systems Major in the Bachelor of Science and it is a core requirement for the Master of Engineering (Electrical). It provides a foundation for various subsequent subjects, including ELEN30013 Electronic System Implementation, ELEN90066 Embedded System Design, and ELEN30012 Signal and Systems. **INDICATIVE CONTENT** Topics include: # Transient and frequency domain analysis of linear time-invariant (LTI) models – linearity, time-invariance, impulse response and convolution, oscillations and damping, the Laplace transform and transfer functions, frequency response and bode plots, lumped versus distributed parameter transfer functions, poles, zeros, and resonance;

	# Electrical network models – one-port elements, impedance functions, two-port elements, dependent sources, matrix representations of two-ports, driving point impedances and network functions, ladder and lattice networks, passive versus active networks, multi-stage modelling and design, and multi-port generalisations; # Analysis and design of networks involving ideal and non-ideal operational amplifiers. These topics will be complemented by exposure to software tools for electronic circuit simulation and further development of laboratory skills.
Learning Outcomes:	**INTENDED LEARNING OUTCOMES (ILO)** On completing this subject it is expected that the student be able to: 1 Model and analyse the linear time-invariant behaviour of electrical and electronic systems, in both the time and frequency domain; 2 Design, construct and test passive and active electrical networks that achieve specified linear time-invariant behaviour; 3 Use software tools to simulate the behaviour of linear electrical networks.
Assessment:	One written examination, not exceeding three hours at the end of semester, worth 60%; Continuous assessment of quizzes, submitted assignments, tutorial, laboratory, and small group (2-3 students) project work, not exceeding 30 pages in total over the semester, worth 30%; A one hour mid-semester test, worth 10%. Hurdle requirement: Students must pass the written exam to pass the subject. Intended Learning Outcomes (ILOs) 1 to 2 are assessed in the final written examination, the mid-semester test, submitted tutorial quizzes, and reports for project work. ILO 2 and 3 are assessed as part of submitted laboratory exercise, project, and in-class discussions
Prescribed Texts:	TBA
Recommended Texts:	Electric Circuits (James W. Nillson, Susan Riedel)
Breadth Options:	This subject potentially can be taken as a breadth subject component for the following courses: # **Bachelor of Arts (https://handbook.unimelb.edu.au/view/2014/B-ARTS)** # **Bachelor of Commerce (https://handbook.unimelb.edu.au/view/2014/B-COM)** # **Bachelor of Environments (https://handbook.unimelb.edu.au/view/2014/B-ENVS)** # **Bachelor of Music (https://handbook.unimelb.edu.au/view/2014/B-MUS)** You should visit **learn more about breadth subjects (http://breadth.unimelb.edu.au/breadth/info/index.html)** and read the breadth requirements for your degree, and should discuss your choice with your student adviser, before deciding on your subjects.
Fees Information:	Subject EFTSL, Level, Discipline & Census Date, http://enrolment.unimelb.edu.au/fees
Generic Skills:	On completion of this subject students should have developed the following generic skills: # Ability to apply knowledge of basic science and engineering fundamentals # Ability to undertake problem identification, formulation and solution # Ability to utilise a systems approach to design and operational performance # Ability to communicate effectively, with the engineering team and with the community at large # Capacity for independent critical thought, rational inquiry and self-directed learning # Expectation of the need to undertake lifelong learning, capacity to do so # Ability to use relevant software tools for computer-assisted circuit design and analysis
Notes:	**LEARNING AND TEACHING METHODS** The subject is delivered through lectures and workshops that combine both tutorial and hands-on laboratory activities. **INDICATIVE KEY LEARNING RESOURCES**

	Students are provided with lecture slides, lecture notes, tutorial worksheets and solutions, assignments and solutions, laboratory documents and solutions, homework project specifications, reference text lists, and online resources. **CAREERS / INDUSTRY LINKS** Exposure to industry standard engineering design automation tools and industry standard data sheet specifications through laboratory activities and lectures. Guest lectures from industry practitioners.
Related Majors/Minors/ Specialisations:	B-ENG Electrical Engineering stream Electrical Systems Master of Engineering (Biomedical) Master of Engineering (Electrical with Business) Master of Engineering (Electrical) Master of Engineering (Mechatronics) Science-credited subjects - new generation B-SCI and B-ENG. Selective subjects for B-BMED
Related Breadth Track(s):	Electrical Engineering