ELEN30009 Electrical Network Analysis and Design

Credit Points:	12.5
Level:	3 (Undergraduate)
Dates & Locations:	2015, Parkville This subject commences in the following study period/s: Semester 1, Parkville - Taught on campus.
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 Circuits and Systems	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 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 Brian Krongold
Contact:	Email: **bsk@unimelb.edu.au** (mailto:bsk@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 (approximately 30-35 hours of work per student), 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/2015/B-ARTS)** # **Bachelor of Commerce (https://handbook.unimelb.edu.au/view/2015/B-COM)** # **Bachelor of Environments (https://handbook.unimelb.edu.au/view/2015/B-ENVS)** # **Bachelor of Music (https://handbook.unimelb.edu.au/view/2015/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 with Business) 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