

ELEN20005 Foundations of Electrical Networks

Credit Points:	12.5																								
Level:	2 (Undergraduate)																								
Dates & Locations:	2016, Parkville This subject commences in the following study period/s: January, Parkville - Taught on campus. Semester 2, Parkville - Taught on campus.																								
Time Commitment:	Contact Hours: 36 hours of lectures and 24 hours of workshops Total Time Commitment: 170 hours.																								
Prerequisites:	<p>VCE Physics OR any tertiary level physics subject OR equivalent</p> <p>AND</p> <table border="1"> <thead> <tr> <th>Subject</th> <th>Study Period Commencement:</th> <th>Credit Points:</th> </tr> </thead> <tbody> <tr> <td>ENGR10003 Engineering Systems Design 2</td> <td>Summer Term, Semester 2</td> <td>12.50</td> </tr> </tbody> </table> <p>AND one of:</p> <table border="1"> <thead> <tr> <th>Subject</th> <th>Study Period Commencement:</th> <th>Credit Points:</th> </tr> </thead> <tbody> <tr> <td>MAST10006 Calculus 2</td> <td>Semester 1, Semester 2</td> <td>12.50</td> </tr> <tr> <td>MAST10009 Accelerated Mathematics 2</td> <td>Semester 2</td> <td>12.50</td> </tr> </tbody> </table> <p>AND one of:</p> <table border="1"> <thead> <tr> <th>Subject</th> <th>Study Period Commencement:</th> <th>Credit Points:</th> </tr> </thead> <tbody> <tr> <td>MAST10007 Linear Algebra</td> <td>Summer Term, Semester 1, Semester 2</td> <td>12.50</td> </tr> <tr> <td>MAST10008 Accelerated Mathematics 1</td> <td>Semester 1</td> <td>12.50</td> </tr> </tbody> </table> <p>Graduate Students Admission into the MC-ENG Master of Engineering (Electrical, Electrical with Business, Mechanical, Mechanical with Business or Mechatronics)</p>	Subject	Study Period Commencement:	Credit Points:	ENGR10003 Engineering Systems Design 2	Summer Term, Semester 2	12.50	Subject	Study Period Commencement:	Credit Points:	MAST10006 Calculus 2	Semester 1, Semester 2	12.50	MAST10009 Accelerated Mathematics 2	Semester 2	12.50	Subject	Study Period Commencement:	Credit Points:	MAST10007 Linear Algebra	Summer Term, Semester 1, Semester 2	12.50	MAST10008 Accelerated Mathematics 1	Semester 1	12.50
Subject	Study Period Commencement:	Credit Points:																							
ENGR10003 Engineering Systems Design 2	Summer Term, Semester 2	12.50																							
Subject	Study Period Commencement:	Credit Points:																							
MAST10006 Calculus 2	Semester 1, Semester 2	12.50																							
MAST10009 Accelerated Mathematics 2	Semester 2	12.50																							
Subject	Study Period Commencement:	Credit Points:																							
MAST10007 Linear Algebra	Summer Term, Semester 1, Semester 2	12.50																							
MAST10008 Accelerated Mathematics 1	Semester 1	12.50																							
Corequisites:	None																								
Recommended Background Knowledge:	<p>Knowledge of the following subject is recommended</p> <table border="1"> <thead> <tr> <th>Subject</th> <th>Study Period Commencement:</th> <th>Credit Points:</th> </tr> </thead> <tbody> <tr> <td>PHYC10004 Physics 2: Physical Science & Technology</td> <td>Semester 2</td> <td>12.50</td> </tr> </tbody> </table>	Subject	Study Period Commencement:	Credit Points:	PHYC10004 Physics 2: Physical Science & Technology	Semester 2	12.50																		
Subject	Study Period Commencement:	Credit Points:																							
PHYC10004 Physics 2: Physical Science & Technology	Semester 2	12.50																							
Non Allowed Subjects:	431-103 Electrical Circuits 1 431-102 Digital Systems 1 431-101 Foundations of Electrical Circuits																								
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:	Assoc Prof Brian Krongold, Dr Robert Schmid
Contact:	<p>January Robert Schmid Email: rschmid@unimelb.edu.au (mailto:rschmid@unimelb.edu.au)</p> <p>Semester 2 Brian Krongold Email: bsk@unimelb.edu.au (mailto:bsk@unimelb.edu.au)</p>
Subject Overview:	<p>AIMS</p> <p>The aim of this subject is to develop an understanding of fundamental modelling techniques for the analysis of systems that involve electrical phenomena. This includes networks models of “flow-drop” one-port elements in steady state (DC and AC), electrical power systems, simple RC and RL transient analysis, and basic functional models for digital systems consisting of combinational logic. This subject is a core pre-requisite for the four subjects that define the Electrical Systems Major in the Bachelor of Science. The subject is also a core requirement for the Master of Engineering (Electrical, Mechanical and Mechatronics).</p> <p>INDICATIVE CONTENT</p> <p>Topics include:</p> <p>Electrical phenomena – charge, current, electrical potential, conservation of energy and charge, the generation, storage, transport and dissipation of electrical power.</p> <p>Network models – networks of “flow-drop” one-port elements, Kirchoff’s laws, standard current-voltage models for one-ports (independent sources, resistors, capacitors, inductors, transducers, diodes), analysis of static networks, properties of linear time-invariant (LTI) one-ports and impedance functions, diodes, transformers, steady-state (DC and AC) analysis of LTI networks via mesh and node techniques, equivalent circuits, and transient analysis of simple circuits;</p> <p>Electrical power systems – overview of power generation and transmission, analysis of single-phase and balanced three-phase AC power systems.</p> <p>Digital systems – electrical encoding of information and the digital abstraction, analog-to-digital and digital-to-analog conversion, quantization and resolution, switching algebra, combinational logic networks, and transient timing issues.</p> <p>This material will be complemented by exposure to software tools for the simulation of electrical and electronic systems and the opportunity to develop basic electrical engineering laboratory skills using a prototyping breadboard, digital multimeter, function generator, DC power supply, and oscilloscope.</p>
Learning Outcomes:	<p>INTENDED LEARNING OUTCOMES (ILO's)</p> <p>On completing this subject it is expected that the student be able to:</p> <ol style="list-style-type: none"> 1 Apply physical principles, fundamental abstractions and modelling techniques in the analysis of electrical and electronic systems 2 Develop and demonstrate basic electrical engineering laboratory skills through implementing, testing and debugging simple electrical circuits on prototyping breadboards 3 Simulate and synthesise simple electrical circuits using software tools 4 Predict and compare the performance of physical circuits in the laboratory with theoretical analysis and software simulations
Assessment:	One written examination, not exceeding three hours at the end of semester, worth 60% Continuous assessment of pre-lab questions and in-class laboratory outcomes in small groups (2-3 students), approximately 10-13 hours of work per student, worth 10% Continuous assessment of five group assignments (2-3 students), not exceeding 30 pages in total over the semester (approximately 10-15 hours of work per student), worth 10% Continuous assessment of five multiple-choice quizzes given in the workshop sessions, worth 10% A 90-minute mid-semester test, worth 10%. Hurdle requirement: Students must pass written exam to pass

	the subject. Intended Learning Outcomes (ILO's) 1 and 2 are assessed in the final written examination, the mid-semester test, workshop quizzes, and group assignments. ILO's 3 and 4 are assessed as part of the pre-lab questions and in-class laboratory outcomes.
Prescribed Texts:	None
Recommended Texts:	<ul style="list-style-type: none"> # Electrical Engineering: Principle and Applications (Allan R. Hambley) # Electric Circuits (James W. Nilsson, Susan Riedel)
Breadth Options:	<p>This subject potentially can be taken as a breadth subject component for the following courses:</p> <ul style="list-style-type: none"> # Bachelor of Arts (https://handbook.unimelb.edu.au/view/2016/B-ARTS) # Bachelor of Commerce (https://handbook.unimelb.edu.au/view/2016/B-COM) # Bachelor of Environments (https://handbook.unimelb.edu.au/view/2016/B-ENVS) # Bachelor of Music (https://handbook.unimelb.edu.au/view/2016/B-MUS) <p>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.</p>
Fees Information:	Subject EFTSL, Level, Discipline & Census Date, http://enrolment.unimelb.edu.au/fees
Generic Skills:	<p>On completion of this subject students should have developed the following generic skills:</p> <ul style="list-style-type: none"> # Ability to apply knowledge of basic science and engineering fundamentals # Ability to undertake problem identification, formulation and solution # 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.
Notes:	<p>This subject is available for science credit to students enrolled in the BSc (new degree only).</p> <p>LEARNING AND TEACHING METHODS</p> <p>The subject is delivered through lectures and workshop classes that combine both tutorial and hands-on laboratory activities.</p> <p>INDICATIVE KEY LEARNING RESOURCES</p> <p>Students are provided with detailed lecture slides, a weekly lecture summary email, a practice problem booklet with answers, a laboratory manual, pre-lab exercise solutions, detailed assignment solutions, and reference text lists and URLs to helpful web content.</p> <p>CAREERS / INDUSTRY LINKS</p> <p>Exposure to industry standard electrical engineering equipment through laboratory activities.</p>
Related Majors/Minors/Specialisations:	<p>B-ENG Electrical Engineering stream B-ENG Mechanical Engineering stream Master of Engineering (Electrical with Business) Master of Engineering (Electrical) Master of Engineering (Mechanical with Business) Master of Engineering (Mechanical) Master of Engineering (Mechatronics) Science-credited subjects - new generation B-SCI and B-ENG. Selective subjects for B-BMED</p>
Related Breadth Track(s):	Electrical Engineering