ELEN30011 Electrical Device Modelling

Credit Points:	12.5
Level:	3 (Undergraduate)
Dates & Locations:	2015, Parkville This subject commences in the following study period/s: Semester 2, Parkville - Taught on campus.
Time Commitment:	Contact Hours: 3 one hour lectures per week and up to 36 hours of workshops Total Time Commitment: 170 hours
Prerequisites:	Graduate Students: Admission into the MC-ENG Master of Engineering (Electrical, Electrical with Business or Mechatronics) AND

Subject	Study Period Commencement:	Credit Points:
ELEN20005 Foundations of Electrical Networks	January, Semester 2	12.50

Undergraduate students must have completed:

Subject	Study Period Commencement:	Credit Points:
ELEN20005 Foundations of Electrical Networks	January, Semester 2	12.50

AND one of

Subject	Study Period Commencement:	Credit Points:
PHYC10004 Physics 2: Physical Science & Technology	Semester 2	12.50
PHYC10002 Physics 2: Advanced	Semester 2	12.50

Corequisites:	None
Recommended Background Knowledge:	Knowledge of the following subject is recommended

Subject	Study Period Commencement:	Credit Points:
ELEN30009 Electrical Network Analysis and Design	Semester 1	12.50

Non Allowed Subjects:	Credit may not be obtained for both 431-328 Digital Systems3: Circuits and Systems AND ELEN30011(431-303) Electrical Device Modelling
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 Peter Dower

Contact:	Email: **pdower@unimelb.edu.au (mailto:pdower@unimelb.edu.au)**
Subject Overview:	**AIM** This subject develops the theoretical and practical tools required to understand, construct, validate and apply models of standard electrical and electronic devices. In particular, students will study the theoretical and practical development of models for devices such as resistors, capacitors, inductors, transformers, motors, batteries, diodes, transistors, and transmission lines. In doing so, students will gain exposure to a variety of fundamental fields in physics, including electromagnetism, semiconductor materials and quantum electronics. This material will be complemented by exposure to experiment design and measurement techniques in the laboratory, the application of models from device manufacturers, and the use of electronic circuit simulation software. **INDICATIVE CONTENT** Topics include: Vector calculus for device modelling, Maxwell's equations, physics of conductors and insulators, passive device models (including for resistors, capacitors and inductors), lumped and distributed circuit models for wired interconnections (including treatment of signal integrity and termination strategies), semiconductors and quantum electronics, static and dynamic models for p-n junctions diodes and bipolar junction transistors.
Learning Outcomes:	**INTENDED LEARNING OUTCOMES (ILO)** Having completed this unit the student is expected to: 1 Develop/interpret useful models for electrical and electronic devices from the underlying physics and/or empirical data 2 Use modelling principles in engineering design with an appreciation for the impact of modelling uncertainty and model complexity 3 Implement and analyse the results of laboratory experiments for gathering empirical data from electrical and electronic devices 4 Use software tools to simulate the behaviour of electrical and electronic devices.
Assessment:	Assessment for this unit consists of the following assessment items (AIs): 1. One written examination, not exceeding three hours at the end of semester, worth 60%; 2. Continuous assessment via workshop-based project work (group of 2-3 students), not exceeding 30 pages in total over the semester(approximately 30-35 hours per student), worth 30%; 3. 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 and 2 are assessed in the final written examination, continuous assessment and the mid-semester test (AIs 1 to 3 above), while ILOs 3 and 4 are assessed in the continuous assessment (AI 2).
Prescribed Texts:	TBA
Recommended Texts:	# W.H. Hayt, J.A. Buck, Engineering Electromagnetics. McGraw-Hill, 8th Edition # B.G. Streetman, S. Banerjee, Solid State Electronic Devices. Prentice-Hall, 6th Edition
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
Notes:	**LEARNING AND TEACHING METHODS** The subject is delivered through lectures and workshop classes that combine both tutorial and hands-on laboratory activities. **INDICATIVE KEY LEARNING RESOURCES** Students are provided with lecture notes, problem worksheets and solutions, a laboratory manual, and reference text lists. **CAREERS / INDUSTRY LINKS** Exposure to industry standard devices, models, datasheets, and modelling tools, and their practical application.
Related Majors/Minors/ Specialisations:	B-ENG Electrical Engineering stream Electrical Systems Master of Engineering (Electrical with Business) Master of Engineering (Electrical) Science-credited subjects - new generation B-SCI and B-ENG. Selective subjects for B-BMED