ELEN90048 Passive Component Design & Simulation

Credit Points:	12.5
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	2015, Parkville This subject commences in the following study period/s: Semester 1, Parkville - Taught on campus.
Time Commitment:	Contact Hours: 1 two hour lecture per week Total Time Commitment: 200 hours
Prerequisites:	Admission into the MC-NE Master of Nanoelectronic Engineering OR Admission into a postgraduate course offered by the Melbourne School of Engineering, subject to program coordinator approval
Corequisites:	None
Recommended Background Knowledge:	Basic knowledge and understanding of electronics
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/
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Subject Overview:	**AIMS** Passive components are critical components for analogue and RF circuits. At high frequencies most of these components can be integrated completely on Chip. Low frequency models are not accurate and the usual synthesis techniques do not account for the thick metal thin operating regime that these components operate. This subject will introduce the student to the latest high frequency models of these devices operating in the multi-gigahertz range. Students will be able learn models, loss mechanisms and effects of the substrate in the design of high frequency analogue components. After completing this subject, students will be able to design, layout, fabricate and test components compatible with small geometry foundry design rules. The subject examines basic principles of electromagnetic design and simulations based on Maxwell's equations and numerical methods. Design techniques are introduced with Maxwell's equations, electromagnetic fields in media, boundary conditions and plane wave propagation covering topics such as transmission lines, networks analysis, impedance matching, resonators, power dividers, couplers, filters, antennas, optical antennas and nanostructures. In addition to the fundamental concepts, topics to be covered include design and electromagnetic fields simulation of various types of passive components such as inductors, capacitors, transmission lines, antennas and nanostructures. **INDICATIVE CONTENT** Topics include:

	Electromagnetic theory, transmission line theory, network analysis, impedance matching, resonators, power dividers, directional couplers, RF filters, antennas and nanostructures. This material is complemented by the use of software tools (e.g. MATLAB, Microwave Studio) for computation and simulation.
Learning Outcomes:	**INTENDED LEARNING OUTCOMES (ILO)** Having completed this unit the student should be able to: 1 Analyse and apply design formulas for inductors, capacitors, baluns and on chip transformers, antennas and filters 2 Estimate passive component performance, losses due to conductive substrates and foundry design rule constraints on devices 3 Explain the fundamentals of the electromagnetic design 4 Use computer simulations to optimise the design.
Assessment:	One written examination (not exceeding three hours) at the end of semester, worth 70% Continuous assessment of submitted project work (not exceeding 30 pages in total over the semester, approximately 40-45 hours of work per student), worth 30%. Intended Learning Outcomes (ILOs) 1-3 are assessed in the final exam and submitted project work, ILO 4 is assessed in the submitted project work.
Prescribed Texts:	TBA
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:	# Ability to apply knowledge of science and engineering fundamentals # Ability to undertake problem identification, formulation, and solution # Ability to utilise a systems approach to complex problems and to design and operational performance # Ability to build and test real world systems that meet industry specialisation and manufacturing standards # Capacity for lifelong learning and professional development
Notes:	**LEARNING AND TEACHING METHODS** The subject is delivered through lectures and workshop classes for hands-on laboratory activities. **INDICATIVE KEY LEARNING RESOURCES** Students are provided with lecture slides, tutorials and worked solutions, laboratory sheets, and reference text lists. **CAREERS / INDUSTRY LINKS** Exposure to engineering design context
Related Course(s):	Master of Nanoelectronic Engineering