

# ELEN90054 Probability and Random Models

<b>Credit Points:</b>	12.50									
<b>Level:</b>	9 (Graduate/Postgraduate)									
<b>Dates &amp; Locations:</b>	2011, Parkville This subject commences in the following study period/s: Semester 1, Parkville - Taught on campus.									
<b>Time Commitment:</b>	Contact Hours: 3 x one hour lectures and 1 x two hour workshop per week Total Time Commitment: 120 hours									
<b>Prerequisites:</b>	Prerequisites for this subject are: Enrolment in Master of Engineering (Electrical, Biomedical or Mechatronics) OR <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>MAST10007 Linear Algebra</td> <td>Summer Term, Semester 1, Semester 2</td> <td>12.50</td> </tr> </tbody> </table>	Subject	Study Period Commencement:	Credit Points:	MAST10006 Calculus 2	Semester 1, Semester 2	12.50	MAST10007 Linear Algebra	Summer Term, Semester 1, Semester 2	12.50
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MAST10006 Calculus 2	Semester 1, Semester 2	12.50								
MAST10007 Linear Algebra	Summer Term, Semester 1, Semester 2	12.50								
<b>Corequisites:</b>	None									
<b>Recommended Background Knowledge:</b>	None									
<b>Non Allowed Subjects:</b>	Anti-requisite for this subject is: <table border="1"> <thead> <tr> <th>Subject</th> <th>Study Period Commencement:</th> <th>Credit Points:</th> </tr> </thead> <tbody> <tr> <td>ELEN30002 Stochastic Signals and Systems</td> <td>Not offered 2011</td> <td>12.50</td> </tr> </tbody> </table>	Subject	Study Period Commencement:	Credit Points:	ELEN30002 Stochastic Signals and Systems	Not offered 2011	12.50			
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ELEN30002 Stochastic Signals and Systems	Not offered 2011	12.50								
<b>Core Participation Requirements:</b>	For the purposes of considering applications for Reasonable Adjustments under the Disability Standards for Education (Cwth 2005) and Students Experiencing Academic Disadvantage Policy, this subject requires all students to actively and safely participate in laboratory activities. Students who feel their disability may impact upon their participation are encouraged to discuss this with the Subject Coordinator and the Disability Liaison Unit. <a href="http://www.services.unimelb.edu.au/disability/">http://www.services.unimelb.edu.au/disability/</a>									
<b>Coordinator:</b>	Assoc Prof Girish Nair									
<b>Contact:</b>	Email: <a href="mailto:gnair@unimelb.edu.au">gnair@unimelb.edu.au</a> ( <a href="mailto:gnair@unimelb.edu.au">mailto:gnair@unimelb.edu.au</a> )									
<b>Subject Overview:</b>	This subject provides an introduction to probability, random variables, estimation and stochastic processes. The material covered is important in fields such as electronic, electrical and computer networks, communications, control and signal processing. Students will study topics including: <ul style="list-style-type: none"> <li># Foundations – combinatorial analysis, axioms of probability, conditional probability, independence;</li> <li># Random variables – definition, distribution functions, density functions, expected value, functions of a random variable, and important distributions;</li> <li># Multiple random variables – joint distribution and density functions, independent random variables, conditional distributions, functions of several random variables, and jointly Gaussian random variables;</li> <li># Expectation, sums, inequalities and limit theorems – sums of random variables, conditional expectation, moment generating functions, Markov and Chebychev inequalities, weak and strong laws of large numbers, and the central limit theorem;</li> <li># Detection and estimation – hypothesis testing; maximum likelihood and maximum a posteriori rules, and minimum mean squared error estimation (MMSE);</li> </ul>									

	<ul style="list-style-type: none"> <li># Stochastic processes – definition, correlation, strict and wide-sense stationarity, ergodicity, important random processes, and simple Markov chains.</li> </ul> <p>This material is complemented by exposure to examples from electrical engineering and software tools (e.g. MATLAB) for computation and simulations.</p>
<b>Objectives:</b>	<p>On completing this subject the student should be able to:</p> <ul style="list-style-type: none"> <li># Define fundamental probabilistic concepts such as the axioms of probability, random variables, independence, expectation and stochastic processes;</li> <li># List several important distribution functions and explain why they are significant;</li> <li># Use the laws of large numbers, the central limit theorem, and inequalities to approximate and bound probabilities;</li> <li># Analyse probabilistic models of engineering systems;</li> <li># Formulate probabilistic models for engineering systems.</li> </ul>
<b>Assessment:</b>	<p>One written examination, not exceeding three hours at the end of semester, worth 60%;          Continuous assessment of submitted project work, not exceeding 30 pages over the semester, worth 30%;          A one-hour mid-semester test, worth 10%.</p>
<b>Prescribed Texts:</b>	TBA
<b>Breadth Options:</b>	This subject is not available as a breadth subject.
<b>Fees Information:</b>	Subject EFTSL, Level, Discipline & Census Date, <a href="http://enrolment.unimelb.edu.au/fees">http://enrolment.unimelb.edu.au/fees</a>
<b>Generic Skills:</b>	<ul style="list-style-type: none"> <li># Ability to apply knowledge of basic science and engineering fundamentals</li> <li># In-depth technical competence in at least one engineering discipline</li> <li># Ability to undertake problem identification, formulation and solution</li> <li># Ability to utilise a systems approach to design and operational performance</li> <li># Capacity for independent critical thought, rational inquiry and self-directed learning</li> <li># Ability to communicate effectively, with the engineering team and with the community at large</li> </ul>
<b>Related Course(s):</b>	Postgraduate Certificate in Engineering
<b>Related Majors/Minors/ Specialisations:</b>	B-ENG Electrical Engineering stream Master of Engineering (Biomedical) Master of Engineering (Electrical) Master of Engineering (Mechatronics)