

# ELEN90054 Probability and Random Models

<b>Credit Points:</b>	12.5																				
<b>Level:</b>	9 (Graduate/Postgraduate)																				
<b>Dates &amp; Locations:</b>	2016, Parkville This subject commences in the following study period/s: Semester 1, Parkville - Taught on campus.																				
<b>Time Commitment:</b>	Contact Hours: 36 hours of lectures, up to 24 hours of tutorials/workshops Total Time Commitment: 200 hours																				
<b>Prerequisites:</b>	<p><b>GRADUATE STUDENTS:</b> Admission into the MC-ENG Master of Engineering (Electrical, Biomedical or Mechatronics)</p> <p><b>UNDERGRADUATE STUDENTS:</b> <b>One of:</b></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><b>AND one of:</b></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>			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
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<b>Corequisites:</b>	None																				
<b>Recommended Background Knowledge:</b>	Knowledge in one of the following subjects is recommended																				
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<b>Non Allowed Subjects:</b>	Anti-requisite for this subject is:																				
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<b>Core Participation Requirements:</b>	<p>&lt;p&gt;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.&lt;/p&gt; &lt;p&gt;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</p>																				

	Equity and Disability Support: <a href="http://services.unimelb.edu.au/disability">http://services.unimelb.edu.au/disability</a></p>
<b>Coordinator:</b>	Assoc Prof Margreta Kuijper
<b>Contact:</b>	Assoc Prof Margreta Kuijper Email: <a href="mailto:mkuijper@unimelb.edu.au">mkuijper@unimelb.edu.au</a> (mailto:mkuijper@unimelb.edu.au)
<b>Subject Overview:</b>	<p><b>AIMS</b></p> <p>This subject provides an introduction to probability theory, random variables, decision tests, and stochastic processes. Uncertainty is inevitable in real engineering systems, and the laws of probability offer a powerful way to evaluate uncertainty and make decisions according to well-defined, quantitative principles. The material covered is important in fields such as communications, data networks, signal processing and electronics. This subject is a core requirement in the Master of Engineering (Electrical, Mechanical, Mechatronics and Biomedical).</p> <p><b>INDICATIVE CONTENT</b></p> <p>Topics include:</p> <ul style="list-style-type: none"> <li># Foundations – combinatorial analysis, axioms of probability, independence, conditional probability, Bayes' rule</li> <li># Random variables (rv's)– definition; cumulative distribution, probability mass and probability density functions; expectation and variance; functions of an rv; important distributions and their properties and uses</li> <li># Multiple random variables – joint cumulative distribution, probability mass and probability density functions; independent rv's; correlation and covariance; conditional distributions and expectation; functions of several rv's; jointly Gaussian rv's</li> <li># Sums, inequalities and limit theorems – sums of rv's, moment generating function; Markov and Chebychev inequalities; weak and strong laws of large numbers; the Central Limit Theorem</li> <li># Decision testing - maximum likelihood, maximum a posterior, minimum cost and Neyman-Pearson rules; basic minimum mean-square error estimation</li> <li># Stochastic processes – mean and autocorrelation functions, strict and wide-sense stationarity; ergodicity; important processes and their properties and uses</li> <li># Introduction to 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>Learning Outcomes:</b>	<p><b>INTENDED LEARNING OUTCOMES (ILO's)</b></p> <p>Having completed this subject it is expected that the student be able to:</p> <ol style="list-style-type: none"> <li>1 Demonstrate an understanding of combinatorics, the axioms of probability, independence, random variables, conditioning and Bayes' rule</li> <li>2 Demonstrate an understanding of important distributions, stochastic processes and decision tests, and their significance</li> <li>3 Formulate random models of signals and systems encountered in engineering</li> <li>4 Calculate and interpret probabilities, probability densities, means, variances and covariances, from given information</li> <li>5 Use the law of large numbers, the central limit theorem, and inequalities to find approximations and bounds</li> <li>6 Simulate random models using software tools</li> </ol>
<b>Assessment:</b>	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 (approximately 40-45 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 (ILO's) 1 to 5 are assessed in the final written examination, the mid-semester test, and submitted reports for several computer-based workshops. ILO 6 is assessed through the workshop reports.

<b>Prescribed Texts:</b>	Probability and Stochastic Processes, Yates and Goodman
<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>	<p>On completion of this subject, students will have developed the following skills:</p> <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>Notes:</b>	<p><b>LEARNING AND TEACHING METHODS</b></p> <p>The subject is delivered through lectures, tutorials and workshop classes.</p> <p><b>INDICATIVE KEY LEARNING RESOURCES</b></p> <p>Students are provided with lecture slides, worked problem sets and reference text lists.</p> <p><b>CAREERS / INDUSTRY LINKS</b></p> <p>Exposure to simulation tools and teamwork through the six workshops.</p>
<b>Related Majors/Minors/ Specialisations:</b>	<p>B-ENG Electrical Engineering stream</p> <p>Master of Engineering (Electrical with Business)</p> <p>Master of Engineering (Electrical)</p> <p>Master of Engineering (Mechatronics)</p>