

# PHYC20015 Special Relativity and Electromagnetism

<b>Credit Points:</b>	12.5																																																
<b>Level:</b>	2 (Undergraduate)																																																
<b>Dates &amp; Locations:</b>	2016, Parkville This subject commences in the following study period/s: Semester 2, Parkville - Taught on campus.																																																
<b>Time Commitment:</b>	Contact Hours: 48 hours comprising 36 hours of lectures and 12 hours of tutorials. Total Time Commitment: 170 Hours																																																
<b>Prerequisites:</b>	<p>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>PHYC10001 Physics 1: Advanced</td> <td>Semester 1</td> <td>12.5</td> </tr> <tr> <td>PHYC10003 Physics 1</td> <td>Semester 1</td> <td>12.5</td> </tr> <tr> <td>PHYC10005 Physics 1: Fundamentals</td> <td>Semester 1</td> <td>12.5</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>PHYC10002 Physics 2: Advanced</td> <td>Semester 2</td> <td>12.5</td> </tr> <tr> <td>PHYC10004 Physics 2: Physical Science &amp; Technology</td> <td>Semester 2</td> <td>12.5</td> </tr> <tr> <td>PHYC10006 Physics 2: Life Sciences &amp; Environment</td> <td>Semester 2</td> <td>12.5</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>12.5</td> </tr> <tr> <td>MAST10009 Accelerated Mathematics 2</td> <td>Semester 2</td> <td>12.5</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>12.5</td> </tr> <tr> <td>MAST10008 Accelerated Mathematics 1</td> <td>Semester 1</td> <td>12.5</td> </tr> </tbody> </table> <p>Plus</p> <table border="1"> <thead> <tr> <th>Subject</th> <th>Study Period Commencement:</th> <th>Credit Points:</th> </tr> </thead> <tbody> <tr> <td>MAST20009 Vector Calculus</td> <td>Semester 1, Semester 2</td> <td>12.5</td> </tr> </tbody> </table> <p>MAST20009 may be taken concurrently</p>	Subject	Study Period Commencement:	Credit Points:	PHYC10001 Physics 1: Advanced	Semester 1	12.5	PHYC10003 Physics 1	Semester 1	12.5	PHYC10005 Physics 1: Fundamentals	Semester 1	12.5	Subject	Study Period Commencement:	Credit Points:	PHYC10002 Physics 2: Advanced	Semester 2	12.5	PHYC10004 Physics 2: Physical Science & Technology	Semester 2	12.5	PHYC10006 Physics 2: Life Sciences & Environment	Semester 2	12.5	Subject	Study Period Commencement:	Credit Points:	MAST10006 Calculus 2	Semester 1, Semester 2	12.5	MAST10009 Accelerated Mathematics 2	Semester 2	12.5	Subject	Study Period Commencement:	Credit Points:	MAST10007 Linear Algebra	Summer Term, Semester 1, Semester 2	12.5	MAST10008 Accelerated Mathematics 1	Semester 1	12.5	Subject	Study Period Commencement:	Credit Points:	MAST20009 Vector Calculus	Semester 1, Semester 2	12.5
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<b>Corequisites:</b>	None																																																

<b>Recommended Background Knowledge:</b>	None
<b>Non Allowed Subjects:</b>	None
<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 Equity and Disability Support: &lt;a href="http://services.unimelb.edu.au/disability"&gt;http://services.unimelb.edu.au/disability&lt;/a&gt;&lt;/p&gt;</p>
<b>Coordinator:</b>	Assoc Prof Harry Quiney
<b>Contact:</b>	<a href="mailto:quiney@unimelb.edu.au">quiney@unimelb.edu.au</a> ( <a href="mailto:quiney@unimelb.edu.au">mailto:quiney@unimelb.edu.au</a> )
<b>Subject Overview:</b>	<p>This subject introduces Einstein's Special Principle of Relativity and develops the fundamental principles of electromagnetism and Maxwell's equations in differential form. Special relativity topics include the foundations of special relativity, spacetime invariance, simultaneity, and Minkowski diagrams, relativistic kinematics, the Doppler effect, relativistic dynamics, and nuclear reactions. Electromagnetism topics include the electric field (e.g. Gauss's law in integral and differential form, scalar potential and gradient, Poisson and Laplace equations), the magnetic field (e.g. Ampere's law in integral and differential forms), Maxwell's equations in vacuum (integral and differential forms), Maxwell's equations in matter (polarization, electric displacement, magnetic vector potential), time-varying electric and magnetic fields (Maxwell's equations in general form, wave equations for E and B, plane electromagnetic wave, Poynting vector). The presentation concludes with the relativistic formulation of the Lorentz force law.</p>
<b>Learning Outcomes:</b>	<p>To challenge students to expand their knowledge of fundamental physics principles and develop their capacity to:</p> <ul style="list-style-type: none"> <li># discuss the key observations and events that led to the development of Einstein's theory of special relativity and Maxwell's equations of electromagnetism;</li> <li># explain the fundamental principles of special relativity and electromagnetism and the far-reaching connections between them</li> <li># use these fundamental physical principles in the analysis of simple problems;</li> <li># discuss the experimental basis of these fundamental principles and how this contributed to the subsequent development of fundamental physics.</li> </ul>
<b>Assessment:</b>	Three written assignments requiring a total of up to twenty-four hours of work outside class time during the semester to be submitted and assessed early, mid and late semester (30%, 10% for each assignment). A three hour written examination during the examination period (70%).
<b>Prescribed Texts:</b>	NMJ Woodhouse, Special Relativity, Springer, 2003 E Purcell, Electricity and Magnetism, 3rd ed., Cambridge University Press
<b>Breadth Options:</b>	<p>This subject potentially can be taken as a breadth subject component for the following courses:</p> <ul style="list-style-type: none"> <li># <b>Bachelor of Arts</b> (<a href="https://handbook.unimelb.edu.au/view/2016/B-ARTS">https://handbook.unimelb.edu.au/view/2016/B-ARTS</a>)</li> <li># <b>Bachelor of Commerce</b> (<a href="https://handbook.unimelb.edu.au/view/2016/B-COM">https://handbook.unimelb.edu.au/view/2016/B-COM</a>)</li> <li># <b>Bachelor of Environments</b> (<a href="https://handbook.unimelb.edu.au/view/2016/B-ENVS">https://handbook.unimelb.edu.au/view/2016/B-ENVS</a>)</li> <li># <b>Bachelor of Music</b> (<a href="https://handbook.unimelb.edu.au/view/2016/B-MUS">https://handbook.unimelb.edu.au/view/2016/B-MUS</a>)</li> </ul> <p>You should visit <a href="http://breadth.unimelb.edu.au/breadth/info/index.html">learn more about breadth subjects (http://breadth.unimelb.edu.au/breadth/info/index.html)</a> and read the breadth requirements for your degree, and should discuss your choice with your student adviser, before deciding on your subjects.</p>
<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>	A student who completes this subject should be able to: <ul style="list-style-type: none"><li># Explain their understanding of physics principles and applications lucidly, both in writing and orally;</li><li># Describe the experimental and observational basis of the physical principles presented in the subject, both in writing and orally;</li><li># Participate as an effective member of a group in tutorial discussions and study groups;</li><li># Think independently and analytically and direct his or her own learning;</li><li># Manage time effectively in order to be prepared for regular tutorial classes, tests, the examination and to complete assignments.</li></ul>
<b>Related Majors/Minors/ Specialisations:</b>	Physics Science-credited subjects - new generation B-SCI and B-ENG. Selective subjects for B-BMED