

DEPARTMENT OF PHYSICS AND ASTRONOMY

PHY119	<i>Frontiers of Physics</i>
Spring	<i>10 Credits</i>
Staff contact	<i>Dr Ed Daw - e.daw@sheffield.ac.uk</i> <i>Dr William Durham - w.m.durham@sheffield.ac.uk</i> <i>Dr Jenny Clark - jenny.clark@sheffield.ac.uk</i> <i>Dr J Maund - j.maund@sheffield.ac.uk</i>

Outline Description	This 10-credit unit is designed to bridge the gap between elementary physics concepts and cutting-edge research. It is divided into four segments, each of which will consist of an introductory seminar describing a current research topic in the Department of Physics and Astronomy, followed by 3 follow-up sessions demonstrating how some of the background to this research can be studied quantitatively using the physical principles learned at A level and in level-1 physics courses. All segments will be presented by researchers active in the field in question.
Restrictions	None
Prerequisites	A level maths and physics at B or above
Co requisites	None
Approx Time allocation (hours)	Lectures 16, Independent Learning 78, Problem solving/examples classes 4, examination 2 hours
Assessment (%)	End-of-semester exam (80%) 4 homework exercises 20% (5% each)
Aims	This course aims to 1. introduce students to some of the research activities within the Department of Physics and Astronomy; 2. demonstrate that cutting-edge physics is often underpinned by fairly straightforward concepts, accessible to first-year undergraduates; 3. provide students with practice in applying fundamental physics concepts to novel situations; 4. develop students' ability to solve numerical problems, including the use of appropriate levels of precision, the use of approximations and estimates, and the application of mathematical models of physical processes.
Outcomes	On successful completion of this course, a student will be able to: 1. describe the key features of the aspects of the Department's research work covered in the course; 2. relate the research work to relevant physical principles; 3. solve numerical, algebraic and computational problems deriving from these physical principles and explain their relevance to the research. These aims and outcomes are appropriate to level F4, because although the course is explicitly research-led, the focus is on relating research to basic concepts and principles as specified in the Qualification Descriptor for F4.
Teaching methods	The course material will be delivered through formal lectures backed up by a website, problems classes and tutorial support. The initial lecture of each segment will take the form of a seminar on the research topic in question, aimed at 6th form/first-year undergraduate level; we are exploring the feasibility of recording these for student self-study and possible use in recruitment. Each

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	segment will conclude with a problems class reviewing the material and demonstrating the relevant problem-solving techniques.
Assessment methods	The end-of-semester 2 hour examination assesses the candidates' factual knowledge and their ability to apply that knowledge in the solution of numerical or mathematical problems (all aims and learning outcomes). The homework exercises will have a similar (mathematical) format, and will be designed to reinforce students' understanding and provide preparation for examinations 300 words (learning outcome 3)
Recommended Books	<p>Low-Dimensional Semiconductor Structures : Fundamentals and Device Applications Ed K Barnham</p> <p>The physics of low-dimensional semiconductors : an introduction J H Davies</p>