Programme Specification: Undergraduate

For students starting in Academic Year 2024/25

1. Course Summary

Names of programme and award title(s)	MSci Astrophysics MSci Astrophysics with International Year (see Annex for details)
Award type	Single Honours (Masters)
Mode of study	Full-time
Framework of Higher Education Qualification (FHEQ) level of final award	Level 7
Normal length of the programme	4 years; 5 years with the International Year between years 2 and 3
Maximum period of registration	The normal length as specified above plus 3 years
Location of study	Keele Campus
Accreditation (if applicable)	This programme will be put forward for accreditation by the Institute of Physics (IoP). For further details see the section on Accreditation below.
Regulator	Office for Students (OfS)
Tuition Fees	**UK students:** Fee for 2024/25 is £9,250* **International students:** Fee for 2024/25 is £20,700** The fee for the international year abroad is calculated at 15% of the standard year fee

How this information might change: *Please read the important information at http://www.keele.ac.uk/student-agreement/. This explains how and why we may need to make changes to the information provided in this document and to help you understand how we will communicate with you if this happens.*

** These fees are regulated by Government. We reserve the right to increase fees in subsequent years of study in response to changes in government policy and/or changes to the law. If permitted by such change in policy or law, we may increase your fees by an inflationary amount or such other measure as required by government policy or the law. Please refer to the accompanying Student Terms & Conditions. Further information on fees can be found at http://www.keele.ac.uk/studentfunding/tuitionfees/*

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2. What is an Integrated Master's programme?

Integrated master's awards - which are common in science, mathematics and engineering - are delivered through a programme that combines study at the level of a bachelor's degree with honours with study at master's level. As such, a student graduates with a master's degree after a single four-year programme of

study. The Integrated Masters programme described in this document builds upon the three year Single Honours programme by adding a fourth year in which students study modules at an advanced level.

3. Overview of the Programme

Astrophysics is a fundamental, curiosity-driven science subject that has many and diverse areas of ongoing research and a strong public interest. Public visibility occurs in areas such as the discovery and characterisation of extrasolar planets, understanding our Sun and other stars, the study of black holes and gravitational wave events, and the origin and evolution of the Universe. It is naturally interdisciplinary and connects in many areas with physics, biology, chemistry, mathematics, computer science, engineering and technology. Astrophysics students obtain a strong grounding in astrophysics and physics, problem-solving skills, numeracy, literacy, data analysis and computing. A degree in astrophysics opens up careers in diverse areas including the academic, industrial research, data analysis, technology and medical technology, IT, telecommunications, electronics and energy sectors.

The programme aims to provide a thorough education in the core areas of astrophysics and physics [as defined by the Institute of Physics (IoP) accreditation standards] and to extend and apply this subject knowledge to more advanced topics, informed by the research interests of staff, together with providing a theoretical and practical understanding of the analytical, experimental and computational techniques that are of particular importance to physics graduates. Compared to the BSc (Hons) Physics with Astrophysics degree, the MSci Astrophysics concentrates more on developing the students' knowledge of astrophysics, their research and analysis skills, research independence, and the communication of astrophysics using a variety of methods. The broad educational aims of this programme are informed by the QAA Benchmark Statement for Physics. Successful graduates will have achieved a demonstrable understanding of the fundamentals of astrophysics and physics, and be able to apply this knowledge to solve problems, plan investigations, analyse results and report and present their work in ways described in more detail below. On successful completion of the MSci Astrophysics programme at Keele, students will be well prepared for postgraduate studies or for graduate level employment in a wide variety of industrial sectors. Tuition will be based on a modular system with varied modes of delivery, ranging from traditional lectures through to laboratory work, problem-solving classes and tutorials in smaller groups. Mathematics and computing form important parts of the programme and are taught both within dedicated modules and synoptically throughout the programme by staff in the Physics and Astrophysics group. A mixed set of assessment modalities include examination, report-writing, presentations, problem sheets, laboratory work, essays, dissertations, group work and vivas, with an overall balance of approximately 50% examination and 50% continual assessment.

4. Aims of the programme

The broad aims of the programme are to enable you to:

- achieve a knowledge and understanding of the breadth of astrophysics and physics and be able to apply this knowledge and understanding to solve problems with a special focus on modern astrophysical knowledge;
- develop proficiency in mathematical, statistical and numerical techniques and employ these to solve physical problems;
- develop proficiency in laboratory activities and computer programming and undertake project work both individually and within a team during years 3 and 4;
- acquire the skills required to assimilate new knowledge and to communicate your work and ideas in a variety of formats;
- acquire a range of subject-specific skills including how to formulate and tackle problems in astrophysics; how to plan, manage, execute and report the results of an investigation; how to use mathematics to describe the physical world; and how to deploy these skills to tackle issues within the subject;
- acquire a range of cognitive, generic and transferable skills including problem-solving skills, investigative skills, analytic skills, communication skills, IT skills, time management skills and interpersonal skills.

Employability

The programme will enable you to:

- engage in independent learning, and to make use of textbooks, research papers and other learning resources;
- critically analyse data, understand statistical information and to use information responsibly and ethically;
- plan projects and investigations, and perform an evaluation of the possible costs and benefits of a course of action;
- develop a range of technical and transferable skills which would enable entry to employment across a range of professions that place high value on the analytical, computational, statistical and experimental skills gained within an astrophysics degree programme and value the ability to communicate complex ideas and information to a variety of audiences.

5. What you will learn

The intended learning outcomes of the programme (what students should know, understand and be able to do at the end of the programme), can be described under the following headings:

- Subject knowledge and understanding
- Subject specific skills
- Intellectual skills
- Key or transferable skills (including employability skills)

Subject knowledge and understanding

The subject knowledge in the MSci Astrophysics programme is underpinned by a core physics curriculum as set out by the Institute of Physics (IoP) and includes the fundamentals of classical and quantum mechanics, electromagnetism, optics, thermodynamics, solid state, atomic and nuclear physics, together with the mathematics that is used to describe them. The programme goes beyond this to explore fundamental topics in astrophysics - stellar structure and evolution, extrasolar planets, galaxies, gravitational waves, and cosmology. There is further work in mathematics, computational and statistical techniques and the applications of these in addressing physical problems.

Successful students will be able to:

- knowledge of the fundamental principles of astrophysics and physics and competence in applying these principles to diverse areas of the subject;
- the ability to solve problems in astrophysics and physics using appropriate mathematical and computational tools including the ability to make sensible approximations;
- the ability to design, execute, and analyse critically, an experiment or investigation and draw valid conclusions;
- the ability to estimate levels of uncertainty in their results, compare their results with expected outcomes, theoretical predictions or published data, and evaluate the significance of their results in this context;
- the development of a wider knowledge and understanding of advanced topics and their applications, and the acquisition of skills in the critical reading and understanding of published work in astrophysics and physics;
- the development of a wider knowledge and understanding of astrophysics and the acquisition of skills in the critical reading and understanding of published work in the underlying physics of astrophysics.

Subject specific skills

Successful students will be able to:

- the ability to work safely in a laboratory or observatory, and a knowledge and awareness of standard safety procedures;
- a sound familiarity with laboratory/astronomical apparatus and techniques;
- competency in the use of appropriate IT packages/systems for the analysis of data and the retrieval of information;
- an ability in numerical manipulation and estimation, statistical interpretation and the ability to present and interpret information graphically;
- an ability to use mathematical analysis and computational techniques to model physical behaviour;
- an ability to research, record and communicate scientific information, in particular through clear and accurate scientific reports and dissertations;
- an ability to question, learn and assimilate knowledge and to evolve their views of the world in response to that new knowledge;
- an ability to contribute through research to the development of knowledge in astrophysics;
- an ability to acquire knowledge and understanding of science itself, and to work productively on scientific problems on an individual basis or in a team.

Intellectual skills

Successful students will be able to:

- analyse and solve problems;
- evaluate evidence and make critical judgements;
- interpret and critique text;
- interpret and critique mathematical and numerical information;
- abstract and synthesise information;
- develop a reasoned argument;
- assess contrasting theories, explanations and policies on the basis of evidence;
- take responsibility for their own learning and critique that learning.

Key or transferable skills (including employability skills)

Successful students will be able to:

- manage their own learning and to make appropriate use of textbooks, research-based materials and other learning resources;
- find information and make responsible use of it;
- make effective written and oral presentations;
- work with numerical and statistical data;
- make sensible estimates;
- evaluate the costs and benefits of their actions;
- work effectively with a variety of types of information technology;
- formulate a problem and solve it using computational methods including computer coding;
- plan, manage, execute and report an investigation;
- learn and gain understanding and to pass on that understanding to others;
- work effectively both as an individual and as part of a team;
- sustain motivation for an extended period of time;
- recognise their responsibilities as an individual and as part of a team or an organisation.

The Keele Graduate Attributes

The Keele Graduate Attributes are the qualities (skills, values and mindsets) which you will have the opportunity to develop during your time at Keele through both the formal curriculum and also through co- and extra-curricular activities (e.g., work experience, and engagement with the wider University community such as acting as ambassadors, volunteering, peer mentoring, student representation, membership and leadership of clubs and societies). Our Graduate Attributes consist of four themes: **academic expertise, professional skills, personal effectiveness, and social and ethical awareness.** You will have opportunities to engage actively with the range of attributes throughout your time at Keele: through your academic studies, through self-assessing your own strengths, weaknesses, and development needs, and by setting personal development goals. You will have opportunities to discuss your progress in developing graduate attributes with, for example, Academic Mentors, to prepare for your future career and lives beyond Keele.

6. How is the programme taught?

Learning and teaching methods used on the programme vary according to the subject matter and level of the module. They include the following:

- Lectures;
- Tutorials;
- Laboratory classes;
- Computational laboratory classes;
- Exercise/problem-solving classes;
- Individual progress interviews;
- Problem sheet assignments;
- Group and individual projects;
- Directed reading and independent study;
- Literature research tasks;
- Use of e-learning/the Keele Learning Environment (KLE).

In a typical week, a student would expect to be engaged in the majority of these activities. Students are also provided with regular opportunities to talk through particular areas of difficulty and any special learning needs they may have with their Academic Mentors or module lecturers on a one-to-one basis.

Much of the core knowledge in astrophysics and physics is described in lectures with accompanying electronic resources. These lectures also map out the academic content and are used to provide examples and case studies. The application of this knowledge is developed in tutorials and problem classes, where there is a greater emphasis on co-operative learning in a more informal setting. Laboratory work and computational classes are designed to reinforce material covered in lectures, but more importantly to foster the many transferable skills discussed in section 4. Students will also gain experience of planning and performing investigations and reporting on them both individually and as part of a team.

All students are also expected to engage in independent learning, with regular directed reading, literature research and assessed problem sheets. In this way they will advance their own understanding but also develop their critical abilities and capabilities for discrimination between different sources of information, the merits of different theories and ideas etc. Students will be expected to manage their time against known targets and deadlines, take responsibility for their own learning and acquire a reflective, self-critical attitude to their own work - attributes that will serve them well in their ongoing professional development.

All modules make extensive use of the Keele Learning Environment (KLE) and/or Microsoft Teams to post

learning resources; these include (and vary from module to module) lecture notes, module and laboratory handbooks, exercises, quizzes, assignments, problem sheets, interesting web links, additional reading; screencasts; collaborative pages. The KLE is also used for electronic submission of course work and feedback in many cases.

Apart from these formal activities, students are also provided with regular opportunities to talk through particular areas of difficulty, and any special learning needs they may have, with their Academic Mentors or module lecturers on a one-to-one basis. Where it is appropriate, some classes may take place online using Microsoft Teams, but the majority of classes will be delivered "in-person".

7. Teaching Staff

The Astrophysics and Physics academic staff exhibit a research profile in astrophysics, theoretical hydrodynamics, materials science and condensed matter physics. Keele performs internationally-renowned work in the fields of extrasolar planets, stellar physics (both observational and theoretical), extragalactic astrophysics and in the study of two-dimensional materials (e.g. graphene), the modelling of combustion processes and soft condensed matter such as polymers and biological molecules. All research-active staff play a role in teaching and most also undertake administrative roles, either within our teaching or research activities. The teaching and research profiles of the staff that currently deliver the MSci Astrophysics programme can be found at http://www.keele.ac.uk/physics/people/. Timetabled teaching is always led by academic staff.

The University will attempt to minimise changes to our core teaching teams, however, delivery of the programme depends on having a sufficient number of staff with the relevant expertise to ensure that the programme is taught to the appropriate academic standard.

Staff turnover, for example where key members of staff leave, fall ill or go on research leave, may result in changes to the programme's content. The University will endeavour to ensure that any impact on students is limited if such changes occur.

8. What is the structure of the programme?

The academic year runs from September to June and is divided into two semesters. The number of weeks of teaching will vary from course to course, but you can generally expect to attend scheduled teaching sessions between the end of September and mid- December, and from mid-January to early May. Our degree courses are organised into modules. Each module is usually a self- contained unit of study and each is usually assessed separately with the award of credits on the basis of 1 credit = 10 hours of student effort. An outline of the structure of the programme is provided in the tables below.

There are two types of module delivered as part of your programme. They are:

- Compulsory modules - a module that you are required to study on this course;
- Optional modules - these allow you some limited choice of what to study from a list of modules.

Language modules: You are able to take up to 60 credits across your degree programme as Faculty Funded additional Modern Language modules in order to graduate with the Enhanced Degree Title. [Please see link for more information on Enhanced degree titles.]

For further information on the content of modules currently offered, please visit:
https://www.keele.ac.uk/recordsandexams/modulecatalogue/

A summary of the credit requirements per year is as follows.

Year	Compulsory	Optional	
		Min	Max
Level 4	120	0	0
Level 5	120	0	0
Level 6	75	45	45
Level 7	120	0	0

Module Lists

Level 4

At Level 4 MSci Astrophysics students require a common knowledge and skills base. Students study eight compulsory modules, all worth 15 credits, over the first two semesters of the programme. All eight modules are common to the BSc Physics with Astrophysics degree. They consist of four modules that directly address core material as specified by the IoP, which include distinct mathematics and laboratory components. The remaining four other modules introduce Astrophysics and develop much broader physical, mathematical, computational, statistical and laboratory competencies

Transfer from MSci Astrophysics to BSc Physics with Astrophysics possible at any point during this year. Transfer from BSc Physics with Astrophysics to MSci Astrophysics is possible at any point during this year.

These modules are taught through a mixture of traditional lectures, problem class learning, smaller group tutorials and practical and computer-based laboratory work. The module descriptors provide detailed synopses of each module with suggested study reading and are available on the KLE.

Five of the modules are taught within a single semester (two in semester 1 and three in semester 2). Three of the modules have elements of teaching and assessment over both semesters, though they are designed so that there is roughly equal student workload in each semester when considering the programme as a whole.

Compulsory modules	**Module Code**	**Credits**	**Period**
Mechanics, Gravity and Relativity	PHY-10022	15	Semester 1
Nature of matter	PHY-10024	15	Semester 1
Scientific Programming	PHY-10028	15	Semester 1-2
Scientific Practice	PHY-10030	15	Semester 1-2
Applied Mathematics and Statistics	PHY-10032	15	Semester 1-2
Oscillations and Waves	PHY-10020	15	Semester 2
Electricity and Magnetism	PHY-10021	15	Semester 2
Introduction to Astronomy and Stellar Structure	PHY-10029	15	Semester 2

Level 5

At Level 5 MSci Astrophysics students continue to be taught the fundamentals of astrophysics and physics, with eight compulsory modules each worth 15 credits. All eight modules are common to the BSc Physics with Astrophysics degree. Three modules directly address the IoP core physics curriculum, two modules deal with the astrophysical fundamentals of stellar structure and galaxies, and additional compulsory modules specific to the single honours programmes further develop the skills of mathematical and computational analysis and discuss the application of physics to contemporary topics such as power generation, novel technologies and the environment. All of these modules are worth 15 credits and all modules are taught and assessed within a single semester.

Transfer from MSci Astrophysics to BSc Physics with Astrophysics possible at any point during this year. Transfer from BSc Physics with Astrophysics to MSci Astrophysics is possible at any point during this year. Transfers onto Level 5 of the MSci Astrophysics degree will be permitted from the 2024-25 academic year.

Compulsory modules	Module Code	Credits	Period
Quantum Mechanics	PHY-20006	15	Semester 1
Optics and Thermodynamics	PHY-20027	15	Semester 1
Numerical Methods	PHY-20030	15	Semester 1
Mathematical Physics	PHY-20032	15	Semester 1
Stellar Astrophysics	PHY-20002	15	Semester 2
Statistical Mechanics and Solid State Physics	PHY-20026	15	Semester 2
Galaxies	PHY-20028	15	Semester 2
Applied Physics and Emerging Technologies	PHY-20033	15	Semester 2

Level 6

At level 6 MSci Astrophysics students will take five compulsory modules that directly address the IoP core physics curriculum and skills inventory. In addition, students will choose three optional modules from a list of available modules. Note that not all optional modules may run in any given year, dependent on student preferences and staff availability. All modules listed are currently running as part of the BSc (Hons) Physics with Astrophysics degree.

BSc Physics with Astrophysics students will be permitted to transfer onto MSci Astrophysics at any point before the start of Level 6, subject to having met any relevant progression criteria and, in any event, only with the approval of the Programme Director. MSci Astrophysics students will be permitted to transfer onto BSc Physics with Astrophysics at any point up to the end of the first semester of Level 6. Transfers onto Level 6 of the MSci Astrophysics degree will be permitted from the 2025-26 academic year.

Compulsory modules	Module Code	Credits	Period
Electromagnetism	PHY-30012	15	Semester 1
Data Analysis and Model Testing	PHY-30027	15	Semester 1
Astrophysics Group Project and Science Communication - ISP	PHY-30006	15	Semester 1-2
Dissertation	PHY-30017	15	Semester 1-2
Cosmology	PHY-30001	15	Semester 2

Optional modules	Module Code	Credits	Period
Polymer Physics	PHY-30010	15	Semester 1
Binary Stars and Extrasolar Planets	PHY-30024	15	Semester 1
Particle Physics and Accelerators	PHY-30033	15	Semester 1
Two-Dimensional (2D) Materials	PHY-30037	15	Semester 1
The Physics of Compact Objects	PHY-30003	15	Semester 2
Life in the Universe	PHY-30025	15	Semester 2
Quantum Mechanics II	PHY-30029	15	Semester 2
Physics of Fluids	PHY-30030	15	Semester 2
Atmospheric Physics	PHY-30031	15	Semester 2
General Relativity, Black Holes and Gravitational Waves	PHY-30035	15	Semester 2

Level 7

At Level 7 MSci Astrophysics students will take five modules, all of which are unique to this degree pathway. Together they further develop the understanding and skills needed for a future career in academia, data analysis, or modelling. Compared to Levels 4, 5 and 6 they focus on developing a higher level of understanding, a greater research focus, more independent working, and the ability to undertake substantial open-ended projects.

Compulsory modules	Module Code	Credits	Period
Advanced Skills in Astrophysics	PHY-40039	15	Semester 1
Astrophysics Research Training	PHY-40031	15	Semester 1-2
Astrophysics Research Project	PHY-40033	45	Semester 1-2
Literature Review and Science Communication	PHY-40035	30	Semester 1-2
Advanced Topics in Astrophysics	PHY-40037	15	Semester 2

Our teaching puts a strong emphasis on problem solving. This occurs in problem classes where practice problems are solved with staff and teaching assistants available to help; in laboratory teaching where practical and computational problems are addressed; and in directed work for assessment. Students are encouraged to call upon module leaders and year tutors for guidance. The staff will be willing to see students at almost any time (we operate an "open-door" policy) and there will be one-to-one progress interviews each semester. The teaching team will monitor progress and attendance, and will contact students if they are not achieving and advise on improvement strategies.

Students benefit from a flexible approach to learning the mathematical and computational skills that are essential to the learning and application of (Astro)physics. In Levels 4 and 5 there are dedicated mathematics modules but mathematics is also embedded as part of several other modules in each year. Similarly, although programming and computational skills are taught in specific modules, there is an expectation that these skills will increasingly be used in later modules and in Level 7.

Learning Outcomes

The table below sets out what students learn in the programme and the modules in which that learning takes place. Details of how learning outcomes are assessed through these modules can be found in module specifications.

Level 4

The table below sets out what students learn in the programme and the modules in which that learning takes

place. Details of how learning outcomes are assessed through these modules can be found in module specifications.

Subject Knowledge and Understanding	
Learning Outcome	**Module in which this is delivered**
Understand basic concepts in astrophysics, mechanics, nature of matter, oscillations and waves, electricity and magnetism, mathematics, statistics and scientific programming.	All Level 4 modules
Demonstrate the understanding of basic concepts in astrophysics and physics by solving relevant problems.	All Level 4 modules
Understand the mathematical techniques needed for knowledge and use of astrophysics and physics.	All Level 4 modules
Understand how to search for information and to disseminate scientific knowledge in various formats including reports and oral presentations.	All Level 4 modules
Understand the principles of scientific programming and to apply computational and mathematical methods to solving problems in astrophysics and physics.	Applied Mathematics and Statistics - PHY-10032 Scientific Programming - PHY-10028
Perform practical work and keep accurate accounts of it, including professionally maintained records of purpose, methodology, and results.	Electricity and Magnetism - PHY-10021 Nature of matter - PHY-10024 Oscillations and Waves - PHY-10020 Mechanics, Gravity and Relativity - PHY-10022
Communicate the process and results of practical work in formal, written presentations. Enter, manipulate, and present data with the aid of computer tools.	Oscillations and Waves - PHY-10020 Mechanics, Gravity and Relativity - PHY-10022 Nature of matter - PHY-10024 Scientific Programming - PHY-10028 Electricity and Magnetism - PHY-10021

Subject Specific Skills	
Learning Outcome	**Module in which this is delivered**
The ability to work safely in a laboratory or observatory, and a knowledge and awareness of standard safety procedures.	Scientific Practice - PHY-10030 Electricity and Magnetism - PHY-10021 Nature of matter - PHY-10024 Mechanics, Gravity and Relativity - PHY-10022 Oscillations and Waves - PHY-10020
Familiarity with laboratory and astronomical apparatus and techniques.	Scientific Practice - PHY-10030 Nature of matter - PHY-10024 Oscillations and Waves - PHY-10020 Introduction to Astronomy and Stellar Structure - PHY-10029 Mechanics, Gravity and Relativity - PHY-10022 Electricity and Magnetism - PHY-10021
Competency in the use of appropriate computer packages and systems for the analysis of data and the retrieval of information.	All Level 4 modules
An ability in numerical manipulation, estimation, and statistical interpretation.	All Level 4 modules
An ability to present and interpret information graphically.	All Level 4 modules
An ability to work productively on scientific problems on an individual basis or in a team.	All Level 4 modules

Intellectual skills	
Learning Outcome	**Module in which this is delivered**
An ability to question, learn and assimilate knowledge and to evolve one's view of the world in response to that new knowledge.	All Level 4 modules
An ability to contribute through research to the development of knowledge in astrophysics.	All Level 4 modules
An ability to acquire knowledge and understanding of science.	All Level 4 modules
Understanding of the development of knowledge and viewpoints based on evidence and reasoning.	All Level 4 modules, particularly Scientific Practice
An ability to critically evaluate ideas expressed in multiple forms.	All Level 4 modules, particularly Scientific Practice

Key or Transferable Skills (graduate attributes)	
Learning Outcome	**Module in which this is delivered**
Manage their own learning and to make appropriate use of textbooks, research-based materials and other learning resources.	All Level 4 modules
Find information and make responsible use of it.	All Level 4 modules
Make effective written and oral presentations.	Scientific Programming - PHY-10028 Introduction to Astronomy and Stellar Structure - PHY-10029 Scientific Practice - PHY-10030
Work with numerical and statistical data.	All Level 4 modules
Make sensible estimates.	All Level 4 modules
Evaluate the costs and benefits of their actions.	All Level 4 modules
Work effectively with a variety of types of Information Technology.	All Level 4 modules
Formulate a problem and solve it using computational methods.	All Level 4 modules, particularly Scientific Programming
Plan, manage, execute and report an investigation.	Scientific Programming - PHY-10028 Scientific Practice - PHY-10030
Work effectively both as an individual and as part of a team.	All Level 4 modules
Learn and gain understanding and to pass on that understanding to others.	All Level 4 modules
Sustain motivation for an extended period.	All Level 4 modules
Recognise their responsibilities as an individual and as part of a team or an organisation.	All Level 4 modules

Level 5

Subject Knowledge and Understanding	
Learning Outcome	**Module in which this is delivered**
Comprehensive understanding of the relevant theoretical, experimental and observational background of stellar physics, galaxies, quantum mechanics, optics, thermodynamics, nuclear physics, particle physics, statistical mechanics and solid state physics	All Level 5 modules
Use a range of established techniques for critical analysis of numerical calculations in connection with problems in stellar physics, galaxies, quantum mechanics, optics, thermodynamics, nuclear physics, particle physics, statistical mechanics and solid state physics.	All Level 5 modules
Extended abilities in the execution and reporting of laboratory work within the context of physics; work safely in a laboratory and have a knowledge and awareness of standard safety procedures; gain a sound familiarity with laboratory apparatus and techniques.	Numerical Methods - PHY-20030 Stellar Astrophysics - PHY-20002 Optics and Thermodynamics - PHY-20027 Galaxies - PHY-20028
Experience of working in a team on a short astrophysics project.	Galaxies - PHY-20028
The ability to select and deploy appropriate mathematical, computational or statistical analysis techniques to solve problems.	Numerical Methods - PHY-20030 Statistical Mechanics and Solid State Physics - PHY-20026 Mathematical Physics - PHY-20032 Quantum Mechanics - PHY-20006

Subject Specific Skills	
Learning Outcome	**Module in which this is delivered**
The ability to work safely in a laboratory or observatory, and a knowledge and awareness of standard safety procedures.	Galaxies - PHY-20028 Optics and Thermodynamics - PHY-20027 Stellar Astrophysics - PHY-20002
A sound familiarity with laboratory/astronomical apparatus and techniques.	Optics and Thermodynamics - PHY-20027 Stellar Astrophysics - PHY-20002 Galaxies - PHY-20028
Competency in the use of appropriate IT packages/systems for the analysis of data and the retrieval of information.	Stellar Astrophysics - PHY-20002 Galaxies - PHY-20028 Numerical Methods - PHY-20030 Optics and Thermodynamics - PHY-20027
An ability in numerical manipulation and estimation, statistical interpretation and the ability to present and interpret information graphically.	All Level 5 modules
An ability to use mathematical analysis and computational techniques to model physical behaviour.	Numerical Methods - PHY-20030 Mathematical Physics - PHY-20032
An ability to research, record and communicate scientific information, in particular, through clear and accurate scientific reports and essays.	Applied Physics and Emerging Technologies - PHY-20033 Optics and Thermodynamics - PHY-20027 Stellar Astrophysics - PHY-20002 Galaxies - PHY-20028
An ability to question, learn and assimilate knowledge and to evolve their views of the world in response to that new knowledge.	All Level 5 modules
An ability to contribute through research to the development of knowledge in astrophysics.	Stellar Astrophysics - PHY-20002 Optics and Thermodynamics - PHY-20027 Applied Physics and Emerging Technologies - PHY-20033 Galaxies - PHY-20028
An ability to acquire knowledge and understanding of science itself, and to work productively on scientific problems on an individual basis or in a team.	All Level 5 modules

Intellectual skills	
Learning Outcome	**Module in which this is delivered**
An ability to question, learn and assimilate knowledge and to evolve one's view of the world in response to that new knowledge.	All Level 5 modules
An ability to contribute through research to the development of knowledge in astrophysics.	All Level 5 modules
An ability to acquire knowledge and understanding of science.	All Level 5 modules
Understanding of the mathematical and statistical basis of astrophysics	Numerical Methods - PHY-20030 Statistical Mechanics and Solid State Physics - PHY-20026 Mathematical Physics - PHY-20032
An ability to critically evaluate ideas expressed in multiple forms.	All Level 5 modules

Key or Transferable Skills (graduate attributes)	
Learning Outcome	**Module in which this is delivered**
Manage one's own learning and make appropriate use of textbooks, research-based materials and other learning resources.	All Level 5 modules
Find information and make responsible use of it.	All Level 5 modules
Make effective written and oral presentations.	Applied Physics and Emerging Technologies - PHY-20033 Numerical Methods - PHY-20030
Work with numerical and statistical data.	All Level 5 modules
Make sensible estimates.	All Level 5 modules
Evaluate the costs and benefits of their actions.	All Level 5 modules
Work effectively with a variety of types of Information Technology.	All Level 5 modules, particularly Mathematical Physics and Numerical Methods
Formulate a problem and solve it using computational methods.	Numerical Methods - PHY-20030 Galaxies - PHY-20028 Stellar Astrophysics - PHY-20002 Optics and Thermodynamics - PHY-20027
Plan, manage, execute and report an investigation.	Numerical Methods - PHY-20030 Galaxies - PHY-20028 Applied Physics and Emerging Technologies - PHY-20033 Optics and Thermodynamics - PHY-20027 Stellar Astrophysics - PHY-20002
Work effectively both as an individual and as part of a team.	All Level 5 modules
Learn and gain understanding and to pass on that understanding to others.	All Level 5 modules
Sustain motivation for an extended period.	All Level 5 modules
Recognise their responsibilities as an individual and as part of a team or an organisation.	All Level 5 modules

Level 6

Subject Knowledge and Understanding	
Learning Outcome	**Module in which this is delivered**
Describe the central role played by the theory of electromagnetism and Maxwell's equations in understanding the universe and the world around them; describe electromagnetic waves, their production, their propagation and their interaction with non-conductive and conductive media; appreciate the connection between electricity, magnetism and special relativity.	Electromagnetism - PHY-30012
Demonstrate good comprehension, planning and execution of an individual project; give a short presentation on the progress of the project; produce a clear, accurate and informative project report; demonstrate a good understanding of the literature associated with the project theme.	Astrophysics Group Project and Science Communication - ISP - PHY-30006

Subject Knowledge and Understanding	
Learning Outcome	**Module in which this is delivered**
Collect information on astrophysics topics and present to a peer group via an oral presentation and poster; assemble and review information on a specific topic and produce a substantial, detailed dissertation.	Astrophysics Group Project and Science Communication - ISP - PHY-30006
Design, execute, and analyse critically, an experiment or investigation and draw valid conclusions; Estimate levels of uncertainty in their results, compare their results with expected outcomes, theoretical predictions or published data, and evaluate the significance of their results in this context; Recognise their responsibilities as an individual and as part of a team or an organisation; Work effectively both as an individual and as part of a team.	Astrophysics Group Project and Science Communication - ISP - PHY-30006 Dissertation - PHY-30017 Data Analysis and Model Testing - PHY-30027
Contribute through research to the development of knowledge in astrophysics	Astrophysics Group Project and Science Communication - ISP - PHY-30006 Dissertation - PHY-30017
Describe cosmological observations; be able to apply basic physics principles to the universe as a whole; and will be able to calculate conditions in the universe at different times and use mathematics to relate the theory with the observations.	Cosmology - PHY-30001
Understand and use literature sources to investigate a topic in astrophysics in detail; write a dissertation on this topic; present the results orally and graphically.	Dissertation - PHY-30017
Demonstrate an understanding of the statistical techniques used to analyse physical data; solve data analysis problems and interpret scientific data using computer-based analysis techniques; critically evaluate data from primary sources; communicate judgements by applying established numerical analysis techniques.	Data Analysis and Model Testing - PHY-30027
Demonstrate their knowledge of the fundamental principles of physics and astrophysics and competence in applying these principles to diverse areas of the subject; demonstrate competency in the use of appropriate IT packages/systems for the analysis of data and the retrieval of information; demonstrate an ability in numerical manipulation and estimation, statistical interpretation and the ability to present and interpret information graphically; demonstrate an ability to use mathematical analysis and computational techniques to model physical behaviour; to question, learn and assimilate knowledge and to evolve their views of the world in response to that new knowledge; to acquire knowledge and understanding of science themselves, and to work productively on scientific problems on an individual basis or in a team; develop a wider knowledge and understanding of advanced topics and their applications, and the acquisition of skills in the critical reading and understanding of published work in Physics; to record and communicate scientific information.	All Level 6 modules
Solve problems in physics and astrophysics using appropriate mathematical and computational tools including the ability to make sensible approximations.	All Level 6 modules

Subject Specific Skills	
Learning Outcome	**Module in which this is delivered**
The ability to work safely in a laboratory or observatory, and a knowledge and awareness of standard safety procedures.	Astrophysics Group Project and Science Communication - ISP - PHY-30006
A familiarity with laboratory/astronomical apparatus and techniques.	Astrophysics Group Project and Science Communication - ISP - PHY-30006
Competency in the use of appropriate IT packages/systems for the analysis of data and the retrieval of information.	Astrophysics Group Project and Science Communication - ISP - PHY-30006 Dissertation - PHY-30017 Data Analysis and Model Testing - PHY-30027
An ability in numerical manipulation and estimation, statistical interpretation and the ability to present and interpret information graphically.	Astrophysics Group Project and Science Communication - ISP - PHY-30006 Data Analysis and Model Testing - PHY-30027 Dissertation - PHY-30017
An ability to use mathematical analysis and computational techniques to model physical behaviour.	Data Analysis and Model Testing - PHY-30027 Dissertation - PHY-30017 Astrophysics Group Project and Science Communication - ISP - PHY-30006
An ability to research, record and communicate scientific information, in particular through clear and accurate scientific reports and a dissertation.	Astrophysics Group Project and Science Communication - ISP - PHY-30006 Dissertation - PHY-30017
An ability to question, learn and assimilate knowledge and to evolve their views of the world in response to that new knowledge.	Astrophysics Group Project and Science Communication - ISP - PHY-30006 Dissertation - PHY-30017
An ability to contribute through research to the development of knowledge in astrophysics.	Astrophysics Group Project and Science Communication - ISP - PHY-30006
An ability to acquire knowledge and understanding of science itself, and to work productively on scientific problems on an individual basis or in a team.	Astrophysics Group Project and Science Communication - ISP - PHY-30006 Dissertation - PHY-30017

Intellectual skills	
Learning Outcome	**Module in which this is delivered**
An ability to question, learn and assimilate knowledge and to evolve ones view of the world in response to that new knowledge.	All Level 6 modules
An ability to contribute through research to the development of knowledge in astrophysics.	Astrophysics Group Project and Science Communication - ISP - PHY-30006 Dissertation - PHY-30017
An ability to acquire knowledge and understanding of science.	All Level 6 modules
An understanding of the mathematical and statistical basis of astrophysics.	Data Analysis and Model Testing - PHY-30027 Astrophysics Group Project and Science Communication - ISP - PHY-30006
An ability to critically evaluate ideas expressed in multiple forms.	All Level 6 modules
An ability to present information in multiple forms and to different audiences.	Dissertation - PHY-30017 Astrophysics Group Project and Science Communication - ISP - PHY-30006
An understanding and ability to participate in teamwork.	Astrophysics Group Project and Science Communication - ISP - PHY-30006

Key or Transferable Skills (graduate attributes)	
Learning Outcome	**Module in which this is delivered**
Manage their own learning and to make appropriate use of textbooks, research-based materials and other learning resources.	All Level 6 modules
Find information and make responsible use of it.	All Level 6 modules
Make effective written and oral presentations.	Dissertation - PHY-30017 Astrophysics Group Project and Science Communication - ISP - PHY-30006
Work with numerical and statistical data.	All Level 6 modules
Make sensible estimates.	All Level 6 modules
Evaluate the costs and benefits of their actions.	All Level 6 modules
Work effectively with a variety of types of Information Technology.	All Level 6 modules
Formulate a problem and solve it using computational methods.	Astrophysics Group Project and Science Communication - ISP - PHY-30006 Data Analysis and Model Testing - PHY-30027
Plan, manage, execute and report an investigation.	Dissertation - PHY-30017 Astrophysics Group Project and Science Communication - ISP - PHY-30006 Data Analysis and Model Testing - PHY-30027
Learn and gain understanding and to pass on that understanding to others.	All Level 6 modules
Work effectively both as an individual and as part of a team.	Astrophysics Group Project and Science Communication - ISP - PHY-30006
Sustain motivation for an extended period.	All Level 6 modules
Recognise their responsibilities as an individual and as part of a team or an organisation.	All Level 6 modules

Level 7

Subject Knowledge and Understanding	
Learning Outcome	**Module in which this is delivered**
Detailed knowledge and understanding of a range of topics in modern astrophysics	Advanced Topics in Astrophysics - PHY-40037
To contribute through research to the development of knowledge in astrophysics	Astrophysics Research Training - PHY-40031 Literature Review and Science Communication - PHY-40035
Understand and use a wide variety of literature sources to investigate a topic in astrophysics in detail; write a review of this topic; present the results in a literature review.	Literature Review and Science Communication - PHY-40035
Detailed knowledge and understanding of a range of skills used in modern astrophysics.	Advanced Skills in Astrophysics - PHY-40039
An ability in numerical manipulation and estimation, statistical interpretation and the ability to present and interpret information graphically.	Advanced Skills in Astrophysics - PHY-40039 Astrophysics Research Training - PHY-40031
An ability to use mathematical analysis and computational techniques to model physical behaviour.	Advanced Skills in Astrophysics - PHY-40039 Astrophysics Research Training - PHY-40031 Advanced Topics in Astrophysics - PHY-40037
An ability to research and record scientific information with precision and accuracy.	Literature Review and Science Communication - PHY-40035 Astrophysics Research Training - PHY-40031
An ability to question, learn and assimilate knowledge and to evolve their views of the world in response to that new knowledge.	All Level 7 modules
Understanding of the wider requirements and implications of scientific research, including issues reated to ethics, financing, transparency and sustainability.	Research Training

Subject Specific Skills	
Learning Outcome	**Module in which this is delivered**
Proficiency in the use of appropriate IT packages/systems for the analysis of data and the retrieval of information.	Literature Review and Science Communication - PHY-40035 Advanced Skills in Astrophysics - PHY-40039 Astrophysics Research Training - PHY-40031
An ability to record information and analysis steps to ensure the reproducibility of scientific results.	Astrophysics Research Project - PHY-40033 Literature Review and Science Communication - PHY-40035 Research Training
An ability to effectively communicate scientific results in a range of ways to a range of different audiences.	Literature Review and Science Communication - PHY-40035 Astrophysics Research Training - PHY-40031 Research Training
Make effective written and oral presentations.	Astrophysics Research Training - PHY-40031 Literature Review and Science Communication - PHY-40035 Research Training
An ability to use mathematical analysis and computational techniques to model physical behaviour.	Advanced Skills in Astrophysics - PHY-40039 Astrophysics Research Project - PHY-40033 Research Training
An ability in numerical manipulation and estimation, statistical interpretation and the ability to present and interpret information graphically.	Advanced Skills in Astrophysics - PHY-40039 Astrophysics Research Project - PHY-40033 Research Training
An ability to acquire knowledge and understanding of science itself, and to work productively on scientific problems.	All Level 7 modules

Intellectual skills	
Learning Outcome	**Module in which this is delivered**
An ability to question, learn and assimilate knowledge and to evolve one's view of the world in response to that new knowledge.	All Level 7 modules
An ability to contribute through research to the development of knowledge in astrophysics.	Astrophysics Research Training - PHY-40031 Literature Review and Science Communication - PHY-40035
An ability to acquire knowledge and understanding of science. All Level 7 modules	All Level 7 modules
Understanding of the mathematical and physical basis of astrophysics.	All Level 7 modules
Be able to critically evaluate ideas expressed in multiple forms.	Astrophysics Research Training - PHY-40031 Literature Review and Science Communication - PHY-40035
An ability to present information in multiple forms and to different audiences.	Astrophysics Research Training - PHY-40031 Literature Review and Science Communication - PHY-40035
A detailed understanding and familiarity with the progress of science through publications and other forms of communication	All Level 7 modules
An ability to develop and implement ideas and analysis through computational means.	Advanced Skills in Astrophysics - PHY-40039 Astrophysics Research Project - PHY-40033

Key or Transferable Skills (graduate attributes)	
Learning Outcome	**Module in which this is delivered**
Manage their own learning and to make appropriate use of textbooks, research-based materials and other learning resources.	All Level 7 modules
Find information and make responsible use of it.	All Level 7 modules
Make effective written and oral presentations.	Astrophysics Research Training - PHY-40031 Literature Review and Science Communication - PHY-40035 Research Training
Work with numerical and statistical data.	All Level 7 modules
Work effectively with a variety of types of Information Technology.	All Level 7 modules
Formulate a problem and solve it using computational methods.	Astrophysics Research Project - PHY-40033 Advanced Skills in Astrophysics - PHY-40039
Plan, manage, execute and report an investigation.	Advanced Skills in Astrophysics - PHY-40039 Astrophysics Research Project - PHY-40033
Learn and gain understanding and to pass on that understanding to others.	All Level 7 modules
Sustain motivation for an extended period.	All Level 7 modules

9. Final and intermediate awards

Credits required for each level of academic award are as follows:

Master's Degree	480 credits	You will require at least 120 credits at levels 4, 5, 6 and 7 You must accumulate at least 360 credits in your main subject (out of 480 credits overall) to graduate with a named single honours degree in this subject.
Honours Degree	360 credits	You will require at least 120 credits at levels 4, 5 and 6 You must accumulate a minimum of 270 credits in your main subject (out of 360 credits overall), with at least 90 credits in each of the three years of study, to graduate with a named single honours degree in this subject.
Diploma in Higher Education	240 credits	You will require at least 120 credits at level 4 or higher and at least 120 credits at level 5 or higher
Certificate in Higher Education	120 credits	You will require at least 120 credits at level 4 or higher

International Year option: in addition to the above students must pass a module covering the international year in order to graduate with a named degree including the 'international year' wording. Students who do not complete, or fail the international year, will be transferred to the three-year version of the programme.

10. How is the Programme Assessed?

The wide variety of assessment methods used within Astrophysics at Keele reflects the broad range of knowledge and skills that are developed as you progress through the degree programme. Teaching staff pay particular attention to specifying clear assessment criteria and providing timely, regular and constructive feedback that helps to clarify things you did not understand and helps you to improve your performance.

Year 1 (Level 4) lecture modules are assessed by a mixture of continuous assessment (mostly in the form of problem classes, problem sheets, laboratory work and laboratory reports, though also including at least one oral presentation and some short essays) and examination. A risk assessment also forms part of the laboratory/observatory work. The skills component of these modules is assessed on your work in laboratories, your understanding of the experiment as displayed in discussion with the staff in the laboratory and in the laboratory reports you are required to write. Problem classes and tests that occur periodically throughout the year specifically assess the mathematics component, although mathematics is an embedded and inherent part of all other assessments including examinations and problem sheets. The computational strand is assessed specifically by computer tests and project work. The module marks from Level 4 count for progression purposes but do not contribute to any final degree classification.

Year 2 (Level 5) lecture modules are assessed by a mixture of continuous assessment (mostly in the form of problem classes and problem sheets), laboratory work and examination. Laboratory work is assessed on your work in laboratory session, your understanding of the experiment as displayed in discussion with the staff in the laboratory and in the laboratory reports you are required to write. A risk assessment also forms part of the assessed laboratory work. The laboratory work is connected to the content of the lecture modules and the marks for the laboratory are therefore combined with the examination and continuous assessment marks to give a final mark for each module. There are also specific class tests associated with computing and mathematics. The module marks from Level 5 count towards progression and also make up 20% of the aggregate marks for the purposes of final degree classification.

Year 3 (Level 6) modules are self-contained. Lecture modules are assessed using a mixture of continuous assessment (mostly in the form of problem sheets, though some feature essays, mini-projects or computer exercises) and examination. The Astrophysics Project module is assessed in terms of the originality you display, the quality and methods of research employed and on the final report. You are also given the opportunity to display these qualities in writing a short article, preparing an oral presentation and the report produced as part of a team. You are also given the opportunity to display these qualities in writing a project plan, progress report and final report, and reviewing of the project plan and progress report by peer and oral presentation. The Dissertation module is assessed on the scientific content and presentation of the dissertation and also on an oral presentation and a poster presentation that you are required to produce. The module marks for Level 6 make up 30% of the aggregate marks for the purposes of the final degree classification.

Year 4 (Level 7) modules are oriented towards developing the ability to perform independent research, the skills

needed in scientific research, and further understanding of a range of topics in astrophysics. Assessments include literature reviews, presentations, vivas, portfolios, reports, class tests and closed-book exams. The module marks for Level 7 make up 50% of the aggregate marks for the purposes of the final degree classification.

The following list is representative of the variety of assessment methods used within MSci Astrophysics:

- **End of module examinations** test the ability of the student to describe, explain, and critically discuss the principles of the subject and to demonstrate competence in applying these principles to applications and to solve problems from appropriate areas of the discipline.
- **Assessed Problem Sheets** assess the student's skills in solving numerical and other problems within the discipline by drawing on their scientific understanding and knowledge, and experience of experimental techniques. Students may also be assessed on their skills of research and communication and on their ability to deploy appropriate mathematical, computational and numerical techniques.
- **Laboratory and Project Reports** - structured proformas and full lab reports are formal summaries of work carried out in the laboratory and test students' understanding of the practical aspects of the programme and assess the skills necessary to enable students to present and analyse their results.
- **Observation of laboratory skills and laboratory notebooks**: Throughout the extensive laboratory and other practical work in this programme, many types of assessment are utilised to achieve the learning outcomes. Notebooks are used to communicate the results of work accurately and reliably and to encourage good working practice, including managing risk assessments and following safe working practices.
- **Oral and/or Poster presentations** on project work demonstrate the ability of the student to present complex concepts and information in a clear and concise manner, to interact and communicate effectively to a wide range of professional environments, including to both scientific and non-scientific audiences. They also test how effectively students have been able to research and sift information.
- **In-class exercises and tests** taken either conventionally or online via the Keele Learning Environment (KLE) assess students' subject knowledge and their ability to apply it in a more structured and focused way.
- **Group oral presentations and reports** assess individual students' subject knowledge and understanding. They also test their ability to work effectively as members of a team, to communicate what they know orally and visually, and to reflect on these processes as part of their own personal development.
- **Engagement with problem classes** assess the extent to which students are able to work on problems and present their solutions in a logical, structured and coherent way.
- **Dissertations and Literature Reviews** assess the students' ability to engage with advanced areas of astrophysics, to research and sift information, and to communicate effectively via an extended piece of writing.
- **Computing Tests** specifically assess a student's computational skills and their ability to design and produce code to solve astrophysics and physics problems.
- **Mini-projects** short projects that form a minor part of module assessments designed to test subject knowledge but also to assess many of the skills components.
- **Risk assessments** are produced by students to test their appreciation of how to design experiments and consider the health and safety aspects of their work.
- **Portfolios** are compiled by students and contain a range of pieces of work submitted together as evidence of learning and engagement with particular modules.

Marks are awarded for summative assessments designed to assess your achievement of learning outcomes. You will also be assessed formatively to enable you to monitor your own progress and to assist staff in identifying and addressing any specific learning needs. Feedback, including guidance on how you can improve the quality of your work, is also provided on all summative assessments within three working weeks of submission, unless there are compelling circumstances that make this impossible, and more informally in the course of tutorial and seminar discussions.

11. Contact Time and Expected Workload

This contact time measure is intended to provide you with an indication of the type of activity you are likely to undertake during this programme. The data is compiled based on module choices and learning patterns of students on similar programmes in previous years. Every effort is made to ensure this data is a realistic representation of what you are likely to experience, but changes to programmes, teaching methods and assessment methods mean this data is representative and not specific.

Undergraduate courses at Keele contain an element of module choice; therefore, individual students will experience a different mix of contact time and assessment types dependent upon their own individual choice of modules. The figures below are an example of activities that a student may expect on your chosen course by year stage of study. Contact time includes scheduled activities such as: lecture, seminar, tutorial, project supervision, demonstration, practical classes and labs, supervised time in labs/workshop, fieldwork and external visits. The figures are based on 1,200 hours of student effort each year for full-time students.

Activity

	Scheduled learning and teaching activities	Guided independent Study	Placements
Year 1 (Level 4)	31.3%	68.7%	0%
Year 2 (Level 5)	34.7%	65.3%	0%
Year 3 (Level 6)	21.6%	78.4%	0%
Year 4 (Level 7)	19.4%	80.6%	0%

12. Accreditation

This subject/programme will be put forward for accreditation by The Institute of Physics (IoP) once the first cohort has graduated, and accreditation (if successful) will be applied retrospectively. The Combined Honours Astrophysics and Single Honours Physics with Astrophysics programmes that form a subset of MSci Astrophysics have already achieved full accreditation. Please note the following:

- Graduates with accredited BSc and MSci degrees are eligible for Membership of the IoP and can follow a route to professional registration as a RSci, CPhys and/or CSci.

13. University Regulations

The University Regulations form the framework for learning, teaching and assessment and other aspects of the student experience. Further information about the University Regulations can be found at: http://www.keele.ac.uk/student-agreement/

If this programme has any exemptions, variations or additions to the University Regulations these will be detailed in an Annex at the end of this document titled 'Programme-specific regulations'.

14. What are the typical admission requirements for the Programme?

See the relevant course page on the website for the admission requirements relevant to this programme: https://www.keele.ac.uk/study/

Applicants who are not currently undertaking any formal study or who have been out of formal education for more than 3 years and are not qualified to A-level or BTEC standard may be offered entry to the University's Foundation Year Programme.

Applicants for whom English is not a first language must provide evidence of a recognised qualification in English language. The minimum score for entry to the Programme is Academic IELTS 6.0 or equivalent.

English for Academic Purposes

Please note: All new international students entering the university will provide a sample of Academic English during their registration Using this sample, the Language Centre may allocate you to an English language module which will become compulsory. This will replace any GCP modules. *NB:* students can take an EAP module only with the approval of the English Language Programme Director and are not able to take any other Language modules in the same academic year.

English Language Modules at Level 4:

- Business - ENL-90003 Academic English for Business Students (Part 1); ENL-90004 Academic English for Business Students (2)
- Science - ENL-90013 Academic English for Science Students
- General - ENL-90006 English for Academic Purposes 2; ENL-90001 English for Academic Purposes 3; ENL-90002 English for Academic Purposes 4

English Language Modules at Level 5:

- Business - ENL-90003 Academic English for Business Students (Part 1); ENL-90004 Academic English for Business Students (2)
- Science - ENL-90013 Academic English for Science Students
- General - ENL-90006 English for Academic Purposes 2; ENL-90001 English for Academic Purposes 3; ENL-90002 English for Academic Purposes 4

English Language Modules at Level 6:

- Business - ENL-90003 Academic English for Business Students (Part 1); ENL-90004 Academic English for Business Students (2); ENL-90005 Advanced Business English Communication
- Science - ENL-90013 Academic English for Science Students
- General - ENL-90006 English for Academic Purposes 2; ENL-90001 English for Academic Purposes 3; ENL-90002 English for Academic Purposes 4

Recognition of Prior Learning (RPL) is considered on a case-by-case basis and those interested should contact the Programme Director. The University's guidelines on this can be found here: https://www.keele.ac.uk/qa/programmesandmodules/recognitionofpriorlearning/

15. How are students supported on the programme?

All the academic staff in Astrophysics and Physics operate an open-door policy for students. If they are available then, at any time in the working day, students may seek help and guidance. If staff are not immediately available, they will arrange a future meeting for such discussions. Our department is reasonably small; students have many opportunities in labs, problem classes and tutorials to discuss their work and progress with staff. Students should feel free to approach any lecturer or module leader to discuss any academic issues.

In addition to this informal assistance there are many other avenues of help for students:

Keele Learning Environment (KLE)

All the Physics modules are supported by learning materials that are accessible to students via the KLE at https://students.keele.ac.uk/webapps/login/.

Academic Mentors

All students are assigned an Academic Mentor as a part of the University's Academic Mentor system for the duration of their studies at Keele. There is a formal requirement for the Academic Mentors to meet with their first-year students during the first week of semester one. Subsequently, Academic Mentors should meet at least four times per year to discuss progress and offer support and advice on academic or any other matter. During the subsequent undergraduate years Academic Mentors and tutees should meet at least three times per year. Students can make arrangements to seek help or advice on any matter that affects their life and work as a student at Keele. More details available at: https://www.keele.ac.uk/students/academiclife/academicmentoring/

Deputy programme director (Student welfare)

Each year of study has an associated deputy programme director (Student welfare) who monitors the students and the modules to ensure the course is running smoothly and that students are making the progress they should. They will note any problems and bring them to the attention of the Course Management Committee who will decide on an appropriate course of action. Students should regard the deputy programme director (Student welfare) as their first point of contact to discuss any topic related to the courses or their own academic performance.

Student Experience and Support Officer

If you need to talk to someone, whether it's about your studies or life outside of them, you will have the support of members of the Student Experience and Support team based within student services (Student experience and support - Keele University).

Students with disabilities

If you have long-term disabilities, you will have the assistance of the DLO and the Examinations Office and from academic and support staff who liaise with these services.

Health and Safety

All students are briefed on Health and Safety as part of their induction, and this is repeated at the beginning of the first laboratory session. Students are required to sign an agreement that they have read the Safety Handbook, and that they will abide by the rules and regulations governing the safety and welfare of all members within the University. The Safety handbook can be accessed on the KLE (https://students.keele.ac.uk/) under the section "Physics and Astrophysics Information".

Further information

It is essential that students check the KLE (http://students.keele.ac.uk/) for up-to-date information on course and teaching materials related to their Physics modules.

Student Services

Student Services also offer a comprehensive range of specialist services that help you at any time from enrolment to graduation. The following link will provide more information: https://www.keele.ac.uk/students/studentservices/

16. Learning Resources

The Physics section of the School is housed in the Lennard-Jones Building and the Central Science Laboratories, which contain well-equipped undergraduate physics teaching laboratories and a dedicated PC laboratory supporting both Windows and Linux.

17. Other Learning Opportunities

Study abroad (semester)

Students on the programme have the potential opportunity to spend a semester abroad in their second year studying at one of Keele's international partner universities.

Exactly which countries are available depends on the student's choice of degree subjects. An indicative list of countries is on the website (http://www.keele.ac.uk/studyabroad/partneruniversities/) but this does not guarantee the availability of study in a specific country as this is subject to the University's application process for studying abroad.

No additional tuition fees are payable for a single semester studying abroad but students do have to bear the costs of travelling to and from their destination university, accommodation, food and personal costs. Depending on the destination they are studying at additional costs may include visas, study permits, residence permits, and compulsory health checks. Students should expect the total costs of studying abroad to be greater than if they study in the UK. Information is made available from the Global Education Team throughout the process, as costs will vary depending on destination.

Whilst students are studying abroad any Student Finance eligibility will continue, where applicable students may be eligible for specific travel or disability grants. Students may be eligible for a variety of funding opportunities, under schemes like the Turing fund or ERASMUS+. Students studying outside of this programme may be eligible for income-dependent bursaries at Keele. Students travel on a comprehensive Keele University insurance plan, for which there are currently no additional charges. Some governments and/or universities require additional compulsory health coverage plans; costs for this will be advised during the application process.

Study Abroad (International Year)

A summary of the International Year, which is a potential option for students after completion of year 2 (Level 5), is provided in the Annex for the International Year.

Other opportunities

There are other opportunities such as the Student Ambassador Scheme and e-mentoring scheme for students to enhance their employability skills.

18. Additional Costs

As to be expected there will be additional costs for inter-library loans and potential overdue library fines, print and graduation. We do not anticipate any further costs for this programme.

19. Quality management and enhancement

The quality and standards of learning in this programme are subject to a continuous process of monitoring, review and enhancement.

- The School Education Committee is responsible for reviewing and monitoring quality management and enhancement procedures and activities across the School.
- Individual modules and the programme as a whole are reviewed and enhanced every year in the annual programme review which takes place at the end of the academic year.
- The programmes are run in accordance with the University's Quality Assurance procedures and are subject to periodic reviews under the Revalidation process.

Student evaluation of, and feedback on, the quality of learning on every module takes place every year using a variety of different methods:

- The results of student evaluations of all modules are reported to module leaders and reviewed by the Programme Committee as part of annual programme review.
- Findings related to the programme from the annual National Student Survey (NSS), and from regular surveys of the student experience conducted by the University, are subjected to careful analysis and a

planned response at programme and School level.
- Feedback received from representatives of students on the programme is considered and acted on at regular meetings of the Student Staff Voice Committee.

The University appoints senior members of academic staff from other universities to act as external examiners on all programmes. They are responsible for:

- Approving examination questions
- Confirming all marks which contribute to a student's degree
- Reviewing and giving advice on the structure and content of the programme and assessment procedures

Information about current external examiner(s) can be found here:
http://www.keele.ac.uk/qa/externalexaminers/currentexternalexaminers/

20. The principles of programme design

The programme described in this document has been drawn up with reference to, and in accordance with the guidance set out in, the following documents:

a. UK Quality Code for Higher Education, Quality Assurance Agency for Higher Education:
http://www.qaa.ac.uk/quality-code
b. QAA Subject Benchmark Statement (Physics, Astronomy and Astrophysics, 2019):
https://www.qaa.ac.uk/docs/qaa/subject-benchmark-statements/subject-benchmark-statement-physics-astronomy-and-astrophysics.pdf?sfvrsn=eff3c881_4
c. Keele University Regulations and Guidance for Students and Staff: http://www.keele.ac.uk/regulations

21. Annex - International Year

MSci Astrophysics with International Year

International Year Programme
Students registered for this Single Honours programme may either be admitted for or apply to transfer during their period of study at Level 5 to the International Year option. Students accepted onto this option will have an extra year of study (the International Year) at an international partner institution after they have completed Year 2 (Level 5) at Keele. Students who successfully complete both the second year (Level 5) and the International Year will be permitted to progress to Level 6. Students who fail to satisfy the examiners in respect of the International Year will normally revert to the standard programme and progress to Level 6 on that basis. The failure will be recorded on the student's final transcript. Study at Level 4, Level 5, Level 6 and Level 7 will be as per the main body of this document. The additional detail contained in this annex will pertain solely to students registered for the International Year option.
International Year Programme Aims
In addition to the programme aims specified in the main body of this document, the international year programme of study aims to provide students with: 1. Personal development as a student and a researcher with an appreciation of the international dimension of their subject 2. Experience of a different culture, academically, professionally and socially
Entry Requirements for the International Year

Students may apply to the 4-year programme during Level 5. Admission to the International Year is subject to successful application, interview and references from appropriate staff.

The criteria to be applied are:

- Academic Performance (an average of 55% across all modules in Semester 1 at Level 5 is normally required. Places on the International Year are then conditional on achieving an average mark of 55% across all Level 5 modules. Students with up to 15 credits of re-assessment who meet the 55% requirement may progress to the International Year. Where no Semester 1 marks have been awarded performance in 1st year marks and ongoing 2nd year assessments are taken into account)
- General Aptitude (to be demonstrated by application for study abroad, interview during the 2nd semester of year 2 (Level 5), and by recommendation of the student's Academic Mentor, 1st and 2nd year tutors and programme director)

Student Support

Students will be supported whilst on the International Year via the following methods:

- Phone or Skype conversations with Study Abroad tutor, in line with recommended Academic Mentoring meeting points.
- Support from the University's Global Education Team

Learning Outcomes

In addition to the learning outcomes specified in the main text of the Programme Specification, students who complete a Keele undergraduate programme with International Year will be able to:

1. Describe, discuss and reflect upon the cultural and international differences and similarities of different learning environments
2. Discuss the benefits and challenges of global citizenship and internationalisation
3. Explain how their perspective on their academic discipline has been influenced by locating it within an international setting.
4. Communicate effectively in an international setting;
5. Reflect on previous learning within an international context.

These learning outcomes will all be assessed by the submission of a satisfactory individual learning agreement, the successful completion of assessments at the partner institution and the submission of the reflective portfolio element of the international year module.

Regulations

Students registered for the International Year are subject to the programme-specific regulations (if any) and the University regulations. In addition, during the International Year, the following regulations will apply:

Students undertaking the International Year must complete 120 credits, which must comprise *at least 40%* in the student's discipline area.

This may impact on your choice of modules to study, for example you will have to choose certain modules to ensure you have the discipline specific credits required.

Students are barred from studying any module with significant overlap to the Level 6 modules they will study on their return. Significant overlap with Level 5 modules previously studied should also be avoided.

Additional costs for the International Year

Tuition fees for students on the International Year will be charged at 15% of the annual tuition fees for that year of study, as set out in Section 1. The International Year can be included in your Student Finance allocation, to find out more about your personal eligibility see: www.gov.uk

Students will have to bear the costs of travelling to and from their destination university, accommodation, food and personal costs. Depending on the destination they are studying at additional costs may include visas, study permits, residence permits, and compulsory health checks. Students should expect the total costs of studying abroad be greater than if they study in the UK, information is made available from the Global Education Team throughout the process, as costs will vary depending on destination.

Students who meet external eligibility criteria may be eligible for grants as part of this programme. Students studying outside of this programme may be eligible income dependent bursaries at Keele.

Students travel on a comprehensive Keele University insurance plan, for which there are currently no additional charges. Some Governments and/or universities require additional compulsory health coverage plans; costs for this will be advised during the application process.

22. Annex - Programme-specific regulations

Programme Regulations: MSci Astrophysics

Final Award and Award Titles	MSci Astrophysics
Intermediate Award(s)	Honours Degree, Diploma in Higher Education, Certificate in Higher Education
Last modified	n/a
Programme Specification	https://www.keele.ac.uk/qa/programmespecifications

The University's Academic Regulations which can be found on the Keele University website (https://www.keele.ac.uk/regulations/)[1] apply to and regulate the programme, other than in instances where the specific programme regulations listed below over-ride them. These programme regulations list:

- *Exemptions* which are characterised by the omission of the relevant regulation.
- *Variations* which are characterised by the replacement of part of the regulation with alternative wording.
- *Additional Requirements* which set out what additional rules that apply to students in relation to this programme.

The following **exemptions, variations** and **additional requirements** to the University regulations have been checked by Academic Services and have been approved by the Faculty Education Committee.

A) EXEMPTIONS

The clause(s) listed below describe where an exemption from the University's Academic Regulations exists:

For the whole duration of their studies, students on this Programme are exempt from the following regulations:

- **No exemptions apply.**

B) VARIATIONS

The clause(s) listed below describe where a variation from the University's Academic Regulations exists:

Variation 1:

The PHY-30006 Astrophysics Group Project and Science Communication module must be passed at 40% and is

not eligible for condonement due to IoP accreditation requirements. All other Level 6 modules are eligible for condonement as defined in Regulation D5.

Variation 2:

The PHY-40033 Astrophysics Research Project module must be passed at 50% and is not eligible for condonement due to IoP accreditation requirements. All other Level 7 modules are eligible for condonement as defined in Regulation D5.

Variation 3:

Transfer from MSci Astrophysics to BSc Physics with Astrophysics is possible at any point during Level 4, Level 5, and the first semester of Level 6, with the approval of the Programme Director.

Additional Requirements

The programme requirements listed below are in addition to the University's Academic Regulations:

There are no additional requirements

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[1] References to University Regulations in this document apply to the content of the University's Regulatory Framework as set out on the University website here https://www.keele.ac.uk/regulations/.

Version History

This document

Date Approved: 04 June 2024

Previous documents

Version No	Year	Owner	Date Approved	Summary of and rationale for changes