Programme Specification[1]

1. Programme Title(s) and Code(s):

Programme Title	*UCAS Code*	*GU Code*
MSci (Combined) in Astronomy (and another subject)		F500-2207H

2. Academic Session:

2018-19

3. SCQF Level (see Scottish Credit and Qualifications Framework Levels):

11

4. Credits:

600

5. Entrance Requirements:

Please refer to the current undergraduate prospectus at:
http://www.gla.ac.uk/undergraduate/prospectus/

6. ATAS Certificate Requirement (see Academic Technology Approval Scheme):

ATAS Certificate not required

7. Attendance Type:

Full Time

8. Programme Aims:

Astronomy involves the observational and theoretical study of the astrophysical universe, ranging from solar system objects through stars, to galaxies and the structure of the universe as a whole. It draws on all branches of physics, including nuclear and particle physics, electromagnetism,

[1] This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if full advantage is taken of the learning opportunities that are provided. More detailed information on the learning outcomes, content and teaching, learning and assessment methods of each course can be found in course handbooks and other programme documentation and online at www.gla.ac.uk/

The accuracy of the information in this document is reviewed periodically by the University and may be checked by the Quality Assurance Agency for Higher Education.

dynamics and gravitation, with principles of optics and materials physics entering via astronomical instrumentation. In this M.Sci. half-programme we aim to give the student an in-depth understanding of the principles and methods of modern astronomy, and the skills to apply this understanding to a range of theoretical and practical problems. In order to illustrate this, we draw on a wide variety of research and applications including work performed in the Department of Physics & Astronomy.

Specific Aims of the Programme

(1) To present an in-depth integrated course of study providing students with knowledge and understanding of the astrophysical universe, and of the methods and principles of astrophysical enquiry;

(2) To develop the student's competence in the application of methods of mathematics and physics in an astrophysical context;

(3) To provide the opportunity to study in depth a choice of advanced treatments of aspects of modern astrophysics;

(4) To offer the opportunity to apply measurement, problem solving and critical assessment, and communication skills in performing and writing a report on an extended and demanding project;

(5) To develop the student's problem solving ability, communication and presentation skills to a level appropriate to an academic, research or industrial career;

(6) To encourage students to work effectively as individuals and in small groups, to develop a professional attitude to what they do and to take full responsibility for their own learning.

9. Intended Learning Outcomes of Programme:

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, skills, qualities and other attributes in the following areas.

Knowledge and Understanding

On completion of the programme the student will be able to:

- Understand and describe the key concepts which underpin current knowledge in the following core subjects: stellar structure and evolution, high energy astrophysics, instruments for optical and radio astronomy, cosmology. Apply these concepts to analyse and solve quantitative problems;
- Understand and describe the key concepts which underpin current knowledge across a subset of 3 more specialist (H-level) topics drawn from: galaxies, cricumstellar matter, astronomical data analysis, planetary systems. Apply these concepts to analyse and solve quantitative problems;
- Demonstrate a deeper understanding of more advanced physical concepts across a subset of more specialist (M-level) topics drawn from: plasma theory and diagnostics, general relativity and gravitation, pulsars and supernovae, statistical astronomy. Apply these concepts to analyse and solve quantitative problems.

Skills and Other Attributes

Subject-specific/practical skills

On completion of the programme students will be able to

- Programme straightforward procedures in a high level computer language, or use professional-level astronomical software, to solve physical problems and analyse data from astronomical sources;

- Plan and execute experimental investigations of physical processes using both standard and advanced bench and astronomical equipment, of complex physical systems or processes, demonstrating logic, initiative and decision making skills in solving problems encountered;
- Evaluate uncertainties inherent in experimental measurements;
- Make a critical analysis and draw valid conclusions from the results of experimental investigations;
- Recover, evaluate and summarise the professional literature and material from other sources concerned with a chosen area of physics or astronomy, and prepare a written analysis of the current position in the chosen area, which should include a critical comparison of the material and a discussion of likely future developments;
- Plan the course of action required to achieve self-defined goals in an open-ended (astro)physics project;
- Write clear and concise reports in a scientific style.

Intellectual skills

On completion of the programme students will be able to:

- Describe and analyse quantitatively processes, relationships and techniques related to the areas covered in the contributory courses;
- Write down, and where appropriate either prove or discuss the underlying basis of, physical laws related to topics in these areas;
- Analyse critically, and solve using appropriate mathematical tools, advanced or complex problems, which may include unseen elements, related to topics included in the course outlines;
- Demonstrate a critical awareness of the significance and importance of the topics, methods and techniques discussed in the lectures and their relationship to other concepts in courses which have been taken.

Transferable/key skills

On completion of the programme students will be able to:

- Perform an in-depth literature study of a scientific topic;
- Prepare and give an audio-visual presentation on a scientific topic;
- Make a preliminary definition of goals to be achieved during open-ended project work and revise these goals and strategies for completion of the work in the light of results achieved and difficulties encountered;
- Prepare an abstract of experimental or project work performed in the accepted scientific format;
- Write a report containing a full description of the aims, methods, outcomes and conclusions of a laboratory investigation or extended piece of project work, including a critical evaluation of the significance of the work and how it compares with earlier work carried out in the same area;
- Apply logical analysis to problem solving;
- Interact positively with colleagues in a small group context;

10. Typical Learning and Teaching Approaches:

Knowledge and understanding:

Lectures and class tutorials

Small group supervisions
Laboratory and project work
Private study

Intellectual skills:

Lectures and class tutorials
Small group supervisions
Experimental and computational laboratory work
Private study

Subject-specific/practical skills:

Laboratory work
Self-study seminar project

Transferable/key skills:

Skills workshop
Seminar project
Small group supervisions

11. Typical Assessment Methods:

Knowledge and understanding:

Written examinations
Written reports of laboratory work
Multiple choice questions

Intellectual skills:

Written examinations
Written reports of laboratory work
Multiple choice questions

Subject-specific/practical skills:

Written reports of laboratory work
Written reports of project work
Verbal presentation of self-study seminar

Transferable/key skills:

Written reports of laboratory and project work
Oral presentation of seminar project work.

12. Programme Structure and Features:

The MSci programme in Astronomy and another *subject* lasts 5 years and contains a minimum of 600 credits, as required by the regulations of the College of Science and Engineering, set out in the University Calendar, for an integrated masters degree. This figure includes a minimum of 120 credits at M-level and a further 240 credits at either H-level or M-level, all of which must be taken in years 3, 4 or 5. The other subject can be Physics, Mathematics or Applied Mathematics.

A minimum of 120 credits must be taken in Years 1 to 4. In year 5 the minimum number of credits is the number required to complete the degree programme. The maximum number of credits which may be taken in any year is 160.

The courses which can be taken in years 3, 4 and 5 are subject to timetabling constraints and to students having taken prerequisite courses in an earlier semester or year. In the sample degree programme listed below, all compulsory courses are taken as soon as possible.

Year 1

Astronomy 1 (40 credits)
Mathematics 1R or 1X and Mathematics 1S, 1T or 1Y (20 credits each)
Additional classes (40 credits, and which should satisfy the requirements of *subject*).

Year 2

Astronomy 2 (30 credits)
Mathematics 2A, 2B and 2D (10 credits each)
Additional classes (which should satisfy the requirements of *subject*).

Year 3

45 credits of compulsory courses as listed:

Stellar Structure & Evolution (15 credits, alternate years, starting 2009-10),
High Energy Astrophysics (15 credits, alternate years, starting 2009-10),
Instruments for Optical & Radio Astronomy (15 credits, alternate years, starting 2008-09),
Cosmology (15 credits, alternate years, starting 2008-09),
Astro Skills 1 (15 credits)

Plus 15 credits of elective courses chosen from the following list:

Galaxies (15 credits, alternate years, starting 2009-10),
Heliophysics and Stellar Atmospheres (15 credits, alternate years, starting 2009-10),
Astronomical Data Analysis (15 credits, alternate years, starting 2008-09),
Exploring Planetary Systems (15 credits, alternate years, starting 2008-09)

Plus 60 credits of courses from *subject*

Year 4

35 credits of compulsory courses as listed:

General Relativity & Gravitation [ASTRO 5001] (15 M-credits, alternate years, starting 2008-09),
Plasma Theory & Diagnostics [ASTRO 5004] (15 M-credits, alternate years, starting 2009-10),
Astronomy 4M Project [ASTRO 4020P] (20 M-credits)**

Plus 30 credits of elective courses chosen from the following list:

Cosmology [ASTRO 4006] (15 credits, alternate years, starting 2008-09),
Exploring Planetary Systems [ASTRO 4007] (15 credits, alternate years, starting 2008-09),

Instruments for Optical & Radio Astronomy [ASTRO 4010] (15 credits, alternate years, starting 2008-09),
Astronomical Data Analysis [ASTRO 4013] (15 credits, alternate years, starting 2008-09),
Statistical Astronomy [ASTRO 5003] (15 M-credits, alternate years, starting 2008-09),
Heliophysics and Stellar Atmospheres [ASTRO 4005] (15 credits, alternate years, starting 2009-10),
Galaxies [ASTRO 4008] (15 credits, alternate years, starting 2009-10),
Stellar Structure & Evolution [ASTRO 4011] (15 credits, alternate years, starting 2009-10),
High Energy Astrophysics [ASTRO 4012] (15 credits, alternate years, starting 2009-10),
Pulsars & Supernovae [ASTRO 5002] (15 M-credits, alternate years, starting 2009-10).

** ASTRO 4020 is not compulsory for Astronomy and Mathematics MSci students.

Year 5

15 credits of compulsory courses as listed:

Plasma Theory & Diagnostics (15 M-credits, alternate years, starting 2009-10)
General Relativity & Gravitation (15 M-credits, alternate years, starting 2008-09)

Plus 30 credits of elective courses from the following list, to give a total of at least 360 credits at H-level or M-level and including at least 120 credits at M-level. Students may not retake any elective courses previously taken in 3rd or 4th year.

Galaxies (15 credits, alternate years, starting 2009-10),
Heliophysics and Stellar Atmospheres (15 credits, alternate years, starting 2009-10),
Pulsars & Supernovae (15 M-credits, alternate years, starting 2009-10)
Astronomical Data Analysis (15 credits, alternate years, starting 2008-09),
Exploring Planetary Systems (15 credits, alternate years, starting 2008-09)
Statistical Astronomy (15 M-credits, alternate years, starting 2008-09)

Plus 40 credits of courses from *subject*

Plus 40 credit M-level project in Astronomy or *subject*. This will constitute a substantial component of independent research at an advanced level, as required by the MSci regulations.

Assessment

The programme is assessed on the basis of performance in compulsory and elective courses taken in years 3, 4 and 5. If a greater number of elective courses is taken than required, the performance in elective courses will be based on the best combination of elective courses meeting the minimum requirement.

The classification of marks for each course is made according to the University Code of Assessment and the programme assessment is based on the average mark of all contributing courses, weighted according to the number of credits for each course.

Lecture Course assessment: 90 minute written paper for each 15-credit lecture course.

Astro Skills 1: continuous assessment. This will include assessment of an oral presentation on a seminar project topic and assessment of a written report on an experiment carried out.

For P4PR40M the weighting will also include an explicit component of 45% assessment of the project work, by the project supervisor(s), and an additional 15% of the assessment weighting will derive from an oral and poster presentation, assessed by a panel of three staff members (including the project co-ordinators).

Progress Requirements

In addition to Science general progress requirements :

Year 1 to Year 2: Astronomy 1, Mathematics 1R or 1X and Mathematics 1S, 1T or 1Y normally all at grade D or better; requirements for *subject*

Year 2 to Year 3: Astronomy 2, plus Mathematics 2A, 2B and 2D at a grade point average of 14, all normally at first diet of examination; requirements for *subject*

Year 3 to Year 4: A grade point average of 12.0 or better over all 3rd year courses at May/June examination diet; requirements for *subject*

Year 4 to Year 5: An average grade of C3 or better over all 3rd and 4th year courses, plus a grade of D3 or better in a relevant 20-credit project course

Marks defining progression are awarded in accordance with the University Code of Assessment.

Exit Awards and programme changes

At the end of Year 3, students who satisfy the University requirements may graduate with a Designated B.Sc. Joint Degree in Astronomy and *subject*.

At the end of year 3, students may also move to the B.Sc. Joint Honours programme in Astronomy and *subject*.

At the end of year 4 students who satisfy the relevant University requirements may, at the discretion of the Dean(s), graduate immediately with an Honours B.Sc. Joint Degree in Astronomy and *subject*.

13. Programme Accredited By:

Institute of Physics

14. Location(s):

Glasgow

15. College:

College of Science and Engineering

16. Lead School/Institute:

Physics and Astronomy [REG30600000]

17. Is this programme collaborative with another institution:

No

18. Awarding Institution(s):

University of Glasgow

19. Teaching Institution(s):

20. Language of Instruction:

English

21. Language of Assessment:

English

22. Relevant QAA Subject Benchmark Statements (see Quality Assurance Agency for Higher Education) and Other External or Internal Reference Points:

This Programme Specification is informed by the QAA Benchmark Statement for Physics, Astronomy and Astrophysics which can be found at : http:/www.qaa.ac.uk/academicinfrastructure/benchmark/honours/physics.pdf

23. Additional Relevant Information (if applicable):

Support for students is provided by the Postgraduate/Undergraduate Adviser(s) of Studies supported by University resources such LEADS (www.gla.ac.uk/myglasgow/leads/), Counselling & Psychological Services (www.gla.ac.uk/services/counselling/), the Disability Service (www.gla.ac.uk/services/studentdisability/) and the Careers Service (www.gla.ac.uk/services/careers/).
Further information for intending students is available on the Department of Physics and Astronomy Website at http://www.physics.gla.ac.uk/ Current students should consult the Course Guide(s) for the course(s) in which they are interested which are available by following the "Undergraduate Information" link at http://moodle2.gla.ac.uk/physci/moodle

24. Online Learning:

No

25. Date of approval:	19/12/2018