Programme Specification[1]

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

Programme Title	*UCAS Code*	*GU Code*
BSc Honours in Theoretical Physics	F344	F344-2208

2. Academic Session:

2018-19

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

10

4. Credits:

480

5. Entrance Requirements:

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

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

ATAS Certificate not required

7. Attendance Type:

Full Time

8. Programme Aims:

Theoretical physics involves the theoretical study of matter and energy and their interactions, ranging from the domain of elementary particles, through nuclear and atomic physics to the physics of solids, and ultimately to

[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.

the origin and evolution of the universe itself. The laws of physics form the basis of most branches of science and engineering and are the foundation of modern technology. In the Theoretical Physics BSc programme we aim to give the student an understanding of the principles and methods of modern physics, with particular emphasis on the theoretical aspects of the subject. Students will be provided with the computational and theoretical skills necessary to analyse and solve a range of physics problems. In order to illustrate this programme, we draw on a wide variety of research and applications, including theoretical work performed in the School of Physics & Astronomy.

Specific Aims of the Programme

(1) To present an integrated course of study that provides the student with knowledge and understanding of the key principles and methods of modern theoretical physics;

(2) To provide the opportunity to study in depth a choice of topics relevant to current developments in physics and its applications;

(3) To provide training in the principles and practice of computational physics and theoretical analysis, and in the critical analysis of data;

(4) To develop the student's transferable skills, concentrating on work in a group context, the writing of reports on group and individual project work, and in verbal communication of such results;

(5) To encourage students to work effectively, 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 to demonstrate knowledge and understanding, skills, qualities and other attributes in the following areas.

Knowledge and Understanding:

By the end of this programme students will be able to:

- Explain the fundamental theoretical principles that underpin modern physics, particularly in the core areas of dynamics, relativity, quantum mechanics, thermal physics, nuclear and particle physics, solid state physics and electromagnetism;
- Discuss current research themes in theoretical physics, explaining where appropriate the relevance of mathematical, computational and data analysis methodology to their study.

Skills and Other Attributes:

By the end of this programme students will be able to:

Subject-specific/practical skills

- Programme straightforward procedures in a high level computer language and use computers to solve physical problems;
- Plan and carry out computational modelling and investigations, using standard and more advanced programming or computational techniques, of physical systems or processes;
- Analyse, interpret and critically evaluate practical data , simulations and models, and make a critical assessment and draw valid conclusions from the results of these investigations;
- Apply computer software to analyse data and to write scientific reports;
- Plan the course of action required to achieve self-defined goals in an open-ended physics project;
- Make appropriate safety assessments for experimental and practical procedures

Intellectual skills

- 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 straightforward unseen elements, related to topics included in the course component outlines;
- Discuss applications of the topics, methods and techniques discussed in the lecture courses and their relationship to other concepts in courses which have been taken.

Transferable/key skills

- Give an oral account of practical work performed and conclusions drawn from it;
- Prepare a detailed written report on a practical investigation;
- Apply logical analysis to problem solving;
- Write a report containing a full description of the aims, methods, outcomes and conclusions of a piece of project work;
- Prepare and present audio-visual presentations and posters summarizing the results of a project;
- Appreciate open problems typical of business situations;
- Interact positively with colleagues in a group context;
- Apply team-working skills to address a complex physics problem and contribute significantly to the work of a group tackling such a problem, combining their own work constructively with the work of others;
- Contribute to the management of a group engaged in project work;
- Combine with colleagues to prepare and deliver a presentation and report of group work.

10. Typical Learning and Teaching Approaches:

The programme will draw upon a wide range of approaches to learning and teaching:

Knowledge and understanding:
Lectures and class tutorials
Small group supervisions
Practical and project work
Private study

Intellectual skills:
Lectures and class tutorials
Small group supervisions
Practical work, including IT laboratory
Private study

Subject-specific/practical skills:
Practical work, including IT laboratory
Individual and group project work

Transferable/key skills:
Skills workshop
Group project
Extended project
Small group supervisions

11. Typical Assessment Methods:

The programme will employ a wide range of assessment methods:

Knowledge and understanding:
Written examinations
Verbal and written reports of practical and IT work
Multiple choice questions

Intellectual skills:
Written examinations
Verbal and written reports of practical and IT work
Multiple choice questions

Subject-specific/practical skills:
Verbal and written reports of practical and IT work
Verbal, written and poster presentations of project work

Transferable/key skills:

Verbal and written reports of practical and IT work

Oral and written presentations of Group project work, and assessments by supervisors

Written and poster presentations of project work, and assessment by supervisors

The programme is assessed on the basis of performance in compulsory and elective courses taken in years 3 and 4. The programme includes 180 compulsory credits at H-level and at least 60 credits of elective courses at H-level. If a greater number of elective courses is taken than required, the assessed 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 10-credit lecture course; 120 minute written paper for each 15-credit lecture course.

The P4GPWH General Physics Workshop course: 90 minute written paper, weighted 2/3, and continuous assessment, weighted 1/3.

P3COMPLABH Computational Physics Laboratory, P3GRTHPRH Group Theory Project, P4PR30H Theory Project: continuous assessment.

12. Programme Structure and Features:

The B.Sc. Honours programme in Theoretical Physics lasts 4 years and contains a minimum of 480 credits, as required by the regulations of the College of Science and Engineering set out in the University Calendar. For courses that can be taken in years 1 and 2 please see: http://www.gla.ac.uk/media/media_126389_en.pdf

Year 1

Physics 1 [PHYS1001] (40 credits)

Mathematics 1R [MATHS1001] or 1X [MATHS1004] and Mathematics 1S [MATHS1002], or 1Y [MATHS1005] (20 credits each)

Year 2

Physics 2 [PHYS2001] (60 credits)

Physics 2T [PHYS2003] (10 credits)

Mathematics 2A, 2B and 2D [MATHS2001, 2004 AND 2006] (10 credits each)

Additional classes (A minimum of 20 credits).

Year 3

90 credits of compulsory courses as listed:

Mathematical Methods 1 [PHYS4011] (10 credits),
Waves & Diffraction [PHYS4031] (10 credits),
Quantum Mechanics [PHYS4025] (10 credits),
Thermal Physics [PHYS4030] (10 credits),
Electromagnetic Theory 1 [PHYS4004] (10 credits),
P3COMPLABH Computational Physics Laboratory [PHYS4008] (20 credits).
P3GRTHPRH Group Theory Project [PHYS4029P] (20 credits).

Plus a minimum of 30 credits (maximum 60 credits) of elective courses chosen from the following list:

Circuits & Systems [PHYS4003] (10 credits),
Modern Optics [PHYS4014] (10 credits),
Medical Imaging [PHYS4013] (10 credits),
Numerical Methods [PHYS4017] (10 credits)
Stellar Structure & Evolution [ASTRO4011] (15 credits, alternate years, starting 2009-10),

High Energy Astrophysics [ASTRO4009] (15 credits, alternate years, starting 2009-10),
Galaxies [ASTRO4008] (15 credits, alternate years, starting 2009-10),
Heliophysics and Stellar Atmospheres [ASTRO4005] (15 credits, alternate years, starting 2009-10),
Instruments for Optical & Radio Astronomy [ASTRO4010] (15 credits, alternate years, starting 2008-09),
Cosmology [ASTRO4006] (15 credits, alternate years, starting 2008-09)
Astronomical Data Analysis [ASTRO4001] (15 credits, alternate years, starting 2008-09)
Exploring Planetary Systems [ASTRO4007] (15 credits, alternate years, starting 2008-09)

Year 4

90 credits of compulsory courses as listed:

Solid State Physics [PHYS4028] (10 credits),
Nuclear & Particle Physics [PHYS4015] (10 credits),
Atomic Systems [PHYS4002] (10 credits),
Mathematical Methods 2 [PHYS4012] (10 credits),
Quantum Theory [PHYS4026] (10 credits)
P4GPWH General Physics Workshop [PHYS4007] (10 credits),
P4PR30H Theoretical Physics Project [PHYS4024P] (30 credits).

Plus a minimum of 30 credits (maximum 60 credits) of elective courses chosen from the following list (Students may not retake any elective courses previously taken in 3rd year).

Circuits & Systems [PHYS4003] (10 credits),
Modern Optics [PHYS4014] (10 credits),
Medical Imaging [PHYS4013] (10 credits),
Numerical Methods [PHYS4017] (10 credits)
Particle Physics [PHYS4018] (10 credits),
Nuclear Physics [PHYS4016] (10 credits),
Semiconductor Physics [PHYS4027] (10 credits),
Magnetism & Superconductivity [PHYS4010] (10 credits),
Electronic Signals Transmission [PHYS4005] (10 credits),
Energy & the Environment [PHYS4006] (10 credits)
Physics Education & Communication [PHYS4034] (10 credits)
Peer to Peer Teaching & Learning in Physics [PHYS4045] (10 credits)
Stellar Structure & Evolution [ASTRO4011] (15 credits, alternate years, starting 2009-10),
High Energy Astrophysics [ASTRO4009] (15 credits, alternate years, starting 2009-10),
Galaxies [ASTRO4008] (15 credits, alternate years, starting 2009-10),
Heliophysics and Stellar Atmospheres [ASTRO4005] (15 credits, alternate years, starting 2009-10),
Instruments for Optical & Radio Astronomy [ASTRO4010] (15 credits, alternate years, starting 2008-09),
Cosmology [ASTRO4006] (15 credits, alternate years, starting 2008-09)
Astronomical Data Analysis [ASTRO4001] (15 credits, alternate years, starting 2008-09)
Exploring Planetary Systems [ASTRO4007] (15 credits, alternate years, starting 2008-09)

Progress Requirements

In addition to Science general progress requirements :

Year 1 to Year 2: Physics 1, Mathematics 1R or 1X and Mathematics 1S, or 1Y normally all at grade D3 or better;

Year 2 to Year 3: Physics 2 at C3 or better, Physics 2T at D3 or better plus Mathematics 2A and 2B and 2D at an average of D3 or better, all normally at first diet of examination;

Year 3 to Year 4: An average grade of D3 or better overall 3rd year courses.

Exit Awards and programme changes
At the end of Year 3 students who satisfy the University requirements may graduate with a Designated B.Sc. Degree in Physics.

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):

University of Glasgow

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/Publications/InformationAndGuidance/Documents/Physics08.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 School of Physics and Astronomy Website at http://www.gla.ac.uk/schools/physics/

24. Online Learning:

No

25. Date of approval:	19/12/2018