Programme Specification[1]

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

Programme Title	*UCAS Code*	*GU Code*
MSci in Chemical Physics with Work Placement		F321-2207

2. Academic Session:

2018-19

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

11

4. Credits:

670

5. Entrance Requirements:

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

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

ATAS Certificate not required

7. Attendance Type:

Full Time

8. Programme Aims:

Chemical Physics is concerned with electrons, nuclei, atoms and molecules in all states of matter, and how they interact with their environment. For example, chemical physicists are interested in understanding the chemical, electrical and magnetic properties of substances that are of central importance in designing solid-state devices for the electronics industry and chemical physicists can study the motions of molecules in cell membranes and hence the transport of metabolites in

[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.

and out of the cells in living organisms. In the MSci programme we aim to give the student an in depth understanding of the principles and methods of modern chemical physics, and the skills to analyse and solve a range of theoretical and experimental problems. In order to illustrate this programme, we draw on a wide variety of research and applications, including work performed in the Schools of Chemistry and Physics & Astronomy.

Specific Aims of the Programme

(1) To present an integrated course of study which describes, analyses and relates the principles of modern physics at a level appropriate for a professional chemical physicist;

(2) To provide the opportunity to study in depth a choice of advanced treatments and applications of aspects of modern chemical physics;

(3) To provide training and experience in the principles and practice of chemical and physical measurement techniques, using advanced instrumentation where appropriate, and in the critical analysis of experimental data;

(4) To develop problem solving abilities, critical assessment and communication skills, to a level appropriate for a career of leadership in academia or industry, and to give students the experience of group work;

(5) 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;

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

(7) To offer the opportunity to experience alternative professional environments

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 apply a range of basic mathematical methods which are useful in solving quantitative problems in physics;
- Understand and describe the key concepts which underpin current knowledge in wave phenomena, quantum mechanics, electromagnetism 1, heterogeneous catalysis, coordination chemistry, solid state chemistry, biomolecular interactions, quantum mechanics and symmetry, kinetics, spectroscopy, diffraction, photochemistry, two further topics chosen from solid state physics, nuclear and particle physics, atomic systems.
- Understand and describe the key physical concepts which underpin current knowledge across a subset of four more specialist (H-level) topics drawn from: numerical methods, modern optics, medical imaging, semiconductor physics and devices, magnetism and superconductivity, particle physics, nuclear physics, stellar structure and evolution, high energy astrophysics, galaxies and cosmology, circumstellar matter, astronomical instrumentation and data analysis;
- Demonstrate knowledge and understanding the following advanced areas (M-level material): Frontiers of chemistry; Colloids & Macromolecules; Thermodynamics; Surface Science; Inorganic Mechanisms; Homogeneous Catalysis; Processing Chemical Data; Heterogeneous Catalysis; Physical Chemistry of Polymers; Molecular Simulation; Molecular Recognition; Metal Oxides as Advanced Materials; Simple Fluorides – Reactivity and Catalysis; Electrochemistry; Biomolecular Separations;
- Demonstrate a deeper understanding of more advanced physical concepts across a subset of more specialist (M-level) topics drawn from: Advanced Quantum Mechanics; Electromagnetism 2; Statistical Mechanics; Imaging and Microanalysis; Dynamics and Relativity; Detectors for Nuclear and Particle Physics; Vibrational Spectroscopy; Applications of Synchrotron Radiation; Molecular Magnetism; Modern Techniques in Surface Science.

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 and use computers to solve physical problems;
- Plan and carry out experimental investigations, using standard and complex or advanced experimental equipment and apparatus, of complex chemical and physical systems or processes, demonstrating logic, initiative, planning and decision making skills in solving problems encountered;
- Analyse, interpret and critically evaluate experimental data, make a quantitative evaluation of the errors inherent in the experimental measurements and draw valid conclusions from the results of experimental investigations;
- Apply computer software to analyse experimental data and to write scientific reports;
- Recover, evaluate and summarise the professional literature and material from other sources concerned with a chosen area of chemical physics, 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 chemical physics project;
- Make appropriate safety assessments for experimental procedures.

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, chemical and 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 component 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 you have taken.

Transferable/key skills

On completion of the programme students will be able to:

- Give an oral account of experimental work performed and conclusions drawn from it;
- Prepare a detailed written report on an experimental investigation;
- Apply logical analysis to problem solving;
- 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;
- Write a report on an extended piece of project work, which should include a critical evaluation of the significance of the work, and how it compares with earlier work done in the same area;
- Prepare an abstract of experimental or project work performed in the accepted scientific

format;

- Prepare and present audio-visual presentations and posters summarising 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:

Lectures and class tutorials
Small group supervisions
Work placement project
Private study
Laboratory work, including IT laboratory
Work placement project
Private study
Individual and group project work
Work placement project
Skills workshop
Group project
Extended project

11. Typical Assessment Methods:

Written examinations
Verbal and written reports of laboratory and IT work
Oral presentation and project report of work placement project and assessment by supervisors
Multiple choice questions
Verbal, written and poster presentations of project work
Oral presentation and project report of work placement project and assessment by supervisors
Oral presentation and project report of project and assessment by supervisors and oral exam.

12. Programme Structure and Features:

The MSci programme in Chemical Physics with Work Placement lasts 5 years and contains a minimum of 670 credits, consistent with the regulations of the College of Science & Engineering, set out in the University Calendar, for an integrated masters degree.

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 150.

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
Chemistry 1 [CHEM1001] (40 credits)
Physics 1 [PHYS1001] (40 credits)

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

Year 2

Chemistry 2X and 2Y [CHEM2001 AND 2002] (30 credits each)
Physics 2 [PHYS2001](60 credits)
Mathematics 2A and 2B [MATHS2001 AND 2004] (10 credits each)

Year 3

Year 3 (70 credits of compulsory Physics courses):
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),
Honours Physics Laboratory [PHYS4009] (20 credits).
Year 3 (80 credits of compulsory Chemistry courses):
Inorganic Chemistry 3 Half [CHEM3011] (20 credits)
Physical Chemistry 3 [CHEM3014] (40 credits)
Frontiers of Chemistry 3M [CHEM5016] (20 credits)

Year 4

120 credits of Work Placement [CHEM4024]

Year 5

Year 5 (40 credits of compulsory Physics courses):
Solid State Physics [PHYS4028] (10 credits)
Nuclear & Particle Physics [PHYS4015] (10 credits)
Atomic Systems [PHYS4002] (10 credits)
Problem Solving Workshop [PHYS5012] (10 M-credits)
Year 5 (10 credits of elective Physics courses) from the following list:

- P307H Modern Optics [PHYS4014] (10 credits),
- P308H Medical Imaging [PHYS4013] (10 credits),
- P309H Numerical Methods [PHYS4017] (10 credits),
- P404H Particle Physics [PHYS4018] (10 credits),
- P405H Nuclear Physics [PHYS4016] (10 credits),
- P406H Semiconductor Physics [PHYS4027] (10 credits),
- P407H Magnetism & Superconductivity [PHYS4010] (10 credits),
- P408H Electronic Signals Transmission [PHYS4005] (10 credits),
- P410M Relativistic Quantum Fields [PHYS5014] (10 M-credits),
- P412M Statistical Mechanics [PHYS5016] (10 M-credits)
- P416H Energy & the Environment [PHYS4006] (10 credits)
- P417H Physics Education & Communication [PHYS4034] (10 credits)
- P418H Quantum Theory [PHYS4026] (10 credits)
- P420M Groups & Symmetries [PHYS5007] (10 M-credits)
- P422H Peer to Peer Teaching & Learning in Physics [PHYS4045] (10 credits)
- P423M Detection & Analysis of Ionising Radiation [PHYS5036] (10 credits)
- P424M Nuclear Power Reactors [PHYS5038] (10 credits)
- P425M Environmental Radioactivity [PHYS5037] (10 credits)
- P426M Quantum Information [PHYS5039] (10 credits)
- P427M Fundamentals of Sensing & Imaging [PHYS5040] (10 credits)

P431M Fundamentals of Sensing & Monitoring [PHYS5044] (10 credits)

Year 5 (50 credits of compulsory Chemistry courses):

Chemistry Special Topics 4M (B) [CHEM5004] (10 credits)

Chemistry Problems 4M (C) [CHEM5007] (10 credits)

Inorganic Chemistry 4M (C) [CHEM5019] (10 credits)

Physical Chemistry 4M (A) [CHEM5022] (20 credits)

Year 5 (40 credits of compulsory Chemistry or Physics Project):

CHEM5009P Chemistry project 4H (40 credits)

Or

PHYS5009P Physics project 4H (40 credits)

Assessment

The programme is assessed on the basis of performance in compulsory and elective courses taken in years 3, 4 and 5 and compulsory level five project (choice of either Chemistry or Physics).

The programme includes 120 compulsory credits at H-level.

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 and 180 minute written paper for each 20-credit course.

The programme is assessed on the basis of performance in compulsory and elective courses taken in years 3, 4 and 5.

The projects are assessed via continuous assessment. In each case, this will include assessment of a written report on each experiment or the project carried out.

Progress Requirements

In addition to Science general progress requirements:

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

Year 2 to Year 3: Physics 2 at B3 or better, Chemistry 2X and 2Y, each at B3 or better, plus Mathematics 2A and 2B at an average of D3 or better, all normally at first diet of examination;

Year 3 to Year 4: An average grade of C3 or better overall 3rd year courses.

Year 4 to Year 5: An average grade of C3 or better for the Work Placement year.

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

Final degree classifications are based on the GPA of Level 3, Level 4 and Level 5, weighted strictly by credits associated with the courses.

Exit Awards and programme changes

At the end of Year 1, students who satisfy the University requirements may leave with a Certificate of Higher Education

At the end of Year 2, students who satisfy the University requirements may leave with a Diploma of Higher Education

At the end of Year 3, students who satisfy the University requirements, may graduate with a Designated BSc Degree in Chemical Physics.

At the end of year 4 students who satisfy the relevant University requirements may, at the discretion of the Head of School of Chemistry, graduate immediately with an Honours BSc Degree in Chemical Physics.

13. Programme Accredited By:

Institute of Physics; Recognised by the Royal Society of Chemistry

14. Location(s):

Glasgow

15. College:

College of Science and Engineering

16. Lead School/Institute:

Chemistry [REG30100000]

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

The Programme Specification also addresses the requirements of the "Core of Physics" programme identified by the Institute of Physics (IoP).

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:	29/09/2017