

Title of Programme: MSc Theoretical Physics

Programme Code: PETPM

Programme Specification

This programme specification is relevant to students entering:
01 September 2023

Associate Dean of School (Academic Quality Assurance):
Mariana Lilley



A programme specification is a collection of key information about a programme of study (or course). It identifies the aims and learning outcomes of the programme, lists the modules that make up each stage (or year) of the programme, and the teaching, learning and assessment methods used by teaching staff. It also describes the structure of the programme, its progression requirements and any programme-specific regulations. This information is therefore useful to potential students to help them choose the right programme of study, to current students on the programme, and to staff teaching and administering the programme.

Summary of amendments to the programme

Date	Section	Amendment
14/08/2023	D	Amendments to the structure of the part time curriculum

If you have any queries regarding the changes please email AQO@herts.ac.uk

Programme Specification MSc Theoretical Physics

This programme specification (PS) is designed for prospective students, enrolled students, academic staff and potential employers. It provides a concise summary of the main features of the programme and the intended learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. More detailed information on the teaching, learning and assessment methods, learning outcomes and content for each module can be found in Definitive Module Documents (DMDs) and Module Guides.

Section 1

Awarding Institution/Body	University of Hertfordshire
Teaching Institution	University of Hertfordshire
University/partner campuses	College Lane
Programme accredited by	N/A
Final Award (Qualification)	MSc
All Final Award titles	MSc Theoretical Physics
(Qualification and Subject)	MSc Theoretical Physics with Advanced Research
FHEQ level of award	7

A. Programme Rationale

This programme introduces the fundamental physical theories that govern the behaviour of space, time and matter, from scales ranging from the very smallest (in particle accelerators at e.g. CERN) to the very largest (gravity, black holes and the history of the cosmos). It provides a solid grounding in foundational topics including General Relativity and Quantum Field Theory, and in mathematical tools including Representation Theory. Beyond that core, it features a series of lectures on Recent Advances in Theoretical Physics, designed to survey areas directly relevant to contemporary research and delivered by specialists.

The Mathematical Physics Group within the Department of Physics, Astronomy and Mathematics at UH have internationally recognised research profiles across a range of topics in theoretical physics.

A theoretical physics curriculum combines advanced reasoning skills with applications to complex physical phenomena, placing the graduates in a strong position of possible diverse future specializations. The programme has a focus on key skills in academia and in industry: working collaboratively and presenting ideas in person and in writing. Graduates are equipped both for careers in STEM areas, and for further study at PhD level leading potentially to a theoretical physics research career.

In addition to the standard 180 credit (1 year full-time, 2-year part time) master's degree, the programme provides the option of a 240 credit (2 year full-time) master's degree "with Advanced Research".

B. Educational Aims of the Programme

The programme has been devised in accordance with the University's graduate attributes of programmes of study as set out in [UPR TL03](#).

Additionally this programme aims to:

- provide students with a systematic knowledge of the central topics of contemporary theoretical physics, informed by new insights and work at the cutting edge of the field;
- provide students a conceptual understanding that enables them to evaluate critically current research in theoretical physics;
- offer students a platform which will enable them to embark on further study in theoretical physics and adjacent disciplines in academia;
- develop the qualities and transferable skills necessary for employment requiring complex decision-making, originality and self-direction.

C. Intended Learning Outcomes

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, skills and other attributes in the following areas. The programme outcomes are referenced to the Frameworks for Higher Education Qualifications of UK Degree-Awarding Bodies (2014), and relate to the typical student. Additionally, the SEEC Credit Level Descriptors for Further and Higher Education (2021) have been used as a guiding framework for curriculum design.

Knowledge and Understanding:	Teaching/learning methods & strategies	Assessment
<p>A1 - The concepts, ideas and theories of theoretical physics at a deep and systematic level.</p> <p>A2 - The mathematical theory, formalisms and techniques arising in the theoretical physics context, to an advanced level.</p>	<p>Acquisition of knowledge and understanding is through a combination of lectures, participation in seminars, small group tutorials, and coursework.</p> <p>Throughout, the learner is encouraged to undertake independent study both to supplement and consolidate what is being taught/learnt and to broaden their individual knowledge and understanding of the subject.</p>	<p>Knowledge and understanding are assessed through a combination of unseen examinations (A1, A2) and in-course assessments (A1-A2).</p>
Intellectual skills:	Teaching/learning methods & strategies	Assessment
<p>B1 - Formulate and tackle problems in theoretical physics using advanced approaches.</p> <p>B2 - Work with highly abstract and mathematical ideas relevant to physics.</p> <p>B3 - Design, execute and report on a substantial investigation on an area of recent research.</p> <p>B4 (with Advanced Research Pathway only) - Carry out scientific peer-review of others' written work.</p>	<p>Intellectual skills are developed through the methods and strategies outlined in section A, above.</p> <p>Learning outcomes B1-B4 are developed through tutorial exercises, coursework, seminars, project work, study of the literature, and project work.</p> <p>Throughout, the learner is encouraged to develop intellectual skills further by independent study.</p>	<p>Intellectual skills are assessed through a combination of unseen examinations (B1-B2) assessed individual assignments (B1-B2, B4) and the project report (B3).</p>
Practical skills:	Teaching/learning methods & strategies	Assessment
<p>C1 - Perform advanced calculations in the settings of various physical theories.</p> <p>C2 - Flexibly apply appropriate analytical and problem-solving techniques to problems in mathematical and theoretical physics.</p> <p>C3 - Synthesise complex material from multiple sources in the</p>	<p>Practical skills are developed through active participation in seminars and tutorials, through group and through project work.</p> <p>Throughout, the learner is expected to consolidate their development of practical computing skills by use of computers available in the Learning Resources Centre.</p>	<p>Practical skills are assessed through coursework and written assignments (C1-C3) and the project report (C1-C3).</p>

scientific literature, and present findings in cogent form.		
Transferable skills:	Teaching/learning methods & strategies	Assessment
D1 - Communicate subtle and complex ideas, both in clear written prose and real-time spoken presentations. D2 - Work effectively in a team on intellectually demanding tasks. D3 - Demonstrate time-management and IT skills. D4 (with Advanced Research Pathway only) - Give constructive feedback on others' technical work.	Transferable skills are developed through coursework reports (D1-D3), oral presentations (D1), project reports (D1) and collaborative work in seminars and tutorial (D2, D4) Throughout, the learner is encouraged to develop transferable skills by maintaining a record of evidence and completing a personal development plan.	Transferable skills are assessed through a range of assignments built into the curriculum - coursework reports (D1,D4), oral presentations (D2,D4), project reports (D1, D2), project management work (D3).

D. Programme Structures, Features, Levels, Modules, and Credits

The programme is offered in the following modes:

- Full-time (1 year), leading to the award of MSc Theoretical Physics;
- Part-time (2 years), leading to the award of MSc Theoretical Physics;
- Full-time (2 years), leading to the award of MSc Theoretical Physics with Advanced Research;

Entry is at Level 7. Intake is in normally Semester A (September).

To progress into year 2 of the Advanced Research route students must pass 90 credits in year 1. If they pass 90 credits or less in year 1, they must repeat their failed modules before progressing onto year 2 modules.

The University welcomes international applicants on the programme. The University of Hertfordshire does not typically sponsor students on a student route visa for part-time study. For additional information, please see <https://www.herts.ac.uk/international/new-international-students/coming-to-the-uk>

Professional and Statutory Regulatory Bodies

No accreditation.

Work-Based Learning, including Sandwich Programmes

Not applicable.

Programme Structure

The programme structure and progression information below (Table 1a and 1b) is provided for the award. Any interim awards are identified in Table 1b. The Programme Learning Outcomes detailed above are developed and assessed through the constituent modules. Table 2 identifies where each learning outcome is assessed.

**Table 1a Outline Programme Structure
MSc Theoretical Physics**

Mode of study Full time

Duration 1 year

Entry point Semester A

	Module Code	Credit Points	% Examination	% Coursework	% Practical	Semesters
Compulsory Modules						
Module Title						
Group and Representation Theory (level 6)	6PAM2009	15	60	40	0	A
Relativity and Field Theory	7PAM1027	15	80	20	0	A
Recent Advances in Theoretical Physics I	7PAM2006	30	0	100	0	AB
General Relativity	7PAM1033	15	50	50	0	B
Quantum Field Theory	7PAM1034	15	60	40	0	B
Theoretical Physics Research Project	7PAM2009	60	0	100	0	C

Select ONE 15-credit module in Semester A, and ONE 15-credit in Semester B:

	Module Code	Credit Points	% Examination	% Coursework	% Practical	Semesters
Optional Modules						
Module Title						
Lagrangian Dynamics (level 6)	6PAM1061	15	80	20	0	A
Statistics and Analysis	7PAM1035	15	50	50	0	A
Physics of Elementary Particles (level 6)	6PAM1051	15	0	100	0	B
High Energy Astrophysics	7PAM1020	15	50	50	0	B

Table 1a Outline Programme Structure
MSc Theoretical Physics

Mode of study Part time

Duration 2 years

Entry point Semester A

Year 1

	Module Code	Credit Points	% Examination	% Coursework	% Practical	Semesters
Compulsory Modules						
Module Title						
Group and Representation Theory (level 6)	6PAM2009	15	60	40	0	A
Relativity and Field Theory	7PAM1027	15	80	20	0	A
General Relativity	7PAM1033	15	50	50	0	B
Quantum Field Theory	7PAM1034	15	60	40	0	B

Select ONE 15-credit in Semester B:

	Module Code	Credit Points	% Examination	% Coursework	% Practical	Semesters
Optional Modules						
Module Title						
High Energy Astrophysics	7PAM1020	15	50	50	0	B
Physics of Elementary Particles (level 6)	6PAM1051	15	0	100	0	B

Semester C is a vacation period.

Year 2

	Module Code	Credit Points	% Examination	% Coursework	% Practical	Semesters
Compulsory Modules						
Module Title						
Recent Advances in Theoretical Physics I	7PAM2006	30	0	100	0	AB
Theoretical Physics Research Project	7PAM2009	60	0	100	0	BC

Select ONE 15-credit module in Semester A:

	Module Code	Credit Points	% Examination	% Coursework	% Practical	Semesters
Optional Modules						
Module Title						
Statistics and Analysis	7PAM1035	15	50	50	0	A
Lagrangian Dynamics (level 6)	6PAM1061	15	80	20	0	A

The award of an MSc degree requires 180 credit points including **at least 150 credit points from level 7 modules** which must include the Theoretical Physics Research Project 7PAM2009, together with up to 30 credit points from level 6 modules.

Table 1a Outline Programme Structure
MSc Theoretical Physics with Advanced Research

Mode of study Full time

Duration 2 years

Entry point Semester A

Year 1

	Module Code	Credit Points	% Examination	% Coursework	% Practical	Semesters
Compulsory Modules						
Module Title						
Group and Representation Theory (level 6)	6PAM2009	15	60	40	0	A
Relativity and Field Theory	7PAM1027	15	80	20	0	A
Recent Advances in Theoretical Physics I	7PAM2006	30	0	100	0	AB
General Relativity	7PAM1033	15	50	50	0	B
Quantum Field Theory	7PAM1034	15	60	40	0	B

Select ONE 15-credit module in Semester A, and ONE 15-credit in Semester B:

	Module Code	Credit Points	% Examination	% Coursework	% Practical	Semesters
Optional Modules						
Module Title						
Lagrangian Dynamics (level 6)	6PAM1061	15	80	20	0	A
Statistics and Analysis	7PAM1035	15	50	50	0	A
Physics of Elementary Particles (level 6)	6PAM1051	15	0	100	0	B
High Energy Astrophysics	7PAM1020	15	50	50	0	B

Semester C is a vacation period.

Year 2

	Module Code	Credit Points	% Examination	% Coursework	% Practical	Semesters
Compulsory Modules						
Module Title						
Recent Advances in Theoretical Physics II	7PAM2007	30	0	100	0	AB
Research Seminar	7PAM2008	30	0	100	0	AB
Theoretical Physics Research Project	7PAM2009	60	0	100	0	AB

The award of an MSc with Advanced Research degree requires 240 credit points including **at least 180 credits from level 7 modules** which must include the modules Theoretical Physics Research Project 7PAM2009 and Research Seminar 7PAM2008, together with up to 60 credits from level 6 modules.

Table 1b Final and interim awards available

The programme provides the following final and interim awards:

Final Award	Award Title	Minimum requirements	Available at end of (normally):	Programme Learning Outcomes developed (see above)
Masters	Theoretical Physics with Advanced Research	240 credit points with at most 60 at level 6 and the remainder at level 7, including passes in Theoretical Physics Research Project 7PAM2009 and Research Seminar 7PAM2008.	6 Semesters	All programme learning outcomes (see Table 2)
Masters	Theoretical Physics	180 credit points with at most 30 at level 6 and the remainder at level 7 including a pass in Theoretical Physics Research Project 7PAM2009.	3 Semesters	All programme learning outcomes other than B4 and D4 (see Table 2)
Interim Award	Award Title	Minimum requirements	Available at end of Level	Programme Learning Outcomes developed (see above)
Postgraduate Diploma	Theoretical Physics	120 credit points, including at least 90 at level 7	2, 3 Semesters	A1, A2, B1, B2, C1
Postgraduate Certificate	Theoretical Physics	60 credit points, including at least 45 at level 7	1-2 Semesters	A1, A2, B1, C1

Masters and Diploma awards can be made "with Distinction" or "with Commendation" where criteria as described in [UPR AS14](#), Section D and the students' handbook are met.

Programme-specific assessment regulations

The programme is compliant with the University's academic regulations (in particular, [UPR AS11](#), [UPR AS12/UPR AS13](#) and [UPR AS14](#)) with the exception of those listed below, which have been specifically approved by the University:

- The award of the MSc Theoretical Physics with Advanced Research degree requires 240 credit points, as detailed in Table 1b above.

Further points of clarification and interpretation relevant to this specific programme are given below:

- To enrol on the project module, students must typically have studied 120 credits of taught modules from the programme and passed at least 60 credits (in order to satisfy UPR AS14, D5.2.3).
- For registration to continue, students should normally have met the requirements for the Postgraduate Diploma within three years and the MSc award within four years (all periods calculated from date of registration on the Programme).
- Students who are registered on the standard 180-credit full time course are not normally allowed to change their study pattern to the corresponding 2-year full time 'With Advanced Research' course.
- **Modules normally only run in either Semester A or Semester B. Failed modules can only be repeated in the semester in which they run. Therefore, depending on when the opportunity exists to repeat failed modules, International Students on certain student visas will need to return to their country of residency and apply for a new visa to return to repeat modules at a later date.**

E. Management of Programme & Support for student learning

Management

The programme is managed and administered through:

- Dean of School;
- Associate Dean (Academic Quality Assurance);
- Associate Dean (Learning, Teaching and Student Experience);
- A Programme Leader, who has overall responsibility for the effective operationalisation of the programme, and ensuring that academic standards are maintained and an effective student learning experience is provided;
- Student representatives on programme committees;
- Module Leaders who are responsible for individual modules;
- A designated administrative team to deal with day-to-day administration associated with the modules within the programme.

Support

Students are supported by:

- An induction week at the beginning of each new academic session
- Overseas Orientation
- You will have a personal tutor who will be an important point of contact, able to help you gain a good understanding of the School and programme you are studying
- A substantial Student Centre that provides advice on issues such as finance, University regulations, legal matters, accommodation, international student support, etc
- Office of Dean of Students, Student Wellbeing (incorporating Counselling, Mental Health and Disability Support), Chaplaincy, and Day Nursery
- A versatile on-line inter-active intranet and learning environment
- Guided student-centred learning on Canvas module sites
- Access to extensive digital and print collections of information resources
- Attractive modern study environments in 2 Learning Resources Centres
- Student Success Hubs, which include a Mathematics Drop-in Centre
- Medical Centre
- University Disability Advisors
- Careers and Employment
- Hertfordshire Student's Union
- Dedicated programme site

F. Other sources of information

In addition to this Programme Specification, the University publishes guidance to registered students on the programme and its constituent modules:

- A Programme (or Student) Handbook;
- A Definitive Module Document (DMD) for each constituent module.

The [Ask Herts](#) website provides information on a wide range of resources and services available at the University of Hertfordshire including academic support, accommodation, fees, funding, visas, wellbeing services and student societies.

As a condition of registration, all students of the University of Hertfordshire are required to comply with the University's rules, regulations and procedures. These are published in a series of documents called 'University Policies and Regulations' (UPRs). The University requires that all students consult these documents which are available on-line, on the UPR web site, at: <http://www.herts.ac.uk/secreg/upr/>. In particular, [UPR SA07](#) 'Regulations and Advice for Students' Particular Attention - Index' provides information on the UPRs that contain the academic regulations of particular relevance for undergraduate and taught postgraduate students.

In accordance with section 4(5) of the Higher Education and Research Act 2017 (HERA), the UK Office for Students (OfS) has registered the University of Hertfordshire in the register of English higher education providers. The Register can be viewed at: <https://www.officeforstudents.org.uk/advice-and-guidance/the-register/the-ofs-register/>.

G. Entry requirements

The normal entry requirements for the programme are:

For current entry tariff point requirements, please refer to the relevant page for the Course on the University website or on the online prospectus.

The programme is subject to the University's Principles, Policies and Regulations for the Admission of Students to Undergraduate and Taught Postgraduate Programmes (in [UPR SA03](#)), along with associated procedures. These will take account of University policy and guidelines for assessing accredited prior certificated learning (APCL) and accredited prior experiential learning (APEL).

If you would like this information in an alternative format please contact:
hhaq@herts.ac.uk

If you wish to receive a copy of the latest External Examiner's Report for the programme, please email a request to aqo@herts.ac.uk

MSc Theoretical Physics

Table 2: Development of Intended Programme Learning Outcomes in the Constituent Modules

This map identifies where the programme learning outcomes are assessed in the constituent modules. It provides (i) an aid to academic staff in understanding how individual modules contribute to the programme aims (ii) a checklist for quality control purposes and (iii) a means to help students monitor their own learning, personal and professional development as the programme progresses.

		Programme Learning Outcomes (as identified in section 1 and the following page)										
		Knowledge & Understanding		Intellectual Skills			Practical Skills			Transferable Skills		
Module Title	Module Code	A1	A2	B1	B2	B3	C1	C2	C3	D1	D2	D3
Relativity and Field Theory	7PAM1027	×	×	×	×		×	×				
Groups and Representations	6PAM2009		×		×		×					
General Relativity	7PAM1033	×	×	×	×		×	×				
Quantum Field Theory	7PAM1034	×	×	×	×		×	×				
Statistics and Analysis	7PAM1035		×					×				
Theoretical Physics Research Project	7PAM2009	×	×	×	×	×	×	×	×	×		×
Lagrangian Dynamics	6PAM1061	×	×	×	×		×	×				
The Physics of Elementary Particles	6PAM1051	×	×	×	×		×	×				
High Energy Astrophysics	7PAM1020	×		×			×	×				
Recent Advances in Theoretical Physics I	7PAM2006	×	×	×	×		×	×	×	×	×	×

MSc Theoretical Physics with Advanced Research

Table 2: Development of Intended Programme Learning Outcomes in the Constituent Modules

This map identifies where the programme learning outcomes are assessed in the constituent modules. It provides (i) an aid to academic staff in understanding how individual modules contribute to the programme aims (ii) a checklist for quality control purposes and (iii) a means to help students monitor their own learning, personal and professional development as the programme progresses.

		Programme Learning Outcomes (as identified in section 1 and the following page)												
		Knowledge & Understanding		Intellectual Skills				Practical Skills			Transferable Skills			
Module Title	Module Code	A1	A2	B1	B2	B3	B4	C1	C2	C3	D1	D2	D3	D4
Relativity and Field Theory	7PAM1027	X	X	X	X			X	X					
Groups and Representations	6PAM2009		X		X			X						
General Relativity	7PAM1033	X	X	X	X			X	X					
Quantum Field Theory	7PAM1034	X	X	X	X			X	X					
Statistics and Analysis	7PAM1035		X						X					
Research Seminar	7PAM2008	X	X	X	X	X	X	X	X	X	X		X	X
Theoretical Physics Research Project	7PAM2009	X	X	X	X			X	X					
Lagrangian Dynamics	6PAM1061	X	X	X	X			X	X					
The Physics of Elementary Particles	6PAM1051	X		X				X	X					
High Energy Astrophysics	7PAM1020	X	X	X	X			X	X	X	X	X	X	
Recent Advances in Theoretical Physics I	7PAM2006							X	X					
Recent Advances in Theoretical Physics II	7PAM2007						X	X						X

KEY TO PROGRAMME LEARNING OUTCOMES

Knowledge and Understanding

- A1. The concepts, ideas and theories of theoretical physics at a deep and systematic level
- A2. The mathematical theory, formalisms and techniques arising in the theoretical physics context, to an advanced level

Intellectual Skills

- B1. Formulate and tackle problems in theoretical physics using advanced approaches
- B2. Work with highly abstract and mathematical ideas relevant to physics
- B3. Design, execute and report on a substantial investigation on an area of recent research
- B4. (with Advanced Research Pathway only) Carry out scientific peer-review of others' written work

Practical Skills

- C1. Perform advanced calculations in the settings of various physical theories
- C2. Flexibly apply appropriate analytical and problem-solving techniques to problems in mathematical and theoretical physics
- C3. Synthesise complex material from multiple sources in the scientific literature, and present findings in cogent form

Transferable Skills

- D1. Communicate subtle and complex ideas, both in clear written prose and real-time spoken presentations
- D2. Work effectively in a team on intellectually demanding tasks
- D3. Demonstrate time-management and IT skills
- D4. (with Advanced Research Pathway only) Give constructive feedback on others' technical work

Section 2

Programme management

Relevant QAA subject benchmarking statements	Physics, Mathematics
Type of programme	Taught Postgraduate
Date of validation/last periodic review	February 21
Date of production/ last revision of PS	March 23
Relevant to level/cohort	Level 7 entering September 2023
Administrative School	School of Physics, Engineering & Computer Science
Language of Delivery	English

Table 4 Course structure

Course details			
Course Code	Course Description	HECOS	UCAS
PETPM	MSc Theoretical Physics	100426	N/A
PETPARM	MSc Theoretical Physics with Advanced Research	100426	N/A