THEORETICAL PHYSICS MSci / UCAS CODE: F345 2020 ENTRY

www.ucl.ac.uk/prospectus
This four-year programme offers an additional year of study on top of the Theoretical Physics BSc, during which students have the opportunity to specialise further by taking advanced optional modules, and undertaking a research project.

**Degree benefits**

- A science degree from UCL is a strong asset across the whole range of careers where basic scientific skills are required, from accountancy to astrophysics, and computing to cryogenics.

- The programme is accredited by the Institute of Physics (IOP) and includes the very latest developments and discoveries in the field, based on our highly rated research.

- Collaborative links with both industry and international research laboratories provide insight into the practical application of your studies.

- A wide range of optional modules are available, including modules from other University of London colleges, which allows for individual preferences and specialisations within your degree.

**Accreditation**

This programme is accredited by the Institute of Physics. Holders of accredited degrees can follow a route to Institute of Physics membership and the Chartered Physicist (CPhys) professional qualification. Graduates of accredited Integrated Master's (MPhys or MSci) degrees have fulfilled the educational requirements for CPhys status, while graduates of accredited Bachelor's (BSc) degrees have partially fulfilled these requirements.

### Degree structure

In each year of your degree you will take a number of individual modules, normally valued at 15 or 30 credits, adding up to a total of 120 credits for the year. Modules are assessed in the academic year in which they are taken. The balance of compulsory and optional modules varies from programme to programme and year to year. A 30-credit module is considered equivalent to 15 credits in the European Credit Transfer System (ECTS).

Compulsory modules in the first year provide a firm foundation in quantum and classical physics, underpinned by mathematics and computing to cryogenics. You will also take a module in practical mathematics.

The second year includes compulsory modules in quantum physics and its application to atoms and molecules, in statistical thermodynamics and in electromagnetic theory, along with further mathematics. Computing and practical mathematics skills are further developed.

The quantum and condensed matter elements of the core are completed in the third year. Students reading for the Theoretical Physics degree replace second and third-year experimental work with theory modules.

The third year also includes optional modules to develop further and enhance knowledge of a range of physics topics. The fourth year comprises a compulsory research project, and a number of optional modules, generally chosen from subjects in the relevant degree specialty.

#### YEAR ONE

**Core or compulsory module(s)**

- Year 1: All first year modules are compulsory – 120 credits at Level 4 in total
  - PHAS0004 Atoms, Stars and the Universe (Level 4) 15 credits
  - PHAS0005 Waves, Optics and Acoustics (Level 4) 15 credits
  - PHAS0006 Thermal Physics and the Properties of Matter (level 4) 15 credits
  - PHAS0007 Practical Physics and Computing 1 (Level 4) 15 credits
  - PHAS0012 Computing for Mathematical Physics (Level 4) 15 credits
  - PHAS0017 Developing Effective Communications 1 (non-credit, but will appear in student's transcript)

**Optional modules**

- All first-year modules are compulsory.

#### YEAR TWO

**Core or compulsory module(s)**

- Year 2: All second year modules are compulsory – 120 credits at Level 5 in total
  - PHAS0021 Electricity and Magnetism (Level 5) 15 credits
  - PHAS0022 Quantum Physics (Level 5) 15 credits
  - PHAS0023 Atomic & Molecular Physics (Level 5) 15 credits
  - PHAS0024 Statistical Physics of Matter (Level 5) 15 credits
  - PHAS0026 Mathematical Methods for Theoretical Physics (Level 5) 15 credits
  - PHAS0027 Further Practical Mathematics and Computing (Level 5) 15 credits
  - PHAS0025 Mathematical Methods III (Level 5) 15 credits
  - MATH0043 Mathematics for Physics and Astronomy (Level 5) 15 credits
  - PHAS0035 Developing Effective Communications 2 (non-credit, but will appear in student's transcript)

**Optional modules**

- All second-year modules are compulsory.
YEAR THREE

Core or compulsory module(s)
- Year 3: 120 credits (at least 90 credits at Level 6)
  - Compulsory module(s) (75 credits)
    - PHAS0038 Electromagnetic Theory (Level 6) 15 credits
    - PHAS0040 Nuclear and Particle Physics (Level 6) 15 credits
    - PHAS0041 Solid State Physics (Level 6) 15 credits
    - PHAS0042 Quantum Mechanics (Level 6) 15 credits
    - PHAS0052 Physics Group Project (Level 6) 15 credits

Optional modules
- You will select 45 credits in total from options that may include the following (choices must be approved by your Programme Tutor)
  - GEOL0022 Physics of Oceans, Ice Sheets and Climate (Level 6) 30 credits
  - PHAS0037 Physical Cosmology (Level 6) 15 credits
  - MATH0025 Mathematics for General Relativity (Level 6) 15 credits
  - PHAS0039 Physics Education (IoE) (Level 6) 15 credits
  - PHAS0049 Theory of Dynamical Systems (Level 6) 15 credits
  - PHAS0050 Energy and Climate (Level 6) 15 credits
  - PHAS0053 Lasers and Modern Optics (Level 6) 15 credits
  - PHAS0048 Project (Level 6) 30 credits

FINAL YEAR

Core or compulsory module(s)
- Year 4: 120 credits at Level 7 in total
  - Compulsory module
    - PHAS0097 Physics Project (45 credits) (Level 7)

Optional modules
- Select 75 credits from options that may include (needs Programme Tutor approval)
  - PHASM047 Physics of Advanced Materials (15 credits) (Level 7)
  - PHASM048 Theoretical Condensed Matter (15 credits) (Level 7)
  - PHAS0061 Advanced Topics in Statistical Mechanics (15 credits) (Level 7)
  - PHAS0069 Advanced Quantum Theory (15 credits) (Level 7)
  - PHAS0105 Atom and Photon Physics (15 credits) (Level 7)
  - PHAS0089 Molecular Physics (15 credits) (Level 7)
  - PHAS0072 Particle Physics (15 credits) (Level 7)
  - PHAS0070 Quantum Computation and Communication (15 credits) (Level 7)
  - PHAS0073 Quantum Field Theory (15 credits) (Level 7)
  - PHAS0102 High-performance Computing (15 credits) (Level 7)
  - PHAS0103 Molecular Biophysics (15 credits) (Level 7)
  - PHAS0074 Space Plasma and Magnetospheric Physics (15 credits) (Level 7)
  - PHAS0075 Order and Excitations in Condensed Matter (15 credits) (Level 7)
  - MATH0078 Boundary Layers (15 credits) (Level 7)

Your learning
Teaching is delivered through lectures, laboratory (and as appropriate, observatory) practical sessions, and supervised problem-solving tutorials. These tutorials are designed to deal with lecture-based questions, enlarge on topics addressed in lectures, and allow clarification and in-depth discussion of new concepts.

Assessment
Assessment will normally involve end-of-year examinations, and an element of assessed coursework. Practical work you will be continuously assessed.

Your career
Your scientific training will equip you with an understanding of mathematics, and of physical principles and techniques, as well as transferable skills in analysis, rational argument and innovative problem solving. Surveys by the Institute of Physics indicate that physicists’ versatility is welcomed by a wider range of professions than any other subject.

Around half our graduates choose to pursue further study for an MSc or PhD. A PhD opens up the possibility of an academic or research career in a university or research institute. Alternatively, like many of our graduates, you may consider employment in research, design, development, computing, finance, marketing and teaching, among others.

Your application
Application for admission should be made through UCAS (the Universities and Colleges Admissions Service). Applicants currently at school or college will be provided with advice on the process; however, applicants who have left school or who are based outside the United Kingdom may obtain information directly from UCAS.

In addition to the subjects and grades specified in the qualifying examinations, we are also looking for evidence of self-motivation and an enthusiastic interest in the subject. This may be demonstrated through paid or voluntary work experience, academic project work, or your interests and hobbies beyond the school curriculum.

Your application will be carefully assessed based on your UCAS form and reference. If you are made an offer, you will be invited to a Physics Offer Holder’s Day. This will include presentations, a tour of facilities and an opportunity to meet current students and staff members. Attendance is strongly recommended as we cannot provide private tours of the department at the moment.
**Entry requirements**

**A LEVELS**

**Standard Offer:** A’AA. A’A in Mathematics and Physics required, any order. Further Mathematics is preferred as a third subject.

**Contextual Offer:** A’AB. A’A in Mathematics and Physics required, any order. Further Mathematics is preferred as a third subject.

**GCSE**

English Language and Mathematics at grade C or 5. For UK-based students, a grade C or 5 or equivalent in a foreign language (other than Ancient Greek, Biblical Hebrew or Latin) is required. UCL provides opportunities to meet the foreign language requirement following enrolment, further details at: www.ucl.ac.uk/ug-reqs

**IB DIPLOMA**

**Standard Offer:** 39 points. A total of 19 points in three higher level subjects including grade 7, 6 in Mathematics and Physics, in any order, with no score below 5.

**Contextual Offer:** 38 points. A total of 18 points in three higher level subjects including grade 7, 6 in Mathematics and Physics, in any order, with no score below 5.

**CONTEXTUAL OFFERS – ACCESS UCL SCHEME**

As part of our commitment to increasing participation from underrepresented groups, students may be eligible for a contextual offer as part of the Access UCL scheme. For more information see www.ucl.ac.uk/prospectus

**OTHER QUALIFICATIONS**

UCL considers a wide range of UK and international qualifications for entry into its undergraduate programmes. Full details are given at: www.ucl.ac.uk/otherquals

**UNDERGRADUATE PREPARATORY CERTIFICATES (International foundation courses)**

UCL Undergraduate Preparatory Certificates (UPCs) are intensive one-year foundation courses for international students of high academic potential who are aiming to gain access to undergraduate degree programmes at UCL and other top UK universities.

Typical UPC students will be high achievers in a 12-year school system which does not meet the standard required for direct entry to UCL.

For more information see: www.ucl.ac.uk/upc.

**TUITION FEES**

The fees indicated are for undergraduate entry in the 2020/21 academic year. The UK/EU fees shown are for the first year of the programme at UCL only. Fees for future years may be subject to an inflationary increase. The Overseas fees shown are the fees that will be charged to 2020/21 entrants for each year of study on the programme, unless otherwise indicated below.

// UK & EU: £9,250 (2020/21)

// Overseas: £28,610 (2020/21)

Full details of UCL’s tuition fees, tuition fee policy and potential increases to fees can be found on the UCL Students website.

**Additional costs**

You will require the approved model of calculator for use in exams. For details please see the Exams and Assessment page of the UCL website. There are some optional activities in which you may like to participate that incur an additional cost, for example membership of the Student Physics Society, or the department’s annual weekend away at Cumberland Lodge. If you are concerned by potential additional costs on t

**FUNDING**

Various funding options are available, including student loans, scholarships and bursaries. UK students whose household income falls below a certain level may also be eligible for a non-repayable bursary or for certain scholarships. Please see the Fees and funding pages for more details.

**CONTACT**

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**Brexit**

For up-to-date information relating to specific key questions following the UK’s decision to leave the EU, please refer to: www.ucl.ac.uk/brexit

**Disclaimer**

This information is for guidance only. It should not be construed as advice nor relied upon and does not form part of any contract. For more information on UCL’s degree programmes please see the UCL Undergraduate Prospectus at www.ucl.ac.uk/prospectus