TRINITY COLLEGE
UNIVERSITY of OXFORD

Further Particulars for Fixed-Term, Part-Time Stipendiary Lecturership in Physics

Trinity College invites applications for a Stipendiary Lecturership in Physics, for Michaelmas Term 2025 and Hilary Term 2026. The Lecturer will primarily liaise with Prof. Justin Wark, the Tutorial Fellow and Subject Tutor in Physics. The Lecturer will deliver an average of 3.5 weighted hours teaching per week for students at Trinity College, for 1st year students of Physics.

Teaching of Physics at Trinity College

Trinity College admits around 6 students a year to read Physics. The teaching required is for the first-year mathematics courses for Physics, and is to cover for Dr Sam Vinko, whilst he is on sabbatical leave. Descriptions of the CP3 and CP4 papers for which teaching is required may be found as an appendix to this document.

Duties of the Lecturer

- to be responsible for teaching the following Maths courses to Trinity 1st Year Physics students: Complex Numbers, Ordinary Differential Equations, Vectors and Matrices, Calculus, Multiple Integrals and Vector Calculus, Normal Modes and Waves;
- to teach 3.5 weighted hours a week, averaged over the two eight-week terms. The candidate should expect to teach around 4 weighted hours a week in Michaelmas term, and around 3 weighted hours in Hilary term. The number of contact hours is somewhat reduced where the teaching is in pairs or larger groups. For example, teaching a pair for one hour counts as 1.25 weighted hours, and teaching a group of three counts as 1.5 weighted hours;
- to undertake other duties connected with the Physics course, such as participating in the undergraduate admissions exercise, which takes place annually in December, and taking part in college Open Days.

Selection Criteria

- education to degree level in Physics; research in a relevant area, a doctorate or substantial progress towards a doctorate.
- some experience of tutorial teaching in the relevant subject areas would be an advantage;
- ability and willingness to undertake the associated duties as specified above.

Term of appointment

This is a fixed-term appointment for two terms for Michaelmas Term 2025 and Hilary Term 2026, from 1st October 2025 – 31st May 2026.

Salary

The salary for the post is 29% of point 23-27 (depending on experience) on the HE single pay spine, *pro rata* (currently £9,665- £10,680 p.a.).

Marking and preparation, attendance at Open Days, admissions interviews and similar duties are covered by the stipend.

Other benefits

- The appointed lecturer will be able to book a pooled teaching room in Trinity College for tutorials.
- Membership of the Senior Common Room (SCR) will be provided free of charge.
- The appointed lecturer will be entitled to 3 lunches and 2 dinners, free of charge, per week at the Common Table (SCR) during term time and vacation, except when the kitchens are closed.

Please note that this post does not carry a housing allowance, and no College accommodation would be available.

Right to work

The appointment will be subject to the provision of proof of the right to work in the UK.

How to apply

Candidates should submit the following documents electronically to the Academic Administrator (academic.administrator@trinity.ox.ac.uk):

- a short letter outlining how they believe they meet the criteria set out for the post;
- an academic CV;
- the names of two referees who should be asked by the candidate to email their references directly to the Academic Administrator**. It is the responsibility of the candidate to ensure that the references arrive by the closing date.**

The closing date for applications is **12 noon (UK time) on 19th May 2025.**

Appointment Process

We expect to hold **interviews on 9th June 2025.** Candidates invited for interview will be asked to give a brief teaching presentation on a topic from the current 1st Year courses in Calculus or Vectors and Matrices. Further details will be given to those shortlisted.

Trinity College is an equal opportunities employer. Entry into employment within the Colleges and progression within employment will be determined only by personal merit and the application of criteria that are related to the duties of each particular post and the relevant salary structure. Subject to any statutory provisions, no applicant or member of staff will be treated less favourably than another because of their age; colour; disability; ethnic origin; marital status; nationality; national origin; parental status; race; religion or belief; gender or sexual orientation. In all cases, ability to the job will be the primary consideration.

Appendix: teaching required

CP3. Mathematical Methods 1

Differential equations and complex numbers
Complex numbers, definitions and operations. The Argand diagram; modulus and argument (phase) and their geometric interpretation; curves in the Argand diagram. De Moivre's theorem. Elementary functions (polynomial, trigonometric, exponential, hyperbolic, logarithmic) of a complex variable. (Complex transformations and complex differentiation and integration are excluded.)

Ordinary differential equations; integrating factors. Second-order linear differential equations with constant coefficients; complementary functions and particular integrals. Application to forced vibrations of mechanical or electrical resonant systems, including the use of a complex displacement variable; critical damping; quality factor (Q), bandwidth, rms, peak and average values. *[Physical interpretation of complex impedance and power factor is not assumed]*

Vector algebra
Addition of vectors, multiplication by a scalar. Basis vectors and components. Magnitude of a vector. Scalar product. Vector product. Triple product. Equations of lines, planes, spheres. Using vectors to find distances.

Matrices
Basic matrix algebra: addition, multiplication, functions of matrices. Transpose and Hermitian conjugate of a matrix. Trace, determinant, inverse and rank of a matrix. Orthogonal, Hermitian and unitary matrices. Vector spaces in generality. Basis vectors. Scalar product. Dual vectors. Linear operators and relation to matrices. Simultaneous linear equations and their solutions. Determination of eigenvalues and eigenvectors, characteristic polynomial. Properties of eigenvalues and eigenvectors of Hermitian linear operators. Matrix diagonalisation.

CP4. Mathematical Methods 2

Elementary ideas of sequences, series, limits and convergence. (Questions on determining the convergence or otherwise of a series will not be set.) Taylor and MacLaurin series and their application to the local approximation of a function of one variable by a polynomial, and to finding limits. (Knowledge of and use of the exact form of the remainder are excluded.) Differentiation of functions of one variable including function of a function and implicit differentiation. Changing variables in a differential equation, integration of functions of one variable including the methods of integration by parts and by change of variable, though only simple uses of these techniques will be required, such as $\int x \sin x \, \mathrm{d}x$ and $\int x \exp(-x^2) \, \mathrm{d}x$. The relation between integration and differentiation.

Differential calculus of functions of more than one variable. Functions of two variables as surfaces. Partial differentiation, chain rule and differentials and their use to evaluate small changes. Simple transformations of first order coefficients. (Questions on transformations of higher order coefficients are excluded.) Taylor expansion for two variables, maxima, minima and saddle points of functions of two variables. Double integrals and their evaluation by repeated integration in Cartesian, plane polar and other specified coordinate systems. Jacobians.

Probability theory and general probability distributions. Line, surface and volume integrals, evaluation by change of variables (Cartesian, plane polar, spherical polar coordinates and cylindrical coordinates only unless the transformation to be used is specified). Integrals around closed curves and exact differentials. Scalar and vector fields. The operations of grad, div and curl and understanding and use of identities involving these. The statements of the theorems of Gauss and Stokes with simple applications. Conservative fields.

Waves

Coupled undamped oscillations in systems with two degrees of freedom. Normal frequencies, and amplitude ratios in normal modes. General solution (for two coupled oscillators) as a superposition of modes. Total energy, and individual mode energies. Response to a sinusoidal driving term.

Derivation of the one-dimensional wave equation and its application to transverse waves on a stretched string. D'Alembert's solution. Sinusoidal solutions and their complex representation. Characteristics of wave motion in one dimension: amplitude, phase, frequency, wavelength, wavenumber, phase velocity. Energy in a vibrating string. Travelling waves: energy, power, impedance, reflection and transmission at a boundary. Superposition of two waves of different frequencies: beats and elementary discussion of construction of wave packets; qualitative discussion of dispersive media; group velocity. Method of separation of variables for the one-dimensional wave equation; separation constants. Modes of a string with fixed end points (standing waves): superposition of modes, energy as a sum of mode energies.