

Department of Mathematics  
Disordered Systems Group



University of London

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# MSc in Complex Systems Modelling

*From Biomedical & Natural to Economic & Social Sciences*

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*Modern societies rely on a wide range of infrastructures, institutions and technologies, whose complexity has grown dramatically in the recent past. Consequently there is an ever growing demand for expertise in complex systems modelling as a prerequisite to understanding, maintaining and further developing such systems...*

There have been numerous significant advances in the last decades in our understanding of complex systems modelling. These developments have been both at a theoretical/mathematical level and at a software level. Students wishing to enter this rapidly expanding field after a first degree, however, will often not be adequately prepared by their undergraduate training. The purpose of the MSc degree in Complex Systems Modelling is to teach students

- (i) properties of complex systems and their modelling in the physical, biological, economic and social sciences.
- (ii) the mathematical techniques required to analyse the properties of complex systems (e.g. statistical learning, information theory, statistical mechanics).
- (iii) where and how to use these techniques to quantify complex systems, with particular emphasis on complex physical and biological systems.
- (iv) how to obtain and maintain access to the most recent research results in the academic community.

After successful completion of this degree the student should be able to contribute to research and development in an academic or industrial environment.

Successful completion will lead to one of the following awards: pass, pass with merit, or pass with distinction. All candidates follow two compulsory lecture courses as well as a selection of six optional courses, chosen in consultation

with their tutor. For a detailed description of the programme of lecture courses see below; note that this is reviewed annually so that the precise list of options is subject to change.

Each candidate must complete a research project in some relevant area of Complex Systems Modelling at the postgraduate level, in the months June–September, after passing the written examinations.

### Location

The MSc is based at the department of Mathematics at King's Strand Campus, which provides dedicated study space for MSc students. King's College London is one of the top 25 universities (THE 2009). in the world and the fourth oldest in England and it has an outstanding reputation for providing world-class teaching and cutting-edge research; over half of our academic staff work in departments that are in the top 10 per cent in the UK in their field and can thus be classed as world leading.

King's occupies four Thames-side campuses in the heart of London. A multi-faculty institution, King's was rated excellent for students' educational experience by the Quality Assurance Agency.

### MSc in Complex Systems Modelling

The MSc programme is based on lecture course modules and a project and requires either one year of full-time study, or may be taken part-time over two years.

*...Partly in response to this demand there have indeed been numerous significant advances in the last decades in our understanding of a broad range of complex systems. Complex Systems Modelling is an exciting and ever-evolving interdisciplinary field involving scientific areas ranging from Biomedical and Natural to Economic and Social Sciences.*

The following modules are compulsory:

- Theory of Complex Networks
- Research Methods and Advanced Topics in Complex Systems

Students also choose optional modules from the following list:

- Equilibrium Analysis of Complex Systems
- Dynamical Analysis of Complex Systems
- Mathematical Biology
- Elements of Statistical Learning
- Applied Probability & Stochastics
- Distribution Theory
- Portfolio Risk Management
- Algorithms Design and Analysis
- Algorithms for Computational Molecular Biology
- Statistics for Bioinformatics
- Bio- and Nanomaterials in the Virtual Lab

Besides, each MSc candidate must complete a project in some area of Complex Systems Modelling at the postgraduate level after passing the written examinations (that is, during the three months mid-June to mid-September). Preparatory work for this project will be carried throughout second semester, resulting in a written project outline. Students will also give oral presentations on their finished projects. Where appropriate, the

project can be carried out and supervised in other departments of King's College London or other academic or industrial institutions outside King's College London.

#### **Entrance requirements**

In order to register for the MSc Degree in Complex Systems Modelling applicants will normally be expected to have a first class or upper second class first degree or its equivalent in any one (or jointly) of Mathematics, Physics, Computing, Engineering or other suitable scientific disciplines. A sound background in basic mathematics and in particular a familiarity with standard concepts of calculus, linear algebra, differential equations and elementary probability theory will be assumed.

Applications from overseas students are welcome.

#### **Funding**

The College has a wide range of scholarships and bursaries available to help fund study at King's. Please visit the Graduate School funding at [www.kcl.ac.uk/gradfunding](http://www.kcl.ac.uk/gradfunding) for eligibility and application details and deadlines.

#### **Contact details**

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