Faculty of Science

University of Strathclyde Science

Postgraduate Research Degrees 2016-2017

The Strathclyde's Faculty of Science is one of the UK's leading faculties of science, providing a vibrant, dynamic, supportive and friendly place to study. The Faculty of Science investigates the challenges and possibilities of the natural and technological world, from drug discovery and public health to environmental concerns, tackling cybercrime and understanding space. Delivered by world-class researchers, our research degrees provide the opportunity to gain an invaluable qualification that will enhance your career prospects. In the 2014 Research Excellence Framework, the department of **Physics** was rated **1st** in the UK for research quality. For research power, **Pharmacy & Biomedical Sciences** was **4th** in the UK and **1st** in Scotland, and **Chemistry** was **4th** in the UK.

In choosing to study Science at Strathclyde you will become part of an international community of staff and students from more than 40 countries. With over 3000 students and around £20m of external research grant income, we provide a high quality research environment that is attractive both nationally and internationally. Facilities are excellent, with well equipped, modern laboratories, plus 24-hour access to an advanced computer information network and a sophisticated virtual e-learning environment.

https://www.strath.ac.uk/science/

RESEARCH DEGREES:
Department of Pure and Applied Chemistry

Our Research

The Department of Pure and Applied Chemistry is one of the largest chemistry research schools in the UK. Our research spans a very wide range of topics from analytical chemistry to materials science and from biological chemistry to theoretical chemistry. Research is well supported by industry, government, research councils, the EU and charitable foundations. We are part of WestCHEM, the joint research school of the University of Strathclyde and the University of Glasgow, with whom we work on many areas of chemistry research.

MPhil & PhD

You can study either option in any of our research areas below:

- **Catalysis and Synthesis**
- **Chemical biology, molecular medicine & synthetic biology**
- **Complex chemical systems**
- **Dynamic & structure**
- **Nanoscience & materials**
- **Forensic & analytical science**
- **Applied Chemistry**

Entry Requirements

2:1 BSc (Hons) or above in Chemistry, Analytical Chemistry, Chemical Engineering or related discipline or a degree agreed by the Head of Department.

General Contact for Department of Pure and Applied Chemistry

University of Strathclyde
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295 Cathedral Street, Glasgow, G1 1XL
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chemistry.enquiry@strath.ac.uk
http://www.strath.ac.uk/research/subjects/chemistry/

Department of Pure & Applied Chemistry: Why choose a PhD in Chemistry at University of Strathclyde

Gina from Malaysia

PhD in Forensic Science

I chose to study at Strathclyde for two reasons.
Firstly, the expert in my field of study was based here, and also because the university was one of the best in the UK.

I would definitely recommend my department to others. I love the course structure and there is plenty assistance given by the staff, including the technical staff when you need it.

I particularly enjoyed the credited courses as I learned a lot and met other people from various fields.

Also, the PhD in general taught me to be very independent in my work and to be resourceful to settle issues faced during the course of my study.

Strathclyde University has wonderful gym facilities which I enjoyed using during my spare time.

When I was doing class work or assignments, the access to staff was very good which I thought was very important when I needed help or just someone to talk to.

Alexandre from France

PhD in Forensic Chemistry

I did the last year of my undergraduate Masters at Strathclyde as an Erasmus student. I really enjoyed it so I applied to do my PhD here.

I would recommend the Department due to the good atmosphere I experienced while here.

Additionally, it offers great opportunity for the future.

My research is in the development of bio-conjugate on nanoparticles, and this is an area that I really enjoy working in.

The union is very good at giving you the opportunity to meet new people.

The university also offers a lot of different leisure activities, mostly in the sport centre.

94% of research in the department has recently been rated as internationally excellent or internationally leading (REF 2014 GPA Power Ranking).

Abimbola from Nigeria

PhD in Analytical Chemistry

I chose to study at Strathclyde because of its long history of cutting edge research, and the fact that my PhD supervisor is internationally renowned.

The culture in Glasgow also attracted me to study here, as I had heard many good things about it.

When I first arrived, the department was very supportive and helped me with the arrangements I had to make. The staff are friendly and helpful, and I also got along well with my classmates, who made me feel at home.

The research expertise of the academics at Strathclyde is a real bonus, as is the up-to-date research equipment available. As for the city of Glasgow, it is very easy to live in, with a good transportation system.

I would recommend Strathclyde to other international students, because it is a good university with experienced and brilliant academics, and it is internationally recognised.

Ana Maria from Portugal

PhD in Biochemistry

When my current supervisor contacted me about his new research project, I was already looking for a PhD related to my biochemistry background, chemistry and new materials.

This research project was completely related to my work and interests. We had a meeting on Skype and discussed the project, my previous research experience and the University of Strathclyde.

When I visited the University of Strathclyde for the first time, I was impressed with how well organised it was, as well as with the facilities and the equipment. After my visit, I was sure that the University of Strathclyde was the place I wanted to do my PhD.

The Pure and Applied Chemistry department has a really helpful academic and technical staff base, along with good IT facilities. Some of the research I am doing is related to my background. However, there are some aspects which are new to me and allow me learn new techniques and subjects and work outside of my comfort zone.

There are also sponsorship opportunities that are available to students, giving us the opportunity to do better research work. In general, the university is well prepared to receive new students and support them.

The diversity of the university is incredible and how they accommodate so many different students is amazing.

Department of Pure & Applied Chemistry: Catalysis & Synthesis

Our Research

Our projects include the design of new reactions and mechanistic studies, the synthesis of complex natural products, metal-free reagents and metal-based transformations, and the emerging area of synergistic bimetallic chemistry. We have strong international links and partnerships with more than 25 companies, including GSK, Merck, and Huntsman.

Research Areas

Our research in this area focuses on five key areas:

- homogeneous catalysis
- heterogeneous catalysis
- target-driven synthesis
- computational chemistry
- emerging new developments in digital synthesis and reactionware.

We also research:

- asymmetric catalysis for the synthesis of chiral compounds and, in particular, bioactive targets
- solid-supported catalysts for industrial applications such as petrochemicals, fine chemicals and fuels
- total synthesis of natural products, pharmaceuticals, agrochemicals, and biological probes
- computer simulation studies of catalytic reactions.

Current Research Topics

- the development of new catalytic reactivity based on both transition metals and organocatalysts for the rapid assembly of complex molecular structures
- the design and synthesis of therapeutic agents, bioactive natural products, and probe molecules for the study of disease and key metabolic processes
- elucidation of structure–activity relationships of solid-supported catalysts with the aim of developing improved catalysts or designing new catalytic materials for new processes
- use of advanced theoretical methods and high performance computing to provide a detailed picture of the fundamental changes occurring as atoms and molecules react, particularly in catalytic cycles

Contact

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chemistry.enquiry@strath.ac.uk
http://www.strath.ac.uk/research/subjects/chemistry/catalysissynthesis/

Department of Pure & Applied Chemistry: Chemical biology, molecular medicine & synthetic biology

Our Research

Our links with Strathclyde Institute of Pharmacy and Biomedical Sciences have developed our outstanding track record in innovation and delivery at all stages of the drug discovery pipeline. Molecular and biological sciences are fully integrated with the medical and veterinary sciences across several institutions including Strathclyde, the University of Glasgow and the Beatson Institute for Cancer Research.

Over the past few years, with our partners at WestCHEM, we have been building capacity in chemical biology and have invested in infrastructure and staff. This has been recognised through an EPSRC-BBSRC-MRC funded Chemical Biology Network grant, which has accelerated growth and partnership.

Research Areas

Among the topics we are currently researching are:

- synthetic methodology
- design and synthesis of biological probes
- synthetic biology
- biomaterials chemistry
- catalysis and synthesis
- molecular medicine

Alongside our WestCHEM partners, our team has a wealth of experience in the area of molecular and biological sciences.

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http://www.strath.ac.uk/research/subjects/chemistry/chemicalbiologymolecularmedicinesyntheticbiology/

Department of Pure & Applied Chemistry: Complex chemical systems

Our Research

We look at the major challenge of the self-assembly of non-biological chemical components into complex structures that have unique properties, like adaptability, molecular recognition, and programmability. We research the links between chemical systems and hybrid devices that have potential to deliver new technologies based on inorganic biology and synthetic systems.

Research Areas

- the development of adaptive materials for biomedical applications
- strategies for solar fuel devices
- clean water
- the production of potential drug and drug delivery candidates.

Research Expertise

Among the topics we are currently researching are:

- non-equilibrium processes
- systems chemistry
- evolvable matter and evolutionary chemical systems
- novel reaction formats for systems chemistry
- dynamical synthetic systems
- self fabricating molecules, materials and systems
- reversible hydration/dehydration of complex solids
- studies of disorder at the atomic level in solidsbiomaterials chemistry

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Department of Pure & Applied Chemistry: Dynamic & structure

Our Research

Dynamics and structure research at Strathclyde covers a wide range of topics including materials and solid-state chemistry, computational studies, biophysical chemistry, and spectroscopy with many projects involving collaborations across multiple areas. We are increasing our research work with our WestCHEM partners in soft condensed matter theory and experiment; the interface between biology and chemical physics studied through spectroscopy and imaging; and solid-state physical chemistry.

Research Areas

- organic electronics
- solid-state chemistry
- polymer chemistry
- computational chemistry
- biophysical chemistry

Current Research Topics

Topics we are currently researching include:

- preparation and characterisation of heteroatomic molecular, oligomeric and polymeric materials
- ultrafast chemical physics and physical chemistry
- photonic and metamaterials for biosensing, chirality
- photochemistry and chemical dynamics
- solid-state NMR
- visualising and manipulating chemical structures
- biomolecular structure and dynamicsstudies of disorder at the atomic level in solidsbiomaterials chemistry

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http://www.strath.ac.uk/research/subjects/chemistry/complexchemicalsystems/

Department of Pure & Applied Chemistry: Nanoscience & materials

Our Research

Based at Strathclyde, the Centre for Molecular Nanometrology is a partnership between the departments of Pure and Applied Chemistry, Physics and associated groups from the Faculty of Science. Nano-metrology refers to the measurement of events on a nanoscale using novel physical techniques and chemical manipulations.

Key areas of research

Our research focuses on the understanding of plasmonic materials for enhanced optical spectroscopies and the creation of new approaches to bioanalysis, based mainly on functionalised nanoparticles and surface enhanced Raman scattering.
The centre's materials research in renewable energy applications (fuel cells, hydrogen storage, solar cells), low power optoelectronic devices, chiral plasmonic metamaterials, and magnetic materials is internationally recognised.
It has wide-ranging capability in inorganic, organic and polymer synthesis, and combines this expertise with device work conducted in-house and through academic and industrial partnerships.

Current Research Topics

Topics we are currently researching include:

- catalysis
- molecular devices
- molecules for future emerging technologies
- molecular magnetic and nanomagnetic materials
- inorganic nano materials, such as polyoxomethalates and sustainable materials processing
- organic semiconductors and solar cells
- supramolecular chemistry, self assembly of complex chemical systems

structural chemistry of hydrogen in nominally anhydrous materials (NAMs).

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Department of Pure & Applied Chemistry: Forensic & analytical Science

Our Research

We're actively engaged in research into many areas of forensic science and forensic practice. This research is both directly related to the field as well as at a more fundamental and theoretical scientific level.

Our research is done at the Centre for Forensic Science at the University of Strathclyde, often in collaboration with operational forensic science laboratories.

Ideas for our research projects originate from a wide range of sources but often focus on following up issues encountered in casework. A good example of this is the generation of databases, vital to the evaluation of evidence, as well as many other areas fundamental to the delivery of forensic science.

Our Achievements

In the last 10 years members of staff of the Centre for Forensic Science have:

- Published more than 100 publications in peer reviewed literature
- Delivered more than 90 conference presentations at the leading forensic science meetings around the world including invited lectures, keynote lectures and workshop presentations
- Authored 19 book chapters and edited three texts relating to forensic science practice
- Patented a number of technological developments of relevance to forensic science

Current Research Topics

- DNA and human genomics
- Drug profiling
- Fire scene investigation and fire debris analysis
- Evaluation of complex data sets using statistical and probabilistic methods, including artificial neural networks and Bayesian techniques
- Environmental forensic science
- Forensic science policy and use of forensic science by law enforcement organisations
- Evaluating new technology and methodology

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Available examples of research topic titles

Research Area and/or Project Title
Inorganic and Analytical Chemistry
Development of nanomaterials for enhanced adsorption platforms in environmental remediation
Heritage Smells: chemical emission profiles to study historical artefacts
Monitoring of particulate processes using optical and acoustic techniques
Main group metal chemistry: heterobimetallic frameworks containing hydrogen rich ligands

Organic Chemistry
Organic Electron Donors – Designing New Reactions for Synthetic Chemistry
Aryl-Aryl and aryl-alkyl coupling reactions in the absence of transition metals – experimental and computational approaches combined
GTP cyclohydrolase inhibitors as new anti-bacterial agents
PTR 1 inhibitors as new treatments for tropical diseases

Organic Chemistry
New analogues of pseudoephedrine amides
Synthetic Chemistry/Medicinal Chemistry - Drugging the untargeted cancer kinome
Organic synthesis; Methodology development and applications in total synthesis; asymmetric organic synthesis; organometallic catalysis and applications on organic synthetic processes
Asymmetric catalysis (metal- and non-metal-based); Medicinal Chemistry targeting Fibrosis; Organic synthesis; Physical-Organic chemistry (reaction mechanism, modelling)

Physical Chemistry
Understanding immobilisation of enzymes for use as industrial catalysts
Understanding enzyme action in unusual reaction media of technological importance, e.g. high salts or mainly solid
Best experimental design for optimisation of preparative enzyme processes, or other systems described by a partial mathematical model
Star-shaped conjugated macromolecules for plastic electronics
New materials for organic solar cells

Centre for Forensic Science
Forensic chemistry or Forensic biology
Legal and investigative aspects of forensic practice and case reviews
Forensic science policy, practice and use by criminal justice systems.
Retrieval of information relevant to organised crime and terrorism from digital media

RESEARCH DEGREES:
Department of Computer & Information Sciences

Our Research

We research a wide range of areas including theoretical computer science, human-computer interaction, information sciences and software systems.
Our research projects are funded by a wide range of organisations including the Engineering and Physical Sciences Research Council, the Arts and Humanities Research Council, the Economic and Social Research Council and the European Union. We also work with a large range of industry and public sector partners including Microsoft, Rolls Royce Marine and the European Space Agency.

MPhil & PhD

You can study an MPhil over the course of one year or a PhD over the course of three years here in Scotland. You also have the option of studying a PhD in Saudi Arabia over three years, four years or five years. Part-time study is available too.
You can study either option in any of our seven research groups:

- iLab
- Software Systems
- Computer Security
- Mathematically Structured Programming
- The Mobiquitous Lab
- Combinatorics
- Similarity & Metric Search

Entry Requirements

2:1 BSc (Hons) BSc Hons 2:1 or equivalent in a relevant subject or a degree agreed by the Head of Department.

General Contact for Department of Physics

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http://www.strath.ac.uk/research/subjects/computerinformationscience/

Department of Computer & Information Science : Why choose a PhD in Computer Sciences at University of Strathclyde

? Testimonial 1

? Testimonial 2

? Testimonial 3

? Testimonial 4

Department of Computer & Information Sciences: iLab

Our Research

iLab is an interdisciplinary information science research group, investigating arising socio-techno phenomena and evolving information behaviour. In pursuit of a literate and informed society, much of our work is societal in nature and holistic in perspective, investigating human information need and use, and informing the design and delivery of public information systems and services.

We work closely with industry and the Library & Information Science profession, and have active research partnership agreements with a number of public sector organisations including NHS Scotland, Glasgow Life, and Barnardo's.

We are members of the ESRC Information Science Pathway Doctoral Training Centre, and the AHRC Information Science Doctoral Scheme Consortium.
By RCUK/EU research funding and ISI ranked research output, we're the leading information science research group in Scotland and one of the top three in the UK.'

Research Areas

- Interactive information retrieval
- Information seeking behaviour
- Information architecture
- Information policy

Research in information policy within iLab reflects this importance and focusses on two vital themes:

- information policy and regulation
- information ethics

Contact

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Department of Computer & Information Sciences: Software systems

Our Research

The Software Systems Group is made up of researchers with a range of expertise spanning the engineering of complex and novel software intensive systems.

The research of the group falls into two broad themes:

I. Supporting the construction and analysis of complex software-based systems - an extremely challenging activity that requires the development of sophisticated tools, techniques and evaluation mechanisms

II. The challenges of engineering mobile and distributed systems that rely on large amounts of globally distributed data but run on small portable computing devices

Much of our research stems from existing challenges and our goal is to produce solutions that are ultimately of use to the practicing software developer. As a result, we have many years of experience in assessing tools and techniques.

Research Areas

Our work is looking to answers questions such as:

- What are the key features, abstractions and interactions in any design and how can they be identified?
- Can good design be identified and visualised?
- What empirical evidence exists to support good design?

Find out more about some of the projects the Software Systems Group have been working on:

- Detecting Design Flaws in Code
- Investigating the Benefits of Entity Relevance During Collaborative Software Engineering
- Investigating Data-Flow Coverage of Classes by Means of Evolutionary Algorithms
- Investigating and Improving the Mental Models Used by Novice Programming Students

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http://www.strath.ac.uk/research/subjects/computerinformationscience/softwaresystems/

Department of Computer & Information Sciences: Computer security

Our Research

We're particularly interested in social and nature inspired approaches to security and situational awareness in self-protecting systems. To support this, we're investigating approaches to detecting web intrusion inspired by the human immune system along with mechanisms based on the human notion of trust for managing security risks in common computing systems.

We're also looking at research problems and solutions in digital forensics and cybercrime. Our research tasks relate to the detection, isolation and proof of digital evidence. These aspects of our research can be used in criminal proceedings. We maintain close links with digital forensic investigators, the legal profession and law enforcement agencies.

The increasing use of computer-based systems throughout many different industries presents many issues concerning computer security such as:

- techniques for system and network integrity
- strategies for information security
- the development of robust network services

Research Areas

We look at a wide range of issues including:

- intrusion detection techniques
- malware characteristics
- textual steganography
- trusted systems
- the role of human factors in enterprise security along with usable authentication

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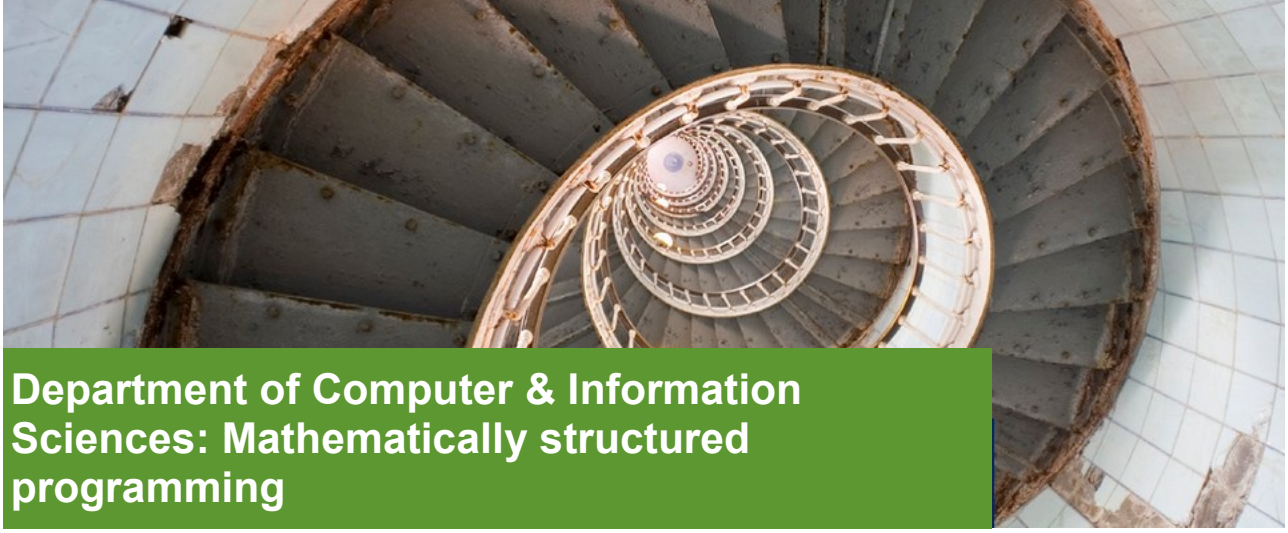

Department of Computer & Information Sciences: Mathematically structured programming

Our Research

The Software Systems Group is made up of researchers with a range of expertise spanning the engineering of complex and novel software intensive systems.

The research of the group falls into two broad themes:

I. Supporting the construction and analysis of complex software-based systems - an extremely challenging activity that requires the development of sophisticated tools, techniques and evaluation mechanisms

II. The challenges of engineering mobile and distributed systems that rely on large amounts of globally distributed data but run on small portable computing devices

Much of our research stems from existing challenges and our goal is to produce solutions that are ultimately of use to the practicing software developer. As a result, we have many years of experience in assessing tools and techniques.

Research Areas

Our work is looking to answers questions such as:

- What are the key features, abstractions and interactions in any design and how can they be identified?
- Can good design be identified and visualised?
- What empirical evidence exists to support good design?

Find out more about some of the projects the Software Systems Group have been working on:

- Detecting Design Flaws in Code
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- Investigating Data-Flow Coverage of Classes by Means of Evolutionary Algorithms
- Investigating and Improving the Mental Models Used by Novice Programming Students

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Department of Computer & Information Sciences: The Mobiquitous Lab

Our Research

Computing is no longer restricted to desktop computers or graphical user interfaces. The Mobiquitous Lab investigates user behaviour on mobile devices and ubiquitous computing (computing on any type of device) along with new, emerging mobile and touch technologies.
Our research spans a variety of user-centred design methods, including quantitative user studies in controlled experiments, participant observation and field studies of technology use. We have experience in conducting system evaluations as well as in contributing to requirements analysis.

Research Areas

Our research helps us to understand how computing can improve people's lives and how it can be used every day. We carry out research investigating these new options. For example:

- how visitors to a museum interact with an interactive table
- how to support a wider range of users on smartphone interactions
- how game engines can support interactive systems

It also allows us to face challenges in interface design eg mobile devices require design for small screens.

Current Research projects

OATS: Older Adults Text Studies

This is a EPSRC funded project conducting an empirical investigation and user-centred development of touch-screen text entry methods for older adults. The project is working with the University's Centre for Lifelong Learning to help us work with groups of older adults. We're also working with Keypoint Technologies to help develop smart text solutions.

meSch: Material Encounters with Digital Cultural Heritage

meSch is an EU funded project with the goal of co-designing novel platforms for the creation of tangible exhibits at heritage sites. Curators will be able to offer visitors new interactive experiences by means of material interaction with smart objects.

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Department of Computer & Information Sciences: Combinatorics

Our Research

Our research interests are in enumerative, bijective and algebraic combinatorics. The research spans a wide spectrum, with recent emphasis on permutation patterns, combinatorics on words, graph theory and applications to physics and biology.

Research Areas

Permutation patterns

The driving force behind much of our work is to find connections between families of different combinatorial structures. We've recently been working with lattice paths, plane trees, planar maps and Ferrers diagrams with various types of fillings. The goal is to find connections between different kinds of combinatorial objects, in the form of bijections that send a set of statistics on one side to a set of statistics on the other. Such statistics-preserving bijections not only reveal structural similarities between different combinatorial objects, they often also reveal previously unknown properties of the structures being studied.

Combinatorics on words

The motivation comes from different modern, classical, fields of mathematics, from computer science, physics, and biology. Many fundamental results of the theory have been discovered, or rediscovered, when using words as tools for other sciences. We're also further developing our work in algebraic combinatorics, with an emphasis on algebraic and topological properties of simplicial complexes.

Department of Computer & Information Sciences: Similarity & metric search

Our Research

We're looking into metric space models and distance-based searching, where no coordinate system is available and all that can be found is the similarity of any two objects to each other. Images and other multimedia objects have various similarities that don't translate into a conveniently indexed space. Rather, all that can be determined is how similar two images are to each other. The unsolved question we want to be able to answer is: "Given a very large collection of images, can we efficiently find all those that are very similar to a new image?".

Contact

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Available examples of research topic titles

Research Area and/or Project Title
ilab
Understanding the information Seeking Behaviour of Recent Immigrants
Understanding the Everyday Life Information Seeking Behaviour of the information poor
Understanding the Everyday Life Information Seeking Behaviour of children
Understanding the Information Seeking Behaviour of young people not in employment, education or training
Software Systems Group
Engineering of complex and novel software intensive systems
Synthesising qualitative models of software systems using dynamic analysis: The aim of this project is to use observations of system behaviour (execution traces and the like) as the basis for reverse engineering abstract and approximate models of systems for the purposes of comprehension, testing etc
Detecting software bugs using anomaly detection: The project will investigate the use of anomaly detection techniques to automatically identify fault-related output in large volumes of software system behaviour observations.
Socio-technical design of authentication mechanisms: Understand the factors that drive user attitudes and behaviour towards authentication systems and based on this understanding devise a methodology for effective authentication mechanism design.
Mathematically Structured Programming Group
Functional Programming, Logic, Type Theory and Category Theory
Categorical Foundations for Quantum Computing: Quantum computers seem to offer a lot more power than classical machines; however we don't really know why this is so, or what their limits might be. Category theory presents a way in, to discover what's really different about quantum theory and how we can use it.
Homotopy Type Theory: Homotopy Type Theory was invented by Fields medallist Vladimir Voevodsky to do nothing less than refund the whole of mathematics and theoretical computer science based upon a new computational interpretation of equality. We are at the heart of this project and are always looking for bright students who wish to get involved.
Querying data streams: We would like to study how the coalgebraic theory of continuous stream functions can be used to develop a language for querying data streams that has a solid mathematical foundation.
The Mobiquitous Lab
How mobiles can support healthier lifestyles
How sensors in mobiles can be used in crowd sourcing smart city behaviour
How to enter text fast and accurately on a wide range of devices from smartphones and tablets to smart watches
Usability of mobile computing devices and presentation of complex data on small screens
Combinatorics Group
Permutation patterns, combinatorics on words, graph theory and applications to physics
The Combinatorics of patterns in permutations and their relation to sorting operators such as stack sorting
Combinatorial aspects of interval orders and related structures
Graphs and Words: Combinatorics project studying various ways to represent graphs via words
Information security
Techniques for defending against malware
Efficient secure data processing protocols: to process big data (encrypted) with high performance
Enhancing digital forensics through intelligent search
Detecting on-line extremist content

RESEARCH DEGREES:
Mathematics & Statistics

Our Research

We have a strong international reputation in the use of mathematical analysis to solve problems in different industries. We work with researchers in other universities and industry across the UK, Europe and the USA.

In the most recent Research Assessment Exercise 95% of our research was of a "quality that is recognised internationally" and 50% was "internationally excellent".

As a focus for activities we've adopted non-linear systems and solution of industrial problems as a major theme.

Our research activity has been focused into key priority areas in order to strengthen and advance the research we undertake. These research areas often overlap and there is significant collaboration between groups.

MPhil & PhD

There are postgraduate research opportunities in all of our five research groups:

- Applied Analysis
- Continuum Mechanics & Industrial Mathematics
- Numerical Analysis and Scientific Computing
- Population Modelling & Epidemiology
- Stochastic Analysis

MRes

You can study an MRes in Mathematical Sciences

Entry Requirements

1st class or 2.1 Hons in maths, computing, engineering or numerate discipline

General Contact for Department of Mathematics & Statistics

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http://www.strath.ac.uk/courses/research/mathematicsstatistics/

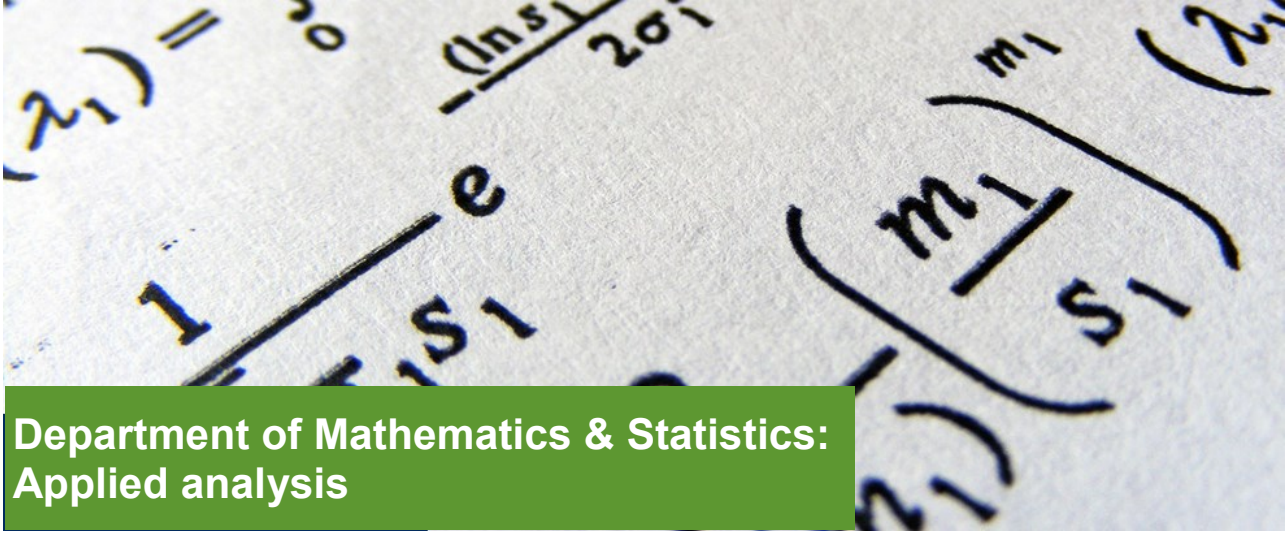
Department of Mathematics & Statistics
Why choose a PhD in Mathematics Sciences at University of Strathclyde

? Testimonial 1

? Testimonial 2

? Testimonial 3

? Testimonial 4



Department of Mathematics & Statistics: Applied analysis

Our Research

The Applied Analysis Teaching & Research Group is involved in the development of rigorous analytic and constructive methods for solving differential and integral equations arising in the applied sciences.

We have a particular focus on nonlinear evolutionary processes and operator equations.

Research Areas

- application of semigroup theory to coagulation-fragmentation equations and other evolutionary processes
- qualitative theory of non-linear dynamical systems in material science and mathematical biology
- solution theory for evolutionary equations from mathematical physics
- fractional integral transformations, including the fractional Fourier transform
- differential operators with interior singularities
- spectral theory of block operator matrices and operator functions
- distributional spectral theory
- multiparameter spectral theory
- spectral graph theory
- complex networks: theory and applications
- mathematical chemistry

Contact

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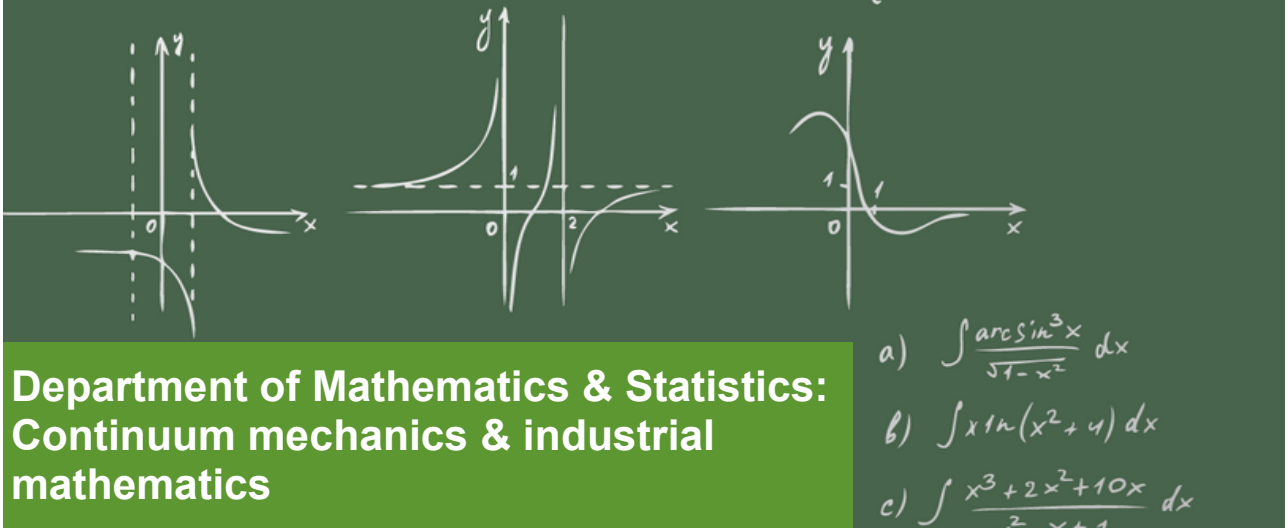

Department of Mathematics & Statistics: Continuum mechanics & industrial mathematics

Research Areas

- Liquid crystals
  - flow induced switching in weakly anchored nematic cells
  - chevrons and flow effects in smectic liquid crystals
  - defect motion in nematic liquid crystals
  - effects associated with the application of external electric and magnetic fields
  - phase transitions, ferroelectric properties and cholesteric ordering in uniaxial and biaxial nematic and smectic liquid crystals
  - continuum modelling of liquid crystal phases
  - dielectrophoresis of both liquid crystals and Newtonian fluids
- Thin-film flow
  - gravity
  - surface tension
  - surface-tension gradients
  - thermoviscosity
  - centripetal forces
  - externally applied jets of air
  - coating and rimming flow on a rotating horizontal cylinder
- Droplet evaporation
- Complex fluids
- Non-destructive testing
- Medical product design
  - the development of a fluorescent capillary-fill device (used for pregnancy testing)
  - drug-eluting stents and an artificial lung
  - the modelling of biomedical systems such as red blood cell membranes and hypoplastic left heart syndrome
- Flows in porous and complex media
  - reaction-diffusion wave propagation in excitable media
  - heat transfer in fractal deposits
  - mass transfer of condensing salts in combustion chambers
- Non-linear waves
  - the stability properties of periodic and solitary wave solutions to some new evolution equations that occur in plasma physics
  - the internal dynamics of soliton interactions
  - the derivation of new equations having multi-loop soliton solutions, and their properties

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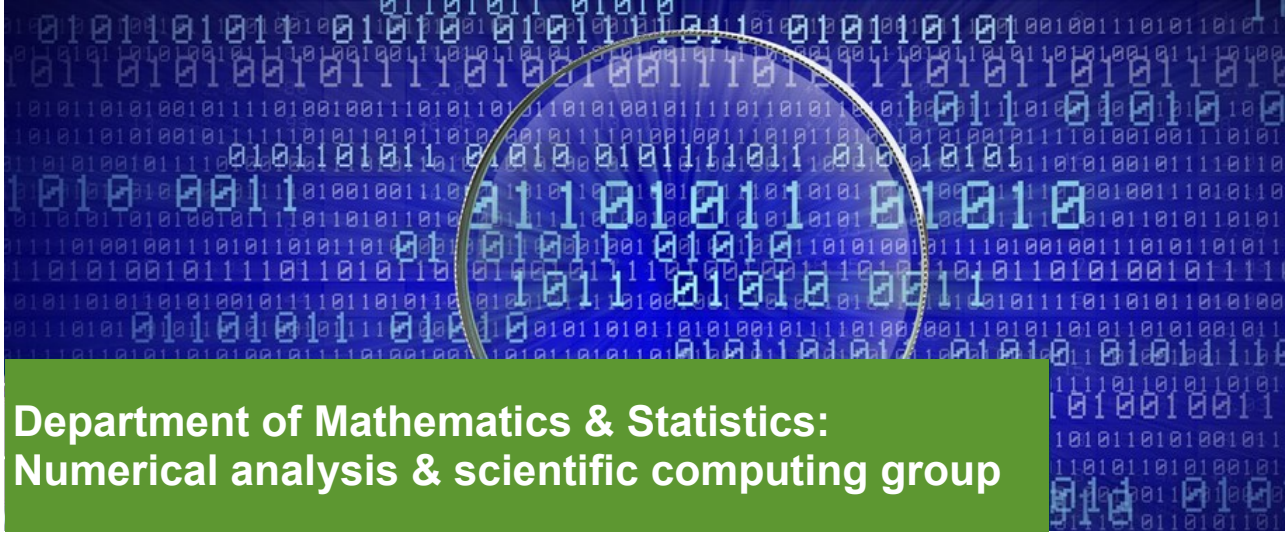
https://www.strath.ac.uk/research/subjects/mathematicsstatistics/continuummechanicsindustrialmathematics/



Department of Mathematics & Statistics: Numerical analysis & scientific computing group

Research Areas

- Numerical solutions of partial differential equations (PDEs)

  ■ hp finite elements for Maxwell's equations
  ■ Mixed hp finite element methods
  ■ Hierarchic modelling
  ■ Domain decomposition methods
  ■ Adaptive moving mesh methods based on the idea of equidistribution
  ■ Adaptive solution of phase change and moving boundary value problems
  ■ Uniform convergence of discrete methods on adaptive meshes for problems with near-singular solutions
  ■ A posteriori error estimates for finite element methods
  ■ Adaptive methods for steady and unsteady problems based on high order pseudospectral discretisations

- Stochastic computation

  ■ Numerical simulation of stochastic differential equations
  ■Applications to mathematical finance
  ■Computation with large, noisy data sets such as those arising in genomics. externally applied jets of air

- Numerical linear algebra

  ■ Effects of nonnormality on the performance of linear algebra routines. In particular, the stability of algorithms for finding a single eigenvalue-eigenvector pair
  ■ Influence of finite precision arithmetic in models of dynamical systems
  ■ Iterative solution of large sparse linear systems arising from finite element discretisation of problems in computational fluid dynamics.

- Computational physics & engineering

  ■ Fluid flow calculations in two and three dimensions using boundary fitted coordinates and adaptivity
  ■ Solution of fluid flows in industrial problems such as flow on rotating circular and elliptic cylinders and rivulets
  ■ Computational electromagnetics - stability and convergence of numerical time marching algorithms of the electric field integral equation on flat plate, thin wire and curved scatterers
  ■ Non-linear elasticity - biomechanics (developing nonlinearly elastic models of intestinal organs), buckling and barrelling of nonlinear elastic columns under axial compression.

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Department of Mathematics & Statistics: Population modelling & epidemiology

Research Areas

- Marine population modelling (MPM)
  - fish stock management
  - nutrient impacts on ecosystem dynamics
  - linkage between individual behaviour and population dynamics
  - the effects of ocean currents on the productivity of copepods
  - the effect of multispecies interactions on complex marine ecosystems
- Mathematical biology
  - antibiotic production in actinobacteria
  - evolutionary epidemiology
  - developmental cell signalling
  - cancer gene therapy
  - the modelling of communicable disease dynamics
- Epidemiology & statistical informatics
  - spatial statistics
  - experimental design and image processing
  - stochastic and deterministic differential equations for the modelling of infectious diseases and risk, particularly in relation to animal diseases

Research Projects

- Implementing spatial models for air pollution in central Scotland to investigate the link between atmospheric sulphur dioxide and health problems
- Modelling the epidemiology of measles, mumps and rubella to assess the spatial risk of the disease an potential effects of low MMR-vaccination uptake, providing key advice to the Chief Medical Officer in Scotland

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Department of Mathematics & Statistics: Stochastic analysis

Research Areas

- Stochastic Differential Equations
  - Existence-and-uniqueness theorems
  - Stochastic stability
  - Stochastic stabilisation
  - Stochastic control
  - Stochastic asymptotic analysis
  - Stochastic population dynamics
- Stochastic Computation
  - Numerical solutions of stochastic differential equations
  - Numerical methods for stochastic stability
  - Applications to mathematical finance
- Time Series
  - Dimension reduction for multivariate time series
  - Non-linear models and their applications in finance
  - Financial econometrics
  - Functional time series analysis
  - Extreme statistics and risk management
  - Empirical processes and related limit theorems
- Probability Theory
  - Random spatial graphs
  - Random walks
  - Martingale
- Image Analysis
  - Image segmentation and measurement, especially cell microscope images
  - Colour image analysis
  - Applications combining pattern recognition and image analysis
  - Prediction of time state of images of evolving textures
  - Morphological image processing
  - Image quality measures
- Bayesian Inference
  - Approximate Bayesian Computation
  - Stochastic modelling of biochemical systems
  - Applications of Bayesian inference in Systems Biology

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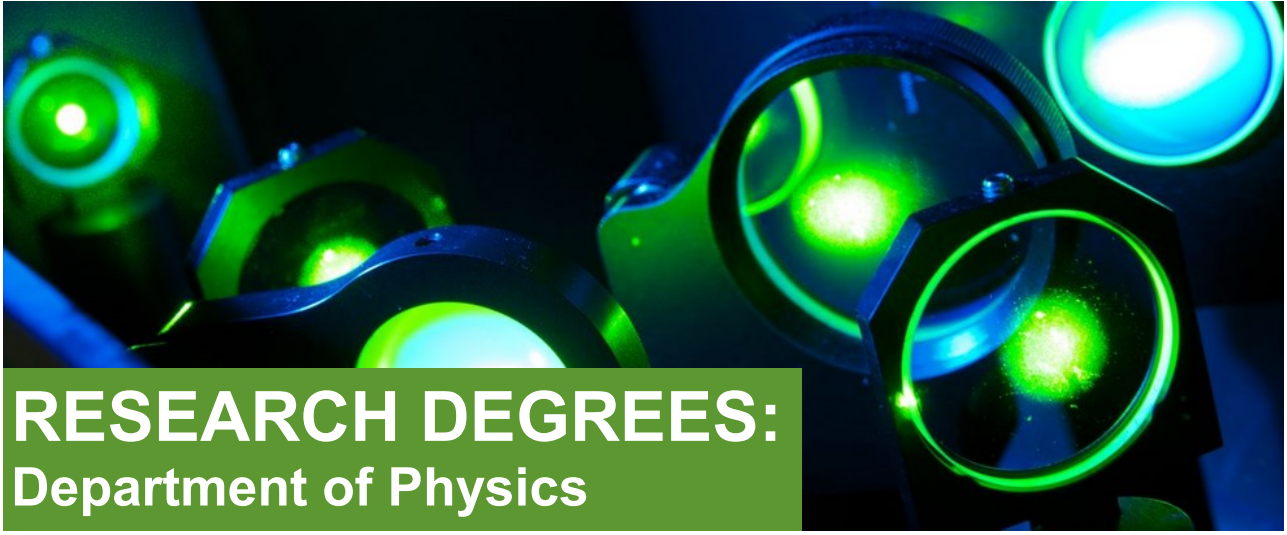
https://www.strath.ac.uk/research/subjects/mathematicsstatistics/stochasticanalysis/

Available examples of research topic titles

Research Area and/or Project Title
Numerical Analysis and Scientific Computing Group
Centrality Measures for Dynamic Networks
Stochastic Models for Online Interaction
Dynamic Communities
Computational methods for cell biology
Applied Analysis Group
Modelling Complex Networks of Fractures in Rocks of Petrophysical Interest
Hypernetwork Representation of Complex Systems
Repulsion-Attraction Model for Network Transitivity
Aspects of coagulation-fragmentation phenomena in submonolyer deposition and protein aggregation
Population Modelling and Epidemiology Group
Experimental Design
Statistical Methods for Quality Systems
Statistical and Mathematical Modelling of Sea Lice Populations
Mathematical Modelling of Disease Awareness Programs
Population Modelling and Epidemiology Group - MASTS
Surfing the Size Spectrum using Length-Structured Models
Modelling fisheries-induced evolution
Fishing for Resources: The Impact of Fishing in Historical and Contemporary Contexts
Evaluation of Maximum Sustainable Yield (MSY) in an ecosystem context
Continuum Mechanics and Industrial Mathematics Group
Dynamics of electric field-induced deformations in SmC and SmC* liquid crystals
Instability patterns in smectic Liquid crystals and Lipid Bilayers
Thin-film flow of complex fluids
Mathematical modelling of active fluids
Stochastic Analysis Group
Stochastic Stabilisation by Discrete-Time Feedback Control
Wind Speed SDE Models and Discrete-Time Feedback Control
Numerical Methods for Stochastic Stability
Stochastic Population Dynamics



RESEARCH DEGREES:
Department of Physics

Our Research

In the latest Research Excellence Framework (REF 2014), our Department of Physics is rated 1st department in the UK for research quality. That's ahead of Oxford, Cambridge and Imperial College.

The Physics Department is a founding member of the Scottish Universities Physics Alliance (SUPA).

You can study an MPhil or an MRes over the course of one year or a PhD over the course of three to four years.
You also have the option of an EngD over four or five years, depending on your research area.

MPhil, MRes & PhD

You can study either option in any of our four research groups:

- Nanoscience
- Optics
- Plasmas
- Institute of Photonics

Our Research is rated No 1 in the UK

EngD

Our EngD degree is specific to Applied Photonics

Entry Requirements

2:1 BSc (Hons) in Physics or related discipline or a degree agreed by the Head of Department.

General Contact for Department of Physics

University of Strathclyde,
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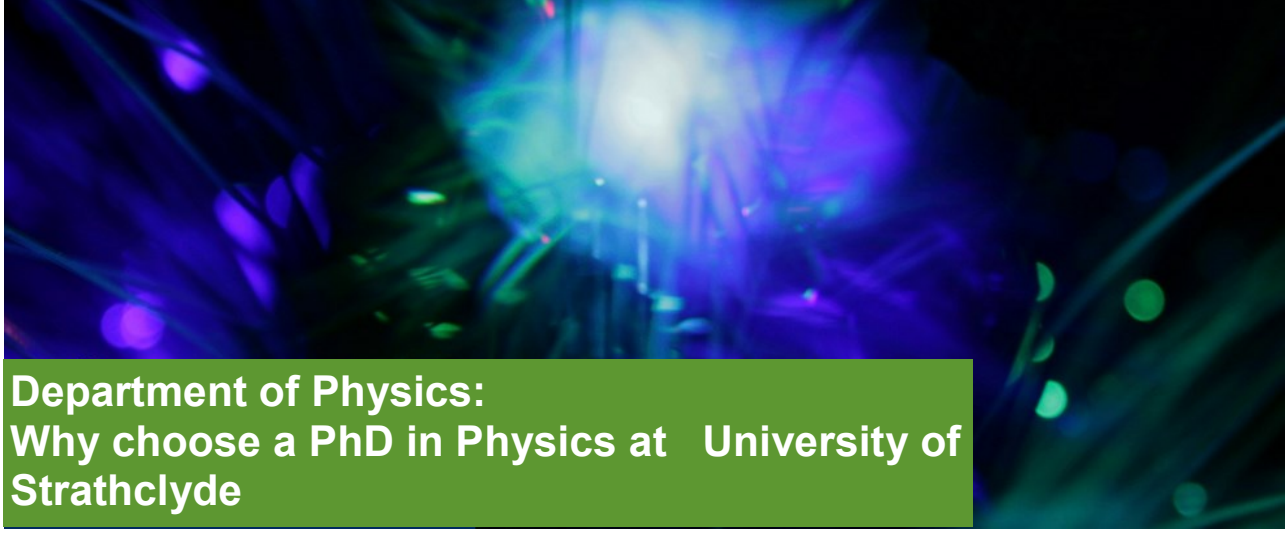


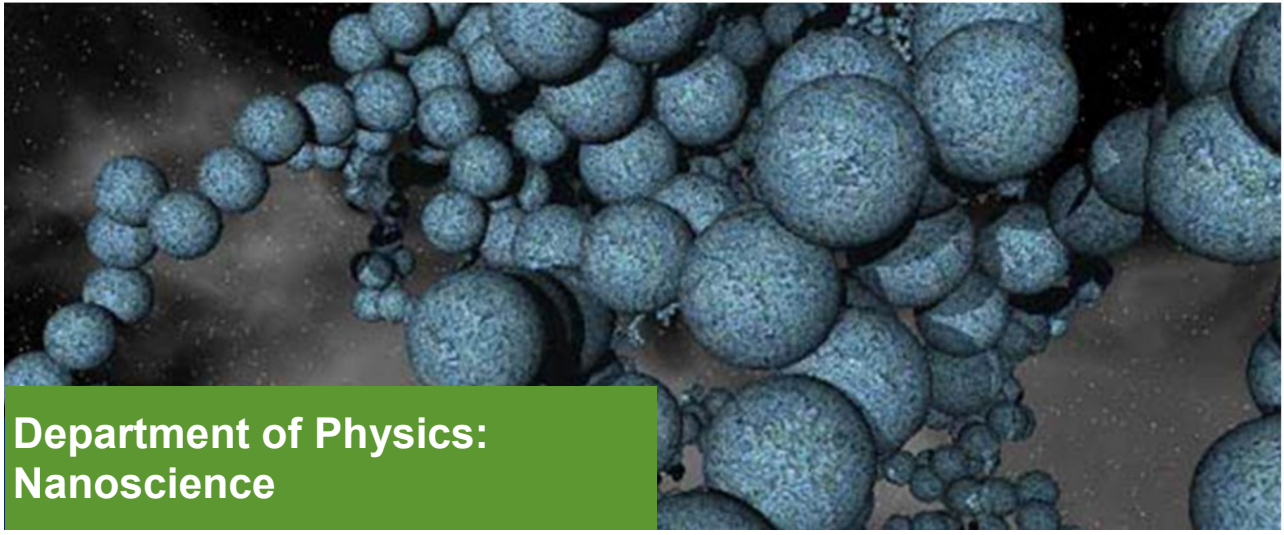
Department of Physics: Why choose a PhD in Physics at University of Strathclyde

? Testimonial 1

? Testimonial 2

? Testimonial 3

? Testimonial 4



Department of Physics: Nanoscience

Our Research

We currently have approximately £7.3m in research grants from EPSRC, SFC, PPARC, EU, NERC, STFC, Royal Society, and Leverhulme Trust.

Research Areas

Nanoscience is the most diverse division in Physics at Strathclyde. It reflects the broad range of scientific areas in which nanotechnology (the use of very small objects) will impact upon our future lives.

These areas include:

- Semiconductor device physics
- Biomolecular science
- Sensor development
- Computational biology
- Ocean science
- Physics and life sciences
- Gravitational wave detection

Our Facilities

- Scanning Electron microscopy suite for analysis of hard and soft matter
- Ultrafast Chemical Physics lab houses state-of-the-art femtosecond laser systems for multi-dimensional IR spectroscopy.
- The Centre for Molecular Nanometrology
- Access to local high-performance computing centre for computer modelling

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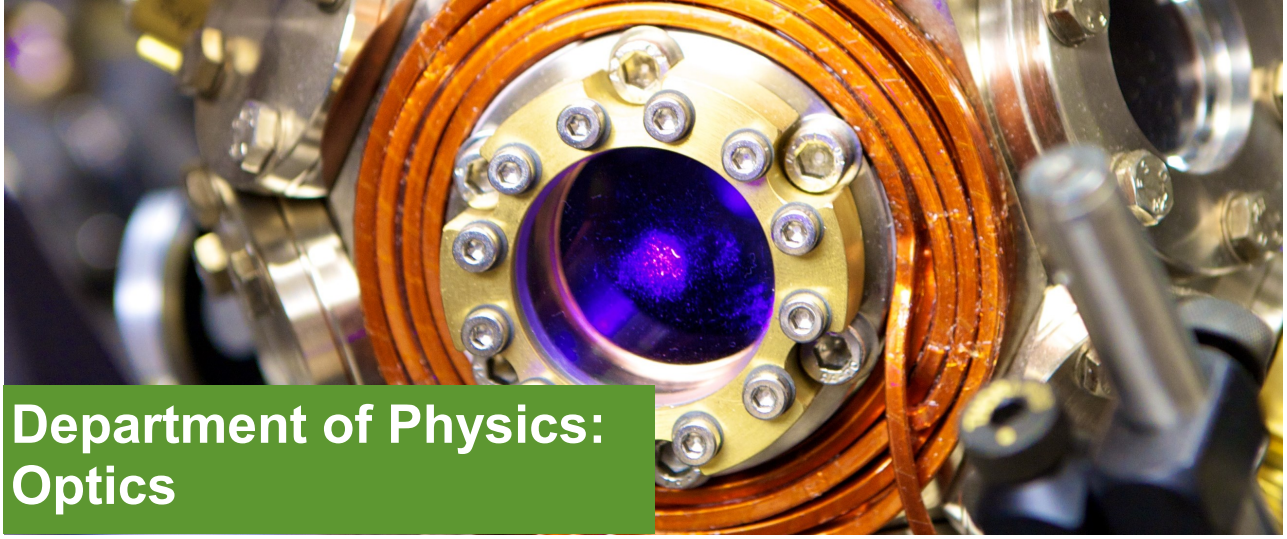
http://www.strath.ac.uk/research/subjects/physics/nanoscience/



Department of Physics: Optics

Our Research

Our optics division includes a theoretical research group, Computational Nonlinear & Quantum Optics (CNQO), and an experimental group, Experimental Quantum Optics and Photonics.

What are photonics and quantum optics?

Photonics refers to the science of light – how to generate and control it.
Quantum optics refers to the ability to control precisely the interactions between light and matter, down to the single atom and photon level.

Research Areas

Experimental Quantum Optics & Photonics Group

Research is focused on the a number of themes:

- Quantum simulation based on single-atom imaging in optical lattices
- Atom interferometry
- Non-linear atom-light interactions
- Dynamics, spatial modes and optical solitons in semiconductor lasers
- Self-organisation in ultracold atoms

Computational Nonlinear & Quantum Optics Group (CNQO)

Research is focused on the a number of themes:

- BECs and Cold Atoms
- Future Light Sources
- Nanophotonics
- Nonlinear Photonics
- Optical Angular Momentum
- Quantum Information

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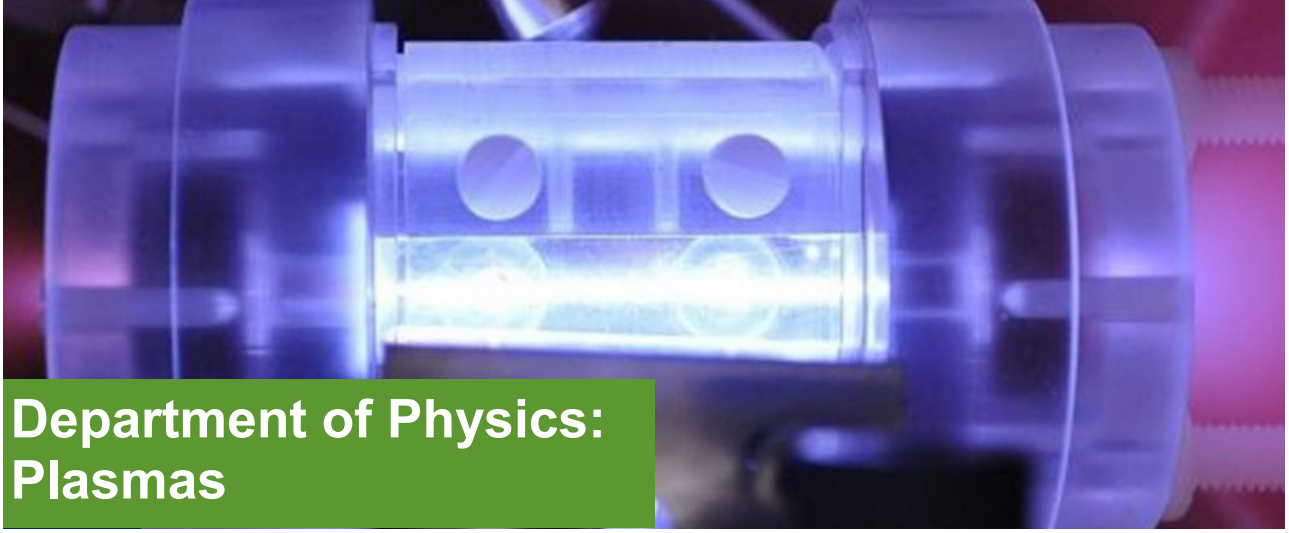

Department of Physics: Plasmas

Our Research

Our research is broadly based on free electron physics, accelerator science, plasma physics and atomic and molecular spectroscopy. Current topics we're researching are listed below.

Research Areas

Free electron physics

- Microwave amplifiers and oscillators based on free electron techniques
- High frequency sources based on novel slow wave and fast wave systems to address the 'THz gap'
- Novel electron optical systems for forming low emittance electron beams

Particle accelerator technology

- The Muon Ionisation Cooling Experiment (MICE) will be used for future lepton accelerators

Plasma physics

- Theoretical investigation of plasma wave propagation and evolution of non-linear structures
- Investigation into non-linear wave interactions in the ionosphere
- Experimental and numerical investigations of magnetospheric cyclotron instabilities, non-linear behaviour of instabilities in non-thermal plasmas and pseudospark discharges
- Theoretical, numerical and experimental investigation of: parametric instabilities in plasmas, relativistic laser plasma interactions, quantum plasmas
- Low pressure and low temperature experimental plasma physics
- Particle in Cell (PiC) simulations of plasma dynamics
- Research relevant to inertial and magnetic confinement fusion and shock physics

Atomic & molecular spectroscopy

- Fundamental atomic scattering theory and collisional-radiative modelling theory
- Development of the ADAS software and database for computation of atomic energy levels and transition rate coefficients
- Analysis of storage ring collision measurements
- Analysis of spectra from laboratory (including fusion) and space plasmas

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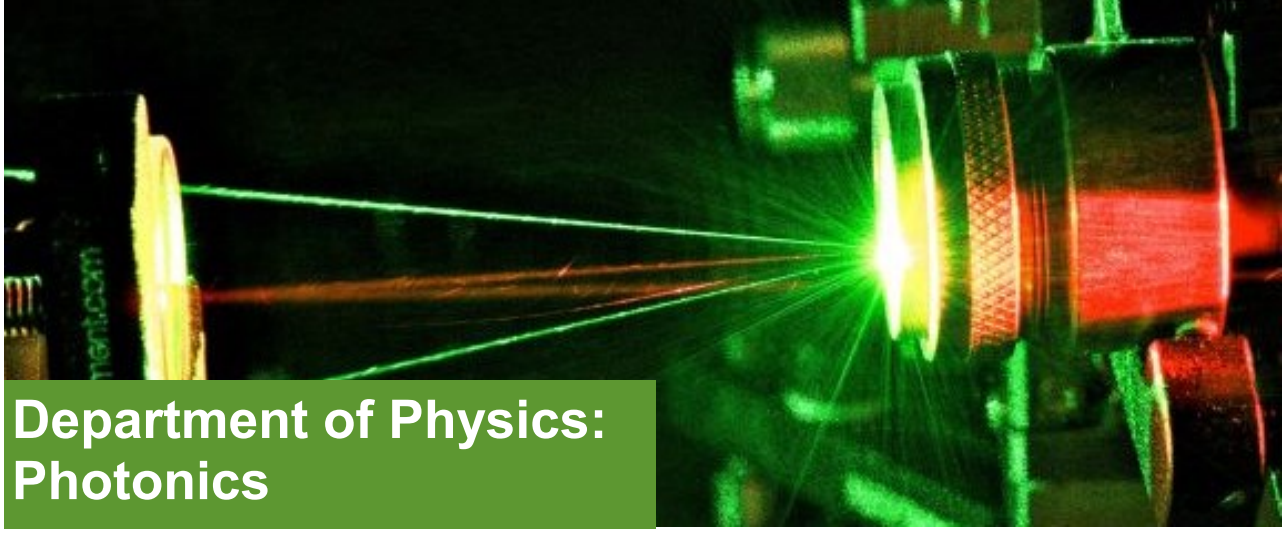

Department of Physics: Photonics

Our Research

Our research is focused on photonic material and devices, neurophotonics and advanced lasers. We specialize in: laser and LED sources, solid-state lasers, diamond raman lasers, VECSELs, microLED and nanoLED arrays, hybrid organic-inorganic photonics and optogenetics and biophotonics.

Research Areas

Photonic Materials and Devices

- Visible light communications (VLC)
- Ultra-portable explosives sensor
- Hybrid inorganic/organic devices
- Optoelectronic trapping (OET)
- Mask-free photolithography
- Colour-tuneable inorganic micro-display

Neurophotonics

- Microelectrode arrays for massively parallel recording from neural tissue
- Technologies for optogenetics
- Development of a retinal prosthesis to repair forms of blindness

Advanced Lasers

- High Brightness Semiconductor Disk Lasers
- Compact Solid-State

Contact

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http://www.strath.ac.uk/photonics/research/

Available examples of research topic titles

Research Area and/or Project Title
Computational & Nonlinear Quantum Optics (CNQO)
Theory and simulation of nonlinear optics & photonics quantum optics quantum information cold atoms/Bose-Einstein condensates future light sources nanophotonics
Photonics
Experimental studies of single-atom imaging atom optics nonlinear Photonics quantum cascade lasers
Photophysics
Interdisciplinary molecular research involving time-resolved fluorescence
Ultrafast Multidimensional Spectroscopy
Applications of ultrafast 2D-IR spectroscopy to understand the fundamental processes that underpin fundamental biological and chemical processes
Molecular Theory & Simulations
Theory and simulation of molecular-level effects at different kinds of solvation interfaces
Marine Optics & Remote Sensing
Studies of radiance transfer in seawater light utilisation by phytoplankton optical monitoring of ecological processes remote sensing in the marine environment
Semiconductor Spectroscopy & Devices
Studies of semiconductor materials issues luminescence characterisation electron backscatter diffraction electron channelling contrast imaging optical properties of plasmonic nanostructures semiconductor modelling
Nonlinear Spectroscopy & Sensing
Applications of spectroscopy in sensing and studies of interactions involving optically active ions in solid state materials
Gravitational Physics
Studies of gravitational wave detection gravity gradiometry gravitational modelling
Strathclyde Laser Interaction Studies
Studies of laser-driven accelerators coherent radiation sources laser-driven inertial fusion and nuclear physics radiobiology and medical imaging high field physics
Atoms, Beams & Plasmas
Studies of relativistic electron beam physics coherent radiation generation from electron beams non-neutral relativistic plasma physics plasma spectroscopy high-temperature stellar and fusion plasmas
Institute of Photonics
Photonic Materials and Devices (Institute of Photonics)
Neurophotonics Group (Institute of Photonics) Development of optoelectronic devices to interface with neural systems and further the understanding of neural processing
Advanced Lasers (Institute of Photonics)
Advanced Fabrication Technologies for Micro/Nano Optics and Photonics; Micro/Nano Diamond Photonics (Institute of Photonics)
Nanomembrane and Hybrid Photonics (Institute of Photonics)
Semiconductor Integrated Photonics (Institute of Photonics)

RESEARCH DEGREES:
Strathclyde Institute of Pharmacy & Biomedical Sciences (SIPBS)

Our Research

The Strathclyde Institute of Pharmacy & Biomedical Sciences is a major research centre in Scotland and is amongst the UK's top Schools of Pharmacy. We have a wide range of state-of-the-art research facilities and recently benefited from the opening of a new £36m building. Our research is focused on 'New Medicines, Better Medicines & Better Use of Medicines'.

MPhil & PhD

You can study either option in any of our three research groups:

- New medicines
- Better medicines
- Better use of medicines

DPharm

- This degree responds to an identified need for more NHS pharmacists to engage in research linked to their professional and practice role in areas in which a PhD research programme may not be the most appropriate qualification.

MRes

- Biomedical Science topics

Entry Requirements

2:1 BSc (Hons) in a Biomedical Science or related discipline or a degree agreed by the Head of Department.

General Contact for Strathclyde Institute of Pharmacy & Biomedical Sciences

University of Strathclyde
John Arbuthnott Building (Hamnett Wing)
161 Cathedral Street, Glasgow G4 0RE
+44 (0)141 548 2125
hodsipbs@strath.ac.uk
http://www.strath.ac.uk/research/subjects/pharmacybiomedicalsciences/

Department of Strathclyde Institute of Pharmacy & Biomedical Sciences: Why choose a PhD in Pharmacy at University of Strathclyde

? Testimonial 1

? Testimonial 2

? Testimonial 3

? Testimonial 4

Strathclyde Institute of Pharmacy & Biomedical Sciences: New medicines

Our Research

Our research incorporates a broad range of activity including cardiovascular, immunology, microbiology and neuroscience. These all focus on the following activities in order to meet the aims of the Strathclyde Institute of Pharmacy & Biomedical Sciences, the Faculty of Science and the University as a whole.

Research Areas

- advance our fundamental understanding of complex biological processes
- determine practical solutions to major challenges including healthier ageing and the control of infectious diseases
- use fundamental bioscience for better health across the life course, reducing the need for medical and social intervention
- utilise fundamental discovery science in order to develop innovative preventative and therapeutic interventions in humans
- develop solutions that underpin the healthcare and life sciences sectors
- discover and apply new technologies and approaches to replace, reduce and refine the use of animals for scientific purposes
- identify and apply research into environmental areas of major economic and societal importance
- apply the latest developments in our science and technology to health-related challenges

Target validation & drug discovery

Medicinal chemistry, chemical biology and regenerative therapeutic approaches are used to improve treatment of significant health needs, or focus on developing research tools that increase interrogative power of disease mechanisms and the efficiency of developing therapeutic interventions.

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https://www.strath.ac.uk/research/subjects/pharmacybiomedicalsciences/newmedicines/

Strathclyde Institute of Pharmacy & Biomedical Sciences: Better medicines

Our Research

This group engages in high quality, basic and applied research relating to the development and manufacture of drug substances and products.
Our research builds on expertise in physical and material science, pharmaceutical technology, and formulation and advanced processing to translate new and existing chemical entities into safe, effective and high quality medicines.

Research Areas

The Better Medicine programme combines investigator led and demand led programmes that will deliver:

- understanding of structure, function and stability of pharmaceutical materials for improved performance including analysis and modelling of structure property relations in pharmaceutical systems
- better science and technology for particulates, formulations and product development
- advanced manufacturing capabilities for small molecules and biopharmaceutical products
- understanding of the interaction between material properties and process parameters and quality
- drug delivery systems for the controlled delivery and targeting of therapeutic agents
- solutions for the industrial biotechnology community, particular for biopharmacy products and platform chemicals
- understanding of the physiological process of appropriate systems
- translation of research into products

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Strathclyde Institute of Pharmacy & Biomedical Sciences: Better use of medicines

Our Research

Our aim is to maximise the use of Scotland's rich health informatics datasets, including the new individual level prescribing dataset, to support stratified medicine approaches and investigate the impact of interventions on public health. We also aim to maximise health outcomes and reduce resource wastage through the design and testing of new health care intervention models.

Research Areas

Pharmacoepidemiology

- medicine adherence
- clinical outcomes
- toxicities in real world clinical practice

⇒ We lead the Farr Institute pharmacoepidemiology programme. This focuses on cardiovascular and immunological therapies and have complementary programmes in respiratory disease, cancer and infection.

⇒ We also lead the clinical infection informatics work stream within the new Scottish Healthcare Associated Infection Prevention Institute. Our clinical–academic pharmacoepidemiology network is embedded in local NHS systems and links with other international research networks.

Practice research

- new health technologies (medicines, diagnostics, telehealth, robotics)
- dosage guidelines to optimise therapy
- service delivery models

Funding

Current funding includes:

- Macmillan Cancer Support to explore new pharmacy palliative care service models in urban and rural communities
- Scottish Government/NHS Boards to develop and evaluate the adoption of clinical guidelines and to evaluate robotic technologies in pharmacy
- Health Foundation to lead the evaluation of the new Scottish Patient Safety Programme – Pharmacy in Primary Care Programme

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https://www.strath.ac.uk/research/subjects/pharmacybiomedicalsciences/betteruseofmedicines/

Available examples of research topic titles

Research Area and/or Project Title
Cardiovascular group
CaMKII modulation of inflammatory signalling in cardiac hypertrophy
Cellular mechanisms underlying P2 receptor-mediated vasoconstriction in pulmonary arteries
Characterisation of novel neurotransmitter signalling mechanism in urinary bladder smooth muscle
Imaging changes in vascular mitochondrial architecture and dynamics in ageing
Cell Biology group
Cell biology project studying the regulation and roles of autophagy in cancer stem cells
Effect of sphingosine 1-phosphate on the phosphoproteome and ubiquitinome of mammalian cells
Identification of novel sphingosine kinase activators from plants
Nonlinear optical mesoscopy
Infection, Immunity and Microbiology group
Bio-imaging to see the benefit of being a biofilm
Characterisation of the Control of Inflammatory Responses in Human Immune cells by bioactive lipids
Comparative genomics and metabolomics of Pseudomonas aeruginosa
Coordination of chromosome segregation with growth and development in the antibiotic producing bacterium, Streptomyces coelicolor
Neuroscience group
Brain systems for reward and reinforcement: understanding the psychoactive properties of nicotine
Characterisation of a novel mechanism for modulating the activity of pain-sensing nerves
Characterisation of a novel mechanism for modulating the activity of pain-sensing nerves
Cholinergic arousal systems and sensory perception
Pharmaceutical Sciences group
Can co-encapsulated antioxidant nanoparticles prevent cyclosporine side effects?
Design of nanosystems for local and systemic delivery of drugs
Marine Symbionts and Terrestrial Endophytes for Industrial Biotechnology of Novel Antibiotics
Natural antibiotics from the beehive