



The Personnel Unit

THE PERSONNEL UNIT

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Further Particulars

Post title	Lecturer/Senior Lecturer in Computational Maths
Reference number	S43088
School/department	School of Mathematics
Closing date for receipt of applications	15/1/2007
Hours	Full time
Salary range	£32,471 - £49,116 The successful candidate will be appointed at an appropriate grade depending on experience and qualifications.
Post duration	Permanent position
Number of vacancies available	1
Personnel contact(s)	Ms. Jo Gerald email: j.a.gerald@bham.ac.uk tel.: 0121 415 9000
Informal enquiries to	Prof. DJ Needham email: needham@maths.bham.ac.uk tel.: 0121 414 6593

Details

Role Purpose

The Applied and Applicable Mathematics Group pursues research in a number of complimentary areas of computational mathematics. Birmingham is recognised, nationally and internationally, as one of the leading centres in the EU for research in computational mathematics and related topics.

A permanent appointment in computational mathematics is sought to strengthen the computational and applied mathematic group, to broaden its research profile, and to open new possibilities for collaboration both within the School and outside.

Main Responsibilities

- To plan, design and co-ordinate broad research activities and programmes
- To contribute to the development of research strategies of the School
- To develop methodologies and techniques appropriate to the type of research being pursued and that add to the knowledge/understanding appropriate to the discipline
- To publish results of research in articles and/or books which lead to an enhanced reputation in the subject area and enhance the School's research profile
- To contribute to the development of innovative research proposals and contribute to funding bids which develop and sustain research support in the specialist area
- Successful supervision of doctoral students to completion

- To engage in scholarly activity that will enhance the School's and University's reputation such as membership of academic bodies and external examining bodies
- To teach and examine courses at all levels, ie undergraduate, postgraduate and/or higher research degree students, through lectures, seminars and personal supervision.
- To plan and review own teaching approach
- To develop and apply innovative teaching approaches and materials to enable learning and enthuse students
- To develop programme proposals and contribute to the wider design of the School's teaching programme
- To undertake the full range of responsibilities in relation to supervision, marking and examining to ensure that students progress is being monitored and reported in line with the School's procedures

Knowledge, Skills, Qualifications and Experience required

PhD in Mathematics or adjacent discipline with substantial experience of teaching and research in computational mathematics
 Excellent presentation skills
 Excellent communication skills both written and verbal

Job Features

Planning and Organising

Plan and manage research activities, publications and research proposals
 Plan and manage own teaching and tutorials as agreed with the Head of School.

Decision Making

Make professional decisions about the appropriate methodology in research.
 Make professional decisions about delivery methods and assessments in teaching

Internal/External Relations

Strengthening and widening existing networks for research and teaching.

In addition: To secure a Senior Lecturer Grade 9 appointment the individual would be required to undertake the following responsibilities and would also be required to have additional skills, knowledge and experience outlined below :-

Senior Lecturer - Teaching & Research (grade 9)

Main Responsibilities

- To make a major contribution to the management of research activities
- To lead major successful funding bids which develop and sustain research support for research in Algebra.
- To secure publication of key results in leading journals and/or books, which further develop the national and international reputation of the individual and the school.
- To provide expert advice to colleagues, students and external bodies e.g Government bodies
- To provide leadership of research that contributes to the progression of computational mathematics
- To referee and peer review articles for peer reviewed academic journals and grant applications by research councils and/or other major funding bodies
- To develop programme curricula within the School, ensuring these meet the standards within the University and external institutions
- To oversee the development and review of teaching provision for students at all levels, having responsibility for their design and quality
- To develop and review approaches to teaching which advance techniques and standards locally, contribute to institutional policy and serve as a contribution to the wider debate
- To plan and review own teaching load and approach to teaching, and share this good practice with others.
- To contribute to the determination of the academic standards framework throughout the University

- To ensure that the teaching activity achieves the educational standards of the School and University

Knowledge, Skills, Qualifications and Experience Required

- Extensive high level research and reputation over many years, supported by a relevant PhD and extensive professional success and achievement
- Research strength in computational mathematics
- Experience in cross-disciplinary collaboration is beneficial
- The capability to attract substantial external funds and research grants;
- Vision in developing undergraduate courses for single, joint and combined honours programmes

Job Features

Planning and Organising

Involved in planning of the School Research Strategy and contribute to the School's planning process

Internal/External Relationships

Lead and develop internal and external networks

FURTHER INFORMATION

The Appointment

The University of Birmingham intends to make an appointment at the lecturer or senior lecturer level in Computational Mathematics.

The School of Mathematics is engaged in further strengthening research activities in Pure Mathematics, Applied Mathematics and Management Mathematics. This appointment will complement recent appointments in computational mathematics namely, Professor Roy Mathias (Numerical Linear Algebra), Dr. Daniel Loghin (Numerical Analysis), Dr David Leppinen, Dr Natalia Petrovskaya, Dr Qian Xi Wang and Dr Grigori Sisoiev (Computational Fluid Mechanics), Professor Michael Kocvara, Dr Peter Butkovic, Dr Joerg Fliege and Dr Sandor Nemeth (Computational Optimisation).

For the senior lecturer position, the applicant will additionally have an existing international reputation in computational mathematics. Should they meet the criteria, successful applicants for the position of senior lecturer will be immediately considered for the title of Reader.

Applied and Applicable Mathematics

In the most recent Research Assessment Exercise (RAE2001), the Applied and Applicable Mathematics Group was awarded a Grade 5 (internationally recognized). Overall the School is currently ranked fifth in Mathematics in the UK by the Times Higher guide on Education. The Head of Group is Professor David Needham, and the Head of the School is Professor John Blake. Our main research areas are computational mathematics, fluid mechanics, reaction-diffusion theory, nonlinear waves, applied analysis and industrial mathematics.

The Applied and Applicable Mathematics Group is a young, vibrant and dynamic research group, attracting over £1.5m in research funding since the last RAE. The academic staff publish in high quality journals, work collaboratively with fellow applied mathematicians, scientists and engineers on the international stage and contribute to mathematical conferences through invitations, participation and organisation. Currently the staffing compliment consists of 6 Professors, 1 Reader, 5 Senior Lecturers, 9 Lecturers and 2 Visiting Professors from industry.

Recently the Applied and Applicable Mathematics Group has made a strategic decision to enhance research in numerical analysis and computational mathematics by the appointments of Professor Mathias, Dr Petrovskaya, Dr Loghin, Dr Wang, Dr Leppinen and Dr Sisoiev. Professor Mathias' expertise includes research in applied numerical linear algebra and numerical analysis, especially eigenvalue problems. Professor

Mathias has recently spent one year on study leave at the University of Oxford, where he has very strong links. Dr Petrovskaya works in applied numerical analysis and computational fluid mechanics, and acts as a consultant to Boeing. Dr Loghin's research interests include numerical analysis arising in non-Newtonian fluid mechanics. Dr Leppinen, Dr Sisoiev and Dr Wang work in areas of Computational Fluid Mechanics. Other areas of computational mathematics research within the School include: computational fluid mechanics problems arising in free-surface flows, chemically reacting flows and aerodynamics; computational biology; research into the finite element method and the boundary integral method; and computational optimization.

The strategy of the Applied and Applicable Mathematics group at Birmingham to date has been to:

- Deliberately focus its research interests in the areas of computational mathematics, fluid mechanics and applied analysis, to ensure a critical mass and to encourage collaboration between colleagues
- Take an international outlook on research and to collaborate with leading authorities in the field
- To build up advanced computing facilities and
- Appoint internationally distinguished academic staff in applied mathematics to any vacancies that may arise.

There is extensive collaboration with groups outside of Birmingham, as well as with the Schools of Biosciences, Chemical Engineering, the Medical School, and Metallurgy and Materials at the University of Birmingham.

Our main areas of research activity include,

- Reaction-diffusion theory and applied analysis
- Computational mathematics,
- Computational fluid mechanics
- Free-surface and interfacial phenomena
- Bubble dynamics and multiphase flow
- Dynamic wetting
- Micro- and nano-fluidics
- Biological fluid mechanics
- Transition to turbulence
- Dynamical systems, chaotic phenomena and control
- Fluid mechanics problems arising from collaboration with engineering and industry
- Nonlinear waves and evolution equations

In terms of the university's thematic research activity the following areas can be identified

- (i) Computationally intensive applied mathematics (boundary integral methods, finite difference, finite elements, Cobra code; 32 SUN V70 3.05GHz dual processors)
- (ii) Medical and biological sciences (Pharmaceuticals, Biosciences, Womens Hospital, e-Science initiative)
- (iii) Micro- and nano-technology phenomena (Kodak, Chemical Engineering, Mechanical Engineering), and
- (iv) Industrial fluid mechanics (Boeing, QinetiQ, Norsk Hydro, Western-Geco, Schlumberger Cambridge Research, Kodak Ltd., Nestle, Prismo, Cadbury's, Pilkingtons, Rugby Cement)
- (v) Energy research (fuel cells, Adelan Ltd.)

The Applied and Applicable Mathematics Group includes members of the University's Molecules and Materials Collaborative Research Network, as well as members of the University's Institute of Energy Research and Policy.

Further more specific details can be obtained on the School's web page www.mat.bham.ac.uk

Research is facilitated through provision of study leave, research funding for postdoctoral research fellows, postgraduate students and a high quality computing infrastructure with the recently funded JREI (£0.5m) supercomputer.

Major Funding Bodies include;

- EPSRC - studentships, CASE studentships, Advanced Fellows, Research Fellows, Equipment
- BBSRC - Research Fellows, Equipment

- NERC - Research Student
- JREI - supercomputer
- QinetiQ - Research Fellows, Equipment
- Wellcome Trust, Value in People Award Scheme
- NSF - Travel Funds
- Royal Society - Equipment, Travel Funds
- Industry - Boeing, Western-Geco, Kodak, Norsk-Hydro, Schlumberger Cambridge Research, Nestle, Prismo, Adelan Ltd., Pilkingtons, Rugby Cement, Yorkshire Water

Teaching

The School of Mathematics received the top score 24 in the last QAA evaluation (one of only two in the nation). The undergraduate programme consists of a 3-year B.Sc. degree and a 4-year M.Sci. degree. The first year is common to all degrees and the syllabus has been worked out in some detail to provide a coverage of all discipline areas. The syllabus for the Applied Mathematics components of the final year of the B.Sc. degree and for the last two years of the M.Sci. degree reflect the research interests of the Group. The programme in Theoretical Physics and Applied Mathematics has attracted highly qualified students while the new Mathematical Engineering is likely to attract students with strong interests in Applied Mathematics. It is also at the forefront with innovative developments in e-learning (AIM) and new courses associated with the Undergraduate Ambassadors Scheme and a course on Advancing the Mathematical Reasoning with funding from the Educational Advancement Foundation based at the University of Texas.

Increased undergraduate admission targets have been met with well qualified students. Our current undergraduate intake is over 215 students per year. Current overseas student numbers are about 15% of the fresher intake.

Within this group, Professor Blake, Dr Sangwin and Dr Hermans are actively involved with the Higher Education Academy's Maths, Stats & OR Network, whose national headquarters are based in Birmingham (funding approx. £2.5m over 5 years). With the recent White Paper on Higher Education, TQEC report and, in particular the Post-14 Mathematics review, chaired by Professor Adrian Smith, there is a potential likelihood that this will become a more significant activity with a strengthened research element. This activity though is spread over all three groups within the School, for which the School is well known on the international stage.

Candidate's areas of research expertise

The School is seeking to strengthen and broaden its research activities in computational mathematics, while still keeping a strong commitment to the practical application of its research to engineering, science and industry (as measured by funding from external bodies, including industry). Applicants from theoretical and applied computational mathematics are welcome, ranging from numerical linear algebra to computational fluid mechanics.

Candidate's areas of research expertise

In the School's Watson Building there are excellent computing facilities for academic staff, postdoctoral fellows and postgraduate students. All rooms have networked computers that allow access to School, central University and Internet facilities. There are also computer laboratories and facilities providing high quality laser and colour printing. Recently the School has been funded by the JREI to purchase a multi-processor supercomputer (32 SUN V70 3.05 GHz dual processors). A wide range of mathematical and statistical software is available including NAG, Gino, Maple, Matlab, Minitab, Glim, BMDP, SAS, SPSS, Genstat and Fluent.

Within the School there are a number of multiprocessor UNIX (Sun, Compaq, Silicon Graphics) and Windows NT servers providing facilities for teaching and research. Three computer clusters equipped with around 100 X-terminals or PCs are used for undergraduate teaching and are available for use by undergraduates and postgraduates. Additional facilities (X-terminals, PCs or UNIX workstations) are provided in postgraduate offices. Local copies of site-licensed mathematical software are available on the School's computers as well as specialist software packages such as Maple, Matlab and NAG software.

The Information Services High Performance Computing (HPC) Service released the

new HPC facility in May 2003. It provides a powerful central facility running a range of commercial applications, as well as providing computer power to researchers who develop their own codes. The applications base covers many areas, including the broad areas of engineering analysis codes (Abaqus, Nastran, Patran) and associated pre- and post-processors, Computational Fluid Dynamics (CFX and Fluent), symbolic mathematics (Mathematica, Maple, Matlab), statistics (SAS) and Geographical Information systems (Arc/Info and Arc/View). A full range of compilers and the NAG Numerical Library are available for the development of bespoke mathematical models. Interactive 3D data and scientific visualisation is provided by AVS/Express, scientific graphing by Gsharp and graphical subroutines (callable from Fortran and C) by the AVS/Toolmaster libraries. The hardware is a cluster of 6 dual-processor HP J6700 workstations, split between batch and interactive use. The batch nodes each have 8 Gbytes of memory, with the interactive node having 16 Gbytes enabling the large jobs that are typically found in the engineering and scientific research teams to be run in real memory. Storage is provided by an HP8000 Network Attached Filestore server. This currently has 2 Tbytes of filestore and can be readily expanded to 78 Tbytes within the same chassis. This filestore is backed up nightly. Since this is a network attached filestore it is possible to make filestore available, by arrangement, to other machines (both Windows and Unix/Linux based systems), opening up the possibility of sharing files easily between several PCs (for example, amongst a research group using a variety of machines), the main compute servers and the facilities in the HP Visual and Spatial Technology Centre. There is also interaction with the e-Science facility in Computer Science.

City of Birmingham

Birmingham is Britain's second city and is at the centre of the national rail and motorway networks. Its International Airport has flights to the major national and European airports.

The city is well equipped with theatres, art galleries and concert halls. The Symphony Hall, one of the leading concert halls in Europe, is home to the internationally renowned City of Birmingham Symphony Orchestra. Birmingham is also the home of the Birmingham Royal Ballet (formerly Sadlers Wells).

General Guidance for Candidates

Applications must include:

- a completed application form
- a full curriculum vitae,
- a list of publications,
- a short description of past and proposed research activities
- the names and addresses of three referees,
- the equal opportunities form

Copies of the following publications are available on request from the School of Mathematics:

The General University Prospectus,
The Postgraduate Handbook of the School,
The Undergraduate Admissions Booklet.

Further Information

The School welcomes informal enquiries from interested persons. Contact may be made with

Professor D. J. Needham - Head of Applied and Applicable Mathematics
Phone: 0121-414-6593 (6587) E-mail: needhamd@maths.bham.ac.uk Fax: 0121-414-3389

or

Professor R Mathias - Professor of Applied Mathematics
Phone: 0121-414-7374 E-mail: mathiasr@for.mat.bham.ac.uk
Applied and Applicable Mathematics Group
Academic and Research Staff

Professor JR Blake, Professor of Applied Mathematics, Head of School.
Biological fluid mechanics, cavitation, bubble dynamics, underwater explosions, industrial mathematical modelling.

Professor DJ Needham, Professor of Applied Mathematics, Head of Applied and

Applicable Mathematics

Reaction-diffusion theory, applied analysis, nonlinear waves, industrial mathematics.
Professor SP Decent, Professor of Applied Mathematics
Liquid jets, micro-fluidics, fuel cells, mathematical modelling in chemical engineering, chemistry and industry.

Professor M Kocsvara, Professor of Combinatorial Optimisation
Computational optimisation, optimisation problems in aircraft design

Professor R Mathias, Professor of Applied Mathematics
Numerical linear algebra and applied linear algebra.

Professor YD Shikhmurzaev, Professor of Fluid Dynamics
Singularities in fluid dynamics, dynamic wetting, free-surface cusps, micro-fluidics, topological transitions in fluids

Dr P N Patil, Reader in Statistics - Statistics, medial statistics.

Dr P Butkovic, Senior Lecturer - Combinatorial and algebraic optimisation, applied discrete mathematics

Dr J Fliege, Senior Lecturer - Multiobjective decision making, optimisation of mobile phone networks, computational optimisation.

Dr DFM Hermans, Senior Lecturer - Mathematical education, Magnetohydrodynamics
Dr JA Leach, Senior Lecturer - Reaction-diffusion theory, nonlinear evolution dynamics, mathematical chemistry

Dr SO Stephen, Senior Lecturer - Hydrodynamic stability, stability of compressible boundary layers and shock layer-boundary layer interactions using asymptotic and numerical methods

Dr DM Leppinen, Lecturer - Heat and mass transfer, multiphase flow.

Dr D Loghin, Lecturer - Computational fluid mechanics. Non-Newtonian flows.

Dr S Z Nemeth - Multicriteria decision problems, optimisation

Dr N Petrovskaya, Lecturer - Computational fluid dynamics

Dr NM Queen, Lecturer - Elementary-particle theory, neural network models, optimization techniques

Dr CJ Sangwin, Lecturer - Nonlinear control theory, Mathematical Education

Dr G Sisoiev, Lecturer - Instability of liquid films. Modelling in chemical engineering.

Dr WR Smith, Lecturer - Differential equations in industry, moving boundary problems, semiconductor lasers

Dr QX Wang, Lecturer - Free-surface flows, waves, bubbles and floating bodies.

Dr DJ Smith, Research Fellow - Biological fluid mechanics

Ms A Watts, Lecturer - Statistics

Professor A Clarke, Honorary Professor of Applied Mathematics, Senior Scientist, Kodak Coating flows

Professor JRA Pearson FRS, Honorary Professor of Applied Mathematics, Formerly Scientific Advisor to Schlumberger Cambridge Research, Industrial fluid mechanics and rheology

Emeritus Professor R A Cuninghame-Green - Industrial Mathematics, industrial stock-cutting problems

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