

Mathematics and statistics

Collecting policy

User profile

This collection development statement covers provision for the Department of Mathematics, and Statistics -part of the School of Mathematics and Physical Sciences, within the Faculty of Science.

It is one of the leading departments of mathematics and statistics in the United Kingdom, with 86% of research recognised as World Leading or Internationally Excellent in the most recent (2014) Research Excellence Framework assessment

Research interests

A large part of the current research interests in mathematics are at the interface of pure and applied areas, while the statistics group has expertise in several areas of applied statistics. The department is involved in a number of interdisciplinary research projects, including joint work with the Department of Meteorology, the Centre for Integrative Neuroscience and Neurodynamics, and the Reading Systems Biology Network.

Research in the department is organised into several research groups which overlap and interact significantly:

1. Analysis - Pure, Applicable and Numerical, including:

Pure and Applicable Analysis:

Pure and Applicable Analysis is one of the core mathematical disciplines offering a wide range of research topics ranging from investigations in Number Theory to applications in important questions triggered by applications in areas such as fluid dynamics. The research group in Mathematical Analysis in Reading is one of the biggest in the department, and covers many different research strands.

Numerical Analysis and Computational Modelling:

Numerical analysis research in Reading is primarily focused on the numerical solution of differential equations. Many physical phenomena can be modelled by differential equations, but apart from some very specific cases it is in general not possible to write down the solution to these problems in closed form. In order to understand the behaviour of the solution, it is thus often necessary to construct an approximation via a computational algorithm. The research concerns the development and analysis of such algorithms for a range of problems, with the goal, in general, being to achieve provably high accuracy without incurring excessive computational cost.

Data Assimilation and Inverse Problems:

Data Assimilation (or DA for short) is a term used in weather, ocean, and climate science that refers to the following problem: given a dynamical model (e.g. a model simulating atmospheric motion) and given a series of observations (e.g. wind measurements from the real weather), find a trajectory of the model that matches the observed data. The Data Assimilation research group at the Department of Mathematics and Statistics is part of the Data Assimilation Research Centre (DARC), which involves researchers across the entire School.

2. Statistics and Applied Statistics, including:

Probability and Stochastic Analysis:

Probability theory naturally appears in the description and analysis of all these different areas. Located between pure and applied mathematics, this field overlaps with many different branches of mathematics and provides a background as well as tools to properly formulate and solve problems from various other sciences. From its inception as an analysis of 'chance', modern probability theory is indispensable in mathematical fields as different as combinatorics, real and complex analysis, and group theory.

Applied Statistics:

Numerous methodological developments by researchers in this group have given rise to important impacts in a wide range of applications. Current research continues in this tradition, with the development of new statistical methods for analysis of large and complex data sets being increasingly important in the current era of 'big data'.

3. Complex Fluids and Theoretical Polymer Physics:

Theoretical Polymer Physics group became part of Department of Mathematics and Statistics in 2007. The main focus of the group is structure and dynamics of complex fluids, with polymeric fluids being the overarching theme.

4. Centre for the Mathematics Of Human Behaviour:

The Centre for the Mathematics of human behaviour research focuses on the dynamics of evolving networks, agent-based modelling and time series analysis.

5. Mathematical Biology:

Mathematical expertise in this group covers continuum modelling, nonlinear ordinary and partial differential equations, agent based modelling, inverse methods, multiscale modelling and asymptotic methods. The research work is focused in the areas of cardiovascular health, bacterial chemotaxis, lipoprotein metabolism, systems pharmacology, neuroscience and neurodynamics and tumour growth.

Dimensions of Teaching and Learning

There are a large number of undergraduates in the department. Taught postgraduate numbers are relatively low.

Taught courses

The department offers a range of undergraduate programmes involving mathematics. All of the programmes can be undertaken with an additional year spent on work placement, in

industry or similar organisation. Students have flexibility in their choice of modules, and may be able to change between degree programmes, provided that appropriate modules have been chosen. Many of the programmes carry accreditation or approval from the relevant professional body or learned organisation. A full list of undergraduate courses can be found here: <http://www.reading.ac.uk/maths-and-stats/Undergraduate/maths-ugcourses.aspx>

There is an MSc taught jointly with the Department of Meteorology (MSc in Data Assimilation and Inverse Methods in Geoscience). There is also an MSc taught jointly with the ICMA Centre within Henley Business School (MSc in Financial Engineering).

Engagement of part-time students on the Masters programmes will be facilitated. There are no undergraduate part-time or distance learning courses.

There are few external users of the collection.

Current holdings

The majority of mathematics material is classed within the 510-519 (mathematics and statistics) sequence. Because of the strong applied and interdisciplinary nature of the subject, books may be found at a variety of numbers within the classification sequence, e.g. mathematical physics at 530.15; biomathematics/biometry at 574.0151; finite element method in engineering at 620.0015176. For more detail see the Mathematics and statistics finding your way guide.

The book and journals stock is reviewed regularly. Older books and pre 1990 journals have either been disposed of or relegated to an off-site store to keep the collection current and to create extra space for new materials.

The Department subscribes to two major series: the two proceedings published by the American Society of Mathematics: *Proceedings of symposia in applied mathematics*, and *Proceedings of symposia in pure mathematics*.

Books and e-books

Electronic only versions of the *Numerical analysis reports* produced by the Department post 2002 are available. The Library also holds a full print archive of these.

There is a large, and increasing number of mathematical e-books including some reference material.

Periodicals

Recent Library subscriptions to large journal packages have resulted in many more mathematics and statistics related titles becoming available online. This is in addition to a number of new discipline-specific subscriptions funded by the increase in Library material budget.

Reference materials – print and electronic (including bibliographic databases)

There are about 40 reference works in mathematics and statistics in the 2nd Floor Reference section. The Library has subscriptions to a number of online reference packages including *Oxford Reference Online Premium* and *Credo* – these give access to specialist reference materials, including substantial articles and reputable web pages as well more general works. There are many Internet resources available in this subject. Information about these can be found in the guides *Useful websites for applied statistics* and *Useful websites for mathematics*

The key subject specific and general bibliographic databases provided are:

- MathSciNet
- ISI Web of Knowledge (containing the Science Citation Index)
- OCLC FirstSearch

Multimedia

The Library does not hold more than the occasional CD-ROM accompanying a book and does not actively collect multimedia materials in this subject area.

Related Special Collections

The Neville Collection has more than 500 significant works in mathematics and related subject areas, collected by the late Eric Harold Neville, Professor of Mathematics from 1919-1954, plus his manuscripts held at UMASCS (University Museums and Special Collections Services).

There are also significant mathematics books in the Special Collections, some of which were donated by Sir Arthur Rücker and Sir George Young.

Strengths, exclusions and areas for development

Strengths of the collection include: numerical analysis, statistics in medicine, computational modelling and numerical solutions of differential equations. Much of the collection is adequate but ageing. From the mathematics perspective History of mathematics is of decreasing importance.

Collections in operator theory, algebra and applied analysis are adequate as are books on Polymer physics.

Current funding allows the Department's Library Representative to purchase all books requested by staff to support research. Complex fluids and polymer fluid dynamics; cell-signalling and mathematical biology, medicine and systems provision is expected to need to develop in future years. Additional texts to support new modules such as systems biology are needed and resources exist to keep pace with developments in teaching.

Additional current physics journals particularly Physical Reviews (available electronically via PROLA up to 2007 and SIAM titles would strengthen the collections as would ejournals packages such as Wiley, Springer, CUP and OUP. Text-mining software would be useful.

Collecting level

The policy is to provide a working collection to support undergraduate teaching and the research carried out within the Department. The Library does not aim to have a complete research collection covering the whole of the subject - the Department's research priorities places the emphasis of the collection on the periodicals, the books supplementing this basic aim.

Taught students are well supported by lecture notes but encouraged to read more widely and avoid overreliance on internet resources.

Alternative access

Inter-library loans

The department is a relatively light user of the Library's Inter Library Loan service.

Other information resources in the University

There is a small Department Library, established in its own room in 2003. It contains a collection of over 1,000 titles and is supported by a modest departmental budget. There is generally no overlap or duplication of titles in the Main Library collection.

Selection, acquisition and stock editing

See the General Collection Development Statement for general principles.

Material is collected in English primarily, however some important works in other European languages may be bought.

Only a few books for the undergraduate courses are duplicated; some are made 7 day loans with a small number of titles in the Course Collection (6 hour loans).

New editions of significant works of relevance to the research and teaching topics of the Department are collected. A high level of currency is required.

Underused extra copies and other material may be withdrawn or relegated to closed access subject to the general principle of maintaining a balanced representative collection on the shelves in consultation with the Department. Relegations of outdated but historically valuable works are sometimes made by transferring such items to Special Collections Services or to remote storage.

Students and teachers often prefer to use printed texts in preference to e-versions because of specialist notation and the need to follow through formulae. The preferred policy is to only acquire e-books for large cohorts in addition to the print versions. Students are encouraged to evaluate books on the shelves before borrowing or buying them for project work. Problems with accessing formats such as pdf's on Kindles or other difficulties with the variety of platforms and devices needs to be taken into consideration in developments of e-book provision. The format of research level books (print or electronic) should be decided on a title by title basis.

Policy written by Tim Chapman, Mathematics and Statistics Liaison librarian, September 2015.