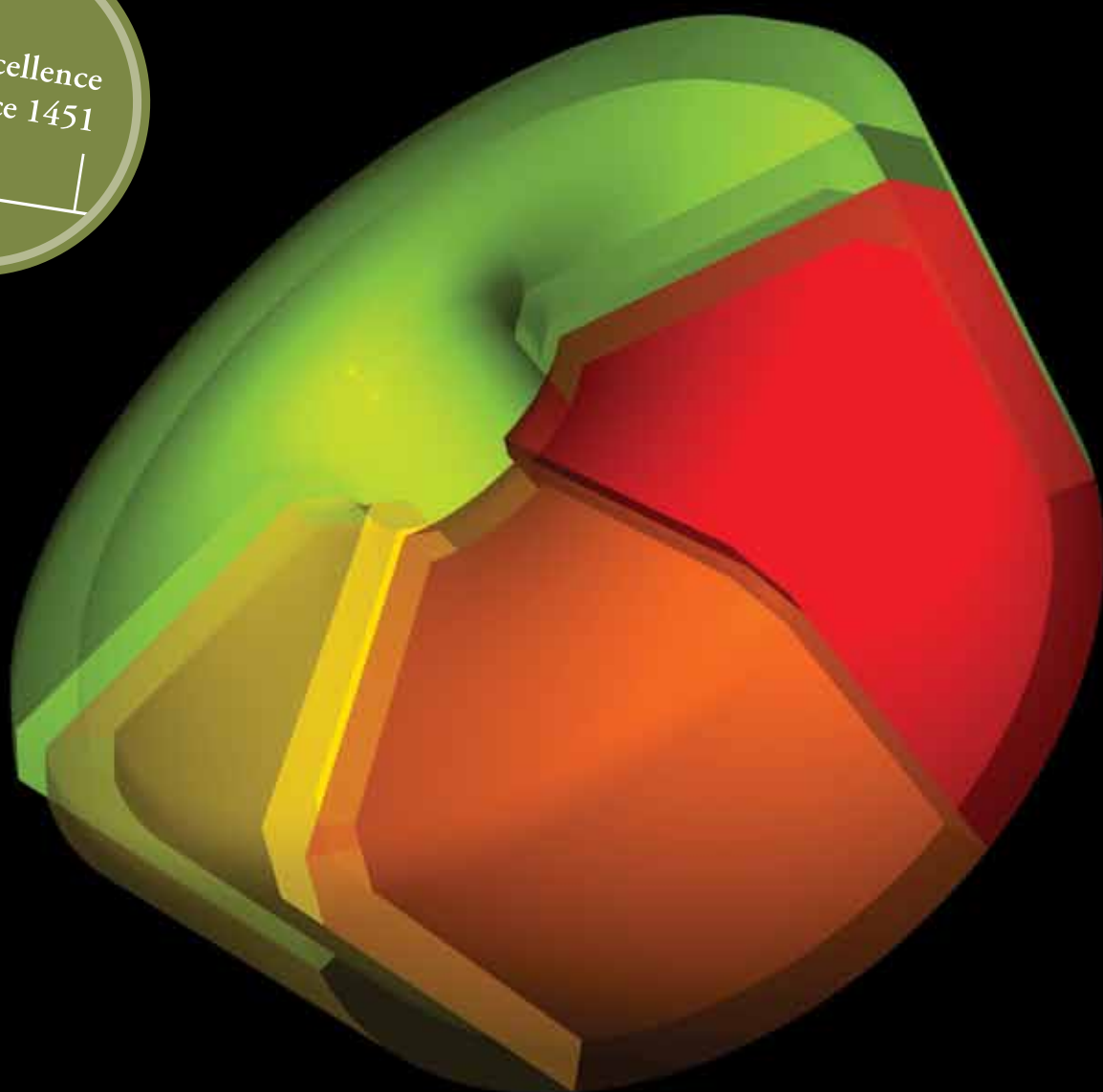




University of Glasgow | Faculties of Science

# Mathematics and statistics

## Undergraduate study 2010





# Mathematics and statistics

## Introduction

At the University of Glasgow, we have a long tradition of training students in the mathematical sciences. Our flexible degree programmes ensure that you will have a broad subject base, so that theoretical training is firmly grounded in reality. The structure of the degree gives you a wide choice of options.

Our degrees are highly respected. Following graduation, our students find interesting jobs in industry, finance, accounting, pharmaceuticals, teaching and research.

We are committed to teaching, research and student support and in the National Student Survey 2008, final year undergraduate students studying Mathematics (including Statistics) expressed overall satisfaction ratings, which were outstandingly high at 96%.

Mathematics and statistics play a key role in the developments that have transformed modern life and are fundamental to progress in:

- engineering
- technology
- medicine
- bioinformatics
- finance.

They are applied in such diverse areas as mobile phone technology, medical imaging and internet security and are essential in designing drug and field trials, analysing brain scans and interpreting satellite data.

New tools are constantly being developed, so there are always jobs for graduates.

## Faster Route programmes

These might be of interest to you if you: are highly qualified at A-level or Advanced Higher level in relevant subjects; are motivated and keen to pursue an Engineering/Science degree with maximum concentration on the subject; wish to complete your degree faster than the normal time frame.

For further information about entry requirements visit [www.glasgow.ac.uk/undergraduate/degrees/entryrequirements](http://www.glasgow.ac.uk/undergraduate/degrees/entryrequirements)

## Mathematics

Mathematics is a dynamic subject that is rapidly developing across a wide spectrum of research areas. For many people the coherence and elegance of mathematics give a sufficient reason to study it. Others are motivated by the fact that it plays a key role in a number of areas, such as:

- the development of science
- the development of models that explain the physical characteristics of the universe
- the study of engineering
- the study of social sciences and economics
- in models for biology and medicine.

A degree in mathematics:

- develops clear logical thinking
- teaches you to separate out the key points in a problem and then use them to solve it.

## Statistics

Statistics is an important and fascinating subject with applications in most academic disciplines and areas of life. Statisticians are in demand to provide expertise in the design of experiments and in the analysis and interpretation of the information generated from these studies.

To deal effectively with these challenging problems, as a statistician you will need to develop:

- a good understanding of the context of the problem
- an ability to present it to others
- an ability to use sophisticated mathematical methods and computer analyses to derive meaningful practical solutions.

Any numerical drudgery is removed through the use of computers, so you will learn to be skilled in using these. You will learn to:

- use software including word-processing, spreadsheet and database packages as well as specialised statistical software
- validly interpret and apply the resulting output.

We have links with business and offer projects that involve working with professionals, **giving an excellent boost to your future employment prospects.**

[www.glasgow.ac.uk/fims](http://www.glasgow.ac.uk/fims)



The Department of Mathematics has a variety of prizes for students who perform well. There are prizes at every level. Our top students in the first year get a scholarship of £380 over two years. At Honours the top prizes can be worth as much as £750.

# Mathematics

## Mathematics/Applied Mathematics

Degree: BSc, MA, MA (SocSci), MSci

### Typical offer

<b>Highers</b>	BBBB, preferably with two science subjects
<b>A-levels</b>	BBB, preferably with two science subjects
<b>IB</b>	30 points including three science subjects

For entry requirements visit [www.glasgow.ac.uk/undergraduate/degrees/entryrequirements](http://www.glasgow.ac.uk/undergraduate/degrees/entryrequirements)

Mathematics is a vast and ever-growing subject which incorporates successful explorations of numerical, geometrical and logical relationships. Both Pure and Applied Mathematics also have varied applications in many branches of human activity, including science, engineering, medicine and commerce.

- The Mathematics degree programme caters for students who are interested in all aspects of mathematics, not just those aspects that have immediate applications.
- The Applied Mathematics degree programme allows students with a flair for mathematics who prefer the practical and applicable aspects of the subject to concentrate on these elements at Honours level, without studying a substantial compulsory amount of Pure Mathematics.

### What can I expect in first year?

We offer two Level-1 streams, one for very well-qualified students, the other for students who come in with a Higher pass in Mathematics or its equivalent. When you come to University you will be assigned an adviser who will help you make the right choice.

Both streams consist of a pair of half-year courses. The topics covered include:

- matrices
- linear equations
- probability
- complex numbers
- vectors
- calculus.

All of these have applications:

- vectors and matrices to computer graphics
- calculus and complex numbers to communications

- calculus to engineering, physics and economics.

Teaching is by four hours of lectures, a one-hour tutorial in mathematics each week, and a mathematics workshop in alternate weeks. Due to the nature of the work, material is presented in detail and you will have a comprehensive set of notes for later study. Your lecturer will set work every week that you have to hand in. The work will be discussed at the tutorial, and further examples explored.

You should understand the main thrust of what the lecturer is explaining at the lecture, but everyone needs to spend time after each lecture going through it and trying examples in addition to the set work. This helps you gain fluency in problem-solving. Often you will have the buzz of getting a fresh insight into a subject or of doing something you could not do before. Additionally, there is a skills test programme running throughout the year to develop the skills required to succeed with university mathematics. This is supported by an online skills practice system, which you can access from any computer, and a drop-in mathematical support centre known as MathsBase. MathsBase is staffed regularly and also offers assistance on all aspects of the first-year Mathematics programme.

### Non-Honours strand

In the first half of the year, everyone studies the same course, whether you want to take Honours Mathematics or just want to do a little more mathematics at university. However, in the second half of the year we offer a course for students who do not wish to do Honours Mathematics. This is concerned more with applying mathematics and less with rigorous proof of the concepts involved. This does lead on to Level-2 courses, but not to the full range on offer in the department.

### What can I expect in second year?

We offer a wide variety of courses at Level-2. Some are core to our Honours degree, others are service courses for other departments or provide a wider curriculum to interested students. The Honours package consists of the following six courses which are prerequisites for Honours in Mathematics or Applied Mathematics:

- Multivariable calculus
- Linear algebra
- Topics in applied mathematics
- Topics in linear algebra and calculus

- Introduction to real analysis
- Foundations of pure mathematics.

We offer a further two courses looking at different areas where mathematical modelling is used:

- Financial modelling
- Linear modelling.

Finally, we offer two further courses on other topics of interest:

- Graphs and networks
- Number theory and cryptography.

### What happens next?

#### Honours

At the end of your second year you may choose what Honours degree you wish to pursue.

If you decide on Honours Mathematics you will study a wide range of topics in pure and applied mathematics.

If you decide on Honours Applied Mathematics then the courses are biased towards topics that are used in applications.

Students who decide to do a Combined Honours degree study a subset of courses, together with courses from the other subject.

All BSc and MA Honours degrees are four-year programmes. The MSci is a five-year degree.

#### BSc degree

If you opt to study for a Single Honours BSc degree, in your third year you will take four courses each semester, each course consisting of lectures plus frequent tutorials.

In addition, you will take two group seminar projects. These give you a chance to explore ideas in more depth and to look at mathematical topics that are of general interest. You will work closely with other students under the supervision of a member of staff and present your results to an audience of students and staff at a one-day meeting.

The topics for the seminars range from the historical to highly mathematical – two recent topics were:

- Discuss Isaac Barrow's life and works
- Linear and nonlinear superposition of waves.

The fact that you have experience of working as part of a team and presenting a report will be invaluable. Employers are very keen on this



[www.glasgow.ac.uk/fims](http://www.glasgow.ac.uk/fims)

### Joint Honours combinations

You may study Mathematics with another subject at Honours level. Subjects which may be taken in combination with Mathematics include:

- Archaeology
- Arts & Media Informatics
- Astronomy
- Business & Management
- Celtic Civilisation
- Celtic Studies
- Central & East European Studies
- Chemistry
- Classics (Classical Civilisation)
- Computing Science
- Czech
- Economic & Social History
- Economics
- English Language
- English Literature
- French
- Gaelic
- Geography
- History
- History of Art
- Italian
- Latin
- Music
- Philosophy
- Physics
- Politics
- Psychology
- Russian
- Scottish History
- Scottish Literature
- Slavonic Studies
- Statistics
- Theatre Studies
- Theology & Religious Studies.

### Joint Honours combinations

You may study Applied Mathematics with another subject at Honours level. Subjects which may be taken in combination with Applied Mathematics include:

- Astronomy
- Business & Management
- Chemistry
- Computing Science
- Economics
- Geography
- Philosophy
- Physics
- Psychology
- Statistics
- Zoology

type of training. Although our students find it quite scary presenting a report for the first time, they say that the practice they have had helps enormously at job interviews.

In fourth year, you will choose what courses you would like to do from a set of options. These change from year to year, but recent options have included:

- Algebraic number theory
- Designs and codes
- Differential geometry
- Nonlinear waves
- Linear analysis
- Fluid dynamics
- Mathematical ecology.

There are usually more than 20 optional courses from which you choose seven over the year. You will also do a project supervised by a member of staff. You can choose to do a project on a mathematical topic, on the history of mathematics or you can participate in the Ambassadors Scheme, which involves working alongside a teacher in a school for part of the semester.

Combined Honours students do a specified half of the Single Honours curriculum, with the same from their other subject.

### MSci degree

This is a truly challenging five-year course for highly motivated and able students. You do the same courses as the BSc Honours students but with a wider choice of options. The final year has advanced courses and a substantial project. It is ideal training if you are thinking of going on to research in mathematics or a related area.

### Designated degree

If you decide not to do an Honours degree, but wish to take a Designated degree in Mathematics, you take a further four courses in Mathematics at Level-3. These build on the work you have done in previous years and give a good basis for going into teaching. In addition, you do some courses from another department.

## Mathematical Sciences

Degree: BSc

### Typical offer

<b>Highers</b>	BBBB, preferably with two science subjects
<b>A-levels</b>	BBB, preferably with two science subjects
<b>IB</b>	30 points including three science subjects

For entry requirements visit [www.glasgow.ac.uk/undergraduate/degrees/entryrequirements](http://www.glasgow.ac.uk/undergraduate/degrees/entryrequirements)

This broadly-based degree programme develops logical thinking and abstract methods of thought to enhance problem-solving skills.

The programme involves the study of three disciplines:

- Mathematics
- Statistics
- Computing Science.

It provides a good grounding in mathematical sciences with an emphasis on algorithmic aspects of these subjects.

### What can I expect in first year?

Initially you will study computing science and mathematics (plus the option of also studying statistics).

### What can I expect in second year?

In the following year you will study statistics, computing science and mathematics.

### What happens next?

#### Honours

If you progress to Honours, you will study equal coursework from each discipline with some compulsory components in third and fourth years. You will also have the opportunity to select courses from a range of options.

A seminar programme in third year develops your group-working and presentational skills. An important feature of the fourth year is a jointly-supervised project which combines two departments.

Teaching is delivered through a combination of lectures, small group tutorials, seminars and lab work.

159	1.40	0.9192
186	1.41	0.9207
12	1.42	0.9222
8	1.43	0.9236
1	1.44	0.9251
	1.45	0.9265
	1.46	0.9279



# Statistics

## Statistics

Degree: BSc, MA, MA (SocSci), MSci

### Typical offer

<b>Highers</b>	BBBB, preferably with two science subjects
<b>A-levels</b>	BBB, preferably with two science subjects
<b>IB</b>	30 points including three science subjects

For entry requirements visit [www.glasgow.ac.uk/undergraduate/degrees/entryrequirements](http://www.glasgow.ac.uk/undergraduate/degrees/entryrequirements)

Statistics is the science of collecting, analysing, presenting and interpreting data.

This can happen in almost all academic disciplines and in every area of life.

Applications include:

- analysis of brain scans
- interpreting satellite data
- computer aided medical diagnosis
- designing drug or GM crop trials
- industrial quality control
- monitoring radioactive fallout
- understanding Alzheimer's disease
- quantitative linguistics
- bioinformatics.

### What can I expect in first year?

The course you study in Level-1 depends upon your experience in mathematics. If you have the equivalent of a current Scottish Higher, there are two Level-1 courses you can take:

- Probability and statistical methods 1
- Design of experiments, analysis of variance and statistical methods for paired data 1.

We also offer one other Level-1 course for students with less mathematical expertise and whose interest in statistics is primarily to support their principal subject of study:

- Practical statistics for psychology, social and life sciences.

### What can I expect in second year?

There are six Level-2 courses. If you are intending to take Honours Statistics, you must study four of these along with the Level-2 mathematics courses in Calculus and Algebra or Linear algebra.

The Statistics courses are:

- Probability
- Statistical methods
- Probability and likelihood
- Regression modelling.

We have two remaining Level-2 Statistics courses that may be taken by intending Honours students, but may also be taken as self-contained practically-orientated developments of any of the Level-1 courses. These are:

- Survey methods and data analysis
- Advanced data analysis.

### What happens next?

#### Honours

At the end of second year you may progress to Honours Statistics, which can be taken as a Single Honours degree or as a Joint Honours degree taken in combination with another subject.

Available since 1971, we can boast one of the UK's longest running Single Honours degrees in Statistics. This degree takes four years. We also offer a Single Honours MSci degree to be taken over five years. The aim of this degree is to challenge the most able students and provide a taste of current topics in statistical research.

All courses in Statistics feature laboratory and/or project work. The aim of these is to illustrate material covered in lectures and give you the opportunity to work on your own with real data sets, most of which will have arisen from the collaborative work of our department's staff.

We have been in the forefront of pioneering this mode of learning from the start of our Single Honours degree and it has always proved valuable when our students are seeking employment.

All Honours students do a project. Past project topics include:

- predicting the need for caesarean section when labour is induced
- mountain rescue casualty bags
- classification of handwritten digits in US zipcodes
- physical activity in overweight children
- mutation models for DNA sequences
- soft drinks and teeth
- condensation in Scottish housing.

### Joint Honours combinations

You may study Statistics with another subject at Honours level. Subjects which may be taken in combination with Statistics include:

- Accounting\*
- Applied Mathematics
- Business & Management
- Business Economics
- Computing Science
- Economics
- Finance\*
- Geography
- Mathematics
- Psychology
- Pure Mathematics.

\* *Need special entry requirements.*

One important feature of project activities is a presentation. You will give a talk or produce a poster describing your project problem, your analyses and results. This, along with writing a report in non-technical language, provides you with two important transferable skills. You will also:

- gain experience in teamwork through working in groups on revision lab problems and giving talks on these
- learn to use statistical packages as well as gaining appreciation of the use and misuse of computers and computer software in statistics.

### Designated degree

If you do not want to study at Honours level, we offer a Designated BSc degree in Statistics. This is gained after three years following the same curriculum as for the first three years of the Honours BSc course.

### Entry routes to Statistics

In addition to Level-1 entry, it is possible to enter Level-2 Statistics directly without any knowledge of the subject. The entry requirement is the equivalent of Level-1 Mathematics. We also have new faster route degree programmes, which offer a reduced time period of three years for Honours (BSc) and four years for MSci.

The Royal Statistical Society accredits all our Honours degrees.

'I love the Statistics department. Everyone's so friendly – they don't act like lecturers or teachers, they're just really friendly people.'

**Abita Bhaskar**, Maths and Statistics (pictured left)

[www.glasgow.ac.uk/fims](http://www.glasgow.ac.uk/fims)

### Can I study abroad?

At Glasgow you can take advantage of a range of exciting opportunities to study abroad as part of your degree. Courses you take overseas form an integral part of your degree without adding an extra year or semester. The benefits are huge. You will not only be able to gain an entirely new perspective on your academic subject and enhance your employability, you will also find out new things about yourself, increase your independence, develop self-confidence, learn to live and work with people from different backgrounds and cultures and form a large circle of international friends.

Students who have studied abroad describe it as a life-changing experience – 'the best year of my life'.

### Studying in Europe

You can study at more than 250 universities all over Europe under the Erasmus programme. Erasmus is an EU exchange programme that enables students in 31 European countries to study for part of their degree in another European country. Exchanges can last from 3-10 months and study credit is transferred to your home university.

### Bologna/Glasgow degree

The University has recently approved a double degree with the University of Bologna. Glasgow students will spend their third year in Bologna where staff will teach in English.

### Beyond Europe

The International Exchange Programme allows you to spend a year at institutions in Australia, Canada, Central & South America, Hong Kong, Japan, Korea, New Zealand, Singapore and the USA. All the institutions teach in English except Chuo University in Japan and those in Central & South America.

**The University holds a Study Abroad Fair every November. Information is also available on our website: [www.glasgow.ac.uk/studying/exchange](http://www.glasgow.ac.uk/studying/exchange)**

### What are my career prospects?

As mathematics and statistics are central to science, technology, computing and finance, it's hard to think of an area where mathematical expertise is not relevant. The range of career opportunities for graduates is shown by the careers our students have entered upon. These include:

- **Finance:** accountancy, insurance, risk analysis, credit scoring
- **Computing:** systems analysis, games design, software design
- **Statistics:** actuarial work, medical statistics, operational research, quality engineering
- **Research and development:** space flight, electronics, aviation, power industry
- **Teaching:** university and school teaching
- **Research:** PhD and MSc degrees

Here are some career paths followed by former students:

- **Music:** Kenny McAlpine graduated with a degree in Mathematics. He always had an interest in music and since graduating has used his knowledge to compose music electronically for computer games.
- **Animation:** Christian Erskine graduated with a degree in Mathematics and Computing Science. He joined Inner Workings, a Glasgow-based software company developing interactive storybooks.
- **Actuarial Science:** John Taylor graduated with a degree in Mathematics. He went on to work for Standard Life as an actuary.
- **Credit Risk Analyst:** Stuart Young graduated with a degree in Statistics, stayed on to do a PhD and joined the Royal Bank of Scotland as a credit risk analyst.
- **Clinical Statistician:** Lynne Young graduated with a degree in Statistics. She immediately embarked on full time postgraduate work focusing on the topic of pain in animals. She now works for Astra Zeneca, drug trials being a major focus of her work.
- **Quality Engineer:** Gary Vint graduated with a degree in Statistics and joined a company in the east of Scotland as a quality engineer. This means he monitors production using statistical process control techniques and carries out experiments to study the effects on product quality characteristics when relevant factors are changed.

### Where can I find out more?

For further information about studying mathematics at Glasgow, please contact:  
Dr David Webber, tel: +44 (0) 141 330 6527/5176, email: [d.webber@maths.gla.ac.uk](mailto:d.webber@maths.gla.ac.uk)

For further information about studying statistics at Glasgow, please contact:  
Dr Ben Torsney, tel: +44 (0) 141 330 5149, email: [b.torsney@stats.gla.ac.uk](mailto:b.torsney@stats.gla.ac.uk)

### Come and visit us

#### Open Day

[www.glasgow.ac.uk/openday](http://www.glasgow.ac.uk/openday)

In June and September we hold an Open Day to allow you, your family and teachers to visit us on campus and see a little of the city.

Open Day allows you to speak to staff in academic departments, find out more about courses, tour the facilities, visit student accommodation and see for yourself what life would be like as a student at Glasgow. If you have a long way to travel you can also stay in one of our student residences.

#### Alternative visiting arrangements

Open Day is the best way for you to get a comprehensive picture of what being a student here would be like. However, if for any reason you can't make it on that date, then we will be able to make alternative arrangements. To find out more visit: [www.glasgow.ac.uk/afternoonvisits](http://www.glasgow.ac.uk/afternoonvisits)

#### Applicants' Visit Day

At Glasgow we go the extra mile. If you receive an offer of a place at Glasgow, we will invite you to visit us before making your final decision. Applicants' Visit Day usually takes place in March. Details will be sent to you together with your offer of a place.

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Lonely Planet



www.seeglasgow.com

## City of Glasgow

### What is it like living and studying in Glasgow?

Named as one of the world's top ten cities by independent travel guide *Lonely Planet*, Glasgow attracts the largest student population in Scotland. The city's reputation for friendliness means that wherever you come from, you'll soon treat it as your second home. Glasgow is:

- situated in the central belt of Scotland on the River Clyde
- Scotland's largest city
- home to a population of 600,000.

### Some of the city's many attractions include:

#### Music and nightlife

In an average week Glasgow hosts 123 bands, 72 classical composers, 49 choirs, 38 orchestras and 21 jazz bands. Renowned for discovering acts from Franz Ferdinand to Primal Scream, the city's fantastic live music haunts include King Tut's Wah Wah Hut – voted UK's best live venue by listeners of Radio 1 three years in a row.

More than 700 bars, pubs and nightclubs mean no two nights in Glasgow are the same. Whether you're after a record-breaking 100-foot long bar (the Horseshoe), or a pub with stuffed stags' heads and kilned staff that's as appealing as it is unpronounceable (Uisge Beatha), Glasgow has a venue to suit. Dance until you drop at the Subclub, or revisit 1920s America at the Vegas clubnight on the Renfrew Ferry, it's up to you.

What's more, due to our diverse and multicultural population, you can eat your way around the world in Glasgow restaurants.

#### Festivals

At least one festival every month of the year shows Glasgow loves to celebrate. Some of our favourites include the Glasgow International Comedy Festival, Celtic Connections folk music festival, Glasgay, Glasgow Film Festival and Aye Write!, the city's book festival. In the summer, you're only 50 minutes away from Edinburgh's International and Fringe Festivals by train.

#### Culture

Art lovers and museum wanderers are spoilt for choice, with the city's famous Burrell collection vying for attention beside Scotland's most visited attraction, the Kelvingrove Art Gallery & Museum. Discover live art within the cavernous brick archway spaces beneath Glasgow's Central Station at the Arches, or enjoy 'a play, a pie and a pint' at Oran Mor, a former church that has since been converted into a theatre, bar and nightclub.

#### Sport

Wearing its passion for sport on its sleeve, Glasgow's set to host the Commonwealth Games in 2014. Across the world people know the city as home of Celtic and Rangers football clubs, but with no fewer than 27 public fitness centres including swimming pools, running tracks, 11-a-side pitches and tennis courts, you're guaranteed to find something to get involved with, whatever your level of fitness.

#### Campus culture

Are you craving cosy campus living, or do you prefer big city excitement? Whichever is your style, you'll be impressed by the University's excellent location in the compact and friendly West End of Glasgow. Just two miles from the city centre, with great bus and underground links, the West End has a reputation as the bohemian, trendy and cosmopolitan quarter of Glasgow.

