Further Information

Faculty of Engineering and Design MSc programmes 1
The University of Bath 2
The City of Bath 4

Department of Architecture & Civil Engineering
MSc Architectural Engineering: Environmental Design 6
MSc Architectural Engineering: Façade Engineering 10
MSc Civil Engineering: Innovative Structural Materials 14
MSc Conservation of Historic Buildings 18
MSc Modern Building Design 22

Department of Mechanical Engineering
MSc Automotive Engineering 26
MSc Engineering Design 30
MSc Innovation and Technology Management 34
MSc Mechatronics 38

Department of Electronic & Electrical Engineering
MSc Electrical Power Systems 42

Distance Learning
MSc Electrical Power Systems by distance learning 47
MSc International Construction Management by distance learning 48

How to apply 49
Fees and Finance 49
Living in Bath 50
Other useful resources 51

The information in this publication is correct as of August 2014, but all matters contained in this brochure are subject to change from time to time both before and after a candidate’s admission. The University may at its discretion, and for any reason, alter or not offer courses or parts of courses.
Faculty of Engineering & Design MSc programmes

Our graduate MSc programmes will give you the competitive advantage in your career.

Our unique Engineering programmes, which develop your professional understanding in a research and design context, and highly specialised Architectural Engineering and Conservation programmes produce graduates widely sought after by industry. Our graduates are able to transfer their technical and business skills from Bath to their chosen career, and all our master’s programmes reflect the world-changing research we carry out.

This brochure details how each programme delivers this unique combination of skills to enable you to become a future specialist and technology leader.

The Faculty Graduate School

The Graduate School team offers a dedicated support service to all postgraduate enquirers, applicants, students and staff, and help to create a friendly community for all our postgraduate students. The team ensures an expert and dedicated point of contact before you arrive for any enquiries about your application and arrival in Bath. During your studies, the team offers support by organising academic, administrative, careers-related and social events. They can be contacted on fedgradschool@bath.ac.uk

“Top 20 amongst the world’s universities”

QS University Rankings of the world top 50 under 50 years old in 2013

Professor J Gary Hawley, Dean of the Faculty of Engineering & Design

“Welcome to the Faculty of Engineering & Design. The University of Bath is consistently ranked in the top ten elite universities in the UK. This speaks volumes not only for the quality of our research and teaching but equally demonstrates our commitment to a high-quality student learning experience. This brochure has been specifically designed to help you better understand the master’s provision we offer and what you can expect in terms of support. I look forward to welcoming you to our university.”

Dr Sally Clift, Associate Dean for Graduate Studies

“We are delighted that you are considering studying an MSc in the Faculty of Engineering & Design at the University of Bath. Our programmes are designed to develop the technical, professional and leadership skills that will support you throughout your entire career, whether that be in industry or academia worldwide.

“Our taught master’s programmes are underpinned by our internationally-leading research environment. You will be taught by our experts and become junior members of our research teams while doing your dissertation project work. Bath is a wonderful place to be; come and join us!”
“All first time overseas postgraduates studying a full-time programme will be guaranteed accommodation as long as they apply by the deadline, usually the end of July.”

Accommodation Office
The University of Bath

The University of Bath is a small elite university with around 15,000 students. We focus on maximising the employability of our students and enhancing our international reputation for excellence and innovation in research.

The Faculty of Engineering & Design ranks in the top 3 across all departments in The Sunday Times League Tables 2013. Our subject areas regularly rank in the top 10 in the UK, as does the University overall. The University is located just one mile from the city centre on one campus with all the amenities and facilities you will need to have a fulfilling student experience.

The benefits of our campus university
A campus university means everything you need as a student is in easy reach on one site. As well as the laboratories and lecture theatres, facilities for your lifestyle and social life are catered for on campus. Benefits of the Bath campus are:

- it is self-contained; it has two grocery stores, two banks, a dentist, medical centre and around ten different places to eat and drink
- it produces a friendly community, with all students working and studying on the same site
- there is 24-hour security providing a safe environment for all
- facilities are within walking distance, with travel time between buildings at a maximum of ten minutes
- it is easy to meet people from other academic departments, due to everything being on the same site.

Campus facilities
The University of Bath has extensive facilities for its students for both academic and social purposes.

- The University Accommodation Centre helps you to find suitable accommodation, as well as offering social trips to the surrounding areas. Examples include the world famous countryside views of the Cotswolds, and trips to the Christmas Markets in Hyde Park, London.
- The Library is open 24 hours, 365 days a year.
- The Careers Advisory Centre offers help on anything from finding and applying for a job, to interview techniques. It also organises networking events and workshops on employability.
- Our Sports Training Village has an ethos of ‘Sport for All’, offering training grounds for professional athletes and starter activities for those who want to try something new. It has facilities for all sorts of exercise from Rugby fields to a Judo Dojo room.
- The Institute of Contemporary Interdisciplinary Arts (ICIA) offers subsidised music, art and dance lessons to students, giving you the opportunity to learn something new at an affordable cost. With music practice rooms, there is a theatre and art gallery on campus. It also offers an extensive programme of live performances, exhibitions and concerts.

The Students’ Union
The Students’ Union (SU) is the social centre and support network of the University, dedicated to students’ welfare. It is a democratically elected student body that represents students’ concerns at the University. Here are just a few things that they do:

- organise social events like the Summer Ball and Freshers’ Week (the first week at university dedicated to socialising and orientation)
- ensure students’ voices are heard on important issues like tuition fees, and social space
- offer over a hundred clubs and societies, presenting a great way to meet new people. Choose anything from breakdancing to bell ringing, curry appreciation to cheerleading
- advertise volunteer opportunities, locally and internationally. Opportunities include volunteering in orphanages in Eastern Europe, multicultural schemes to introduce young people to new cultures, and tutoring and mentoring schemes.

International students
The University of Bath has a vibrant international community, with students from 100 different countries. Specific support and facilities are provided to help international students arrive here safely and feel at home on campus:

- a handbook before you leave for university, informing you of all essential information
- expert help and support on issues such as visas, from the International Student Advice Team and the International Office
- Fresh, the campus supermarket, including Fresh Oriental, an international foods section
- the International Student Association, which offers weekly drop-in sessions for any concerns you may have, and also organises campus-wide activities that give you the opportunity to showcase cultural talents, such as at the Festival on the Hill
- we have around 20 cultural societies at the University of Bath that offer support as well as a great way to meet others from different countries. Examples are the Bath Thai Society, Chinese Student Society and the Japanese Society. See more at www.bathstudent.com
The City of Bath

View of Bath Abbey from the ancient baths.

“Favourite UK city”
Guardian & Observer Travel Awards 2013
The City of Bath

Voted the UK’s favourite city (Guardian & Observer Travel Awards 2013), Bath is one of the most interesting, cosmopolitan and vibrant cities in the UK. It is also the only city in the UK to be included in UNESCO’s World Heritage list. Bath was named after its famous natural hot spring, popular with the ancient Romans and still enjoyed today. You can enjoy the same mineral rich waters in the modern Thermae Spa, Britain’s original and only natural thermal spa, with its rooftop panoramic views of Bath’s skyline.

You can enjoy many things in Bath for free as a student, and there’s more to see than just the sites for tourists, with locals enjoying underground nightclubs and boutique shops. When living here, you can enjoy the frequent cultural events, with festivals going on every couple of months, ranging from the International Film Festival to the Jane Austen festival and the Great Bath Feast.

Bath has everything from high-end famous restaurants to cheaper student bars, as well as theatres and cinemas and a large variety of shops. There is a lot to do in Bath and there are many outdoor activities like boating along the River Avon and the famed Bath Half Marathon.

As well as being a very safe city, and famous for the beauty of its Georgian and Roman architecture, the city is also surrounded by classic English rolling hills and picturesque countryside.

Beyond the city

Bath is in a great location to get a full understanding of British life, seeing famous tourist attractions as well as experiencing some of the best of Britain. The University Accommodation Centre arranges tours throughout the year to the surrounding south-west areas.

Here are some of the things you can do around Bath:

- The south-west countryside offers a wide variety of British landscapes from the famous sites such as Stonehenge and Cheddar Gorge, to the rolling hills of the Mendips and the traditional villages of the Cotswolds.
- London is only 90 minutes from Bath by train, with trains every 30 minutes.
- Bristol Airport provides fast access to an ever-increasing number of destinations and there is also a direct bus route from Bath to all major London airports, including Heathrow.
- The city of Bristol is just 15 minutes away, offering more shopping opportunities and live entertainment venues.
- The country of Wales is nearby, with the capital city Cardiff just one hour away by train with all the fun a capital city has to offer.
- You can even experience the classic British seaside with the nearby coastal town of Weston-super-Mare, which has a typical old-style pier with arcade games and rides.

Related links:
- Visitbath.co.uk
- www.bath360.co.uk
- www.somersetguide.co.uk/Bath
- www.nationalexpress.com

City facts
- 84,000 population
- 90 minutes from London by train
- UNESCO World Heritage City
“Studying in Bath has been a wonderful experience. The subject modules were very intense and interesting, requiring extensive readings and research, but there was amazing support provided by the academic staff. Their learning and research experience was of great benefit. Getting taught from industry experts was also a very exciting opportunity.

“One of the most rewarding parts of the programme was the extensive in-depth study and breadth of particular modules, providing us with holistic knowledge of the subject areas. Compared to similar courses in other universities, the knowledge provided is much more practical, relevant and rounded, requiring us to learn the concepts in detail, which can later be applied to the building environment.

“During the programme I also had an opportunity to participate in a national level Sustainable Retrofit competition organised by University of Cambridge, which involved application of all the knowledge gained on this programme. Whilst working for the competition was very challenging, as I had to take time out from regular studies and PassivHaus training, winning it was very, very rewarding.

“Being on a multinational programme, I have made some very good friends from many different nations and cultures and formed a strong bond. I can easily say I have made some new friends for life. The University of Bath, its education, teachers, friends, and the city have provided me with an amazing, unforgettable time of my life.”

Nishesh Jain
Why study the MSc in Environmental Design at Bath?

The environmental impact of buildings is significant, accounting for around 50% of carbon emissions in the UK. There is a need for construction professionals and building designers, who have the skills and knowledge base to create buildings with a low-carbon footprint and reduced environmental impact.

The University of Bath MSc in Environmental Design will enable you to move your career forward in this rapidly expanding field. The University of Bath is an ideal institution for a specialist course in environmental design, with specialised centres founded to embrace research into the effects on the built infrastructure of climate change and the need for sustainable development. Each centre has a particular focus, such as sustainable building design in the Centre for Energy and the Design of Environments (EDEn), or materials and products in the BRE Centre for Innovative Construction Materials (BRE CICM).

What skills will I gain?

This programme is designed to provide you with the skills and knowledge base to create buildings that have a low-carbon footprint and reduced environmental impact, yet provide the comfort expected in modern buildings. It will lead you to re-appraise the design process and develop sustainability strategies for building projects. After graduation, you will be qualified to pursue careers as specialists in architectural and engineering practices. In particular it will help you to:

- deeply understand the holistic building design process
- understand the way in which individuals interact with buildings
- become fully aware of the drivers for sustainable building
- acquire in-depth knowledge of some of the technologies available to reduce the environmental impact of buildings
- develop strategies for achieving sustainable buildings
- work in multidisciplinary design teams
- acquire in-depth knowledge of how to design non-traditional buildings that are comfortable and functional
- research new concepts and technologies and report them clearly in the context of sustainable buildings.

Programme structure

The programme is offered as a modular course comprising ten taught units. The programme may be studied full time over a period of 12 months for the MSc or 9 months for the Diploma. A maximum period of 48 months is allowed for completion of the MSc or Diploma for part-time students.

Units are held as block-weeks on alternate weeks. Each unit comprises four consecutive days attendance (Tue – Fri, with a variety of lectures, seminars, tutorials, group projects), preparatory work beforehand, and/or work afterwards, amounting to 100 hours of study. Students are assessed during the unit or by work submitted immediately after each unit. Part-time students are encouraged to establish a regular pattern of attendance such as attending every second or third unit over a period of two or three years to establish and maintain the group dynamic of a cohort.

The research dissertation may be based on work carried out in the University, working under the supervision of research and academic staff, or where a suitable opportunity exists it may be based on work at the student’s industrial work place. The work is undertaken during the summer for full-time students. Part-time students will complete the research dissertation in the year in which they declare an intention to submit.

The work may be computer based, laboratory based or a case study. The emphasis is on individual and original work. The work is defined in consultation with a member of staff and possibly the student’s employer during semester 2.
Current areas of EDEn and BRE CIMC research can be explored at:  
www.bath.ac.uk/ace/ede  
and  
www.bath.ac.uk/bre

Facilities
The research facilities of the Department available to the group include:

- a range of environmental and meteorological sensors with dataloggers for environmental monitoring
- artificial sky with a range of light meters
- associated workshop facilities
- computing and software facilities for environmental modelling (IES and ECOTECT).

Admissions requirements
This programme is open to engineers, architects and suitably qualified candidates from other related disciplines. At the discretion of the Board of Studies students may be admitted solely on the basis of extensive professional experience in a relevant field.

IELTS 7.0 (with not less than 6.5 in each of the four components) or a minimum of 69 in PTE Academic, with no less than 62 in each component may be required.

Career opportunities
The Bath MSc in Environmental Design will enhance your employability by providing you with valuable skills and knowledge that are directly applicable in the construction industry and in sustainable developments in the UK and abroad. Our graduates have gone on to work for architectural engineering and building physics firms all over the world.

What our students say
“The high quality of teaching made the programme extremely enjoyable, as tutors were always keen to help out with any query and talk in further detail after lectures.

“I would highly recommend MSc Architectural Engineering: Environmental Design to anyone with a keen interest in reducing the environmental impact of buildings, as you learn a magnitude of new skills, interests and knowledge during the year, which are extremely applicable to the industry. 

“My current role within the Technical Department for Berkeley Homes required either an Architectural or Architectural Engineering background, ideally with an understanding of the relevant sustainability standards within the industry, therefore the MSc Architectural Engineering: Environmental Design programme combined with experience in practice was ideal.”

Katherine Jenkins

“My understanding of modern day environmental design has really increased since I started this programme. Also, the interaction with my fellow students, coming from all over the world, has made me a more open-minded person, provided me with an unforgettable experience and knowledge, and resulted in strong friendships. After my graduation I would like to take a gap year to travel around the world, volunteering and learning. Then I would like to find a job related to the content of my master’s programme. My intention is to offer people comfortable living spaces with minimal running cost and energy demands, as well as reduced carbon emissions to benefit the environment.”

Chrysi Avgousti
### Programme structure diagram

#### SEMESTERS 1 & 2 (September to May)

The taught units comprise the following topics:

<table>
<thead>
<tr>
<th>Core units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Building design for low carbon use</strong></td>
</tr>
<tr>
<td>Explore why global greenhouse emissions in cities is important for building designers and what techniques can be used to reduce emissions. Topics include optimising building geometry via a design exercise, low-energy standards and regulations, and the basics of low-carbon HVAC design.</td>
</tr>
<tr>
<td><strong>Health, comfort and productivity in buildings</strong></td>
</tr>
<tr>
<td>Use of a range of metrics to measure building performance. Topics include thermal comfort, agents of pollutant production and their control, and simulation techniques to predict performance under future climates.</td>
</tr>
<tr>
<td><strong>Sustainable construction materials</strong></td>
</tr>
<tr>
<td>How to make the right choice for building design using a range of materials such as concrete, earth, straw, lime and timber. Includes a visit to the BRE innovation park. Covers life-cycle analysis and responsible sourcing to measure material sustainability.</td>
</tr>
<tr>
<td><strong>Thermal performance of façades</strong></td>
</tr>
<tr>
<td>Techniques to ensure low-energy consumption in façade design. Topics include U-values in layered constructions, thermal bridging, air-tightness, thermal imaging and vapour control.</td>
</tr>
<tr>
<td><strong>Daylight and shading</strong></td>
</tr>
<tr>
<td>Minimising artificial lighting through good daylight and sunlight design of buildings, whilst optimising thermal performance. Topics include daylight factor analysis, daylighting technologies, solar geometry, glare, and the use of both physical and virtual lighting models to undertake measurement and analysis.</td>
</tr>
<tr>
<td><strong>Renewable energy sources and low-carbon techniques</strong></td>
</tr>
<tr>
<td>Why and when might renewables be required in buildings, how they can be integrated, pros and cons of available technologies and how their benefits can be designed and calculated. Concludes with a design exercise that integrates knowledge from previous units.</td>
</tr>
<tr>
<td><strong>Natural ventilation in buildings</strong></td>
</tr>
<tr>
<td>Examine different types of ventilation, their underlying physics, how the effect of strategies can be calculated and how natural ventilation and mechanical ventilation can be combined.</td>
</tr>
<tr>
<td><strong>Building energy modelling</strong></td>
</tr>
<tr>
<td>Examines a range of models for building design and planning from steady-state to complex dynamic models using practical examples. Half the unit comprises hands on training using an industry standard dynamic model to model the various techniques available.</td>
</tr>
<tr>
<td><strong>Artificial lighting</strong></td>
</tr>
<tr>
<td>Techniques of lighting design, types of lamps and luminaires, their energy efficiency, access and maintenance. Includes training in using an industry-standard lighting design software tool.</td>
</tr>
<tr>
<td><strong>Acoustics</strong></td>
</tr>
<tr>
<td>Issues of room acoustic design and how they need to be considered along with other principles such as ventilation. Topics include acoustics fundamentals, propagation, absorption, measurement, sustainability and construction detailing.</td>
</tr>
</tbody>
</table>

| Optional unit (June, non-credit bearing) on PassivHaus Design* |

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#### SUMMER PERIOD – RESEARCH DISSERTATION (June to September)

The research dissertation may be based on work carried out in the University working under the supervision of research and academic staff, or where a suitable opportunity exists it may be based on work at the student’s industrial workplace. The work is undertaken during the summer for full-time students. Part-time students may take longer to complete the research dissertation.

* Five-day intensive course with inputs from industry practitioners and consultants covering the syllabus of the PassivHaus Design Examination (conducted by the PassivHaus Institute, Germany). Includes principles and theory, use of the PassivHaus Planning Package (PHPP), construction and design detailing and building services. Taught using lectures and demonstrations interspersed with exercises.

Descriptions of the content of each unit can be found at [www.bath.ac.uk/catalogues](http://www.bath.ac.uk/catalogues)

Availability of units listed may change.
“I have always liked the idea of coming to the UK to do a master’s degree, so the first thing I did, when looking for the perfect university for me, was to look at UK rankings, which Bath rates highly in.

“Every day I have learned something new from the Façade Engineering programme, whether from my classmates or my professors. I have always thought that one can learn more from experience rather than from studying, so by talking and going out to dinner with my classmates (many of whom are working professionals) I could learn much more.

“Bath has a wide range of societies with nice, fun and engaging activities in which I was happy to participate. There is always something going on at the University; you could never get bored. Additionally, the community at Bath has a wide diversity, so as a student I had the opportunity to meet a lot of people from different backgrounds. To top it all, the sports facilities are fully equipped, where international athletes train.

“Studying this programme was not easy; to new applicants I would highly recommend them to be prepared for this; it is not a stroll in the park, but a marathon!”

Rosario Lidia Maguey Peña
Why study the MSc in Façade Engineering at Bath?

The programme at the University of Bath is the most established of its kind in the world. Unique until 2007, only five other similarly styled programmes exist across the EU.

The University of Bath is an ideal institution for a specialist course in façades because it is home to the Centre for Window and Cladding Technology (CWCT). The Centre has become a national focus for research and standards in the field of Façade Engineering and plays an important part internationally in the dissemination of knowledge. CWCT and the Department of Architecture and Civil Engineering recently hosted the eight European Façade Network conference at Bath in June 2014.

The University has a long history of successful interdisciplinary education for design professionals. We pioneered the use of design projects in postgraduate teaching by making use of both university-based researchers and practising architects and engineers.

What skills will I gain?

The main aim of the programme is to provide students with a broad understanding and knowledge of façade engineering. This ensures they will have the skill, knowledge and understanding to design, manufacture and construct building façades and cladding. This programme provides the theoretical basis for a sound understanding over all disciplines involved in the performance of façades, and examines the complex inter-relationships between those different aspects through a consideration of existing constructions. Knowledge of materials, methods of manufacture and installation are considered as essential elements in the successful design of façades and are given a prominent place in the programme. The units broaden students’ knowledge outside their original disciplines and give them a more holistic understanding of all aspects of the building envelope.

Programme structure

The MSc/Diploma programme comprises a total of 14 taught units, (8 core and 2 chosen from the remaining 6 optional units), followed by a research dissertation. Each unit is taught in four-day blocks and the programme may be taken in full-time or part-time mode. Assessment is a combination of preparatory exercises, continuous assessment, computer-based modelling exercises and real-time calculation tutorials. Group presentations are also included to improve peer-to-peer industrial knowledge transfer. All taught material is supported and uploaded to Moodle, the University’s online learning environment.

Facilities to support the programme of study

The programme is taught in the Department of Architecture & Civil Engineering in a dedicated teaching facility. This is supported by the Department’s structures and materials laboratory and the Centre for Cladding and Window Technology (CWCT), with its dedicated library and material/technology collection. In addition, students have access to thermal modelling software, (IES and THERM).

CWCT is comprised of members from internationally recognised industrial façade organisations, specialist contractors and façade engineering consultants. Their expertise and advice on the advisory board ensures timely and relevant industrial input on a regular basis. Industry façade experts are invited to give regular specialist lectures on this programme. CWCT currently has over 300 industry full members who are actively engaged in supporting the development of the programme.

The CWCT and the Department of Architecture & Civil Engineering (ACE) are one of only six postgraduate institutions across the EU involved in façade research, education and training. They are members of the European Façade Network and have strong links to the Society of Façade Engineers.
What our students say

“I chose to study at the University of Bath as it was the only university in the UK that offered an MSc programme in Façade Engineering. The reputation of the programme is high and it is very well known in the cladding industry. It was also recommended by some colleagues who specialise in this field.

“The quality of the teaching is very high and I’ve always found my teachers and tutors to be very approachable and keen to assist in any matter to help us to achieve the best results. The programme is intense and touches many disciplines involved in Façade Engineering. I’ve found all the units very interesting and complementary to each other. The programme gave me a good insight into all the disciplines involved in façade engineering and a solid base to start a career in this field.

“One of the things that I’ve found the most amazing is the flexible structure and contents of the programme that suits the interests of a high variety of students from many different nationalities and academic or professional backgrounds. The variety of students adds a special flavour and richness to the programme.”

Maria Elena Arzua Tourino

“I chose to study Façade Engineering at the University of Bath because it was the first Façade engineering master’s programme in the world. The Centre for Window Cladding Technology (CWCT) is the backbone of the MSc programme and the professors share their experience of dealing with real projects through CWCT and enlighten us with the problems faced by the industry in the practical world. The students come from diverse fields in the Façade industry, holding years of experience that we all share and gain knowledge from.

“The fact that the programme director and professors are in touch with the fast growing industry proves to be an advantage for the employment possibilities the programme can provide. I was recruited by Laing O’Rourke Facades from the programme during my dissertation period, which helped me focus my dissertation and gain experience at the same time. The Façade industry is on the rise and companies want to recruit professionals from a respected course endorsing quality technical education such as University of Bath’s MSc Façade Engineering programme.”

Huzefa Ali

Admissions criteria

This programme began in 1996 and over 200 graduates are now employed in industry and research. Students come from many backgrounds, but all have a common interest in façade engineering and share their experience while learning. Students are recruited from, and return to, careers in architecture, engineering, and specialist façade contracting across the world.

Typical jobs that our graduates progress to include Technical Director, Group Operations Director, façade design management, product development, product testing, application development, façade analysis and modelling.

Our alumni show a rich variety of career opportunities worldwide, such as:

- Façade and cladding consultants, Wintech Ltd, UK
- Head of Façade Engineering, Trow Consulting Engineers, Canada
- Managing Director, Façade Engineering Ltd, Ireland
- Executive Architect, Ong & Ong Architects, Singapore
- Technical Director, Wintech, UK
- Designer, TRO Jung/Brannen, USA
- Façade Engineer, LG Hausys, South Korea.

Admissions criteria

A first or upper second class UK honours degree or internationally recognised equivalent in Civil/Structural Engineering. Applicants are required to have at least two to three years relevant façade industry experience. Applicants from other engineering-related or architectural backgrounds and over five years relevant façade industry experience will also be considered.

IELTS 7.0 (with not less than 6.5 in each of the four components) or a minimum of 69 in PTE Academic, with no less than 62 in each component may be required.
Programme structure diagram

**SEMESTERS 1 & 2 (September to May)**
Students will study taught units delivered by national experts in the field of façade engineering and building physics. The units studied comprise the following topics:

<table>
<thead>
<tr>
<th>Core units</th>
<th>Option units (two from):</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introduction to façade engineering</strong></td>
<td><strong>Daylight &amp; shading</strong></td>
</tr>
<tr>
<td>The multi-functional nature of the building envelope and the need for</td>
<td>To provide a comprehensive theoretical grounding that will enable students to</td>
</tr>
<tr>
<td>holistic design.</td>
<td>tackle the range of lighting calculations likely to be encountered in practice in</td>
</tr>
<tr>
<td></td>
<td>relation to the control of natural light through the building.</td>
</tr>
<tr>
<td><strong>Glass &amp; glazing</strong></td>
<td><strong>Contract management</strong></td>
</tr>
<tr>
<td>Understanding the performance of glass for appearance, integrity,</td>
<td>To provide an understanding of management of the construction process.</td>
</tr>
<tr>
<td>safety and environmental control.</td>
<td><strong>Structural analysis of façades</strong></td>
</tr>
<tr>
<td></td>
<td>To provide an understanding of the principles of structural engineering applicable to</td>
</tr>
<tr>
<td></td>
<td>façade engineering.</td>
</tr>
<tr>
<td><strong>Thermal performance of façades</strong></td>
<td><strong>Natural ventilation in buildings</strong></td>
</tr>
<tr>
<td>How the different elements of a façade work separately and when</td>
<td>The advanced principles and role of NV in buildings. Developing a critical awareness</td>
</tr>
<tr>
<td>combined as a whole building envelope to control energy flows in to and</td>
<td>of the architectural consequences of NV on building design and explore the latest</td>
</tr>
<tr>
<td>out of a building.</td>
<td>techniques, strategies and experiences of NV in buildings.</td>
</tr>
<tr>
<td><strong>Façade construction</strong></td>
<td><strong>Thermal analysis of façades</strong></td>
</tr>
<tr>
<td>The principles and methods of façade construction.</td>
<td>To provide an ability to analyse and evaluate the thermal performance of façades.</td>
</tr>
<tr>
<td></td>
<td><strong>Acoustics &amp; fire</strong></td>
</tr>
<tr>
<td></td>
<td>To provide a theoretical grounding that will enable students to strengthen the link</td>
</tr>
<tr>
<td></td>
<td>between theory and design of acoustics and fire in buildings.</td>
</tr>
</tbody>
</table>

**Façade materials & components**
Gain an understanding of the through-life performance of the many materials used in façade construction.

**Weather tightness**
The principles, design and testing of the sealing of building envelopes.

**Structural integrity**
The principles of structural engineering applicable to façade engineering.

**Façade procurement**
Understand the procurement of façades in terms of supply chain, specification, risk management and value engineering.

**SUMMER PERIOD – DISSERTATION (June to September)**
You will undertake an individual research project in either one of three leading departmental research centres or with the Centre for Window and Cladding Technology (CWCT). The topics will fundamentally relate to façade engineering but may encompass materials, structures, glazing technologies, building physics, daylight and natural ventilation, fire or acoustics.

Descriptions of the content of each unit can be found at [www.bath.ac.uk/catalogues](http://www.bath.ac.uk/catalogues)
Availability of units listed may change
“The focus on the novel use of traditional materials and innovative new ones attracted me to this MSc. The strong reputation of Bath for engineering programmes, my personal interests and the opportunity to develop skills working with students from a different engineering background were key to my choice to study here.

“The best thing so far has been the challenge of getting a deeper insight into structural engineering and the enrichment of my knowledge on a wide range of structural materials, empowering my engineering skills, and assisting a holistic engineering approach with equal focus on structural and architectural aspects. The opportunity of studying such a subject and working closely with civil engineers improved my communication skills with other engineering professions, as well as my understanding of structural issues and the ways to approach them.

“The variety of the lectures and the information conveyed in the first semester, through expert staff and guest lecturers well respected in their field, offered a treasury of structural knowledge and allowed for invaluable interaction. And although some engineering aspects were at times challenging for an architectural engineer, with help from the staff and personal effort the final rewards have greatly surpassed the hurdles presented.”

Vasileios Bakas
Why study the MSc in Civil Engineering: Innovative Structural Materials at Bath?

The use of construction materials is key to infrastructural development globally. New approaches are now needed for innovative renewable and low-carbon structural engineering materials.

This MSc in Innovative Structural Materials is a unique UK postgraduate programme that draws upon the research strengths of the BRE Centre for Innovative Construction Materials (BRE CICM), based at the University of Bath. It offers an advanced qualification useful to engineering and science graduates wishing to develop an in-depth and practical understanding of the use of innovative structural materials in the provision of sustainable and holistic construction solutions for the built environment.

What skills will I gain?

You will develop practical knowledge and tools to support you in the use of innovative structural engineering materials in the context of sustainable and holistic construction. You will gain analytical and teamwork skills to enable you to deal with the open-ended problems typical of structural engineering practice.

In particular, you will gain:

- intellectual understanding of the nature and behaviour of structural materials in terms of strength, deformation characteristics, durability and environmental considerations
- knowledge of materials and structures research methods to enable you to undertake independent research in construction materials and structures’ problems
- the ability to appropriately apply knowledge on structural materials in the provision and delivery of sustainable and holistic construction
- the capability of contributing to the technical and business operation of a project team
- comprehensive knowledge and appreciation of significant contemporary issues in structural materials and structural engineering research
- research training, including personal project management and innovative thinking, enabling you to continue on to doctoral level research, should you choose
- the ability to act autonomously in planning and implementing the use of structural materials in design situations.

Programme structure

Semester 1 (September to January)

The first semester consists of five taught compulsory units, providing a foundation in the most significant issues relating to the sustainable use of innovative structural engineering materials in design and construction. Typically each unit consists of 22 hours of lectures and 11 hours of tutorials, and may additionally involve a number of hours of laboratory activity and field trips with approximately 65-70 hours of private study (background reading, report writing, laboratory results processing and revision for examinations).

Semester 2 (February to May)

In Semester 2 you will study both technical specialist units and project-based units. You will develop your professional understanding of engineering in a research and design context. In the group activity, you will apply engineering and project management techniques to solve a design problem, just as an industry-based design team would operate. Project unit 1 introduces you to research methods and project planning, which you then apply to detailed background research in your discipline area in preparation for your individual summer dissertation project in Project unit 2. Assessment is by coursework and examinations.

Summer/dissertation period (June to September)

In Project unit 2 you will undertake an individual research project leading to an MSc dissertation. Depending on your chosen area of interest, the individual project may involve theoretical, computational and/or experimental activities. The individual projects are carried out under the supervision of a member of academic staff. There may be an opportunity to carry out your project with the Building Research Establishment (BRE).
Facilities to support the programme of study

The Department of Architecture & Civil Engineering offers dedicated computer suites and well-equipped and newly refurbished laboratories for experimental work to support your studies. There may also be project related research opportunities at the BRE laboratories in Garston, UK.

Admissions criteria

A first or upper second class UK honours degree or internationally recognised equivalent in an engineering or science subject with a high level of structural analysis.

IELTS 6.5 (with not less than 6.0 in each of the four components) or a minimum of 62 in PTE Academic, with no less than 59 in each component may be required.

Career opportunities

The construction industry needs experts in innovative renewable and low-carbon structural engineering materials and as a graduate of this programme, you will be well placed to fulfil this role. The holistic project-based learning environment in semester 2 will develop key skills actively sought by top employers.

Career prospects for graduates will be enhanced by:

- the reputation of the undergraduate Civil Engineering programmes (ranked 2nd in the UK for 2014 by the Complete University Guide and 1st for employability by the Guardian newspaper)
- excellent links with local, national and international employers
- links with the Building Research Establishment (BRE) through the BRE Centre for Innovative Construction Materials (CICM) based at the University of Bath.

The BRE CICM has approximately 50 PhD and other research students conducting research into innovative construction materials, mainly funded through grants from external sources. It is anticipated that the top MSc students will have the opportunity to further their studies through the PhD programme at Bath should they wish to.

This degree is accredited as meeting the requirements for Further Learning for a Chartered Engineer (CEng) for candidates who have already acquired a partial CEng accredited undergraduate first degree.

See www.jbm.org.uk for further information.

Up-to-date information is available on our website, go.bath.ac.uk/ism

What our students say

“I very much liked the idea of a joint department of architects and civil engineers. The specific modules the programme offers are very interesting and exactly the type of programme I was looking for. Bath had a good ranking and I received an international scholarship to study here.

“The timetable is nicely grouped and organised so I’m not in classes from 9 to 5 every day. The professors have been great and mostly really helpful with an incredible amount of knowledge, both academic and in practice.

“The most rewarding part of the programme has been the dissertation experiments, and professor interaction whilst increasing and broadening my building engineering knowledge. The work has been challenging, of course, but fascinating and I have enjoyed researching for each unit.”

Grant Walkin
Programme structure diagram

**SEMESTER 1 (September to January)**

**Compulsory units**

**Architectural structures**
Overview of how structural engineering can be used to enhance architecture through innovative design and analysis.

**Advanced composites in construction**
Practical and theoretical aspects related to the use of fibre-reinforced composites (FRPs) in construction. Includes both new build and retrofit to extend the life of existing structures.

**Natural building materials**
Use of natural building materials including timber, stone, straw bales, earth, lime and hemp in historic and modern building construction.

**Sustainable concrete technology**
Concrete manufacture is responsible for 5-7% of global CO₂ emissions (approximately twice that of aviation). This unit provides details on various sustainable concrete technologies with a view to reducing the impact of this important structural material.

**Professional skills for engineering practice**
Written and oral communication in engineering, time management and workload planning, critical analysis, group work and structured reflection, engineering ethics.

**SEMESTER 2 (February to May)**

**Compulsory units**

**Materials engineering in construction**
Materials engineering in construction develops an awareness and enthusiasm for the use of advanced materials technologies, including nanomaterials and multifunctional materials, and an understanding of material compatibility issues within the context of sustainability and the environment.

**Advanced timber engineering**
Innovative structural engineering using timber and timber-based materials. Includes joint design, manufacture and testing, and a timber building design project.

**Project unit 1**
Introduction to the research process, surveying prior research, critical interpretation of the engineering literature, project scoping and planning, data analysis.

**Conceptual design group activity**
Small team working on multidisciplinary engineering design problems, team roles, structured reflection, technical communication.

**Engineering project management**
Models of engineering project management, strategic context, time and cost estimation, uncertainty & risk management, project monitoring and control, teamwork.

**SUMMER PERIOD (June to September)**

**Individual research project**
You will undertake a substantial research project, in which you will analyse research data and formulate conclusions and communicate your research findings by written and oral means.

Descriptions of the content of each unit can be found at www.bath.ac.uk/catalogues
Availability of units listed may change
“The University is situated within a UNESCO World Heritage Site. What more could one ask for when choosing where to study Historic Building Conservation?

“The faculty and staff here at the University are knowledgeable, professional and, most importantly, helpful mentors. I know that when I leave here I will leave with a degree that means something to me and others. I love the city of Bath as well. For international students uprooting their lives to travel across the globe, the city of Bath is an ideal location to relocate. It is large enough to retain the convenience of urban living, yet small enough to provide the comforts and homely atmosphere of a small town.

“This programme is unique in that it is not strictly a classroom environment. Often, during the year, the class commences on site at active local (and not-so-local) conservation sites. This means teaching allows students a hands-on learning experience vital to the comprehension of the material.”

Micah Nicole Fowler
MSc Conservation of Historic Buildings
12 months full time, 2-4 years part time, Postgraduate Diploma option available.

Why study the MSc in Conservation of Historic Buildings at Bath?

The UNESCO World Heritage city of Bath is an ideal location for a specialist course in the conservation of historic buildings, both for the available study material and as an environment in which to live. The programme provides training in structural and architectural conservation, within an academic framework of architectural history and theory, including the philosophy of conservation. The course is taught by leading architects, structural engineers and related professionals, directed by Dr Michael Forsyth.

The Department of Architecture and Civil Engineering has a well-established tradition of education and training based on interdisciplinary cooperation between architects and engineers, as well as experience in related areas and techniques, including urban management and computer modelling.

Students travel from across the UK to attend the programme and it attracts overseas students from many countries (recently from China, Thailand, Malaysia, India, Taiwan, Hong Kong, Japan, Mexico, Argentina, USA, Canada, Serbia, Greece, Cyprus, Turkey).

Accreditation

The curriculum accords with the conservation guidelines of ICOMOS (International Council on Monuments and Sites) and is accredited by the Institute of Historic Building Conservation (IHBC) and the Royal Institution of Chartered Surveyors (RICS). After completing the MSc, graduates are exempt from the RICS internal examinations and eligible for entry to the RICS Assessment of Professional Competence (APC).

How is the programme structured?

The programme is structured into four distinct units, which are taught on separate days. Full-time students attend the programme on Wednesdays and Fridays for lectures, seminars, discussions and visits. Part-time day-release students attend either on Wednesday or Friday and, for their benefit, the units flip over yearly so that the day remains constant for two years. Teaching takes place over eleven weeks in semester 1 and eleven weeks in semester 2, plus three and four weeks respectively to complete coursework.

What skills will I gain?

By the end of the programme students will be expected to be able to demonstrate:

- a knowledge of the structural and constructional techniques used in the conservation of historic buildings
- a knowledge of architectural history and theory, in particular the philosophies and approaches to conservation of the built environment
- an ability to research the history of a building and to assess and understand its significance
- knowledge of the law, contracts and international standards and charters relating to historic buildings and the ability to assess a building's significance
- visual awareness of the characteristics of classical architecture.

Admissions criteria

A first or upper second class UK honours degree or internationally recognised equivalent in engineering, architecture, surveying, planning, geography, archaeology, history or management.

IELTS 7.0 (with not less than 6.5 in each of the four components) or a minimum of 69 in PTE Academic, with no less than 62 in each component may be required.

www.bath.ac.uk/engineering/graduate-school/taught-programmes/conservation
What our students say

“Studying this programme at the University of Bath has been especially valuable as Bath is a World Heritage City and there are many fine examples of historic buildings relating to the programme within the City. The programme has been extremely interesting with lectures by visiting professionals from outside of the University. This has enabled me to gain an in-depth understanding from those who are specialists in the field.

“Site visits proved also to be an important part of the programme, bringing the understanding alive with interesting case studies and hands-on demonstrations. I feel that the most rewarding part of the programme has definitely been seeing all my hard work and efforts being reflected in my grades.

“When I graduate I hope to become an Architectural Technologist, perhaps specialising in conservation. This programme has given me the knowledge and understanding of conservation of buildings, which will give me a versatile approach in addition to my undergraduate degree of modern construction and the environment.”

Abigail Cockram

Career opportunities

The degree has a proven track record of employability. We aim to draw students from a range of backgrounds, mostly architects, engineers, surveyors and suitably qualified candidates from other fields, including planners and building industry managers. We also accept (and encourage) students who have either taken a non-vocational degree (usually historians or art historians, but also geographers, archaeologists and others). Examples of career opportunities for previously non-vocational graduates on the basis of our MSc degree are English Heritage, the National Trust, local authorities and private practices.

Examples of jobs obtained by graduates from a non-vocational background on the basis of our MSc degree include:

- English Heritage (historic research department, inspectors, managers)
- Conservation officer, UNESCO, Paris
- Conservation architects with many well-known practices working on every type of historic building from Salisbury Cathedral to medieval timber-framed barns
- Architects’ practices working on conservation and building new country houses in a classical style
- Development officer with Turquoise Mountain repairing a mosque in Kabul
- Inspector with the Victorian Society
- National Trust Manager of Uppark House, West Sussex
- Member of the Information Team, The Science Museum, South Kensington.
Programme structure diagram

SEMESTER 1 (September to January)

**Structural conservation**
History of structures, survey techniques and report writing, assessment and diagnosis of structural failure, repair techniques, philosophy and technology, fire prevention in historical buildings, case studies of structural problems in selected building types, environmental control and monitoring.

**History and theory**
The theory of classical architecture, philosophy and history of the conservation of historic buildings, garden conservation and archaeology: an introduction.

Case studies

SEMESTER 2 (February to May)

**The legislative framework**
The law and listed buildings, listed building consent and appeals, ancient monuments legislation, The National Amenity Societies and the role of pressure groups, conservation and development: urban planning from the 1947 Town and Country Planning Act to the present day, contracts in conservation work, maintenance programmes.

**Materials, construction and skills**
Wall materials, roof coverings: timber, metals, finishes.

Case studies

**DISSEMINATION (June to September)**
This is a specialist study on an agreed selected subject relating to areas such as the history and theory of architecture and conservation, structures and structural engineering, materials technology and conservation, the law relating to listed buildings and urban management and the planning process.

Descriptions of the content of each unit can be found at [www.bath.ac.uk/catalogues](http://www.bath.ac.uk/catalogues)
Availability of units listed may change
Why study the MSc in Modern Building Design at Bath?
The MSc Modern Building Design provides students with the knowledge of modern building design practice, methodologies and processes that are increasingly sought after by major engineering and design consultancies. It places emphasis on the key engineering and modelling challenges faced during the building design process and prepares students for industry, providing you with the practical and interpersonal skills to stand out to potential employers in a highly competitive market.

- This unique and innovative 15-month programme has three core components:
  - a taught element, consisting of eight units
  - a professional practice placement, where students apply low-carbon building strategies and methodologies from their taught component to establish the industrial impact of their dissertation ideas
  - a research dissertation based on a real consultancy project and informed by your industrial placement experience.

What skills will I gain?
You will develop the hard and soft skills required by professionals working in key carbon-dominated built environment sectors, with the ability to demonstrate an understanding of carbon management of the built environment in practice. The taught element of the programme focuses on student professional development through the design process that is mapped to the 2013 RIBA (Royal Institute of British Architects) plan of work for multidisciplinary working. In particular, you will gain:

- trans-sector skills required by the construction industry, with a focus on employability
- a detailed knowledge of the design tools and strategies that comprise modern design processes
- the capability to demonstrate initiative and originality within the scope of low-carbon modern design strategies, planning and management

Programme structure

Semesters 1 & 2 (September to June)
The first two semesters consist of eight taught units, co-designed and co-taught with employers, providing a foundation in the most significant issues related to working in key carbon-dominated built environment sectors and professional development. Each unit comprises lectures, tutorials, practical classes and workshops alongside time for personal study. Assessment is by a combination of coursework and oral examination.

Semester 3 (July to September)
The third semester consists of a three-month professional practice placement. Workshops during the first two semesters with industrial placement providers will help you improve your employability and prepare you to undertake a mutually beneficial placement at one of our partner companies. Assessment is by report and presentation to your placement employer and academic staff.

Semester 4 (October to December)
The final semester consists of a research dissertation. The dissertation will build on the skills acquired in the taught component. The dissertation provides a start-to-finish research experience to embed the research and professional knowledge gained throughout the programme, and informed by the needs of your industrial placement provider.

Industrial partners
The programme is co-developed and co-delivered with a number of employers and partners in Architecture and Civil Engineering, including:

- Atkins
- Building Research Establishment
- Expedition
- MACE
- Buro Happold
- Mott MacDonald
- LaBox Architcutura
- Keep Architecture.
Facilities to support the programme of study
Your academic progress and general welfare will be supported by your personal tutor, in addition to the specialist student support services within the University. We have a thriving portfolio of taught postgraduate programmes providing the opportunity to meet, and work alongside, students from other areas of the Department.

The Department of Architecture & Civil Engineering offers well-equipped computer suites and laboratories for experimental work to support your studies.

Admissions criteria
A first or upper second class UK honours degree or internationally recognised equivalent in Architecture, Civil or Mechanical Engineering or a related subject.

IELTS 7.0 (with at least 6.5 of the four components) or a minimum of 69 in PTE Academic (with at least 62 in each component) may be required.

Industry-led research project and placement
MSc Modern Building Design has a unique approach to placements with employers involved throughout the full duration of the programme. The bespoke matching process begins with the opportunity to meet placement providers at the start of your first semester. Your interests, experience and skills will be of specific benefit to the company you work with enabling you to add value to real-world projects through your research and placement.

Career opportunities
Engineering consultancies and multidisciplinary design consultancies are seeking graduates with knowledge of modern building design. This programme takes advantage of the strong relationships between the Department of Architecture and Civil Engineering and our industrial partners. It has been co-developed and co-delivered with these employers to ensure it provides the range of skills and experience they are looking for when they recruit. As a result, graduates of this programme should be highly employable.

Career prospects for graduates will be enhanced through:
• units focusing on key design practice and methodologies including BIM (Building Information Modelling)
• an industry-led research project focusing on the key issues and challenges faced during the building design process
• professional development to enhance practical and interpersonal skills increasingly sought by employers.

The Department also has links with the Building Research Establishment (BRE) through the BRE Centre of Innovative Construction Materials. PhD and other research students conduct research into innovative construction materials, and it is anticipated that the top graduates of MSc Modern Building Design will have the opportunity to further their studies through the PhD programme at the University of Bath. See www.bath.ac.uk/bre for further information.

Placement profile
As part of the programme you will be matched with an employer that fits with your interests, experience and skills. Labox and MACE, two companies providing support for the research project and placement, describe what they are looking for in a placement student:

MACE: “Working within our Strategic BM Consultancy, Design and Construction teams you will be acting as a Trainee BIM Coordinator working alongside the core BIM team and provide BIM support for projects. Working with our BIM Integrators, Designers and Construction Design Managers you will be responsible for the effective use of technology on your project whilst assisting in the development of BIM standards and use for the business. You will liaise with the project team, client and consultants, and assist the reviewing of models for the project and guidance of project teams through the BIM process, as well as provide ad hoc assistance to the wider practice when required.”

Labox: “We are a design led multidisciplinary architectural practice specialising in individual site and client specific projects with a strong emphasis on energy efficiency as a means of improving quality of life. We strongly believe that everyone involved in the project is vital, and for a successful end result the technical information that we provide has to be accurate and very well considered. This means, that must be produced by well informed, interested and capable people who understand what they are trying to achieve and why. I would hope that someone who has completed this MSc would have the global vision that we are looking for.”
Professional development through the design process
To enhance student career development in modern building design.

BIM & the design process
To examine and compare the impacts of a BIM supported design process with that of more traditional approaches.

BP visualisation tools
To quantify real building physics phenomena that will accelerate the student along the path from theory into professional practice.

Dynamic modelling tools
To use dynamic modelling tools optimally and manage the design tensions of building physics parameters during the design process.

Regulations codes & certification
To embed a full understanding of the regulatory and political context under which buildings are constructed both now and in the future.

Low-carbon building envelopes
To evaluate how low-carbon building envelope solutions may be combined and integrated for the optimal through-life performance of low-carbon buildings.

Smart buildings
To develop a critical awareness of the potential benefits/limitations and resistance to uptake of intelligent control systems, smart envelopes and buildings.

Research methods & professional practice
To develop the ability to undertake and report independent industry-led research project work in the field of low-carbon modern building design.

Compulsory units

SEMESTER 1 & 2 (September to May)

SEMESTER 3 (July to September)
Professional practice placement
To provide industry-relevant professional development through a comprehensive and well-rounded knowledge and experience of modern building design. Producing graduates who can communicate and work with different stakeholders, such as clients, the public, and other industry professionals.

SEMESTER 4 (October to January)
Research dissertation
To develop the ability to undertake and report independent industry-led research project work in the field of low-carbon modern building design.

Descriptions of the content of each unit can be found at www.bath.ac.uk/catalogues
Availability of units listed may change
“I chose to pursue a master’s degree at the University of Bath for many reasons: the University’s excellent academic reputation, the short degree completion period and modern engineering programme curriculum. The beautiful living environment is definitely a big plus.

“After completing my undergraduate study in China, I found that most of the theoretical education I received at Bath was not strictly new to me; however, it was the applied engineering side of the programme that really broadened my mind. In addition, I found the business units very useful and inspiring; they introduced me to new perspectives on how I look at engineering. I find myself much more equipped in terms of commercial awareness and I believe this prepares me better for my career.

“The programme for me personally was a wise choice. I’ve learnt a lot and I am now studying a PhD. My advice would be to choose a subject you are truly interested in, use the library, use the pool and make the most out of your time at Bath.

“I am now finishing my PhD and look to either stay in academia or to pursue a career in industry in the area I am working in.”

Nic Zhang, Frank Wallace scholarship holder on the MSc Automotive Engineering, now studying for a PhD at Bath.
MSc Automotive Engineering
12 months full time. September start.

Why study the MSc in Automotive Engineering at Bath?

This is an exciting era to be starting a career in automotive engineering. We are living in a global environment where change is being driven by an accelerating demand that we must move to low-carbon vehicles and fuels. The engine forms the heart of any low-carbon vehicle. This MSc programme is firmly rooted in our international research standing, in the applications and performance evaluations of high-efficiency diesel engines, bio and other alternative fuels, as well as the design and operation of next-generation transmission systems. The University of Bath’s MSc programme in Automotive Engineering will provide you with the key skills and specialist experience needed for you to contribute effectively to the development of low-carbon vehicles.

What skills will I gain?

This programme is aimed at engineering graduates who wish to work in the automotive industry or to pursue automotive research, with particular focus on the design, performance and operation of automotive powertrains and vehicle systems. As an Automotive Engineering MSc student, you will develop technical expertise in automotive engineering and also learn how to harness that knowledge in a business environment. You will gain teamwork and analytical skills to enable you to deal with the open-ended problems typical across today’s engineering industry.

In particular, this programme of study will help you to:

- understand and apply the various management processes used in automotive engineering
- understand the nature and role of technology strategy in creating value in the automotive industry
- use a range of tools (scenario planning, real options, etc.) to develop practical technology strategies
- apply subject-specific knowledge in a range of complex situations, taking into account the implications for other areas of a business
- develop a detailed understanding of project planning and through-life project costing
- operate effectively – both independently and within teams – assuming leadership roles where opportunities arise
- complete a substantial research project in a technical aspect of automotive engineering and prepare material for publication in the open literature.

Programme structure

The structure follows a unique pattern, in three parts, starting with advancing your technical skills and understanding, through to further specialist professional development and multidisciplinary group work, preparing you to finally undertake an individual project under expert supervision.

Semester 1 (September to January)
You will integrate your fundamental background of mathematics and engineering science into the arena of automotive engineering. You will take five taught units, delivered by our expert lecturers. Assessment is by examinations and coursework.

Semester 2 (February to May)
In Semester 2 you will study both technical specialist units and project-based units. You will develop your professional understanding of engineering in a research and design context. In the group activity, you will apply engineering and project management techniques to solve a design problem, just as an industry-based design team would operate. Project phase 1 introduces you to research methods and project planning, which you then apply to detailed background research in your discipline area in preparation for your individual summer dissertation project. Assessment is by coursework and examinations.

Summer period (June to September)
You will undertake an individual research project in one of our leading research centres. MSc Automotive Engineering students carry out their research projects across the entire department – reflecting the multidisciplinary nature of this
subject – but with a focus towards the Powertrain and Vehicle Research Centre (PVRC) and also the Centre for Power Transmission and Motion Control (PTMC). Typical project areas include experimental and analytical investigations of new turbocharger concepts, after-treatment operation, alternative fuel performance, and the control and calibration of advanced vehicle and powertrain systems.

Current PVRC research areas can be explored at: www.bath.ac.uk/mech-eng/auto and www.bath.ac.uk/mech-eng/research/ptmc.

Facilities to support the programme of study

- A state-of-the-art chassis dynamometer (which forms the hub of vehicle research activities).
- Three dynamic engine research platforms.
- Advanced transmission research facility.
- Emissions measurement facility.
- Control, simulation and rapid prototyping.

Admissions criteria

A first or upper second class UK honours degree or internationally recognised equivalent in Mechanical Engineering or Automotive Engineering.

IELTS 6.5 (with not less than 6.0 in each of the four components) or a minimum of 62 in PTE Academic, with no less than 59 in each component may be required.

Career opportunities

Our MSc graduates now work all over the world in various industries. A number of them pursue their doctorates in universities worldwide.

Recent jobs secured in the UK and overseas by our graduates include:
- Calibration engineer, Ford Motor Company Ltd
- Product engineer, Renault
- Engineering consultant, D’Appolonia.

Other companies that have hired our recent graduates include:
- British Aerospace
- Airbus UK
- Intel
- Ricardo
- Cambustion
- Panama Canal Authority
- Moog Controls Ltd.

What our students say

“While I was doing my undergraduate degree in California, I felt as though I needed another qualification to improve my career opportunities. After some digging through online forums and league tables, it was clear Bath’s Mechanical Engineering Department has the best balance between academic rigor and a practical approach to developing students’ employability. In addition, the ties with industry – particularly in engineering – present many opportunities for learning and employment to students.

“I found out that Bath had a Formula Student team in my first week and got involved straight away. It was a great opportunity to develop practical engineering skills in a workplace-like environment. We’ve competed at Silverstone and were the fastest UK team, coming 7th out of 97 worldwide!

“The dissertation period has allowed me to work on a project in collaboration with Jaguar/Land Rover, Lotus and a few other research partners. It’s challenged me to work independently on a three-month project developing critical thinking, communication, and writing skills. I’ve learnt a lot during this time, and will take this experience with me when I graduate.”

Frederik Botes
MSc Automotive Engineering

Programme structure diagram

SEMESTER 1 (September to January)

Vehicle engineering
Whole-vehicle design concepts, including engine management, on-board diagnostics, and braking & transmission systems.

Heat transfer
Concepts of conduction, convection and radiative heat transfer, formulation of heat transfer equations for numerical solution, and heat exchanger design.

Engineering systems simulation
Role of simulation in design, analysis of dynamic systems in the time and frequency domains, and Simulink and Matlab modelling.

Professional skills for engineering practice
Written and oral communication in engineering, time management and workload planning, critical analysis, group work and structured reflection, and engineering ethics.

Engine & powertrain technologies part 1
Thermodynamic and mechanical principles, emission reduction, IC engine simulation techniques, alternative automotive propulsion and powertrain systems, and alternative fuels, technological and resource implications.

SEMESTER 2 (February to May)

Vehicle dynamics & aerodynamics
Suspension systems, tyre behaviour, roll centres, steady state handling characteristics, motorcycle dynamics, and aerodynamic design for reduced drag and ground effect.

Engine & powertrain technologies part 2
Thermodynamic and mechanical principles, emission reduction, IC engine simulation techniques, alternative automotive propulsion and powertrain systems, and alternative fuels, technological and resource implications.

Project phase 1
Introduction to the research process, surveying prior research, critical interpretation of the engineering literature, project scoping and planning, and data analysis.

Engineering project management
Models of engineering project management, strategic context, time and cost estimation, uncertainty & risk management, project monitoring and control, and teamwork.

Conceptual design group activity
Small team working on multidisciplinary engineering design problems, team roles, structured reflection, and technical communication.

SEMESTER 3 (June to September)

Dissertation
You will undertake a substantial research project, in which you will analyse research data and formulate conclusions, and communicate your research findings by written and oral means.

Descriptions of the content of each unit can be found at www.bath.ac.uk/catalogues
Availability of units listed may change

www.bath.ac.uk/engineering/graduate-school/taught-programmes/automotive
“I wanted the ability to work anywhere in the world and chose Bath as its international clout has given me a qualification that will pass muster in almost any country. The scholarship scheme is a bonus as well.

“I have been extremely impressed how the Faculty takes heed of students’ needs and ideas as to how the programme can be improved and acts upon them. Regarding the course material, the fact that Bath has strong industrial links, and that all academics are at the forefront of research in their fields, has ensured that the curriculum is current and robust.

“I have appreciated the variety of assignments that I have been given, including several open-ended ones to simulate a real design environment. A good balance is struck between focused expertise and broadening our awareness and knowledge of general engineering.

“I hope to continue on at Bath and do a doctorate in engineering.”

Peter Harris
Why study the MSc in Engineering Design at Bath?
The MSc produces graduates with the creative, technical, managerial skills and expertise highly sought after in the field of engineering design. The programme covers an extensive range of innovative design techniques and approaches, reflecting how design impacts across all sectors of industry, whilst broadening your career opportunities as much as possible.

Design influences all industrial activity, whether from the perspective of a process, a support system or a technology. In a rapidly developing global marketplace, the emerging critical differentiating issue is one of design, in terms of appeal, innovation, speed and cost-effectiveness. It is vitally important that engineering designers understand the needs of increasingly demanding customers of all types. Current research areas are detailed on the IdMRC website: www.bath.ac.uk/idmrc.

What skills will I gain?
The aim of this MSc programme of study is to provide a high-level experience for graduates who wish to specialise in engineering design or to undertake engineering design research in a holistic manner.

You will develop technical expertise in engineering design and also learn how to harness that knowledge in a business environment. You will gain analytical and teamwork skills to enable you to deal with the open-ended problems, typical of engineering practice.

In particular, you will learn:
- to understand the issues associated with creativity and innovation
- detailed knowledge and experience of the issues of global working
- a number of techniques to enable the management of engineering design projects and teams
- a number of knowledge management strategies associated with design rationale: information for innovation, design reuse, manufacturing knowledge, and knowledge-based engineering
- to understand the nature and role of technology strategy in creating value in the engineering design industry
- to use a range of practical tools (scenario planning, real options, etc.) to develop practical technology strategies
- to apply subject-specific knowledge in a range of complex situations, taking into account the implications for other areas of the business.

Programme structure
Semester 1 (September to January)
In the first semester, you will take five units that introduce the fundamental principles of new product design and development, advanced design and innovation techniques, system modelling and simulation, and computer-aided packages for design. Assessment is by coursework and examinations.

Semester 2 (February to May)
In Semester 2 you will study both technical specialist units and project-based units. You will develop your professional understanding of engineering in a research and design context. In the group activity, you will apply engineering and project management techniques to solve a design problem, just as an industry-based design team would operate. Project phase 1 introduces you to research methods and project planning, which you then apply to detailed background research in your discipline area in preparation for your individual summer dissertation project. Assessment is by coursework and examinations.

Summer period (June to September)
You will undertake an individual research project in one of our leading research centres. MSc Engineering Design students carry out their research projects across the entire department, reflecting the multidisciplinary nature of this subject. Projects are carried out in areas such as design information and knowledge, creativity and IT systems. The projects are often related to other ongoing research. The design projects originate from a variety of sources in the Department or local industry and from students’ own interests.
Facilities to support the programme of study

You will make extensive use of the advanced facilities, which are regularly upgraded and updated according to industry and research needs. These include advanced CADCAM capabilities (Solid Edge and a full Unigraphics suite) and rapid prototyping facilities. A recent development has been a bespoke model shop for ‘design and make’ and ‘prototyping’ activities.

Admissions criteria

A first or upper second class UK honours degree or internationally recognised equivalent in Mechanical Engineering.

IELTS 6.5 (with not less than 6.0 in each of the four components) or a minimum of 62 in PTE Academic, with no less than 59 in each component may be required.

Career opportunities

Previous graduates of the MSc in Engineering Design have progressed to begin careers in the UK and abroad in areas such as environmental design and design consultancies.

Recent graduates have secured jobs at:
- Garrad Hassan
- ABB Research
- Dyson.

We actively encourage the best of our MSc students to continue their studies with us to PhD level.

What our students say

“Engineering Design is a programme that is highly linked with modern industries. It helps you understand today’s products and their development. You also learn useful design methods and how to design a product that is practical. Moreover, the programme gives you an idea about how to manage engineering design projects, that are highly associated with the industry.

“The programme provides theoretical knowledge and also offers practical knowledge. The second semester is a kind of practical semester, which teaches you how to manage design projects. Furthermore, in this semester you can learn how to cooperate and communicate with each other to complete a group project. These are the things that you cannot learn from traditional taught courses.

“Bath is small, quiet, and beautiful; a place where you can concentrate on your study as well as entertain yourself. The University is located on top of a hill near the city centre, and the campus is a relatively small one that offers an open, intellectual atmosphere. The tutors and students are really nice and friendly, and you can easily make friends with them.

“After I graduate from the University of Bath, I plan to return to China and find a job in Shanghai. I have strong self-confidence that I can find a job that is relevant to my MSc.”

Ji Han
Programme structure diagram

SEMESTER 1 (September to January)

Innovation & advanced design
Product effects evaluation techniques, innovation techniques (particularly TRIZ method), and design and management approaches.

Product design & development
Aspects of the product design process, including creativity and styling methods, handling human factors and ergonomics, and managing the introduction of new products.

Engineering systems simulation
Role of simulation in design, analysis of dynamic systems in the time and frequency domains, and Simulink and Matlab modelling.

Professional skills for engineering practice
Written communication in engineering, oral communication in engineering, time management and workload planning, techniques of critical analysis for the engineering literature, introduction to group work and structured reflection, and engineering ethics and professional codes of practice.

Advanced computer-aided design part 1
Computer aids for design, mechanism/machine design; solid modelling, feature-based modelling, and constraint modelling; data representation and exchange; and product data management.

SEMESTER 2 (February to May)

Compulsory units

Advanced computer-aided design part 2
Computer aids for design, mechanism/machine design; solid modelling, feature-based modelling, and constraint modelling; data representation and exchange; and product data management.

Materials in engineering design
The design process, the designer and materials selection; formalised procedures for materials selection; use of merit indices; and case studies.

Project phase 1
Introduction to the research process, surveying prior research, critical interpretation of the engineering literature, project scoping and planning, and data analysis.

Engineering project management
Models of engineering project management, strategic context, time and cost estimation; uncertainty & risk management, project monitoring and control, and teamwork.

Conceptual design group activity
Small team working on multidisciplinary engineering design problems, team roles, structured reflection, and technical communication.

SEMESTER 3 (June to September)

Dissertation
You will undertake a substantial research project, in which you will analyse research data and formulate conclusions, and communicate your research findings by written and oral means.

Descriptions of the content of each unit can be found at www.bath.ac.uk/catalogues
Availability of units listed may change
“The programme is very unique and it is not delivered anywhere else in the UK. Other programmes provided by other institutions explore the management of technology from either a technical or management perspective; however, this MSc is unique through its combination of management and engineering, integrating the two disciplines to bridge the two.

“The mix of people really shows in group projects: Sometimes a project is more engineering-oriented, sometimes more management-oriented. Then you get a diverse mix of people in terms of background and culture.

“My communication skills, presentation skills and group work skills have really developed during the programme. I am the academic representative for the programme so that has developed my soft skills as well. I have also benefited from professional development programmes such as academic writing, networking, and dealing with conflicts in cross-cultural environments.

“I am looking forward to starting my semi-funded PhD at one of the largest business schools in France.”

Malek El Qallali
MSc in Innovation & Technology Management

12 months full time. September start.

Why study the MSc in Innovation and Technology Management at Bath?
The business world is changing; 21st century leaders need to be equipped with both technological and managerial skills. It is no longer enough to be an engineer with sound technological skills if you are unable to manage a supply chain and lead a diverse workforce. At the same time, you need experience of creativity, design and manufacturing methods in order to understand the technological processes that operate within your company. The MSc in Innovation & Technology Management is designed with this in mind; it teaches engineering and science graduates key management and leadership skills whilst simultaneously training management graduates about the technological operations within business. Whilst most of our Engineering MScs focus on a specific technical area, the MSc in Innovation & Technology Management takes a broader, more strategic view. As the name suggests, this programme is designed for graduates with an aspiration to manage the creation, development and deployment of complex and innovative technology.

The MSc in Innovation & Technology Management is the flagship programme of a unique collaboration between the School of Management and the Department of Mechanical Engineering, both ranked highly in national league tables.

The Department of Mechanical Engineering has a proud record of achievement, consistently rated as producing world-leading and internationally excellent research. Close links with industry ensure that all teaching and research remains topical and cutting edge. The School of Management has over 40 years’ experience in providing high quality and innovative management programmes. Our world-class research combined with a unique emphasis on real-world learning makes Bath an outstanding place to study.

What skills will I gain?

This programme is designed for engineering, science and management graduates who are looking to develop an in-depth understanding of innovation and technology management concepts and methods, and the skills to apply these in real life. By combining the development of your innovation, management and technological/engineering skills you will gain the expertise to excel as leaders in complex business environments. On the programme you will:

- build a systematic and thorough understanding of innovation and technology management theory and principles
- gain hands-on experience of creativity tools, decision analysis and product design
- acquire project management, marketing and strategic skills
- learn about management and innovation in complex, global inter-organisation networks
- plan innovation and technology management strategies
- develop your leadership capabilities, enabling you to make an impact on strategic decisions
- apply your skills to real-life problems.

From lectures to seminars, group project work to practitioner presentations, you will be exposed to a diverse range of teaching and learning techniques. You will be assessed via a variety of individual and group methods including exams, projects, reports and presentations, as well as the final dissertation. The teaching schedule is supplemented by invited talks from external practitioners, active case studies and trips to innovative engineering companies.

Programme structure

The programme has been designed around the specific themes of Innovation & Technology Management. The units are structured to provide a strong and coherent narrative. The introductory unit takes a high-level look at innovation management, introducing the key themes and concepts that will be explored in more depth throughout the year. Subsequent units are focused on an aspect of innovation, such as creativity, strategy, new product development and commercialisation. Each unit is delivered in modular format, over one week, which creates an in-depth learning experience.

Students work in groups to produce innovative communications plans and strategies.
Since the programme began in 2008, a highly international profile has developed, with students joining us from (among others) Brazil, Mexico, the UK, France, Germany, Nigeria, Kenya, Kazakhstan, India, Russia, China and Brunei. Our graduates’ opportunities are proving to be varied and worldwide, with many recent graduates securing management positions at world-leading engineering companies including Tata motors, Honda, Messier-Dowty and Airbus. Others take analyst roles in consultancies such as Accenture, Ernst & Young and Deloitte; or take on innovation strategy responsibilities at organisations like Oxford University Press and Transport for London. Those who wish to further their innovation research have taken up PhD studentships at the University of Bath and other leading Universities.

**Admissions criteria**
A first or upper second class UK honours degree or internationally recognised equivalent in engineering, management or science. Other disciplines with some numerical content will be considered, on an individual basis.

IELTS 6.5 (with not less than 6.0 in each of the four components) or a minimum of 62 in PTE Academic, with no less than 59 in each component may be required.

**Career opportunities**
Since the programme began in 2008, a highly international profile has developed, with students joining us from (among others) Brazil, Mexico, the UK, France, Germany, Nigeria, Kenya, Kazakhstan, India, Russia, China and Brunei.

Our graduates’ opportunities are proving to be varied and worldwide, with many recent graduates securing management positions at world-leading engineering companies including Tata motors, Honda, Messier-Dowty and Airbus. Others take analyst roles in consultancies such as Accenture, Ernst & Young and Deloitte; or take on innovation strategy responsibilities at organisations like Oxford University Press and Transport for London. Those who wish to further their innovation research have taken up PhD studentships at the University of Bath and other leading Universities.

**What our students say**

“The management units assume you are starting from first principles and so everyone is coming from a level playing field whether you are from engineering or from management. This programme sits in the middle of both fields and everyone meets in the middle with the result that you end up with a really good mix. It’s a pedigree academic programme where you learn a lot of scholarly skills, including things like critical thinking. Studying at the University of Bath has enhanced my career prospects, not just from the skills I have learnt here, but also by exposure through meeting new people, as the support given by the school extends much further than just the academic aspects. Also, the name the ‘University of Bath’ carries some weight. Studying in the city of Bath has been an interesting experience for me; it’s a beautiful city, being a heritage centre, and you can do so many unusual things.”

*Duncan Ng’Enda*
Programme structure diagram

**SEMESTER 1 (September to January)**

- **Creativity & innovation methods**
  Description: Introduction to creative thinking, includes group work to develop an innovative design proposal.

- **TRIZ-based innovation**
  Description: An immersive grounding in the Theory of Inventive Problem Solving, a world-leading innovative method.

- **Managing product development**
  Description: New product and service management and development. Explore contemporary challenges such as risk, change, knowledge management and sustainable design.

- **Decision analysis**
  Description: How organisations make rational decisions about innovative technology in the face of uncertainty, change and cognitive biases.

- **Introduction: Management of innovation**
  Description: Introduction to technology innovation: what it is, how it happens and how to best manage it.

**SEMESTER 2 (February to May)**

- **International networks for production, service and logistics**
  Description: Considering innovations in manufacturing, supply chain and international management to support global collaborative technology projects that support delivering value.

- **Engineering project management (ITM)**
  Description: Modern project management covering not just the traditional triple constraint of time, cost and quality, but also shared risk, stakeholder management and organisational change.

- **Commercialisation of new technology**
  Description: Exploring process and issues involved in bringing technological innovations to market.

- **Innovation in networks**
  Description: Understand and manage innovation within inter-organisational networks by examining how different network factors within the business environment may influence, enable and inhibit the innovation process.

- **Technology strategy & organisation**
  Description: How strategic plans and organisational structures can foster and promote innovation, the role of technology strategy and organisational structures in creating value for the innovative organisation.

**SEMESTER 3 (June to September)**

- **Dissertation**
  Description: You will undertake a substantial research project, in which you will analyse research data and formulate conclusions, and communicate your research findings by written and oral means.

Delivered by the Department of Mechanical Engineering

Delivered by the School of Management

Descriptions of the content of each unit can be found at [www.bath.ac.uk/catalogues](http://www.bath.ac.uk/catalogues)

Availability of units listed may change.
"I chose my MSc as the combination of courses related to my subject area were well suited to my needs as a student who has a background in electrical engineering. Also, Bath is one of the leading universities in the UK. The best things about studying in Bath are the challenges you face; you are encouraged to maximise your potential and do what you thought would never be possible.

"The most rewarding part of my programme has been the coursework I have done, you really learn a lot from it. My final project has been extremely rewarding as I have been exploring a newly emerged imaging technique: fault detection in carbon fibre using magnetic induction tomography imaging. I hope to continue my studies to PhD level."

Fatima Abdullahi Muhammad
**Why study the MSc in Mechatronics at Bath?**

This MSc programme produces graduates with technical, managerial skills and expertise across both electrical and mechanical engineering. This makes them in high demand across the aerospace, automotive and manufacturing sectors. The programme has been specifically designed to fulfill the needs of modern industry requiring knowledge in both fields and incorporates a significant input from industry to complement its academic foundations. The programme specialises in enabling students to produce mechatronic components, which increase performance and energy efficiency, as sought after by industries worldwide.

The programme is supported by both the Department of Electronic & Electrical Engineering and the Department of Mechanical Engineering, both of which are among the top performers in the UK, with international excellence in both teaching and research. There are also strong links with firms such as Rolls-Royce and BAE Systems in the electrical power and energy-related industries.

**What skills will I gain?**

Graduates of this programme have an in-depth knowledge of how electrical engineering can be integrated with mechanical engineering to effect state-of-the-art technologies. You will be qualified to significantly improve the performance of equipment and devices by using, for example, artificial intelligence and modern control and computer engineering. You will be able to approach a problem from a systems engineering point of view, having developed the ability to apply the concepts and principles of mechatronics design to complex multi-physics engineering situations.

In particular, you will learn to:

- apply artificial intelligence and modern control and computer engineering techniques to improve the performance of modern equipment and devices
- understand the nature and role of technology strategy in creating value in the mechatronics industry
- apply subject-specific knowledge in a range of complex situations, taking into account the implications for other areas of the business
- develop a detailed understanding of project planning and through-life project costing
- operate effectively, both independently as well as within teams, assuming leadership roles where the opportunity arises
- complete a substantial research project in a technical aspect of mechatronics engineering and prepare material for publication in open literature.

**Programme structure**

The structure follows a unique pattern, in three parts, starting with advancing your technical skills and understanding, through to professional development and multidisciplinary group work, preparing you to finally undertake an individual project under expert supervision.

**Semester 1 (September to January)**

You will study five units in the first semester (see the programme structure diagram overleaf). You will integrate your fundamental background of mathematics and engineering science into the arena of mechatronics. The first semester covers the fundamental principles of computational artificial intelligence, integrated engineering control techniques and robotics engineering. Assessment is by examinations and coursework.

**Semester 2 (February to May)**

In Semester 2 you will study both technical specialist units and project-based units. You will develop your professional understanding of engineering in a research and design context. In the group activity, you will apply engineering and project management techniques to solve a design problem, just as an industry-based design team would operate. Project phase 1 introduces you to research methods and project planning,
which you then apply to detailed background research in your discipline area in preparation for your individual summer dissertation project. Assessment is by coursework and examinations.

**Summer period (June to September)**
You will complete your MSc through an individual research project in one of our leading research centres. This project work involves the integration of electrical engineering and mechanical engineering. Each student is assigned two supervisors, one from each of the two departments.

Examples of appropriate projects include:
- design and control of autonomous robots
- undersea tidal wave power generators
- design and control of high speed mechanisms.

**Facilities to support the programme of study**
There is a dedicated Autonomous Systems and Robotics laboratory that serves the programme. Facilities in both Departments (Electronic & Electrical Engineering and Mechanical Engineering) are also open to Mechatronics MSc students for their group and individual projects. The Electronic & Electrical Engineering Department has a state-of-the-art, real-time digital simulation facility and a microgrid laboratory. The Department of Mechanical Engineering has numerous high-tech experimental facilities organised under 12 research centres and covering a wide range of research activities in areas including aerospace, automotive, manufacturing, energy and environment, power transmission and motion control.

**Admissions criteria**
A first or upper second class UK honours degree or internationally recognised equivalent in Mechanical Engineering or Electrical & Electronic Engineering.
IELTS 6.5 (with not less than 6.0 in each of the four components) or a minimum of 62 in PTE Academic, with no less than 59 in each component may be required.

**Career opportunities**
Graduates with knowledge and training in both electrical and mechanical engineering are very much in demand in aerospace, automotive and manufacturing industries. More and more of the hydraulic and mechanical aspects of these industries are being replaced by mechatronics components to reduce weight and increase performance and energy efficiency. The career opportunities in the UK and worldwide industry are significant.

We also actively encourage the best of our MSc students to continue their studies with us to PhD level.

Jobs our recent graduates have secured include:
- Product Research Development Engineer, KTP Associate, University of Bath, UK
- Project Manager, Guandong Best Control Technology, PR China
- Software Engineer, DIAGNOS, UK
- Engineer, MAN Diesel & Turbo, USA.

**What our students say**
“I chose to study at the University of Bath because of the extremely strong reputation of its engineering faculty, the content of the Mechatronic programme, and the city of Bath itself.

“Because of its reputation, the University attracts a diverse postgraduate and undergraduate population from all over the world, and it’s been great meeting so many people from other places. The campus is a great place to work, and living in the city has been fun.

“I’ve enjoyed the variety of units I have studied, which have broadened the skills I developed as an undergraduate.

“I’m currently hoping to stay on for a PhD in the Department of Electronic & Electrical Engineering.”

*Stephen Davey*
Programme structure diagram

SEMESTER 1 (September to January)

Core units

- Computational intelligence
- Robotics engineering
  Industrial robot manipulators, kinematics, dynamic analysis and inverse dynamics, trajectory generation, and robot vision.
- Engineering systems simulation
  Role of simulation in design, analysis of dynamic systems in the time and frequency domains, and Simulink and Matlab modelling.

- Control engineering
  Design of linear systems in the time domain, observability and controllability, state feedback, and methods for analysing non-linear systems.
- Professional skills for engineering practice
  Written and oral communication in engineering, time management and workload planning, critical analysis, group work and structured reflection, and engineering ethics.

SEMESTER 2 (February to May)

- Power systems control
  Power system modelling, power system small-signal stability analysis, damping torque analysis, transient stability analysis and improvement, and power system control design.
- Project phase 1
  Introduction to the research process, surveying prior research, critical interpretation of the engineering literature, project scoping and planning, and data analysis.
- Signals & information
  Analog and digital signal processing, and information theory.
- Conceptual design group activity
  Small team working on multidisciplinary engineering design problems, team roles, structured reflection, and technical communication.
- Engineering project management
  Models of engineering project management, strategic context, time and cost estimation; uncertainty & risk management, project monitoring and control, and teamwork.

SEMESTER 3 (June to September)

Dissertation
You will undertake a substantial research project, in which you will analyse research data and formulate conclusions, and communicate your research findings by written and oral means.

Descriptions of the content of each unit can be found at [www.bath.ac.uk/catalogues](http://www.bath.ac.uk/catalogues)
Availability of units listed may change
“I was studying at the University of Bath for two years on a partnership programme with my university in China before my MSc. I chose to continue my studies at the University of Bath because every lecturer in the Department was very helpful compared with the experience my friends have had studying in other places.

“The best thing about the University of Bath is the study environment and the University’s facilities; for example, the library and the IT support service, all of which make my study life easier. It is a good place to really concentrate on my work every day.

“I started my PhD at the University in 2014 and I’m sure that I will enjoy it and make good progress.”

Wei Wei
MSc Electrical Power Systems
12 months full time. September start.

Why study the MSc in Electrical Power Systems at Bath?
The University of Bath MSc programme in Electrical Power Systems will give you the skills and specialist experience required for your career in the electrical power industry, including transmission and distribution companies, and manufacturers worldwide.

This MSc programme is taught within the Department of Electronic & Electrical Engineering and builds on a long-term involvement with the power industry, the education of electrical power engineers and extensive research work. The programme provides engineers with a firm grasp of the field, enabling them to understand the subject in depth and contribute to the wealth and health of the industry worldwide.

The programme follows a unique structure, flowing from technical teaching through to business management techniques to individual and group-based design projects. This combination of design, business and project management elements ensures that graduates acquire the academic and personal qualities, as well as business acumen, to make an immediate contribution to industry or to undertake research.

What skills will I gain?
The aim of the MSc programme in Electrical Power Systems is to equip you with the ability to make an immediate engineering contribution to electrical power systems analysis, planning, operation and management. You will be able to perform in-depth engineering work on defined tasks requiring technology, research, personal project management and innovative thinking. The University of Bath MSc programme in Electrical Power Systems provides its graduates with the underpinning knowledge of business operation and project teamwork that leads to maximised impact within an industrial setting.

In particular, this programme of study will help you to:
- understand the fundamental concepts of electrical energy systems and analysis
- detail the principal subsystems of a modern power systems network
- recognise and explain the functional purpose of each subsystem
- understand and apply the various management processes used in electrical power systems engineering
- analyse the nature and role of technology strategy in creating value in the electrical power systems industry
- use a range of practical tools (scenario planning, real options, etc.) to develop practical technology strategies
- apply subject-specific knowledge in a range of complex situations, taking into account the implications for application of electric power in general
- develop a detailed understanding of project planning and through-life project costing
- operate effectively – both independently as well as within teams – assuming leadership roles where opportunities arise
- complete a substantial research project in a technical aspect of electrical power systems engineering, and prepare material for publication in the open literature.

Programme structure
The structure follows a unique pattern, in three parts, starting with advancing your technological skills and understanding, through to personal professional development and multidisciplinary group work, preparing you to finally undertake an individual project under expert supervision.

Semester 1 (September to January)
You will integrate your fundamental background of mathematics and engineering science into the arena of Electrical Power Systems. You will take five taught units, delivered by our expert lecturers. Assessment is by examinations and coursework.

Semester 2 (February to May)
In Semester 2 you will study both technical specialist units and project-based units. You will develop your professional understanding of engineering in a research and design context. In the group activity, you will apply engineering and project management techniques to solve a design problem, just as an industry-based design team would operate. Project phase 1 introduces you to research methods and project planning, which you then apply to detailed background research in your discipline area in preparation for your individual summer dissertation project. Assessment is by coursework and examinations.

Summer period (June to September)
As a student of MSc Electrical Power Systems, you will undertake an individual research project in the Centre for Sustainable Power Distribution, which is widely recognised as a centre of research

Student uses motor test rig to investigate instability of induction motor drives under high-load conditions.

www.bath.ac.uk/engineering/graduate-school/taught-programmes/power
excellence within the area of electrical power and energy systems. It carries out research in all aspects of power generation, transmission and distribution and has internationally recognised expertise in:

- power system planning
- operation and management
- security and stability analysis of large systems
- control of power systems
- protection of power systems
- distributed generation
- power systems economics and market operation
- condition monitoring and protection of power plants.

Facilities to support the programme of study

The Department of Electronic & Electrical Engineering provides extensive laboratory facilities to all its postgraduate students. In addition, electrical power systems postgraduates have access to:

- a real-time digital transient simulator
- a multi-machine power system simulator
- chemical and kinetic energy storage equipment
- a full range of industry-standard software such as ATP, EMTDC, ERACS, and ANSYS
- electrical power market simulator.

Admissions criteria

A first or upper second class UK honours degree or internationally recognised equivalent in Electrical Engineering. Applicants must demonstrate an existing academic background in electrical power systems.

IELTS 6.5 (with not less than 6.0 in each of the four components) or a minimum of 62 in PTE Academic, with no less than 59 in each component may be required.

Career opportunities

Recent worldwide employment examples from MSc Electrical Power Systems graduates include:

- London Engineering Manager, EDF Energy, UK
- Special Project Engineer, Guam Power Authority, USA
- Transmission and Control Engineer, Scottish and Southern Energy, UK
- Senior Strategic Projects and Research Analyst, Central Electricity Board, Mauritius
- Distribution Manager, Barbados Light & Power Co. Ltd, Barbados
- Head of Mechanical Engineering, First Hydro, UK
- Power Systems Design Engineer, National Grid, UK
- Electrical Engineer, British Power International, UK
- Senior Electrical Engineer, Torishima Pump Mfg. Co. Ltd, United Arab Emirates.

We also actively encourage the best of our MSc students to continue their studies with us to PhD level, for which scholarships are available.

What our students say

“Knowing that the University of Bath is ranked amongst the top universities in electrical/electronic engineering was a huge selling point for me. Furthermore, it boasts one of the best research facilities in the country and I wanted nothing more than to be part of a leading institution such as this.

“The most rewarding parts of the programme have been the group project work, which has greatly developed my problem-solving, conflict-resolution and communication skills, essential skills for life. I think the most impressive thing about the programme at the University of Bath is the structure of the academic year. The transition between the three phases of technical study, project management and individual project has been seamless compared to other universities’ curricula.

“I recently got offered a job to work as a technical graduate for an engineering company based in Cambridge. I owe this mostly to the tireless support and guidance I have received from the dedicated careers service at the University of Bath, to which I am very grateful.

“Bath is a beautiful city, possessing just the right balance between vibrancy and serenity. The Students’ Union is very welcoming and active. I have been involved with lots of different activities and societies outside of the classroom: basketball, football, the Afro-Caribbean society and the Christian Union, to name a few. Additionally, I have found the student support to be faultless. I always know where to go to get help, and each time there is someone at hand to point me in the right direction. I really appreciate how the academic staff always have their doors open, willing to offer help or advice whenever it is needed.”

Gregory Otoide
SemeSTeR 1 (September to January)

Core units
- **Electrical energy systems & analysis**
  Sources of electrical power generation, including green, nuclear and fossil fuels, as well as the structure of modern electrical power systems.
- **Power system protection**
  Protection of power system components, including transmission lines, transformers, feeders and busbars.
- **Power electronics & machines**
  High-power applications, such as industrial and traction drives, small-scale power generation, and power system control.

**Professional skills for engineering practice**
- Written and oral communication in engineering, time management and workload planning, critical analysis, group work and structured reflection, and engineering ethics.

SemeSTeR 2 (February to May)

Compulsory units
- **Control of power systems**
  Power system modelling and analysis and control of the stability of power systems.
- **Power quality**
  Defining power quality, identifying power quality problems in electrical power networks and studying techniques for their mitigation.
- **Engineering project management**
  Models of engineering project management, strategic context, time and cost estimation; uncertainty & risk management, project monitoring and control, and teamwork.

**Project phase 1**
- Introduction to the research process, surveying prior research, critical interpretation of the engineering literature, project scoping and planning, and data analysis.

**Conceptual design group activity**
- Small team working on multidisciplinary engineering design problems, team roles, structured reflection, and technical communication.

SemeSTeR 3 (June to September)

**Dissertation**
- You will undertake a substantial research project, in which you will analyse research data and formulate conclusions, and communicate your research findings by written and oral means.

Also see our part-time Electrical Power Systems by distance learning programme on page 47

Descriptions of the content of each unit can be found at [www.bath.ac.uk/catalogues](http://www.bath.ac.uk/catalogues)

Availability of units listed may change
The Faculty of Engineering & Design’s Distance Learning Unit runs two programmes:

- Electrical Power Systems (EPS) by distance learning
- International Construction Management (ICM) by distance learning.

Our programmes are designed for working professionals wanting flexible, part-time study to fit around their careers. Students are taught online through our Virtual Learning Environment (Moodle) by our experienced tutors.

**Why study via distance learning at Bath?**

Our programmes provide the unique opportunity to study:

- a curriculum developed in conjunction with industry
- units that are current and ever-evolving in response to new developments and issues within the sector
- content with real-world relevance directly applicable to students’ workplaces
- a residential school programme with involvement from leading practitioners.

**What will I gain?**

By studying our programmes you will gain:

- an internationally recognised postgraduate qualification
- improved skills in research, personal project management and innovative thinking
- membership of an international group of career professionals
- tuition from highly experienced tutors.

**Our residential schools**

Our residential schools are an excellent opportunity to meet fellow students and to participate in skills development exercises and practical demonstrations. They provide the chance to gain up-to-date insights and information on current issues and developments within the industry.

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<td>Time frame</td>
<td>2 years</td>
</tr>
<tr>
<td>2 years</td>
<td>3 years</td>
</tr>
</tbody>
</table>
MSc Electrical Power Systems by Distance Learning

Three years part time, Postgraduate Diploma. October start. Accelerated study schedule possible for full-time study.

Why study Electrical Power Systems at Bath?
The MSc Electrical Power Systems by distance learning programme aims to give you the specialist knowledge and skills required to significantly enhance your career prospects in the Electrical Power Systems industry.

Our MSc is comprehensively covers topics critical to Electrical Power Systems Engineering practice, including electrical power systems analysis, planning, operation and management. In addition to equipping you with up-to-date technical skills, our MSc also gives you the opportunity to enhance your commercial and project management skills with study focused on project management, power markets and economics.

The MSc Electrical Power Systems builds on a long-term involvement with the power industry, the education of power engineers and extensive research work and expertise within the Department of Electronic & Electrical Engineering.

Entry Requirements
A first or upper second class UK honours degree or internationally recognised equivalent in a numerate study discipline such as electrical power systems, electronic engineering, telecommunications, physics or mathematics.

IELTS 6.5 (at least 6.0 in each of the four components); or a minimum of 62 in PTE Academic (with no less than 59 in each component).

Career opportunities
The programme has been fully accredited by The Institution of Engineering and Technology (IET) and is especially relevant if you are:
- looking for Chartered Engineering status
- a manager or have management-focused work and need more formal training and a recognised qualification
- moving from a specialist or technical role into management
- wishing to develop your career potential by moving into management
- seeking to move from management to an electrical power systems design engineering role.

What our students say
“Working in a power station, the electrical power systems by distance learning programme was the most relevant electrical engineering degree programme for the work I am doing. A course of this type was not offered at other universities and the flexible distance learning programme allowed me to fit in studies around work and social commitments.

“The best part of the programme is the residential schools where you get an opportunity to interact with lecturers and meet the other students studying on the programme. It is rewarding when you can apply what you have learnt on the programme back to your work life.

“The programme builds your confidence by providing a more in-depth, technical foundation to base your judgements and analysis for practical work on site.”

Nia Roderick

www.bath.ac.uk/engineering/distance-learning/eps
MSc International Construction Management by Distance Learning

Three years part time, Postgraduate Diploma. November or June start. Accelerated study schedule possible for full-time study.

Why study International Construction Management at Bath?

International Construction Management (ICM) reflects the breadth of management issues facing today’s international construction manager and seeks to develop creative decision-making and problem-solving skills critical for success in a competitive business environment.

A key element of the programme is learning through reflection on your practice. Emphasis is placed on applying what you learn to the industry and on comparing and contrasting issues with your peers from around the world. This approach is reinforced by the opportunity to attend residentials at the University of Bath, the British Columbia Institute of Technology, Vancouver or in Dar es Salaam, Tanzania.

The programmes covers areas integral to construction management such as economics, law, procurement, strategy and managing human resources.

Entry Requirements

A first or upper second class UK honours degree or internationally recognised equivalent from a recognised University or a professional qualification. IELTS 6.5 (at least 6.0 in each of the four components); or a minimum of 62 in PTE Academic (with no less than 59 in each component).

Career opportunities

The programme is accredited by the Royal Institution of Chartered Surveyors (RICS) and is especially relevant if you are:

- a manager or have management-focused work and need more formal training and a recognised qualification
- moving from a specialist or technical role into management
- wishing to develop your career potential by moving into management
- seeking to move from management in a domestic to an international arena.

What our students say

“The University of Bath’s league table status coupled with good reviews about the programme itself led me to believe that Bath would match the high expectations that are associated with postgraduate study. Furthermore, the content of the programme closely matched my personal development aspirations.

“The online learning environment is an incredibly useful tool and the way that the ICM programme is centred around it and the emphasis on learning from peers enhances the learning experience. Discussions with fellow students around the world is very informative, broadens horizons (in terms of enhancing one’s practice based on new tips and tricks learned from others) and encourages a move away from a local mindset.

“Being able to immediately apply new concepts into my day-to-day activities has been rewarding and, in cases, fruitful for my development and beneficial for my employer. The residential schools offer a chance to mingle with like-minded individuals from all over the world adding to the overall learning experience.

“The likely perception is that as the programme is a distance learning course, there is minimal contact with key individuals, but communication with the academic staff is constant and the support from fellow students plugs any perceived gaps.”

Garikai Mudyiwa
How to apply for an MSc programme

To apply for one of our MSc programmes in the Faculty of Engineering and Design you need to register for the online application system. Using your unique login, you can complete the application form and upload supporting documents such as references and exam results. You will be able to track the progress of your application and access correspondence regarding your offer.

Step 1 Apply online
Once you have decided to apply, you will need to submit your application to us online. You will need the following documents (they can be uploaded or scanned):
- one reference (usually academic)
- a scan/copy of your degree certificate
- a scan/copy of your degree transcript
- a scan/copy of your English Language result, if applicable.

Select the programme you wish to apply for at www.bath.ac.uk/study/pg/applications.pl and follow the instructions.

Step 2 Keep track of your application
You can track the progress of your application at www.bath.ac.uk/applicant. Most students receive news of the decision on their application within six to eight weeks. If you receive an offer it will either be:

Conditional - the university will offer you a place if you meet certain conditions, usually based on exam results. You will need to check the conditions of your offer.

Unconditional - you have met all the academic requirements for the course and the university is happy to accept you.

All our offer holders receive online information, that details the next steps you need to take.

Step 3 Accepting an offer
You can accept your offer whether it is conditional or unconditional. Once you have met the conditions of your offer, you will receive confirmation of your place at Bath.

Next steps
After you have accepted your offer you can start preparing for your arrival at Bath. At this stage, you can apply for scholarships and book your accommodation.

ATAS certificate
If you require a student visa for your MSc, you may also need to apply for a taught masters Academic Technology Approval Scheme (ATAS) certificate. Please consult the website before applying for a visa. www.fco.gov.uk/atas

Fees and finance

Tuition fees
Fees for full-time MSc programmes vary between disciplines so consult our website for up-to-date information. Some programmes offer alternative study options such as distance learning, short professional courses and part time, with alternative fee structures. Please note that visa restrictions exclude international fee payers from the part-time study option. www.bath.ac.uk/study/pg_FEES

Scholarships
The Faculty of Engineering & Design offer scholarships to our best MSc applicants. There are also scholarships offered by the International Office and eligible applicants can be considered for more than one award up to a value of £5,000. To be eligible for a scholarship you need to have accepted an offer to study one of our MSc programmes. For up-to-date information, refer to the taught scholarships section of the Faculty Graduate School office website. www.bath.ac.uk/engineering/graduate-school/funding

Finding part-time work
You may want a part-time job during your studies to help towards your living costs, or just for the experience and to meet new people. The University offers numerous jobs on campus through Joblink in the Students’ Union. The benefit of having a job on campus is the potential for flexible working hours depending on your study schedule and deadlines. Students with visas need to check their working hour restrictions.

There are a number of resources available to help you find a job on campus or in Bath including:
- search Joblink: bathstudent.com/joblink
- Bath Chronicle newspaper is out every Thursday and has a range of jobs advertised: www.thisisbath.co.uk/jobs
- the shopping complex in Bath offers many jobs too: southgatebath.com/jobs/
Living in Bath: student accommodation and living costs

Accommodation

Postgraduates can pick from university halls accommodation or private rental accommodation. Postgraduate university rooms are based in the city centre, near all the shops and a few minutes bus ride from the campus. There is a broad range of room types to suit all budgets, and over 40 per cent of the rooms have en suite facilities. There are lots of rental choices in the city centre, and if you prefer to rent a private room, the accommodation centre can help you with their online search facility for private accommodation.

www.bath.ac.uk/study/pg/accommodation

Living costs

As a guideline, living costs for the 2013/14 academic year estimate at £13,364 for students in halls accommodation, or £12,844 if you choose private accommodation, based on a single person sharing an apartment or house.

Student services provides this useful estimated breakdown example:

<table>
<thead>
<tr>
<th>Expenditure</th>
<th>Per week (based on 52 weeks unless otherwise stated)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rent</td>
<td>Ranges from £88 - £150 per week (according to choice and availability)</td>
</tr>
<tr>
<td>Average costs</td>
<td>£125 per week x 52 weeks. Inclusive of utility bills including internet and core insurance</td>
</tr>
<tr>
<td>Food, toiletries, laundry etc.</td>
<td>£40.00</td>
</tr>
<tr>
<td>Clothes</td>
<td>£7.00</td>
</tr>
<tr>
<td>Travel, local &amp; outside of Bath</td>
<td>£14.00</td>
</tr>
<tr>
<td>(public transport)</td>
<td></td>
</tr>
<tr>
<td>Leisure/social/sport</td>
<td>£40.00</td>
</tr>
<tr>
<td>TV licence 12 months (rate from 1st April 2013 - refunds are available on any unused part of the annual fee. See <a href="http://www.tvlicensing.co.uk">www.tvlicensing.co.uk</a> for more information)</td>
<td>£3.00</td>
</tr>
<tr>
<td>Mobile phone</td>
<td>£5.00</td>
</tr>
<tr>
<td>Health costs (e.g. contact lenses, dentist, prescriptions etc)</td>
<td>£4.00</td>
</tr>
<tr>
<td>Programme costs (these can vary depending on course requirements, so check the costs with your Department)</td>
<td>£15.00</td>
</tr>
<tr>
<td>Your own allowance for emergencies/other</td>
<td></td>
</tr>
</tbody>
</table>

| Total weekly cost                        | £253.00                                              |
| Total cost for year                      | £13,364.00                                           |

Your overall living costs will clearly depend on your choice of accommodation and lifestyle. Student services provides some useful budgeting guides to help you plan your likely costs for living in Bath for 12 months.

www.bath.ac.uk/studentservices/money-service/budgets
Other useful resources

Information for international students

- [www.bath.ac.uk/international](http://www.bath.ac.uk/international): Country specific guidance on applying to Bath.
- [www.fco.gov.uk/atas](http://www.fco.gov.uk/atas): Academic Technology Approval Scheme (ATAS). Information on requirements for non UK, EEA or Swiss Nationals.
- [www.ukba.homeoffice.gov.uk/visas-immigration](http://www.ukba.homeoffice.gov.uk/visas-immigration): UK border agency website for information on obtaining a student visa.

Women in Engineering

- [www.bath.ac.uk/engineering/women](http://www.bath.ac.uk/engineering/women): For funding opportunities, resources, events and news for and about women in the Faculty of Engineering & Design.

Publications

- The Grants Register: [The Complete Guide to Postgraduate Funding Worldwide](http://www.bath.ac.uk/engineering/women) - Published by Palgrave Macmillan (also on CD).

Websites

- [www.direct.gov.uk/studentfinance](http://www.direct.gov.uk/studentfinance) - For links and information regarding postgraduate funding.
- [www.rcuk.ac.uk](http://www.rcuk.ac.uk) - Research Councils in the UK for Postgraduate students.
- [www.prospects.ac.uk](http://www.prospects.ac.uk) - A careers website for postgraduate students with sections on further study and funding.

Contact us

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[www.bath.ac.uk/engineering/graduate-school](http://www.bath.ac.uk/engineering/graduate-school)

Campus from the lake.