

Engineered Materials for High Performance Applications in Aerospace and Related Technologies EngD

Postgraduate combined research and teaching degree programme in Engineered Materials for High Performance Applications in Aerospace and Related Technologies EngD:

This is an EPSRC-sponsored doctoral training programme, suitable both for full-time students and seconded employees, comprising a four-year research project based in industry, and a number of one-week modules in Advanced Metallurgy/Materials and Professional Development, which are taken at the University.

[Study here and find out why the University of Birmingham has been awarded The Times and The Sunday Times University of the Year 2013-14](http://www.birmingham.ac.uk/news/latest/2013/09/20-sep-Birmingham-announced-as-University-of-the-Year.aspx) (<http://www.birmingham.ac.uk/news/latest/2013/09/20-sep-Birmingham-announced-as-University-of-the-Year.aspx>)

Course fact file

Type of Course: Combined research and taught, continuing professional development

Study Options: Full time

Duration: 4 years full-time

Start date: Contact the School directly for further information

Related courses

[Biomaterials MRes \(/postgraduate/courses/combined/metallurgy-materials/biomaterials-mres.aspx\)](/postgraduate/courses/combined/metallurgy-materials/biomaterials-mres.aspx)

[Materials for Sustainable Energy Technologies MRes \(/postgraduate/courses/combined/metallurgy-materials/materials-sustainable-energy-technology-mres.aspx\)](/postgraduate/courses/combined/metallurgy-materials/materials-sustainable-energy-technology-mres.aspx)

[Postgraduate programmes - School of Metallurgy and Materials \(/schools/metallurgy-materials/postgraduate-courses/index.aspx\)](/schools/metallurgy-materials/postgraduate-courses/index.aspx)

[Science and Engineering of Materials MRes \(/postgraduate/courses/combined/metallurgy-materials/science-engineering-materials.aspx\)](/postgraduate/courses/combined/metallurgy-materials/science-engineering-materials.aspx)

Contact

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[School of Metallurgy and Materials \(/schools/metallurgy-materials/index.aspx\)](/schools/metallurgy-materials/index.aspx)

Details

This is an EPSRC-sponsored doctoral training programme, suitable both for full-time students and seconded employees, comprising a four-year research project based in industry, and a number of one-week modules in Advanced Metallurgy/Materials and Professional Development, which are taken at the University.

The programme focuses on research across aerospace and related technologies, covering alloy and process development, cost-reduction, life cycle analysis and environmental degradation. The science and technology underpinning these themes is aimed at:

- Materials processing
- Materials characterisation
- New materials developments
- Structural integrity
- Materials modelling

Related links

- **[Postgraduate programmes - School of Metallurgy and Materials \(/schools/metallurgy-materials/postgraduate-courses/index.aspx\)](/schools/metallurgy-materials/postgraduate-courses/index.aspx)**

Why study this course

“The quality of the research work in the Department of Metallurgy and Materials has been confirmed by our outstanding performance in successive Research Assessment Exercises. We are justly proud of this international reputation and are keen to maintain it by encouraging high quality students from materials, physics, chemistry, life sciences or engineering backgrounds to apply to undertake research with us. We are prepared to help in finding financial support, if needed. If you are interested in coming to do research with us, or with the **[Interdisciplinary Research Centre \(IRC\) in Materials Processing \(http://www.birmingham.ac.uk/research/activity/irc-materials-processing/index.aspx\)](http://www.birmingham.ac.uk/research/activity/irc-materials-processing/index.aspx)**, write directly to me or to the contacts given on our website. I look forward to hearing from you.

Professor Paul Bowen, Head, Metallurgy and Materials



<http://www.birmingham.ac.uk/research/activity/irc-materials-processing/index.aspx> together make up the largest centre for materials research in the UK. Our Research School comprises more than 20 full-time academic staff in addition to 30 honorary and visiting staff, 30 research fellows and close to 150 postgraduate students.

Our diverse research portfolio ranges from fundamental aspects of materials science to practical high performance engineering applications. Research is funded from a wide range of sources including the UK research councils, the EU and a cross-section of UK and overseas industry. Our research income is around ?4 million per annum.

Most of our research projects involve active collaboration with industrial partners.

Fees and funding

Standard fees (</postgraduate/pgt-fees/fees.aspx>) apply, plus bench fee

Tuition fees for home/EU students (2013/2014)

- Research programmes (including Masters by research) £3925**Research fees are yet to be confirmed by Research Councils UK, and may change.
- Part-time programmes. Most part-time programmes run for two years and their fees are one half of the standard full-time programme fees.

Learn more about **fees and funding** (</postgraduate/pgt-fees/index.aspx>)

Scholarships and studentships

Scholarships may be available. International students can often gain funding through overseas research scholarships, Commonwealth scholarships or their home government.

For further information contact the School directly or email sfo@contacts.bham.ac.uk (<mailto:sfo@contacts.bham.ac.uk>)

Entry requirements

An upper second-class Honours degree or equivalent in Materials Science or Engineering

Learn more about **entry requirements** (</postgraduate/requirements-pgt/index.aspx>)

International students

We accept a range of qualifications from different countries – learn more about **international entry requirements** (</postgraduate/requirements-pgt/international/index.aspx>)

Standard English language requirements (</postgraduate/requirements-pgt/international/index.aspx>) apply

How to apply

Learn more about **applying** (</postgraduate/courses/apply-pg/index.aspx>)

When clicking on the Apply Now button you will be directed to an application specifically designed for the programme you wish to apply for where you will create an account with the University application system and submit your application and supporting documents online. Further information regarding how to apply online can be found on the **How to apply pages** (<http://www.birmingham.ac.uk/students/courses/postgraduate/apply-pg/index.aspx>)

Apply now (<https://pga.bham.ac.uk/lpages/EPSo41.htm>)

Apply now (<https://pga.bham.ac.uk/lpages/EPSo41.htm>)

Related links

Postgraduate programmes - School of Metallurgy and Materials (</schools/metallurgy-materials/postgraduate-courses/index.aspx>)

Learning and teaching

EngD in Engineered Materials for High Performance Applications in Aerospace and Related Technologies

The course is administrated from the EngD Centre at the University of Birmingham, and all taught modules are delivered there.

Research Programme

Each EngD research programme is company-based, with at least one industrial and one academic supervisor. The programme will be coordinated from the EngD Centre at Birmingham, but can be networked between any of the five EngD partner universities (Birmingham, Cambridge, Oxford, Swansea and Southampton) giving wide access to specialised techniques and equipment.

The research programme may consist of a single project or a group of linked projects with a common theme. This aspect of the scheme is designed to be of particular relevance to permanent employees seconded from the industrial partners.

Training Programme: Advanced Materials

The formal training programme comprises a series of modules designed to develop your knowledge in Advanced Materials. The modules typically comprise a week long residential course normally at the University of Birmingham, and the equivalent of a week of private study. Accommodation and travel expenses for these residential courses are covered by the EngD Centre. The modules are designed to cater both for Metallurgy/Materials graduates and graduates from a range of engineering subjects with a broad materials content (eg Aeronautical, Mechanical and Manufacturing Engineering). Each module is self-contained and assessed formally - most with a two-hour written examination directly at the end of each module. Most of these courses are held at the EngD Centre at Birmingham. The remainder of all years are spent on a research project or projects, usually based at company locations.

Training Programme: Professional Development

Four professional modules are to be taken. Presently these are:

- Effective Management
- Law
- Effective Project Management
- Presentation and Communication Skills; Team Skills Development

Supervision, Monitoring, Progression and Assessment

You will have at least one industrial and one academic supervisor: you will meet on a weekly basis with your industrial supervisor and have regular meetings with your academic supervisor, together with quarterly review meetings.

There is an annual EngD conference, which is a major opportunity for student/company/academic interactions across the spectrum of EngD activities.

The final assessment is submission of the thesis, which may, if appropriate, be presented as a series of linked reports (within an overarching theme), rather than an individual investigation of the type normally found in a PhD thesis. As with a conventional PhD, the EngD thesis must contain material of sufficient quality which demonstrates individual merit and contribution.

Research Project/Industrial Partners

Projects are available in areas of materials research and development pursued by the participating industrial sponsors. General information is given below. In the early stages of recruiting for the EngD, specific projects will be developed to suit the interests and capabilities of individual candidates. New industrial partners are likely to become involved in the near future.

Main Industrial Partners to date

- **AEA Technology (<http://www.aeat.co.uk>)**
Advanced materials performance, microsystems materials, advanced battery materials, structural materials integrity, and biomaterials.
- **BAE Systems (<http://www.baesystems.com/>)**
The effects of processing on high performance materials in the manufacture of structural aerospace components.
- **Doncasters plc (<http://www.doncasters.com>)**
Manufacture of highly engineered components for tolerance-critical applications in Aerospace, Industrial Gas Turbine, Automotive and Medical markets, titanium, nickel alloys, steels and aluminium alloys.
- **Firth-Rixson plc (<http://www.firthrixson.com/>)**
Die forgings, seamless rings and superalloys for aerospace and nuclear, automotive and oil industries.
- **Goodrich (<http://www.goodrich.com>)**
Aerospace technology, high strength stainless steels, cobalt chrome alloys, chrome alloys, joining methods, near net shape manufacture.
- **Honeywell-Hymatic Engineering Company Ltd (<http://www.hymatic.co.uk/>)**
Engineering design and manufacture. A leading specialist in the field of cryogenic cooling for the military infrared market.
- **Innoval (<http://www.innovaltec.com/>)**
A materials consultancy that provides technical expertise, contract research, analytical and testing services and specialises in the manufacture and use of aluminium alloys for packing, architectural, automotive and mass transportation applications.
- **QinetiQ (<http://www.qinetiq.com>)**
Microstructure, coatings and composites, aeroengines and airframes, nickel, titanium; process modelling.
- **Rolls-Royce plc (<http://www.rolls-royce.com/>)**
Aerospace and marine technology; oil and gas; environmental degradation of materials, manufacturing technology, titanium, nickel, gas turbine engines.
- **The Welding Institute (<http://www.twi.co.uk/>)**
All aspects of research, development and application of welding and joining technologies.

Research overview

Our research facilities for materials preparation range from vacuum melting and casting for special alloys, through crystal growth equipment for rare-earth and very reactive alloys to melt-spinning facilities for the production of rapidly cooled alloys, atomizers to make metal powders and laser ablation equipment for the production of multilayer and superconducting materials.

Surface engineering facilities allow plasma nitriding, boriding, carburising and other surface treatments to be carried out on a range of alloys under controlled conditions, and we have recently installed plasma-spray equipment to produce coatings. There are polymer-processing laboratories and the IRC possesses a large plasma-melting furnace, HIP equipment, direct laser fabrication, a laboratory for the hydrothermal synthesis and colloidal processing of ceramics, and the £8 million Net Shape Manufacturing Laboratory.



The physical techniques laboratory contains a range of equipment for processes including VSM, dilatometry, differential scanning calorimetry, electrical resistivity and density measurements. The world-class mechanical testing laboratories consist of approximately 30 facilities for fracture and fatigue studies over the temperature range of -196 to 1,500°C, and are accredited by Rolls-Royce for the acquisition and interpretation of data.

Seven creep machines from Nuclear Electric form the basis of a creep-testing laboratory, and thermogravimetric balances, also donated by Nuclear Electric, allow sensitive oxidation measurements to be made at temperatures up to 1,400°C. There is specialised mechanical testing for polymers and foams, at strain rates from creep to impact. X-ray diffraction facilities provide essential back-up to the crystal growth and alloy preparation activities.

Microstructural assessment is well provided for, with a wide range of optical microscopes and quantitative image analysis, and extensive electron microscope facilities. The Electron Microscope Centre provides a service to all schools in the University, as well as to the Midlands region. The five SEMs include

- a JEOL 7000F with WDX, EDX and EBSD;
- an FEI FEG ESEM with cryo and heating (1500°C) stages.

The TEMs include

- a 200 kV FEI Tecnai F20 FEG(S)TEM with PEELS, EDX and HAADF.

A scanning Auger facility with an X-ray photo-electric spectrometer (XPS) is available for a wide range of surface studies and we also have an atomic force microscope.

The new hydrogen technology laboratory has a range of equipment to characterize the properties of materials in hydrogen. This includes two constant pressure Thermogravimetric Analysers, and a volumetric PCT system to measure the uptake and sorption kinetics of hydrogen storage materials.

A recent addition has been the Netzsch differential scanning calorimeter (DSC) with simultaneous thermal analysis (STA). Nicolet Magna-IR infrared and Raman spectrometers are being used to study polymer and ceramic-type materials. Other novel analytical equipment in this category include simultaneous DSC and FTIR, DSC and non-contact thermo-mechanical analysis.

The Department has good facilities for the fabrication and characterization of optical fibre sensors including sensor systems for strain, temperature, vibration, acoustic emission and chemical sensing. The autoclave-based processing of advanced fibre reinforced composites is carried out in the Astro-Physics Department.

We have excellent workshop facilities and a large suite of networked PCs, housed in a computing laboratory provided by Corus, which supplements the extensive computer facilities in individual research groups.

Related staff

[Professor Paul Bowen \(/staff/profiles/metallurgy/bowen-paul.aspx\)](/staff/profiles/metallurgy/bowen-paul.aspx)

Employability

University Careers Network

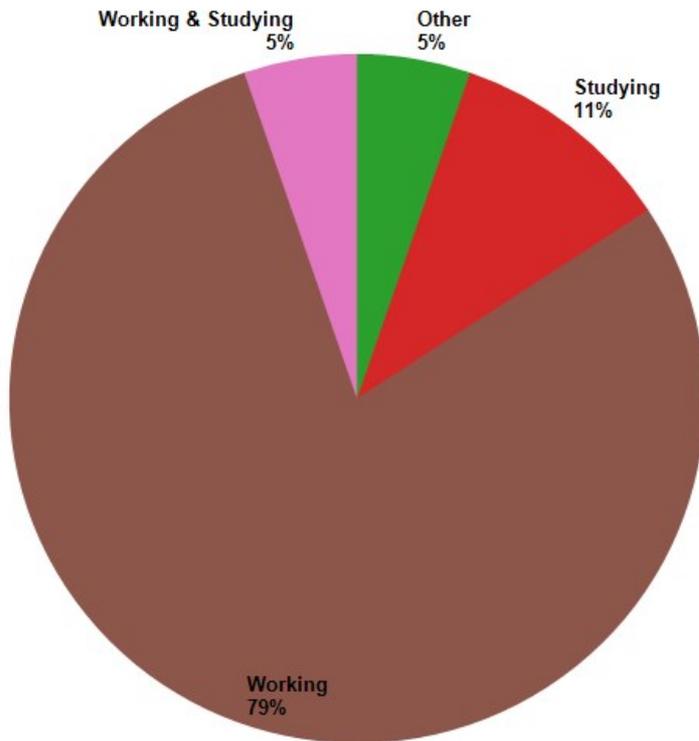
Preparation for your career should be one of the first things you think about as you start university. Whether you have a clear idea of where your future aspirations lie or want to consider the broad range of opportunities available once you have a Birmingham degree, our Careers Network can help you achieve your goal.

Our unique careers guidance service is tailored to your academic subject area, offering a specialised team (in each of the five academic colleges) who can give you expert advice. Our team source exclusive work experience opportunities to help you stand out amongst the competition, with mentoring, global internships and placements available to you. Once you have a career in your sights, one-to-one support with CVs and job applications will help give you the edge.

If you make the most of the **wide range of services** (<https://intranet.birmingham.ac.uk/as/employability/careers/college/eps/index.aspx>) you will be able to develop your career from the moment you arrive.

Destinations of Leavers from Higher Education (DLHE) 2011/12 (postgraduate taught graduates)

The DLHE survey is conducted 6 months after graduation.



Examples of employers

- Burhill Group Limited
- BAE Systems
- Softcat
- Royal Air Force
- Decathlon UK
- Ministry of Defence
- Corona Technology Limited
- BP
- KBR

Examples of occupations

- Applications Engineer
- Engineering Officer Cadet
- Mechanical Engineering
- Advanced Manufacturing Engineer
- Junior Accounts Manager
- Graduate Consultant Engineer
- Teaching Assistant
- School Sports Partnerships Coach
- Product Development Engineer

Further study - examples of courses

- MSc Advanced Materials
- MSc Material Science
- MSc Diagnostic Radiography

- MSc Energy Engineering
- MRes Science and Engineering
- PhD Metallurgy and Materials

Visit the **Careers section of the University website** (<https://intranet.birmingham.ac.uk/as/employability/careers/college/eps.aspx>) for further information.
