ENGINEERING AND INFORMATION TECHNOLOGY
Postgraduate Programs
Postgraduate studies provide a strong foundation on which to advance your career. They augment your existing qualifications and experience to enable you to cross disciplinary boundaries, develop specialist skills and to get ahead in your chosen field.

Industry increasingly wants people who have a combination of technological knowledge, business and research skills as well as people with advanced interpersonal skills who can develop relationships of trust with customers, suppliers, business partners and who can work in teams.

Investing in postgraduate studies will develop your skills and knowledge in areas identified as current and future priorities and will enable you to take advantage of opportunities arising from local and global challenges.
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How to Apply ................................ 30
The University of Queensland (UQ) is your gateway to the future.

UQ offers its postgraduate students practical, industry focused programs, a wide range of quality resources, and access to more award winning teachers and researchers than any other university in Queensland.

Our lecturers are among Australia’s best university teachers, winning one-third of all Australian Awards for University Teaching and consistently dominating national rankings, including the 2003 recipient of the Prime Ministers Award for Individual University Teacher of the Year, Professor Ian Cameron from Chemical Engineering and 2007 Award for Teaching Excellence winner Associate Professor Peter Sutton from Electrical Engineering.

World-class research facilities and research higher degree programs in engineering, and information and communications technology (ICT) provide outstanding opportunities for postgraduate students to fulfill their potential as the next generation of innovators.

The Federal Government’s 2010 Excellence in Research for Australia survey confirmed The University of Queensland as one of the nation’s top two universities, measured on a combination of research quality and breadth. ERA reported that research at UQ is above world standard in more broad fields than at any other Australian university: this reflects UQ’s leading global role in many areas of discovery. UQ’s outstanding critical mass offers researchers significant interdisciplinary capability.

Strong links with industry have enabled us to establish many strategic partnerships resulting in research collaboration and commercialisation, which benefit the community by delivering visionary solutions to the challenges facing the planet.

Graduates of UQ are in demand throughout Australia and the world, and have some of the best employment rates and starting salaries in the country. By choosing to study at UQ you have the opportunity to engage in a safe and vibrant environment with the most active campus life of any Queensland university.

I invite you to explore this prospectus, and hope to welcome you to UQ.

Professor Graham Schaffer
Executive Dean
UQ Engineering and ICT offers postgraduate students practical and industry-focused programs, a wide range of quality resources and access to more award-winning teachers and researchers than any other university in Queensland. Students learn from and are supervised by academic staff who are professionals in their fields and involved in pioneering research.

UQ’s excellent reputation ensures graduates are highly sought after by employers and other research institutions within Australia and internationally.

Representing some of the University’s largest research schools, UQ Engineering and ICT contribute to UQ’s reputation as one of Australia’s major providers of industry-funded research and development expertise.

Tailored postgraduate coursework curriculum
The suite of Engineering and ICT postgraduate coursework programs have been designed specifically to meet the academic and professional needs of students and industry. Learning takes place on campus, off campus in some programs, and at industry sites. Courses are offered wherever possible in intensive delivery allowing easier access to education.

Strong industry links
Our academic staff maintain close connections with industry. These links feed into curriculum design and teaching to ensure that our programs evolve in line with advances in technology and industry requirements.

UQ is also internationally acclaimed for its innovation and strengths in commercial development. Our Engineering and ICT programs are supported by companies that invest in our research and teaching facilities, and also provide on-site learning opportunities. Local and international partners include BHP Billiton, Mitsubishi, Alliance, Boeing, CSIRO, DSTO, Ergon Energy, Golder, IBM, Microsoft, NASA, P&H MinePro Services, Powerlink, Queensland Rail, Rio Tinto, SAP, Siemens Medical, Suncorp, Sun Microsystems, Telstra, Thiess and Xstrata.

Scholarships for International Students
Scholarships are available for outstanding international students in certain categories. For further information visit www.eait.uq.edu.au/international-scholarships
PROGRAM OPTIONS - POSTGRADUATE COURSEWORK

At UQ, students can undertake postgraduate coursework studies in a graduate certificate, graduate diploma, or coursework masters.

Graduate Certificate

Graduate certificates extend a student’s knowledge in a specialist area. They can help to upgrade qualifications or provide specific advanced skills required in specialist industries. Graduate certificates involve six months of full-time study or an equivalent part-time commitment.

Entry requirements

Generally, students require a bachelor degree in a similar field, or further study after high school with two or more years work experience in a related field.

Graduate Diploma

Graduate diplomas offer more in-depth study than graduate certificates, and can provide a means for people to move into new areas of expertise.

Graduate diplomas consist of one year of full-time study or an equivalent part-time commitment. Graduate diplomas are usually for students who have already received a Bachelor degree in a relevant field.

Entry requirements

Generally, students require a bachelor degree in a similar field, or further study after high school with two or more years work experience in a related field.

Coursework Masters

Coursework masters programs offer students the chance to extend their professional understanding, change careers, or adjust to changing employment requirements. Part-time enrolment is available to domestic students and international students studying offshore.

Coursework masters programs usually take one to two years of full-time study. Typically there is one year of study for students with an appropriate four year undergraduate degree, including a background relevant to the proposed field of study.

Students who lack a relevant background may be accepted into a graduate certificate with a view to proceeding to a coursework masters program upon completion.

Entry requirements

Generally, students require a bachelor degree in a similar field, or a graduate diploma in engineering or ICT.

NATHAN CAMMERMAN - MASTER OF INTEGRATED WATER MANAGEMENT

“I searched for the right program for over a decade. The strength of the program was its multi-disciplinary nature and the way that each unit was actually integrated through problem-based learning. Two years since I completed the Master of Integrated Water Management they continue to provide direction, advice and access to networks.”
ENERGY STUDIES

Location: St Lucia
Commencement: Semester 1
Delivery mode: Internal
Duration:
- MASTERS 1.5 years (#24) or 1 year (#16) full-time
- GRADUATE DIPLOMA 1 year full-time (#16)
- GRADUATE CERTIFICATE 0.5 years (#8)
Entry requirements for Master:
An approved degree in a relevant field of study.

The Master of Energy Studies was established by the Universities Low Emission Coal Consortium, represented by The University of Queensland, the University of Western Australia, the University of Newcastle and Monash University.

Students can specialise in two streams; Carbon Management, and Low Carbon Solutions. The program addresses the current gap in Carbon Management and Carbon Capture and Storage graduate programs worldwide and prepares a new generation of professionals to strategically address the challenges posed by a carbon constrained economy.

Available Courses
- Applied Carbon Methods - MRF for Business and Government
- Drivers for the Transition to a Low Carbon Economy
- Economics and Finance of Carbon Management
- Energy Options to Fuel the Low Carbon Economy
- Energy and Technology Principles
- Fundamentals of Climate Change
- Low Emission Technologies and Supply Systems
- Mitigation Responses - A Risk Management Approach
- Problem-Based Learning Project
- Professional Project in Energy Studies

This is an indicative list of available courses.
For full program information visit www.uq.edu.au/study

ENGINEERING SCIENCE

Location: St Lucia
Commencement: Semester 1 or 2
Delivery mode: Internal
Duration:
- MASTERS 1.5 years (#24) or 1 year (#16) full-time
- GRADUATE CERTIFICATE 0.5 years (#8)
Entry requirements for Master:
Bachelors degree in engineering or related field
International students must undertake this program on campus at UQ on a full time basis to be eligible to apply for an Australian student visa.

This program is typically undertaken in two semesters by students with a recognised undergraduate engineering degree. Students without the necessary background studies but with significant, relevant work experience may be eligible to complete the MEngSc in three semesters or the Graduate Certificate in Engineering, with a view to proceeding to the MEngSc on completion.

The program is offered in six specialisations:

> The general engineering science field with options for, Chemical Engineering, Civil Engineering, Materials, Mechanical Engineering, or Mechatronic Engineering
> Electrical Engineering: Biomedical, Microwave Telecommunications, Power Systems
> Electricity Market
> Power Generation
> Software Engineering
> Systems Engineering

ENGINEERING SCIENCE

Students in the general engineering science field will obtain advanced skills in engineering analysis and problem solving, and will complete a project in one of the following areas:

> Chemical Engineering
> Civil Engineering
> Materials
> Mechanical Engineering
> Mechatronic Engineering
It is suitable for those interested in solving advanced technical challenges, managing projects and overseeing teams. Students develop a greater understanding of complex engineering challenges and gain practical experience and knowledge of advanced engineering tools and processes through case studies and individual projects relevant to their field.

This specialisation builds on knowledge taught in undergraduate engineering programs and has been designed to produce engineers that will lead their companies and industries into the future.

Available Courses
- Engineering Project in related discipline
- Advanced Computational Techniques in Engineering
- Advanced Engineering Laboratory Techniques
- Advanced Engineering Practice
- Advanced Topics in Control Engineering
- Applications of Project Management
- Environmental Performance of Materials
- Experimental Design
- Principles of Project Management

This is an indicative list of available courses.

For full program information visit [www.uq.edu.au/study](http://www.uq.edu.au/study)

ELECTRICAL ENGINEERING

The Electrical Engineering program offers three areas of specialisation, Biomedical, Microwave Telecommunications, and Power Systems

Biomedical

The Biomedical field integrates physical, chemical, mathematical, and computational sciences and engineering principles with the ultimate aim of improving healthcare through advances in technology.

Microwave Telecommunications

Microwave Telecommunications provides students with the technological skills needed in the modern telecommunications industry for the design of RF/microwave communication systems, including wireless and optical technologies and deals principally with design and manufacturing techniques.

Power Systems

The Power Systems field focuses on power system stability and reliability, operations and planning, deregulation, condition monitoring, sustainability and renewable energy issues, as well as future trends in power engineering.

Available Courses
- Advanced Control & Robotics
- Computational Techniques in Electrical Engineering
- Computer Networks
- Computer System Design Project
- Digital Communications
- Digital System Design
- Electrical Energy Conversion & Utilisation
- Electronic Circuits
- Embedded System Design
- Fundamentals of Electromagnetic Fields & Waves
- Introduction to Communications
- Introduction to Control Systems
- Introduction to Image Formation
- Medical & Industrial Instrumentation
- Medical Imaging
- Microwave Subsystems and Antennas
- Modern Asset Management and Condition Monitoring in Power System
- Operating Systems Architecture
- Photonics
- Power System Protection
- Power Systems Analysis
- Signal & Image Processing
- Systems Engineering
- Systems Safety Engineering

This is an indicative list of available courses.

For full program information visit [www.uq.edu.au/study](http://www.uq.edu.au/study)
ELECTRICITY MARKET

The power industry is being deregulated worldwide and power engineers need to have knowledge of both power engineering and market issues to provide a linkage between engineers and economists/accountants. The MEngSc (Electricity Market) provides these skills and the graduates from this program will find opportunities in both Australia and around the world to work not only with traditional power companies but also with consulting firms that provide services for the broader energy market.

Electricity market engineers will find employment with traditional power companies and also with consulting firms and government agencies that provide services for the broader energy market.

Available Courses

- Accounting
- Benefit-Cost Analysis & Project Evaluation
- Computational Techniques in Electrical Engineering
- Computer Networks I
- Course Title
- Digital System Design
- Electrical Energy Conversion & Utilisation
- Electronic Circuits
- Fundamentals of Electromagnetic Fields & Waves
- Introduction to Communications
- Introduction to Control Systems
- Introduction to Image Formation
- Managerial Accounting and Control
- Medical & Industrial Instrumentation
- Microeconomic Analysis
- Microeconomics for Business
- Modern Asset Management and Condition Monitoring in Power System
- Operating Systems Architecture
- Power System Protection
- Power Systems Analysis
- Signal & Image Processing I
- Statistics for Business & Economics
- Systems Engineering

This is an indicative list of available courses.
For full program information visit www.uq.edu.au/study

POWER GENERATION

The MEngSc (Power Generation) offers professional engineers and those operating in para-professional roles the opportunity to accelerate their technical competency and fast-track their career in the power generation sector.

UQ, Queensland University of Technology and Central Queensland University together with CS Energy, Stanwell Corporation and Tarong Energy have worked to develop a curriculum enabling power generation professionals to increase their skill sets to include those identified as future priority areas for the power generation industry. Students can choose to take core courses and electives from each of the partner universities, depending on their area of interest.

The MEngSc (Power Generation) is delivered in intensive learning sessions at multiple campus and generator sites. Courses are delivered in a variety of formats and locations to enable those working in full-time roles to easily access their professional development opportunities.

Further information visit www.powergeneration.edu.au

This specialisation is only available to domestic students in the Graduate Certificate and Master of Engineering Science.

Available Courses

Courses delivered at UQ

- Gas Plant and Systems
- Generator Technology Design & Application
- Plant Control Systems
- Regulation, Compliance & Safety
- Rotating Machinery
- Transformer Technology Design and Operation

Courses delivered at CQU and/or QUT

- Advanced Power Plant
- Applied Thermodynamics
- Asset Management Systems
- Bulk Materials & Waste Products
- Industrial Electrical Power Distribution
- Introduction to Power Plant
- Plant Materials
- Power Plant Chemistry
- Project Delivery
- Protection of Industrial Power Systems

This is an indicative list of available courses.
For full program information visit www.uq.edu.au/study
SOFTWARE ENGINEERING

Software is growing in importance and complexity. This field specialises in the design of computer software and systems with a special emphasis on large-scale systems where systematic approaches are necessary to deal with the size, complexity and the need for enhancement over time to ensure the software system maintains its value.

Students in this program have access to many intermediate and advanced level courses. Selection of courses is normally made with the assistance of an academic adviser, who takes into account the material covered in previous engineering studies.

Job opportunities are widespread, as society comes to rely more and more on computer technology. Graduates find work not only in large multinational companies, state and federal government departments, but also in many small, specialised and emerging companies. Courses are available externally through distance education.

Available Courses
Advanced Algorithms & Data Structures
Advanced Computer and Network Security
Advanced Database Systems
Advanced Human-Computer Interaction
Algorithms & Data Structures
Artificial Intelligence
Compilers and Interpreters
Computer Networks
Data Mining
Digital System Design
Distributed Computing
Embedded System Design
Engineering Project Management
Games Design
Information Security
Machine Learning
Models of Software Systems
Operating Systems Architecture
Predictable Professional Performance
Service-Oriented Architectures
Spatial and Multimedia Databases
Systems Engineering
The Software Process
Web Information Systems

This is an indicative list of available courses.
For full program information visit www.uq.edu.au/study

SYSTEMS ENGINEERING

Systems Engineering is the discipline of building highly sophisticated computer systems that work successfully. Systems engineers develop key creative processes to transform concepts into system designs, technology and management processes to enable the system to progress in an orderly, interdisciplinary fashion.

Systems engineers are employed in a wide range of industry sectors including defence, aerospace, transport, mining, power and manufacturing. The program is modelled on the Boeing masters program conducted in the USA and includes a wide choice of electives. Many courses are offered in flexible delivery modes aimed at professionals interested in upgrading or updating their qualifications. A range of specialist electives are available.

Available Courses
Advanced Algorithms & Data Structures
Advanced Computer and Network Security
Advanced Control & Robotics
Advanced Human-Computer Interaction
Artificial Intelligence
Compilers and Interpreters
Computer Networks
Digital Communications
Digital System Design
Distributed Computing
Embedded System Design
Engineering Project Management
Information Security
Introduction to Communications
Introduction to Control Systems
Machine Learning
Operating Systems Architecture
Systems Engineering
Systems Thinking for Sustainability
The Software Process

This is an indicative list of available courses.
For full program information visit www.uq.edu.au/study
Location: St Lucia
Commencement: Semester 1 or 2
Delivery mode: Internal
Duration: MASTERS 2 years (#32)

Entry requirements for Master:
Bachelors degree in engineering or related field

International students must undertake this program on campus at UQ on a full time basis to be eligible to apply for an Australian student visa.

The Master of Engineering Science (Management) is a two year program that combines postgraduate studies in engineering with business, economics and management. The program provides opportunities to develop business management skills in engineering graduates without prior formal management background while also extending their engineering knowledge, research experience or technical expertise.

This program offers students a variety of courses with three areas of specialisation:
- Electrical Engineering, which incorporates power systems, microwave telecommunications and biomedical engineering;
- Undeclared Field, which includes a research project in chemical, civil, materials, mechanical, or mechatronic engineering;
- Or Software Engineering.

Business courses include courses such as entrepreneurship and new ventures, marketing, strategic management and international business.

Master of Engineering Science (Management) graduates will acquire knowledge and skills that enable them to cross discipline boundaries, and be equipped to take on advanced engineering work. They will develop a combination of business, problem solving and interpersonal skills; as well as technical engineering experience or research that will enable them to understand markets and develop relationships of trust with customers, suppliers, business partners, and worth within teams.

Available Courses
Courses listed in the Electrical Engineering, Software Engineering, or general engineering science field in the Master of Engineering Science combined with Master of Business courses.

Master of Business courses
Entrepreneurship and New Ventures
Marketing
Operating International Business
Principles of Strategic Management

with courses in the disciplines of
Entrepreneurship
Human Resource Management
International Business
Marketing
Public Sector Management
Sustainability

This is an indicative list of available courses.
For full program information visit www.uq.edu.au/study
The Master of Integrated Water Management is coordinated by the International Water Centre (IWC). The program is taught by lecturers from four internationally recognised Australian Universities: The University of Queensland, Monash University, The University of Western Australia and Griffith University.

Students will become familiar with all aspects of integrated water resource management and become capable of providing water management expertise to help reduce poverty through equitable and sustainable use of water. In addition, courses enable students to be skilled in providing technical and managerial input into planning, design and operation of water projects and facilities, understand the principles of managing water supply and wastewater treatment and urban infrastructure projects. Students will also recognise the socioeconomic factors impacting on effective water solutions, and understand the governance and institutional frameworks underpinning water resource management.

Full and partial tuition scholarships are available for Australian citizens, permanent residents and international applicants for the Master of Integrated Water Management program.

For further information:
www.watercentre.org/education/masters

Available Courses
Capacity Building and Community Development for IWRM
Catchment & Aquatic Ecosystem Health
Integrated Water Management Project
Project Management
Science of Water
Water Governance and Policy
Water Planning and Economics
Water Supply & Sanitation
Water, Sustainability and Development

This is an indicative list of available courses.
For full program information visit www.uq.edu.au/study.
**Location:** St Lucia  
**Commencement:** Semester 1 or 2  
**Delivery mode:** Internal

**Duration:**  
MASTERS 1.5 years (#24) full-time  
GRADUATE DIPLOMA 1 year full-time (#16)  
GRADUATE CERTIFICATE 0.5 years (#8)

**Entry requirements for Master:**  
Bachelors degree in a field other than information technology  
OR Graduate Diploma in Information Technology.

International students must undertake this program on campus at UQ on a full time basis to be eligible to apply for an Australian student visa.

The Master of Information Technology (MInfTech) has a strong focus on information systems and database technology. This program is for students who do not have a previous IT degree and wish to enhance their current discipline areas with IT applications, development, skills and knowledge. Students with a background in IT should consider the Master of Computer Science (page 17).

Introductory courses are available in software engineering and information systems, discrete mathematics, basic operating systems and networking.

Central to the program is a project where students take an industrial-scale system from initial specification through design, implementation and documentation. Students can choose to develop their programming skills through courses in advanced software engineering, algorithms and data structures, as well as develop their networking skills with information security and computer networks.

A wide range of elective courses are available that allow students to develop an understanding of the application of information technology and new ways of thinking.

**Available Courses**

- Advanced Database Systems
- Advanced Information Technology Project
- Advanced Software Engineering
- Algorithms & Data Structures
- Artificial Intelligence
- Computer Networks I
- Decision Support Systems
- Developing Business from Science
- Discrete Mathematics
- Electronic Commerce Fundamentals
- Games Design
- Geographical Information Systems
- Geographical Information Systems for Planning & Management
- Geospatial Information & Analysis
- Graphic Design
- Healthcare in Cyberspace
- Human-Computer Interaction
- Information Economics
- Information Security
- Information Systems Control & Audit
- Introduction to Biotechnology
- Introduction to Computational Biology
- Introduction to Computer Systems
- Introduction to Information Systems
- Introduction to Software Engineering
- Introduction to Web Design
- Managing Information Systems
- Mathematical Biology
- Network & Operating Systems Principles
- New Technology & Healthcare
- Operating Systems Architecture
- Programming for Engineering Systems
- Relational Database Systems
- Service-Oriented Architectures
- Software Engineering Studio
- Technology & Innovation Strategy
- The Software Process
- Web Information Systems

This is an indicative list of available courses. For full program information visit [www.uq.edu.au/study](http://www.uq.edu.au/study).
Location: St Lucia
Commencement: Semester 1 or 2
Delivery mode: Internal
Duration: MASTERS 2 years full-time (#32)
Entry requirements for Master:
Bachelors degree in a field other than information technology
OR Graduate Diploma in Information Technology.
International students must undertake this program on campus
at UQ on a full-time basis to be eligible to apply for an Australian
student visa.

Industry demands professionals who have both knowledge of
IT and management and can combine these skills to enhance
the performance of information systems.

The Master of Information Technology (Management) is designed
for students with a background in a discipline other than
Information Technology, who wish to acquire skills in this rapidly
advancing field in combination with management studies to
become inspirational IT business leaders of the future.

The program has a strong focus on IT application development
and business management. Students combine their core IT
skills in programming, software design, database technology,
human-computer interaction, networking and practical project
management with key business management skills in
preparation for employment and leadership in a professional,
applications-oriented setting.

This program caters for the needs of emerging IT professionals
by embracing the dynamics of the IT environment and project
management within the IT industry. Students will study core
information technology courses combined with business management
courses and can tailor their electives to suit their career goals.

Available Courses
Courses listed in the Master of Information Technology combined
with Master of Business courses.

Master of Business courses
- Accounting
- Business Information Systems
- Developing Business from Science
- Electronic Commerce Fundamentals
- Finance
- Information Economics
- Managing Application Databases
- Managing Information Systems
- Strategic Human Resource Management
- Technology & Innovation Strategy

This is an indicative list of available courses.
For full program information visit www.uq.edu.au/study.
INTERACTION DESIGN

Location: St Lucia
Commencement: Semester 1 or 2
Delivery mode: Internal
Duration:
MASTERS 1.5 years (#24) full-time
GRADUATE DIPLOMA 1 year full-time (#16)
GRADUATE CERTIFICATE 0.5 years (#8)
Entry requirements for Master
Bachelors degree in a field other than interaction design or information environments OR Graduate Certificate/Diploma in Interaction Design.

The Master of Interaction Design teaches students to explore multimedia design issues related to creating physical and digital environments that support interaction between people and technology. Students use state-of-the-art multimedia computers, collaboration technologies and learning methods to develop core skills in information technology and product design through an appropriate mix of small group design projects, studio work, hands-on tutoring, lectures and computer-based learning. This is achieved through an integration of study in studio, design, information technology skills, and elective courses.

Studio is a project-based collaborative work environment where students apply skills and knowledge from multiple disciplines including architecture, industrial design, social sciences, human computer interaction, sound, music, art, modelling and graphics.

The Master of Interaction Design program provides multiple pathways for students to specialise in interaction design from a variety of alternative backgrounds. The two primary paths are for information technology-based students to master the design aspects, and for design-based students to master the technology aspects. Regardless of background, Master of Interaction Design students are provided with multiple opportunities to acquire and develop interdisciplinary skills in collaboration with other students in the school.

Students with a technology background develop software design skills through courses covering seeing, imagining and communicating, which are then developed through design projects in a studio-based learning environment. Areas covered include visual thinking methods, brainstorming, user centred thinking, media studies, form and colour, harmony, aesthetics and illustration.

Students with a design background learn basic programming, the nature of technology, and how to creatively apply this technology. Students gain experience in a variety of multimedia areas including 3D modelling, animation, web design and video using packages such as Photoshop, Flash, Illustrator, InDesign, 3DS Max, and Final Cut Pro.

Available Courses
3D and Interactive Media
Advanced Human-Computer Interaction
Clinical Online Communication
Digital Video Production
Discrete Mathematics
e-Healthcare Systems Evaluation
Games Design
Graphic Design
Healthcare in Cyberspace
Human-Computer Interaction
Introduction to Information Systems
Introduction to Software Engineering
Introduction to Web Design
Masters Studio
Masters Thesis
Network & Operating Systems Principles

This is an indicative list of available courses. For full program information visit www.uq.edu.au/study
Location: St Lucia
Commencement: Semester 1 or 2
Delivery mode: Internal, external
Duration:
MASTERS 1.5 years (#24) full-time
GRADUATE DIPLOMA 1 year full-time (#16)
GRADUATE CERTIFICATE 0.5 years (#8)

Entry requirements for Master
Bachelor degree in engineering, science or related field OR the Graduate Diploma in Mineral Resources.

The Master of Mineral Resources suite of programs provides professional postgraduate education in areas that impact directly upon the efficient technical, scientific and commercial management of the minerals industry. Students gain analytical skills that enable critical assessment of alternative solutions to complex industry problems, and focus on investigating and resolving design and operational problems in a safe and efficient manner.

The Environment specialisation is coordinated through the Centre for Mined Land Rehabilitation (CMLR) with courses providing relevant practical solutions for mining environmental challenges. Courses are offered externally and utilise web-based learning techniques, including online discussions for remote site-based professionals.

The Minerals Industry Risk Management specialisation addresses specific training needs in the mining industry, and is conducted by the Minerals Industry Safety and Health Centre. The program equips students with an understanding of the concepts and issues connected to minerals industry risk management and the skills to implement good practice in their operations.

Courses use flexible learning techniques and are offered each year, both internally and externally. Study in these specialisations is only available to international students via online delivery as international students will not travel to Australia to study in this program.

Students can also study in the Exploration specialisation which is concerned with exploration geology and geophysics.

For further information:
www.cmlr.uq.edu.au
www.postgrad.smi.uq.edu.au
www.mishc.uq.edu.au

Available Courses

Environment
Community Aspects in Mineral Resource Development
Mine Waste Management & Landform Design
Mining Environmental Management Processes
Mining Environmental Planning
Mining Environmental Regulation
Mining Environmental Risk Management
Project or Thesis
Soil and Growth Media Management
Special Topics III
Sustainable Development in the Minerals Industry Context
Vegetation & Habitat Rehabilitation
Water Management in the Minerals Industry

Minerals Industry Risk Management
Human Factors Engineering
Human Factors in the Minerals Industry
Incident Investigation & Analysis
Mine Occupational Health & Safety Management
Minerals Industry Risk Analysis
Minerals Industry Risk Management
Project or Thesis
Special Project in Minerals Industry Risk Management
Sustainable Development in the Minerals Industry Context

This is an indicative list of available courses. For full program information visit www.uq.edu.au/study
**Location:** St Lucia  
**Commencement:** Semester 1 or 2  
**Delivery mode:** Internal  
**Duration:**  
MASTERS 1 year (#16) or 1.5 years (#24) full-time, depending on student background  
GRADUATE DIPLOMA 1 year full-time (#16)  
GRADUATE CERTIFICATE 0.5 years (#8)  
**Entry requirements for Master:**  
Bachelor degree in Information Technology or Computer Science or related field OR the Graduate Diploma/Certificate in Computer Science or equivalent.

UQ’s Master of Computer Science is a cutting-edge coursework program for ICT professionals with a recognised undergraduate degree in a relevant field that equips students for the challenges of an ever changing world of ICT and rapidly advancing technologies.

The program can be used as a general upgrade of skills or to develop skills in a specific area, such as information systems, software engineering, distributed systems, networks, security of computing systems and other ICT areas.

The Master of Computer Science does not have any compulsory courses, allowing students to focus on an area of their interest when selecting courses.

Students of the Master of Computer Science have the opportunity to enrol in an advanced computer science research project (#8), which enables students to explore a particular ICT area in depth. It can also prepare ICT professionals for entry into the research degrees MPhil and PhD. The #8 project is also offered in the summer semester, allowing students to complete the 1.5 year Master of Computer Science program in one year.

**Available Courses**
Advanced Algorithms & Data Structures  
Advanced Computer and Network Security  
Advanced Database Systems  
Advanced Human-Computer Interaction  
Algorithms & Data Structures  
Artificial Intelligence  
Compilers and Interpreters  
Computer Network  
Computer Science Research Project  
Data Mining  
Digital Communications  
Digital System Design  
Distributed Computing  
Embedded System Design  
Engineering Project Management  
Games Design  
Information Analysis & Design  
Information Security  
Machine Learning  
Models of Software Systems  
Operating Systems Architecture  
Predictable Professional Performance  
Service-Oriented Architectures  
Social & Mobile Computing  
Spatial and Multimedia Databases  
Systems Engineering  
Systems Safety Engineering  
The Software Process  
Web Information Systems

This is an indicative list of available courses. For full program information visit [www.uq.edu.au/study](http://www.uq.edu.au/study)
The Master of Computer Science (Management) provides a combination of the ICT, business and management skills that are increasingly required by the ICT industry.

The program offers ICT professionals with a recognised undergraduate degree in a relevant field the opportunity to either upgrade their general skills in ICT or to focus on a specific ICT area, such as information systems, software engineering, distributed systems, networks, information security and other ICT areas. The further combination of ICT, business and management skills is currently an essential requirement for candidates seeking to advance their career in the ICT industry.

The program is practical and industry-focused and students have access to a wide range of quality resources and world class facilities at UQ’s St Lucia campus.

Like the Master of Computer Science, the Master of Computer Science (Management) program is very flexible and does not have any compulsory courses. Students are able to enrol in an advanced computer science research project (#8) which is also offered in the summer semester, allowing students to complete the Master of Computer Science (Management) in 1.5 years.

Available Courses
Courses listed in the Master of Computer Science page 17 combined with Master of Business courses.

Master of Business courses
Accounting
Business Information Systems
Entrepreneurship and New Ventures
Finance
Information Analysis & Design
Management Systems
Managing Information & Knowledge
Managing Information Systems
Managing Organisational Behaviour
Marketing
Operating International Business
Strategic Human Resource Management

This is an indicative list of available courses.
For full program information visit [www.uq.edu.au/study](http://www.uq.edu.au/study)
The University of Queensland is recognised the world over as a provider of high quality fundamental and applied engineering and ICT research. As one of the top three research institutions in Australia, UQ has earned a global reputation for its outstanding facilities, strong industry links and research excellence. The University is a destination of choice for a growing community of internationally renowned scholars, scientists and research experts.

In 2010, UQ received more than AUD$330 million in research funding from sources including the Australian Research Council (ARC) and the National Health and Medical Research Council (NHMRC). This financial strength supports over 2330 research projects in progress at UQ. Over 1500 scientists and research experts provide advice and expertise to a cohort of almost 4000 RHD students, 30% of whom are international students.

Recent Federal Government reports have confirmed UQ’s position as a truly comprehensive university with research in 24 of a possible 25 research groupings, and as a university of global repute with all research groupings performing at or above world standards.

A unique research higher degree experience

Almost 4,000 students undertaking an RHD at UQ are supported by the UQ Graduate School, who focus on enriching the quality of academic life; providing high standards of supervision; and assisting RHD students in achieving their desired employment outcomes. The Graduate School also coordinates a year-round skills training program, professional development activities and a range of events for RHD students.

The UQ RHD Advantage Model

From 2012, research students will have access to a new PhD program. The UQ RHD Advantage model will allow for a more multi-faceted research experience and provide training modules composed exclusively for PhD students. Each module is designed to accelerate career development, encourage cross-disciplinary dialogue and collaboration, and enhance employability.

The RHD Advantage model harnesses UQ’s reputation and strengths, specifically in higher education teaching, research commercialisation, international collaborations and industry engagement. Students will have the opportunity to choose from one of four pathways and will receive formal recognition upon graduation that attests to the enhanced nature of their research training and experience, improving employability, and producing more globally aware and mobile graduates.

Research Commercialisation

UQ is one of the most successful universities in Australia for the commercialisation of research with more staff dedicated to research commercialisation than any other Australian university. With 80 staff and group revenues exceeding AUD$100 million, UQ company UniQuest benchmarks in the top 10% globally for university-based technology transfer. Research commercialisation is integral to UQ’s research and research training effort and we extend the benefits of this expertise to our RHD students through free research commercialisation workshops and other professional development opportunities.

Scholarships and research travel grants

UQ offers financial support to research higher degree (RHD) students through a wide range of scholarships. We currently support over 1600 RHD students from an annual scholarships budget of more than $24 million in Australian Government and University funding. Financial assistance is available to both domestic and international students and can include living allowances, establishment grants, tuition fees and overseas health cover (OSHC). Annually, the Graduate School provides more than $250,000 in research travel grants to enable RHD students to access research facilities elsewhere in Australia and overseas. These opportunities promote international collaboration and partnership and enhance the research experience and employment opportunities for students. Scholarships are competitive and merit-based and awarded to students in four rounds each year.

The UQ Graduate School www.uq.edu.au/grad-school
**PROGRAM OPTIONS - POSTGRADUATE RESEARCH**

**Master of Philosophy (MPhil)**

The Master of Philosophy (MPhil) provides research training for candidates to foster the development of independent research skills. These skills include the ability to formulate a significant problem, mastery of appropriate conceptual and methodological frameworks, and the capacity for critical analysis. Candidates undertake an original and significant research project that culminates in a thesis consistent with one to two years full-time study and supervised research training.

**Entry requirements**

Students require a bachelor degree with the equivalent of a UQ honours class II or better. Alternate pathways are available to students with at least one year of full time equivalent postgraduate study, or at least two years of documented relevant work experience.

**Doctor of Philosophy (PhD)**

The Doctor of Philosophy (PhD) provides training for students interested in career advancement and research. The doctoral thesis provides evidence of a contribution to knowledge with a level of originality consistent with three to four years of full-time study and supervised research training. It also demonstrates a candidate’s capacity for critical analysis and that he or she is capable of pursuing scholarly and programmatic research that answers significant questions within a three-to-four year time frame.

**Entry requirements**

Students require a bachelor degree with the equivalent of a UQ honours class II or better. Alternate pathways are available to students with at least one year of full time equivalent postgraduate study, a research masters degree, at least two years of documented relevant experience, or a coursework masters degree with a grade equivalent to 5.0 on the 7-point UQ scale.

**Research Activities**

The University of Queensland offers engineering and ICT related research in the following broad categories:

- Aerospace Engineering
- Biological Engineering
- Chemical Engineering
- Civil Engineering
- Electrical Engineering
- Environmental Engineering
- Information and Communications Technology
- Materials
- Mechanical Engineering
- Mining and Minerals Technology
- Modelling and Simulation of Complex Systems
- Power and Energy Systems
- Water Engineering

CAROLYN JACOBS - PHD STUDENT, SCHOOL OF MECHANICAL AND MINING ENGINEERING

“I choose to do my PhD at UQ because it gave me the opportunity to work with the Centre for Hypersonics (CfH). The CfH at UQ is one of the world leaders in hypersonics research, and is part of numerous international collaborations. Working at the CfH I have been able to conduct experimental research on some unique facilities and work with researchers from the European Space Agency (ESA) and the National Aeronautics and Space Administration (NASA). It’s been incredibly rewarding.”
AEROSPACE ENGINEERING

Hypersonics

Hypersonic aerodynamics has been a major research activity in Mechanical Engineering at The University of Queensland over the last 25 years. Researchers in this group have been active internationally and, during that period, have been involved in collaborative research programs with about 20 universities and research organisations around the world.

The Centre for Hypersonics is the largest university based hypersonics group in the world and conducts research into all aspects of hypersonic flight, including test facilities, air-breathing engines, rocket flight testing, aerothermodynamics, computational fluid dynamics and optical diagnostics. This includes development of scramjets for high speed propulsion and interplanetary and moon entry aerothermodynamics.

www.uq.edu.au/hypersonics

Systems and Software Engineering

Refer to Information and Communications Technology (Page 24)

BIOLOGICAL ENGINEERING

Biomaterials

Biomaterials is a relatively new field that draws on knowledge from the traditional physical science, engineering, biology, physiology and clinical science disciplines. Over the past few decades, the number of new biomaterials has expanded rapidly, as has our understanding of the series of events that occur when a foreign material is placed in contact with living tissue. From dental repairs to controlled drug release or total organ/joint replacement and the new field of tissue engineering, almost every human being on earth will be exposed to one biomaterial or another during their lifetime.

UQ biomaterials research involves the development of new polymers, alloys and (nano) composites for application in medical devices. This also encompasses the emerging need to better understand the biological interactions and toxicology of nanomaterials being developed for medical applications.

www.nanobio.uq.edu.au

Tissue Engineering

Modern biology has opened up new approaches to the repair, augmentation or replacement of dysfunctional tissue. Tissue engineering is the development of technologies for production of blood cells used for gene therapy, immunotherapy, bone marrow transplantation and transfusion, as well as microtissues used for drug discovery and delivery.

With new opportunities constantly emerging in the pharmaceutical and biomedical areas, research into tissue engineering is a key element to modern medicine. The research group is involved with resolving some of technical problems related to haematopoietic (blood) cell therapies and the use of avascular microtissues for drug discovery and delivery.

www.chemeng.uq.edu.au
www.aibn.uq.edu.au

Medical Biotechnology

Medical Biotechnology uses specialised techniques to manipulate microorganisms, plants, animals and human tissues with the overall aim of understanding, treating, and curing human disease.

Pressures such as increasing and aging populations, the rise in obesity-related illness and the threat of new and fast moving disease, including pandemics, are driving innovation in the area of biomedical and biological engineering. To meet these challenges, researchers in medical biotechnology are working in areas as diverse as designing new medicines and therapies, better drug-delivery technologies, improving medical diagnostic systems and developing systems for effective tissue cell regeneration.

www.chemeng.uq.edu.au

Metabolic Engineering

Metabolic engineering is concerned with the rational redesign, typically using genetic engineering, of organisms to meet commercial objectives. Continuing advances in the ability to engineer biological systems are redefining biotechnology and will broadly impact on existing industries, as well as creating totally new ones.

Research within this area is focussed on biopolymer production and focuses on the production of industrial biopolymers as well as new approaches to enhance production of monoclonal antibodies in mammalian cells, hyaluronic acid in bacteria and polyhydroxyalkanaotes (PHAs) in sugarcane. This technology will enhance yield and quality of biopolymers and can also be transferred to other systems to improve desirable traits in other organisms.

www.chemeng.uq.edu.au
www.aibn.uq.edu.au

CHEMICAL ENGINEERING

Biomolecular Engineering

The Centre for Biomolecular Engineering at UQ provides a unique multidisciplinary research environment that brings together scientists and engineers defining the knowledge and process needed to speed the delivery of complex bioengineered products to society.
UQ’s research in Biomolecular Engineering focuses on two major themes: Biorenewable Materials and Vaccine Nanotechnology. Active research into the design of new biomaterials and their manufacture through industrial biotechnology is being undertaken. Research into Vaccine Nanotechnology gears our ability to mass produce empty virus shells in reactors, and to tailor these for a rapid response to diseases including influenza. Our Vaccine Nanotechnology theme encompasses research from molecular to bioprocess scales, and includes immunological testing.

www.chemeng.uq.edu.au/cbe
www.aibn.uq.edu.au

CIVIL ENGINEERING

Adsorption and Reaction Engineering
The adsorption and reaction engineering group studies the fundamentals of adsorption, transport and reaction of gases, liquids in nanoporous materials, such as activated carbons, coal chars, etc. As well as the potential industrial applications. The two main areas of interest include adsorption and reaction in nanoporous materials, and adsorption engineering and science. Research is carried out to study the effect of solid heterogeneity, such as micropore size distribution, functional group distribution and surface topography on the adsorption equilibria and dynamics of single component systems as well as multi-component systems. This will help design and refine impurity removal and gas separation processes.

www.chemeng.uq.edu.au/adsorption

Particle and System Design
Particle technology has been a major research activity at The University of Queensland over the last 20 years. Researchers in this group have been actively collaborating with many research organisations both in Australia and internationally.

The Particle and System Design Centre (PSDC) is an internationally recognised centre for fundamental and applied research in modern particle technology and systems engineering. The Centre promotes research and development in particle science and technology as a centre of excellence in Australia and internationally. PSDC takes a multi-scale approach to addressing major research and development activities.

www.cheque.uq.edu.au/psdc

Geotechnical Engineering
Geotechnical engineering is vital to the design and delivery of civil infrastructure and mining development. It combines the disciplines of soil mechanics, rock mechanics and engineering geology. The Golder Geomechanics Centre, a partnership between Golder Associates Pty Ltd and UQ, specialises in a range of research fields in ground engineering and environmental science. Current research projects span computational modelling and monitoring of soil and rock blasting, rock damage and waste rock infiltration; dynamic testing using tunnel boring machines; mined land form design, ground improvement and operational and post-closure mine waste balance and seepage; risk assessment and cost-effective analysis of water and process chemical recovery.

www.uq.edu.au/geomechanics

Structural Engineering
Structural Engineering is one of the main areas in Civil Engineering. Research in Structural Engineering at UQ has led to a number of significant advancements in design and analysis techniques and provided solutions to many industrial problems. Collaboration with other institutions, authorities and industry, both national and international, has always been a catalyst to research in structural engineering at UQ. Current research themes in Structural Engineering within the School of Civil Engineering are concrete and composite materials, energy dissipation devices for seismic retrofitting, cold-formed steel sections for housing, sustainable structures, durability of infrastructure, computational mechanics and nonlinear analysis and biomechanics.

www.civil.uq.edu.au
CIVIL ENGINEERING cont.

Transportation Engineering
Transportation engineers practice in planning, design and management of transportation facilities such as roads, railways, airports or seaports, or in the running of private or public transportation systems. They work closely with other engineers, architects, planners and economists. They contribute to solutions to many of the major issues facing society today including energy usage, greenhouse emissions, urban sprawl and personal safety.

Through industry oriented approaches, the University undertakes theoretical and applied research in transport strategy and policy, system performance, transport planning, systems modelling and operations, and sustainable urban transport.

www.civil.uq.edu.au

ELECTRICAL ENGINEERING

Microwave and Optical Communications
Microwave and optical communications activities evolve around microwave and optoelectronic technologies and signal processing with applications in communications and radar. The group is involved with modelling and simulation of modern wireless (radio) and optoelectronic communication systems and radar, and the design and development of computer algorithms for measurement and control of microwave and optoelectronic hardware.

The group conducts research on multiple-element antennas and associated signal processing techniques (also known as smart antennas), ultra wideband microwave imaging and target recognition, spectrum management in multi-user broadband communication systems, design and modelling of short-reach optical interconnects and the design and characterisation of self-mixing sensors based on Vertical-Cavity Surface-Emitting Lasers (vcsels).

www.itee.uq.edu.au/moc

Biomedical Engineering
Biomedical engineering is a transdisciplinary field that bridges the gap between technology, medicine and biology by integrating the physical, chemical, mathematical, and computational sciences and engineering principles with the ultimate aim of improving healthcare. Biomedical engineers are vital in the management of technology in hospitals and health care delivery. Links with industry and hospitals allow UQ Biomedical Engineering research to respond to clinical needs with immediacy.

Research focus is on developing new tools to improve data acquisition, image reconstruction, and image analysis from medical images, such as magnetic resonance imaging and histological imaging. Designing monitoring devices for respiratory conditions, electromagnetic field safety and foetal movement are also key areas of research.

www.itee.uq.edu.au/bme

ENVIRONMENTAL ENGINEERING

Biofilm Engineering Research
Biofilms are communities of bacteria or other single-celled organisms and can be used effectively in wastewater treatment plants to remove excessive nutrients from the water. This technology can help to prevent the eutrophication of water systems and subsequent negative environmental effects.

The biofilm group currently conducts research primarily relating to the role of biofilms in waste treatment technologies and the fate of contaminants in the environment. The group is engineering new technologies for the treatment of, and product generation from, solid organic waste (e.g. Biosolids, agricultural waste) and the reduction of organic compounds in subsurface environments.

www.civil.uq.edu.au

Environmental Modelling
An environmental model, deployed to assist in the management of a real-world system, mainly concerns human-induced climate change and the associated impacts. Environmental models are a means of ensuring environmental protection and used to simulate the finer details of a problem to build a solution to the affected processes.

The School of Civil Engineering and S.S. Papadopulos and Associates (SSPA) in the US are undertaking collaborative research into parameterisation through the use of numerical modelling and analysis to improve environmental data processing and the use of computer simulation in environmental management. The theme of much of this research is parameter estimation and predictive uncertainty analysis.

www.civil.uq.edu.au
www.sspa.com

Sustainable Tourism
Travel and tourism is a relatively new industry that has grown rapidly and now employs more Australians than any other sector. Internationally, tourism is the largest traded good or service and during the next 10 years, it is projected that travel and tourism will become Australia’s largest export earning sector. However, it is also a large user of natural resources, is responsible for significant waste and
greenhouse gas emissions and can have serious impacts on fragile environments. Research within the Engineering, Design and Technology Research Program for the CRC for Sustainable Tourism is focused on improving environmental outcomes through improved design, construction and management of travel and tourism infrastructure.

www.civil.uq.edu.au

INFORMATION AND COMMUNICATIONS TECHNOLOGY

Cognitive Systems Engineering

Cognitive Systems Engineering is a multidisciplinary area of research focused on how to build highly complex systems so that the human and technical sides work well together. Researchers investigate ways to analyse, model and evaluate how humans and technology interact, with a view to designing systems that are safer, more productive and easier to work with.

At UQ, cognitive engineering researchers work in healthcare, air traffic control and industrial process control. The University also enjoys a close relationship with National ICT Australia’s (NICTA) Cognitive and organisational Systems Engineering project at the Queensland Research Laboratory.

www.itee.uq.edu.au/cse

Data and Knowledge Engineering

The Data and Knowledge Engineering research group conducts research in the organisation of the content and behaviour of large-scale information systems, to provide modern information infrastructure for data-driven applications. The group is dedicated to finding effective and efficient solutions to data management, data integration, search and data mining for personal, business and scientific applications. Its research strengths are in Enterprise Information Infrastructure and Complex Data Management focusing on data quality management and integration, web information systems, workflow technology, business process management and collaborative information systems, as well as performance and scalability issues for spatial, temporal, multimedia, sensor, RFID, biological, environmental and health data.

www.itee.uq.edu.au/dke

E-Research

E-Research is the term given to large scale science that is increasingly carried out through distributed, global collaborations, enabled by the Internet and advanced ICT. E-Research involves distributed teams of scientists accessing and sharing: very large data collections, unique scientific facilities (eg, microscopes, telescopes), large scale computing resources, and high performance analysis, modelling and visualisation services, over high speed networks.

The primary areas of research focus are advanced scientific data management, collaborative platforms and scientific data publishing and preservation. This research is being applied and evaluated through close collaboration with industry partners and world renowned scientific leaders across many disciplines.

www.itee.uq.edu.au/e-research

Security and Surveillance

In the 21st Century, international usage and interest in surveillance of public spaces is growing at an unprecedented pace in response to global terrorism. The immense cost of successful terrorist attacks indicates that forensic analysis of video after the event is simply not adequate.

UQ researchers working with National ICT Australia (NICTA) have been awarded $1.5 Million (200_ – 2011) by the Australian Federal Government to research and develop advanced security solutions based on computer vision, pattern recognition technologies and advanced embedded systems. Members of the group are leading the NICTA Advanced Surveillance Project, which also involves researchers from other Australian universities.

www.itee.uq.edu.au/sas

Systems and Software Engineering

A central problem for systems and software engineering is the complexity of computer-based systems and of the requirements they must satisfy. These systems provide a multiplicity of features which must be somehow combined to give a desirable overall behaviour.

UQ research covers novel approaches to the analysis, design, verification and validation of systems in order to address the challenge of ensuring the dependability of critical computer-based systems. Current research includes requirements analysis based on Behaviour Tree models built from the informal requirements; model-based approaches to system design, implementation, and testing; structuring real-time systems according to time bands and implementing them using teleo-reactive programming techniques (a mid-level agent approach); verification of the emergent global properties of large collections of locally-interacting agents; program analysis techniques; and software process modelling.

www.itee.uq.edu.au/sse
Informa

Ubiquitous Computing

Ubiquitous computing means computing everywhere, every when, every how - computers that disappear into the environment around us.

Research activities are focused in four main areas to address the issues that arise as global computing infrastructure becomes pervasive and interconnected. Reconfigurable Computing research investigates FPGAs and embedded processors with applications in areas such as safety-critical systems, information security, aerospace and low-power systems. Research into Sensor Networks includes ad-hoc networks, marine sensor systems and wireless control, with applications in areas such as emergency services, environmental monitoring, and industrial automation. Context-Aware Computing research investigates how systems can respond automatically to their environment. Interaction Design research focuses on users’ interactive experience with technology including multi-modal interfaces and ubiquitous computing; information design and information visualisation; collaborative learning environments; human-centred design; studies of the design process; participatory design; affective computing; and interactive environments and immersion.

www.itee.uq.edu.au/ubq

Materials Engineering

Light Metals

Light metals are used in engineering structures and components when weight is a critical design parameter. They are a key instrument in the automotive industry’s drive to lower weight to improve fuel efficiency and lower emissions in response to world environmental pressure. This is critical in the Australian context because the automotive and automotive component business is this country’s largest value-added export industry.

Light metal research at UQ concentrates on the net shape processing of aluminium, magnesium and titanium, particularly casting, solidification, surface engineering, corrosion, powder processing, rapid manufacturing and hydrogen storage. The research is supported by the CAST CRC and the ARC Centre of Excellence for Design in Light Metals.

www.uq.edu.au/materials

Nanomaterials

One of the hallmarks of nanotechnology is the ability to tailor design materials at the molecular level. Nanomaterials research underpins and enables the tailoring and functionalisation of materials for innovative technologies in clean energy, environment and health care industries. The ARC Centre for Functional Nanomaterials was established in 2003 for five years and was granted an extension of three years in 2008 as a Centre of Excellence. The Centre is also part of the AIBN.

Current Centre research projects include gas to liquid conversion, hydrogen production and storage, fuel cells and high energy density batteries desalination membranes, nanoparticles-based drug delivery, and the fabrication of functionalised silica nanospheres and nanocapsules bioseparation.

www.nanomac.uq.edu.au
www.arccfn.org.au

Polymers

New polymer structures, suitable for use in drug and gene delivery, as well as high-strength coatings, will provide Australian products with advanced features and capabilities to significantly improve performance. UQ research in this field significantly advances the basic knowledge of polymer science and related fields through preparation of previously unavailable, novel and well-defined nanostructures.

The Centre for High Performance Polymers undertakes research and development into the design, synthesis, characterisation, rheology, processing and flow simulation of biopolymers and polymer nanocomposites. The major research areas are focused on developing high performance polymers for high value added manufacturing, biopolymers and nanostructured polymers.

www.chemeng.uq.edu.au/chpp

Mechanical Engineering

Mechanical engineering is a broad field of engineering and a many other areas of research are undertaken at UQ including non-destructive testing and evaluation, coal gasification, non-linear systems, composite materials, mechanical properties of emerging materials, Co2 sequestration and combustion.

Smart Machines

The University of Queensland through CRC Mining is a leader in the development of automation technologies for surface mining equipment. The research team work with the major equipment manufacturers including Caterpillar and P&H and many of the large mining companies. They have delivered several innovative automation capabilities which are transforming the industry.
Successfully deploying high-end automation technologies requires a non-traditional mix of skills. Developments in mining technology research concentrate on the evolving capabilities of computing technologies, advances in sensing methods (particularly the development of positioning systems with full mine coverage, mine-robust imaging technologies such as radar, and laser technologies) the increasing capabilities and capacities of communication systems, and developments in advanced control system technologies.

www.mechmining.uq.edu.au

Rail
The CRC for Rail Innovation seeks to meet growing transport needs identified by both the rail industry and researchers. This Australian rail research centre develops world-standard railway systems through cooperative research. Rollingstock is the signature of the railway industry, however critical importance and substantial cost rests on the performance of the track, ballast and track structure in the overall rail system.

Research in this area is focussed on developing technologies and systems for track maintenance and upgrading, to ensure safer and more reliable rail operations. UQ maintains an active commitment to research in this industry.

www.mechmining.uq.edu.au

Geothermal Energy
Throughout the world, developed and developing nations are seeking sustainable energy solutions to the growing and complex needs of industry, government and communities of all types. The ultimate energy source would be emission-free, abundant, price-competitive, long-term and able to deliver reliable baseload power. In September 2007 the Government of Queensland, Australia, made a major investment in the technologies and expertise that aim to realise such an energy solution. Responding to a proposal from UQ the Queensland Geothermal Energy Centre of Excellence at UQ, Brisbane, was established to focus on research on energy derived from subterranean “hot rocks”.

www.uq.edu.au/geothermal

MINING AND MINERALS TECHNOLOGY

Mining Technology
The mining boom currently experienced by Australia continues to place great demands on the supply of energy, water and skilled professionals. Energy demands, coupled with the impending introduction of a carbon tax, are driving changes in mining equipment and processes. The Division of Mining Engineering of the School of Mechanical and Mining Engineering is active is investigating means for reducing carbon footprint of mining operations, including the indirect measurement of fugitive methane gas emissions from coal operations, optimisation of equipment utilisation and use of in-pit crusher conveyor systems. Another area of research relates to the efficient operation of mine ventilation systems. New mining systems require new ways to design and plan mines. As such, a third active area of R&D relates to optimisation of mine planning.

www.mechmining.uq.edu.au/mining-research

Metallurgical Engineering
UQ Metallurgy provides opportunities to actively collaborate with industry, participate in cutting edge research, and develop a firm foundation on which to launch a career in research, process development or academia. The research strengths of UQ in metallurgical engineering span the key disciplines of mineral processing, hydrometallurgy and pyrometallurgy.

Current research in the Hydrometallurgy Research Group is focussed on key aspects of processing including precipitation from aqueous solutions, ion exchange and membrane separations and leaching of minerals.

The Pyrometallurgy Research Centre has particular expertise in chemical thermodynamics and phase equilibria in high temperature metallurgical systems, and reaction kinetics and mechanisms in metallurgical systems.

www.pyrosearch.uq.edu.au

Mineral Research
The Julius Kruttschnitt Mineral Research Centre at UQ is a world leader in mineral processing science and technology. Mineral processing, the first stages of processing of ores, involving comminution and physical separation of minerals from ores that have been extracted from the mine, are critical to determining mineral and metal recoveries, and overall energy consumption.

Research in Minerals Processing Engineering is undertaken on a range of issues including geometallurgy, particle, ore and drill-hole core characterisation, comminution, physical separation processes, flotation and interface science, mathematical process modelling, simulation and optimisation.

www.jkmrc.uq.edu.au
MINING AND MINERALS TECHNOLOGY cont.

Geomechanics
As mining activity continues to expand, engineers skilled in geomechanics will be required to meet the challenges of ever-deeper open pits and underground operations, in high stress environments, and the management of escalating mining and processing wastes and mine site rehabilitation.

Research within this theme includes the application of geomechanics principles to mine waste management, mine closure, and mineral processing; field instrumentation and monitoring; materials modelling; computational geomechanics; and laboratory modelling and characterisation.

www.uq.edu.au/geomechanics

MODELLING AND SIMULATION OF COMPLEX SYSTEMS

The strengths of the Complex and Intelligent Systems group are in cross disciplinary research in natural and artificial systems, from systems biology to systems neuroscience, and from biorobotics to intelligent information systems. The group’s areas of focus include the following four areas.

Complex and Intelligent Systems
Complex systems is an emerging discipline developing new ways of investigating large, highly intricate, dynamically changing systems across diverse areas such as biology, social networks and socio-technological systems, economics, ecology and the environment.

Central to our research, and distinct from traditional computer programming, is our belief that intelligent machines of the future will be primarily self-taught requiring vast amounts of knowledge, ranging from subtle fine motor commands needed to manipulate objects, through to knowing the consequences that various actions will have on the world. Research areas include agent-based systems, data mining, machine learning, metaheuristic optimization, genetic and neural networks and evolutionary computation.

www.itee.uq.edu.au/cis

Biorobotics
Biologically-inspired robots functioning in the real world provide valuable physical models of biology and essential alternatives to conventional methods of designing intelligent systems. The group’s research activities within Biorobotics focus on biologically-inspired systems for navigation, robot control, embodied learning, vision and movement.

Computational Biology
Computational biology and bioinformatics draw on information technology, software engineering, maths and statistics to enable discoveries in molecular biology. This cross-disciplinary field is represented at UQ by collaborative teams of researchers at the School of Information Technology and Electrical Engineering (ITEE), Institute for Molecular Bioscience and the Faculty of Science.

UQ computational biologists develop and apply machine learning, heterogeneous data integration and computational modelling seeking to understand a range of open problems in molecular biology, including mechanisms of cellular regulation and determinants of protein function.

Thinking Systems
Thinking Systems study how humans, animals, robots and information systems navigate: how trajectories through space are used to build maps, the neural bases of these mapping processes and how to use maps to achieve goals.

Current research in this theme explores navigating through real and conceptual spaces, bringing together a cross-disciplinary team to study fundamental issues in how animals, robots and computers can make sense of vast amounts of information when navigating through the world. The Complex and Intelligent systems group collaborate widely, including with the ARC Centre of Excellence in Bioinformatics, ARC Centre for Complex systems, csiro, Institute for Molecular Bioscience, Institute for Social Science Research, Queensland Brain Institute and Queensland Health.

www.itee.uq.edu.au/cis

POWER AND ENERGY SYSTEMS

Power Systems
Power systems are generally large, nonlinear, interconnected and complex. Faced with the challenges of climate change, increasing power demand, system nonlinearities and ageing within these systems, there is a significant need for an improvement in the planning and operation of such power systems to avoid catastrophic blackouts, and to deliver high quality power to consumers. In addition, renewable energy sources such as solar photovoltaic, solar-thermal, wind and geothermal will play significant roles in our future energy growth. This means more and varied sources of renewable energy will be introduced to the Australian electricity grid. Hence the impact of volatile renewable energy sources and long distance transmission lines, are of significant importance for maintaining the grid security.

Research in this area is specifically directed at the analysis and prediction of the dynamic behaviour of power systems for reliable and secure operation, focusing on voltage and transient stability analysis, fault analysis tools, power systems
control methodologies, integration of renewable energy sources, and accurate modelling and interpretative tools for power transformers and underground cables. UQ’s Power Systems Group enjoys strong industry collaboration in research both nationally and internationally and is a major partner of the Australian Power Institute.

www.itee.uq.edu.au/pes

Geothermal Energy
Refer to Mechanical Engineering (Page 25)

Low Emission Coal Technologies
The University of Queensland Centre for Coal Energy Technology (CCETech) is one of the largest critical mass of engineers and scientists working in the clean energy delivery area in Australia. The Centre is also engaging UQ researchers in other discipline areas including sustainability research (social and economic), economic modelling, coal geology, environmental modelling of trace elements and cleaner energy production.

The Centre brings together more than 20 leading academics to deliver the technical solutions required in a decarbonised economy. Research excellence within the field includes novel clean coal processing technologies (coal seam gas, ultraclean coal and gasification), gas processing (membranes for CO2, H2 and O2 separation, gas cleaning and gas to liquids), modelling, simulation and control.

www.chemeng.uq.edu.au

Energy Environment Engineering
Energy production has perhaps had the greatest of all human impacts on the environment, upon which a high quality of life inextricably depends. UQ’s ENtri research group focuses on energy environment engineering to develop knowledge and solutions for energy and environmental issues and achieve sustainability in energy supply. Its research activities include renewable, low and no carbon energy sources, extended usage of fossil energy through sequestration of CO2, energy efficiency, and the hydrogen economy. ENtri’s work spans experimental, mathematical modelling, simulation, demonstration and practical engineering development across a wide range of areas. www.chemeng.uq.edu.au

WATER
Water Engineering
Water is now strongly recognised as a highly valuable and often limiting resource for population development, manufacturing, agriculture and mining operations. Effective water management and the associated infrastructure are absolutely critical elements of any development activity and essential for the sustainability of our population and lifestyle.

The research focus of the Advanced Water Management Centre (AWMC) at UQ is on creating leading edge knowledge in wastewater treatment, sewer management, resource recovery and environmental biotechnology. The Centre has made major contributions in this field internationally, particularly in relation to nutrient removal, anaerobic treatment, sewer operation and microbial ecology of complex systems and is widely recognised as a leading research group at the interface of biological science and process engineering.

www.awmc.uq.edu.au

Catchment and Waterways Research
Water resources researchers in Environmental Engineering are concerned with water, nutrient and chemical flows and general catchment processes at all stages of the water cycle - catchment hydrology and hydraulics, groundwater recharge, storage and discharge, biogeochemical processes and water quality, salinity, lake dynamics and water quality, as well as river and estuarine flows. The group specialises in the quantitative analysis of these flows through mathematical modelling and the linking of physical flow modelling with quantitative understanding of chemical and biological processes. Parameter estimation and assessing uncertainty and the associated consequences for quantification and risk assessment in decision-making are key skills of the division and are strong elements of the University’s catchment and waterways research.

www.awmc.uq.edu.au

Water and Environmental Engineering
While all areas of engineering consider sustainability to some extent, it is a primary concern of water and environmental engineering. The Centre of Water Studies specialises in the quantitative analysis of catchment and groundwater hydrology, including chemical and biological processes, through mathematical modelling. Applications to mine sites include estimating impacts of tailings and spoil drainage as well as landscape and geological disruption, Acid Mine Drainage (AMD) processes, final void hydrology and water quality, water supply design options. Treatment and management of waste rock leachates, AMD abatement technologies such as co-disposal of organic and mine wastes including improved estimation approaches for acid generating potential.

www.civil.uq.edu.au
AUSTRALIAN INSTITUTE FOR BIOENGINEERING AND NANOTECHNOLOGY

The University of Queensland's Australian Institute for Bioengineering and Nanotechnology (AIBN) is an integrated multi-disciplinary research institute bringing together the skills of world-class research professionals leading the areas of bioengineering and nanotechnology.

The unique combination of engineers and scientists focus their efforts towards research that produces positive health and environmental outcomes including biomedical delivery, biodevices, tissue regeneration and cell therapies with positive health and commercial outcomes.

The AIBN’s primary research and development focus leads to new products, processes and devices for improving human health and quality of life. The institute goes beyond basic research to promote the growth of new applications and industries.

The AIBN is making major contributions to advance knowledge in the rapidly developing fields of nanotechnology and bioengineering and provides outstanding training opportunities for the next generation of engineers.

www.aibn.uq.edu.au

SUSTAINABLE MINERALS INSTITUTE

The Sustainable Minerals Institute (SMI) provides solutions to challenges within the global minerals industry to expand and diversify research and postgraduate education within the broad context of sustainable development.

The research activities at the SMI, through its six research centres, are aimed at developing and communicating the knowledge required to combine new and existing techniques that deliver practical and accessible solutions to achieve minimum impact mining and minerals extraction.

The SMI conducts a diverse range of research in areas of importance to the national and international minerals industry including; mining and geology; mineral processing; environment; mine site rehabilitation and mine site closure; water and energy; risk, safety and health; social responsibility and community relations.

Multidisciplinary researchers in technical, environmental and social disciplines make up SMI. It is this blend of skills which allows SMI to make significant contributions to the advancement of sustainable development within the industry.

www.smi.uq.edu.au
POSTGRADUATE COURSEWORK

Download and complete the Application for Postgraduate Coursework form, available online from www.uq.edu.au/study/forms/postgrad.

Submit the application form in person at a UQ Student Centre, or by mail to:

Student Centre
The University of Queensland
Brisbane Queensland 4072

Successful applicants will be sent an enrolment pack with instructions for online enrolment, fee payment, etc.

Please note: postgraduate coursework applicants need to provide complete, certified academic transcripts in English (showing all courses undertaken and degrees/diplomas awarded) with the Application for Postgraduate Coursework, unless their qualifications are from UQ.

POSTGRADUATE RESEARCH

ENTRY REQUIREMENTS

The different nature of research higher degrees mean that, at UQ, selection for candidature is more like selection for employment than applying to study coursework.

The UQ Graduate School administers the MPhil and PhD programs; awards scholarships for research higher degrees; oversees submission and assessment of theses; and provides a range of services to promote graduate study at UQ.

Postgraduate student support staff, who can advise on research interests and areas, and application processes, are available in each of the Schools in the Faculty of Engineering, Architecture and Information Technology.

Identify your research interests and search for potential advisors. You can find potential advisors through:

> UQ researchers: www.uq.edu.au/uqresearchers
> UQ Experts: www.uq.edu.au/uqexperts
> individual school websites

Simply search for your field of interest, complete an expression of interest form www.uq.edu.au/grad-school/candidature-forms and submit it to the school or institute which best matches your research interests. The form helps the school or institute to match your research interests and experience to advisors and resources.

DEVELOP YOUR RESEARCH PROPOSAL

If your expression of interest is successful, you will be invited by the school to further develop your research proposal. The proposal is the recipe for a successful candidature and details all the necessary components for a successful research candidature, including:

> the significance of the research question is appropriate to the degree;
> the research methodology is academically strong;
> the expected outcomes are described;
> the research can be completed within two years for a MPhil or four years for a PhD;
> the right academic experts are available; and
> there is adequate funding and facilities.

Once you have developed your research proposal, complete an application for admission and scholarship form and submit it to the school. If you are not an Australian citizen, Australian permanent resident, or New Zealand citizen, you will require a visa to undertake postgraduate research.

If your research proposal is approved you will be invited to formally apply for admission to UQ. For more information visit www.uq.edu.au/grad-school/how-to-apply
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In the event of any conflict arising from information contained in this publication, the material approved by The University of Queensland Senate shall prevail.

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