

University of Southern Queensland

FACULTY OF ENGINEERING AND SURVEYING RESEARCH REPORT 2009



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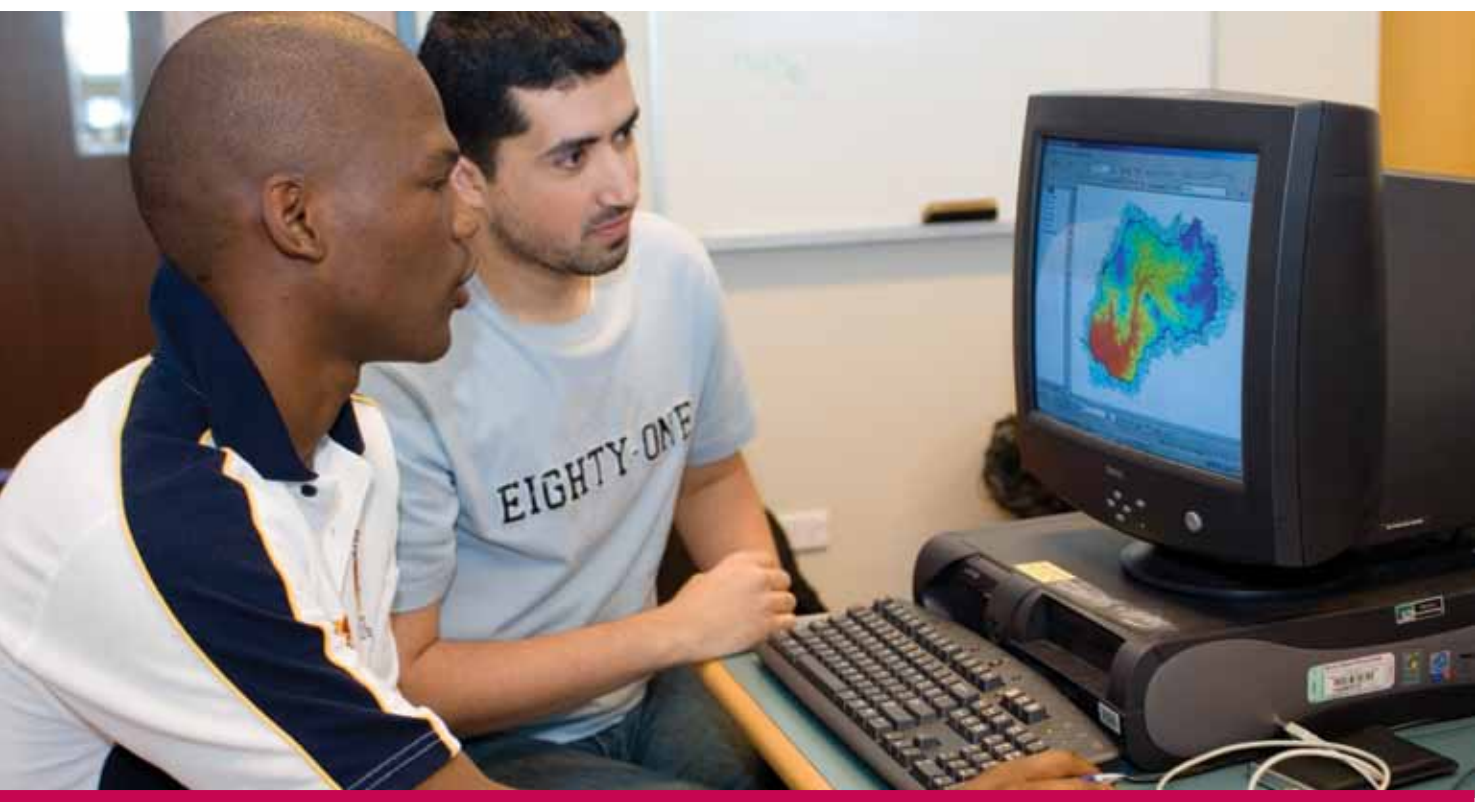
Message from the Dean of the Faculty of Engineering and Surveying & Pro-Vice Chancellor for Research – Professor Frank Bullen



Over the past 40 years, the Faculty of Engineering and Surveying, has built a distinguished national and international reputation for high quality, multi modal delivery of undergraduate and postgraduate programs across all the major engineering surveying and spatial science disciplines. The staff contributes to the scholarly profile of the Faculty across a diverse set of disciplines including the Agricultural, Civil, Environmental Engineering & Building Construction, Electrical, Electronic, Computer and Power Engineering, Mechanical and Mechatronic Engineering and Surveying and Spatial Science.

As in all good universities, the Faculty's excellence in learning and teaching is underpinned by world class research. Our students' learning experience is enriched via the research centres affiliated with the Faculty: the Australian Centre for Sustainable Catchments, the Centre of Excellence in Engineered Fibre Composites, the National Centre for Engineering in Agriculture, the Computational Engineering and Science Research Centre and the Centre for Systems Biology. Teaching and Research in the Faculty has been further strengthened by the ongoing appointment of new postdoctoral research and teaching fellows and the concurrent appointments of staff to research centres.

In the past year, the Faculty staff has continued to contribute to USQ's scholarly output by participating in National and International conferences, publishing their research in high quality international journals and providing their research expertise to both the local, national and international community. Several staff members were also successful in attracting competitive grants to support their research activities. The number of research higher degree students has increased by over 40% from 2008, adding significant potential to the Faculty's research output. I see 2010 as the year for the Faculty to build on its new research foundation with significant advances in research income to be made in 2011 onwards.



Introduction from the Associate Dean Research – Assoc Prof David Buttsworth

The 2009 year saw a strong growth in research for the Faculty of Engineering and Surveying and we are pleased to highlight research contributions of the Faculty in this report.

The Faculty produced research publications across a broad range of disciplines including areas such as computational mechanics, composite structures, agricultural and water resource engineering, and engineering education. An appropriate focus on high quality forums for dissemination of research outcomes was adopted across the faculty. Numbers of conference papers produced by faculty staff increased from 52 in 2008 to 69 in 2009 while the number of journal articles increased from 53 to 68 over the same period.

The total number of postgraduate research student enrolments in the Master of Engineering Research, Master of Spatial Science Research, Doctor of Philosophy, and Engineering Doctorate rose from 64 in 2008 to 92 in 2009. The faculty was pleased to host many international students from a wide variety of countries including Bangladesh, China, France, Libya, India, Indonesia, Iran, Iraq, Malaysia, Nepal, Pakistan, Philippines, Singapore, Switzerland, Thailand and Vietnam during 2009. On first arriving at USQ, many of our international students took English language courses prior to embarking on their research programs and the faculty was able to provide additional support for our international students during their English language programs.

Research funding for the Faculty in 2009 was close to two million dollars and this funding supported a range of research including composites for structural applications, education research, computational mechanics, irrigation and water resources/environment, and biomedical engineering. Research efforts of the faculty are closely aligned with the University Research Centres affiliated with the faculty. The faculty also supports research in emerging areas of strength through the Engineering Education Research Group and the Sustainable Energy Innovation Group.



Research within the Faculty of Engineering and Surveying

USQ is committed to excellence in applied research and research training, with a particular emphasis on research in sustainable futures. The Faculty is also committed to the same mission by providing excellent research training for our students, and by linking with industry and business through local and international research networks.

The Faculty continues to expand its commitment to Research and Scholarship and it hosts and works closely with the four research centres within the University. The Faculty has also established two emerging research groups. The establishment of multidisciplinary research centres and groups fosters cooperation between individuals, companies and agencies to support ground breaking research. Staff and students are working on solving some of Australia's most important issues. These research centres and research groups now form the core part of the Faculty's strong research culture.

Australian Centre for Sustainable Catchments (ACSC)

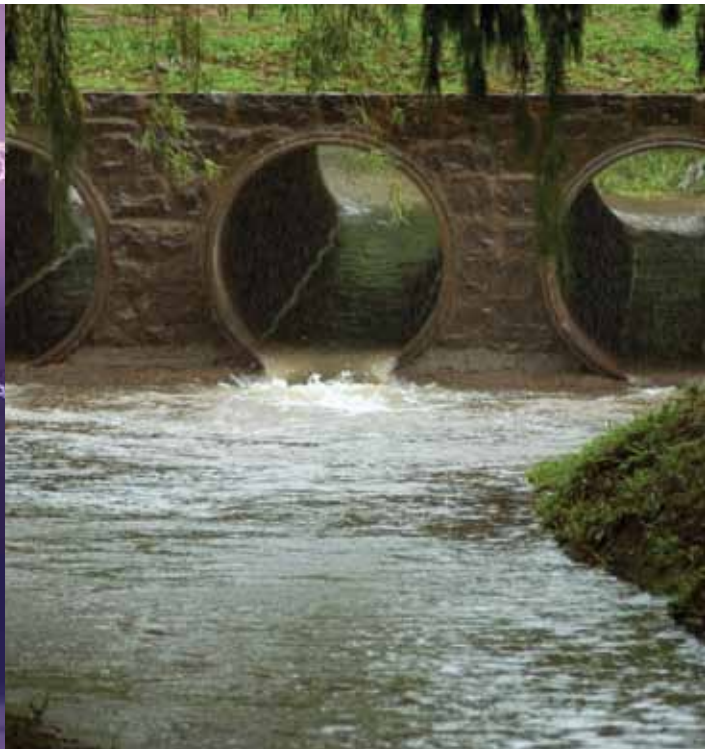
The Australian Centre for Sustainable Catchments (ACSC) focuses on and underpins the profitability and sustainability of water and catchment management in Australia. There are four identified research areas within the ACSC: Climate Science, Environmental Measurement and Modelling, Sustainable Landscapes, Sustainable Water Use and Spatial Analysis and Modelling. ACSC members are encouraged to work within one or more of these areas depending on the research expertise and interests of individual and groups of members.

ACSC researchers are currently developing integrated environmental models to provide stronger predictive capacity for regional land and water planning and management; investigating broader issues concerning the sustainable management of natural resources and connections with communities within our catchments; focusing on issues concerning water quality in rivers and reservoirs; on urban stormwater runoff; on wastewater treatment and reuse; and on groundwater hydrodynamics and quality and exploring new spatial modelling tools to support the development of sustainable land and water management.



Australian Centre for Sustainable Catchments

The Centre provided core involvement for major Australian and State international collaboration activities. This included forming a component of the Australian Mission to the European Union Joint Science and Technology Committee (Brussels); completing discussions with the United Nations Commission for Agricultural Meteorology in Geneva on a major international meeting and workshop to be held at USQ, Toowoomba in 2009; and developing processes for joint China- Queensland Climate Change research programs with the Office of International Collaborations, Queensland Department of Premiers and Cabinet. The Centre has established a 20 year research program so that, by 2025, Queensland has a thriving regional economy based on world-leading practices in regional water and catchment management, including the most efficient and sustainable stewardship of our natural resources.





Centre of Excellence in Engineered Fibre Composites (CEEFC)

The Centre of Excellence in Engineered Fibre Composites (CEEFC) is one of the leading research centres in Australia. It has an international reputation for pioneering research and development for exciting new technologies which are helping to make fibre composites a viable and competitive material for engineers.

The Centre is focused on strategic research directions on fibre composites technology consistent with the needs of the industry, the academic community and relevant research institutions. It has also maintained close collaborative arrangements with many government sectors, industry partners and private organisations in the areas of road development, environmental protection, polymer and composites to convert our successful research outcomes to applied technologies for different engineering applications.

CEEFC provides a wide range of trainings at the postdoctoral, postgraduate and undergraduate levels, which also include student and staff exchange program. The Centre provides opportunities for researchers to undertake joint research projects as members of a multidisciplinary team nationally and internationally, and gain access to its unique range of cutting edge facilities and equipment. The Centre also offers professional training and education in the form of online postgraduate courses, short courses, workshops and seminars.

CEEFC has established itself as a leading research centre through its dedicated and experienced research and technical staff. The multidisciplinary nature of CEEFC lends itself to undertake a broad range of programs from fundamental to the applied research in the areas of civil infrastructure, smart composite structures (embedded sensors and actuators technologies), green composites (biodegradable and recyclable polymer composites and novel advanced composites manufacturing process.

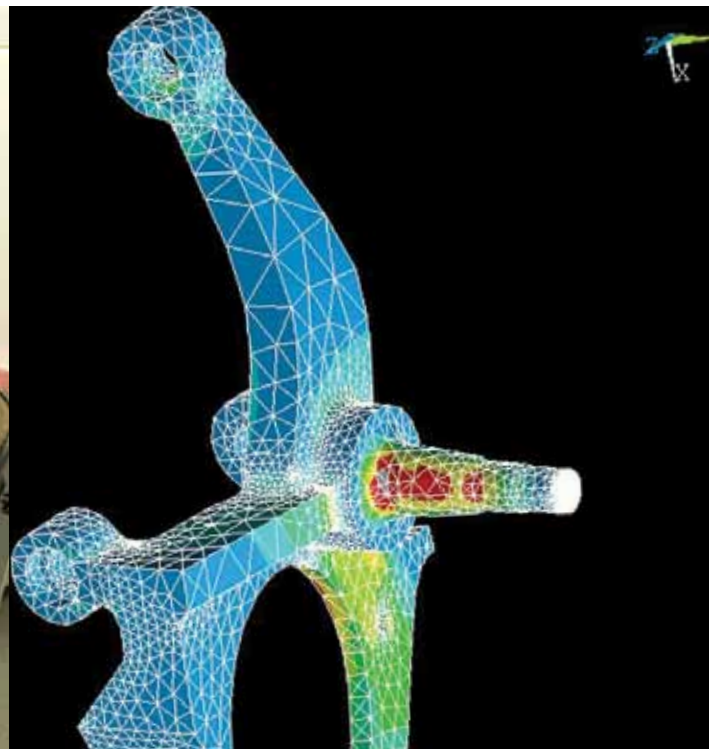
Computational Engineering and Science Research Centre (CESRC)

The Computational Engineering and Science Research Centre (CESRC) is a multi-disciplinary group which has an international reputation for excellence in the development of novel computational methodologies for the solution of key problems in engineering mechanics. Areas of expertise include: solid and fluid mechanics numerical modelling and the numerical modelling of electromagnetic machines and systems. Validation, experimentation, and physical implementation of numerical simulations are also core activities of the CESRC. Expertise within the CESRC includes: non-Newtonian and multi-phase fluid flow, thermofluid mechanics including compressible flow and heat transfer, rock fracture modelling, numerical simulation of composite structures, modelling of electromagnetic machines and systems and network communications modelling.



The CESRC undertook many initiatives to increase its research capacity in future years during 2009. The major developments for the Centre included the acquisition of a high performance computing cluster, commission of new high speed wind tunnel facility (developed with Smart State and USQ funding), the signing of a collaborative agreement with Ho Chi Minh City University of Technology (HCMUT) and the establishment of a CESRC research node at HCMUT. The Centre also secured more than \$1 million in grant funding throughout the year for ongoing projects.

The overarching performance target is to provide the research and development capability that will allow companies to become involved in the use of the most advanced computational engineering tools to create smart design, products and technology to compete effectively in all markets.



National Centre for Engineering in Agriculture (NCEA)



The NCEA develops solutions for a sustainable and profitable rural sector through applied engineering, research, training and commercialization.

During 2009 the NCEA made significant progress expanding our research capability in a number of emerging research areas. These include:

- Agricultural, water resource, irrigation and agronomic responses to climate variability and change.
- Agricultural energy use and greenhouse gas emissions.
- Precision crop and livestock management through smart technologies for sensing, decision support and control.
- Sustainable water and soil management in response to mining and wastewater operations.

NCEA's national reputation in irrigation and water management has resulted in our providing significant planning and research support to the Federal Government and State governments of Queensland, NSW and Victoria in delivery of the Water for Future program. NCEA staff has been engaged in activities across NSW, Victoria, SA, WA and New Zealand.

The NCEA were the key organizers and sponsors of the 2009 CIGR international symposium of the Australian Society for Engineering in Agriculture titled "Agricultural Technologies in a Changing Climate" which was held in Brisbane in September 2009.

NCEA expanded its international linkages during 2009 through establishment of collaborative arrangements with the University of Kwazulu-Natal in South Africa and Technical University of Cartagena, Spain including hosting of PhD students and visiting academics.



Centre for Systems Biology (CSBi)



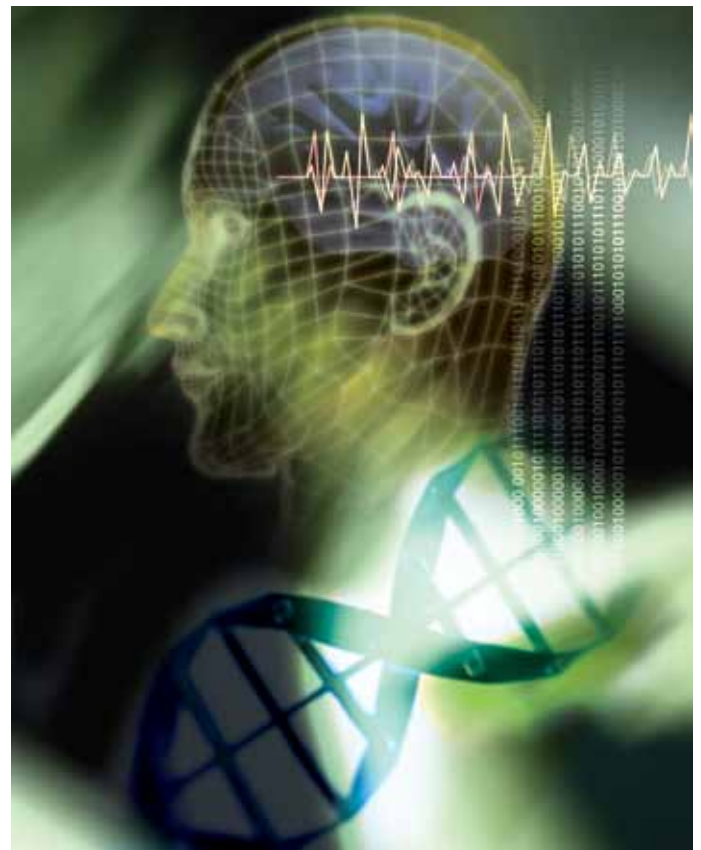
The Centre for Systems Biology (CSBi) conducts multi-disciplinary research and research training in complex biological systems. Specifically, CSBi offers:

- Information and consultancy services to regional industry and the community.
- Research training opportunities for undergraduate and post-graduate students.
- Studentships and honours scholarships.
- Facilitation of industry participation in collaborative research and research training.
- Workshops and Bio-industry forums.

Systems Biology seeks to understand complex biological functions by studying the regulation of intricate cellular pathways and intercellular communications. Because many interacting components are examined simultaneously, high-throughput, quantitative technologies are essential.

There are six identified research groups within CSBi. CSBi members are encouraged to work within one or more of these groups depending on the research expertise and interests of individual and groups of members. The Research Divisions are Biodata mining, Crop Improvement, Infectious diseases and systemic pathology, Medical informatics and neural technology, Muscle physiology and Wine Science.

The Faculty of Engineering and Surveying is a part of the Medical informatics and neural technology division. The division strives to develop new methods and techniques for head modelling and analysing brain signals, such as EEG, MRI and ERP. The aim is to help patients with brain diseases such as epilepsy, dementia and sleeping disorders.



Aside from the Faculty's Research Centres, there are two more research groups which cover a variety of research interests and discipline.

Engineering Education Research Group (EERG)

The Engineering Education Research Group (EERG) has forty-one members including staff from Faculty of Engineering & Surveying, Learning and Teaching Support Unit and the Library. Members of the group have won National Teaching Awards and a prestigious ALTC research grant. The members published articles in 34 peer-reviewed conferences, 7 journals and 1 book. The group continues to enhance learning and teaching professional development within the faculty along with research and scholarly activities in a number of areas.

The aims of the group are to:

- Enhance and inform the learning and teaching practices in the faculty through quality scholarship and research.
- Develop the scholarship and research profile of staff in the area of learning and teaching.
- Develop the research profile of the faculty through publications and grants.

Members identified a number of common research interests which include:

- Cooperative and work-based learning (including practical work)
- Design in Engineering Education
- Graduate attributes
- Problem Based Learning (PBL), teamwork and assessment
- Post graduate course work
- Retention and progression
- Technology and engineering education e.g. virtual labs, simulation etc.
- The first year experience.

It is also recognised that key areas such as assessment, flexible and blended delivery and internationalisation of the curriculum are overarching interests.

Sustainable Energy Innovation Group (SEIG)

The Sustainable Energy Innovation Group (SEIG) was established in the Faculty of Engineering and Surveying at the University of Southern Queensland in 2008. The group draws on the expertise of agricultural, civil, electrical, environmental and mechanical engineers who are motivated to provide innovative solutions for energy problems.

The mission of SEIG is to develop innovative solutions that enhance the sustainability of energy conversion practice in our regional and global communities. The vision of SEIG is to be the leading regional provider of research, consulting and educational services in the area of sustainable energy conversion.

Current work by the group includes the following:

- The establishment of an integrated renewable power facility with a wind turbine and solar panels for teaching and research. The facility is being established on-campus but will also be accessible via the web.
- The enhanced delivery of renewable energy topics in undergraduate engineering coursework degrees. This initiative is being supported by the Australian Power Institute.

The revitalisation of the Engines and Fuels research facilities continued throughout 2009 and a dedicated laboratory is scheduled for completion in 2010.



Faculty of Engineering and Surveying Staff Profile

STAFF NAME	RESEARCH CENTRE/ GROUP AFFILIATION	RESEARCH INTEREST/TEACHING AREAS
Agricultural, Civil, Environmental Engineering & Building Construction		
Assoc Prof Thiru Aravinthan BEng <i>Peradeniya</i> MEng, PhD <i>Saitama</i>	CEEFC/EERG	<ul style="list-style-type: none"> • Fibre composite structures • Structural rehabilitation • External post-tensioning • Concrete technology and structures • Engineering education
Dr Vasanthadevi Aravinthan BScEng, <i>Peradeniya</i> MEng, PhD <i>Tokyo</i>	ACSC/EERG	<ul style="list-style-type: none"> • Advanced wastewater treatment processes • Wastewater reclamation and reuse • Emerging new contaminants, their occurrence and fate in the treatment processes • Source control for sustainable potable reuse • Drinking water quality • Investigation of domestic water end use using smart metering system
Prof Ron Ayers BSc, BEng(Hons), MEng <i>UNSW</i>	EERG	<ul style="list-style-type: none"> • Rural transport • Pavement engineering • Engineering education
Dr Ian Brodie BEng <i>USQ</i> MEngSc <i>UNSW</i> PhD <i>USQ</i>	ACSC	<ul style="list-style-type: none"> • Stormwater treatment and re-use • Urban drainage management • Environmental impact of waste flows in receiving waters • Floodplain management
Prof Frank Bullen BSc, BEng, MEng <i>Newcastle</i> PhD <i>Qld</i>	CEEFC/ EERG	<ul style="list-style-type: none"> • Site investigation and foundation design • Characterisation of road pavement materials • Road crash investigation and analysis • Influence of micro and macrotexture on road surface safety • Innovations in engineering education and leadership
Dr Guangnan Chen PhD <i>Sydney</i>	NCEA/ACSC	<ul style="list-style-type: none"> • Drying and post-harvest technologies • Development of tools and technologies to reduce energy uses and greenhouse gas emissions in agriculture • Teaching and program development in agricultural engineering
Dr Ian Craig BSc <i>DerbyshireCHE</i> MSc, PhD <i>Cranfield IT</i>	NCEA/ACSC	<ul style="list-style-type: none"> • Water use efficiency and evaporation control technology • Micrometeorology and air quality • ACSC cloud seeding project
Ms Jo Devine BEng(Hons) <i>Adelaide</i> GDipMgt <i>Deakin</i>	EERG	<ul style="list-style-type: none"> • Innovation in engineering education • Construction innovation • Safety in construction
Mr Trevor Drysdale MSc <i>Birmingham</i>	EERG	<ul style="list-style-type: none"> • Highway engineering • Construction management • Management methods and applications • Professional development for young engineers

STAFF NAME	RESEARCH CENTRE/ GROUP AFFILIATION	RESEARCH INTEREST/TEACHING AREAS
Mr Joseph Foley BEng <i>USQ</i> MEng <i>UniSA</i>	NCEA	<ul style="list-style-type: none"> Hydraulic simulation of pressurised irrigation systems Agricultural water use efficiency Sprinkler fluid dynamics
Dr Malcolm Gillies BEng, PhD <i>USQ</i>	NCEA	<ul style="list-style-type: none"> Prediction of soil infiltration rates Hydraulic modelling of furrow, bay and basin irrigation Maximising the uniformity of pressurised irrigation systems Development of software tools for irrigation system design and management Spatially varied flow in open channels and pipelines
Dr Troy Jensen BEng, MEng, PhD, <i>USQ</i>	NCEA	<ul style="list-style-type: none"> Application of engineering technologies to agriculture Precision agriculture Agricultural mechanisation Animal and plant biosecurity Remote Sensing Intensive animal industries and biomass reuse
Assoc Prof Karu Karunasena BScEng <i>Peradeniya</i> MEng <i>Asian IT</i> PhD <i>Manitoba</i>	CEEFC	<ul style="list-style-type: none"> Fibre composites Modelling and analysis of structures Rehabilitation of concrete, steel and timber structures Structural health monitoring Wave propagation in composite materials
Dr Rabi Misra BSc <i>Orissa</i> MSc, PhD <i>Indian Ag Research Ins</i> PhD <i>Adelaide</i>	ACSC/NCEA	<ul style="list-style-type: none"> Impact on reuse of wastewater (with focus on grey water) Precision irrigation strategies to accommodate spatial variability in soils and crops Nuclear magnetic resonance approaches to measurement of water Soil structure affecting compaction and erosion of soils Modelling of plant and soil processes Plant roots and the processes at the soil-root interface
Prof Steven Raine BAGSc(Hons), MAgSt, PhD <i>Qld</i>	NCEA	<ul style="list-style-type: none"> Design and management practices to improve the efficiency and productivity of both surface and pressurised irrigation systems Decision support systems for irrigation management Factors influencing soil slaking and dispersion and their subsequent effect on infiltration processes Mechanisms affecting soil aggregate hierarchy and structural stability Salinity, sodicity, soil-water and solute movement under commercial practices Natural resource management
Dr Jim Shiau MEng <i>UNSW</i> PhD <i>Newcastle</i>	CESRC	<ul style="list-style-type: none"> Limit and shakedown analyses Numerical and experimental geomechanics Deep braced excavation Soft ground tunnelling

STAFF NAME	RESEARCH CENTRE/ GROUP AFFILIATION	RESEARCH INTEREST/TEACHING AREAS
Prof Rod Smith DipEng <i>Geelong IT</i> BEng, MEngSc <i>Melbourne</i> PhD <i>UNE</i>	NCEA	<ul style="list-style-type: none"> • Evaluation, simulation, optimisation and real time control of surface irrigation • Infiltration from surface irrigation advance data • Precision or prescription irrigation • Development of diagnostic tools for mobile sprinkler irrigation systems • Irrigation pipeline hydraulics • Salinity and leaching
Dr Somasundaraswaran Kathirgamingam BEng <i>Peradeniya</i> , MEng, <i>AIT</i> PhD <i>Yokohama</i>	EERG	<ul style="list-style-type: none"> • Rural road pavement design strategies • Global road safety & crash investigation • Freeway traffic flow analysis • Traffic facility design and evaluation • Airport studies • Role of intermediate mode of transport in Asian developing countries
Dr David Thorpe BBus <i>UCSQ</i> BEng(Hons) <i>Qld</i> GDipBusAdm <i>QIT</i> MEngSc <i>Qld</i> PhD <i>QUT</i>	EERG/ACSBD	<ul style="list-style-type: none"> • Sustainable engineering development and management • Technological innovation in the light of economic, environmental and social development • Innovation in engineering construction and development • Innovative delivery methods for postgraduate engineering coursework programs (such as the Master of Engineering) • Development of engineering programs at a new campus
Assoc Prof John Worden BSc(Hons) <i>Adelaide</i> GCertODL <i>USQ</i> , PhD <i>ANU</i>	EERG	<ul style="list-style-type: none"> • Isotope and trace element geochemistry • Geochronology • Mineral deposit genesis modelling • Uranium exploration techniques • Radiometrics • Environmental management decision-making and compliance by petroleum companies • Problem-based learning as applied to engineering education • Assessment and intractivity in learning • Groundwater issues
Dr Yan Zhuge PhD <i>QUT</i>	CEEFC	<ul style="list-style-type: none"> • Permeable concrete pavement • Seismic retrofitting of unreinforced/historical masonry structures using fibre reinforced polymer (FRP) • Nonlinear analysis and modelling of masonry structures under both static and dynamic loads • Recycling and reuse of wasted materials • Natural fibre composite structures
Electrical, Electronic, Computer and Power Engineering		
Dr Tony Ahfock BEng(Hons), PhD <i>Monash</i>	CESRC/SEIG	<ul style="list-style-type: none"> • Axial flux machines • Brushless DC machines • Low frequency electromagnetics • DC magnetisation of transformers • Inverter output DC offset elimination

STAFF NAME	RESEARCH CENTRE/ GROUP AFFILIATION	RESEARCH INTEREST/TEACHING AREAS
Mr Leslie Bowtell BEng, MEng <i>USQ</i>	SEIG	<ul style="list-style-type: none"> • Power quality & efficiency of grid connected • PV systems • Dispersed power quality control with 'smart' multi-quadrant inverters • High power magnetostrictive ultrasonic chemical agitation systems • Automation of biogas control systems • Humane electronic animal incapacitation
Dr Lyn Brodie BEng <i>DDIAE</i> MEng <i>USQ</i>	EERG	<ul style="list-style-type: none"> • Biomedical engineering • Engineering and surveying education • Women in engineering
Mr Gordon Hampson BEng <i>DDIAE</i>	SEIG	<ul style="list-style-type: none"> • Electricity supply systems • Electrical technology • Energy conversion • Electrical control systems
Assoc Prof Nigel Hancock BSc <i>VicUni Manchester</i> PhD <i>Strathclyde</i>	NCEA	<ul style="list-style-type: none"> • Evaporation science and measurement • Measurement and control applications in agriculture • Measurement science and technology
Mr Glenn Harris BTech, GDipFET <i>USQ</i>		<ul style="list-style-type: none"> • Computer engineering • Electronic workshop & production • Electrical & Electronic Practice A & B • Electronic systems • Electronic measurement
Dr Fouad Kamel DipEng <i>Hanover</i> BElectEng <i>Helwan</i> EngD <i>Hanover</i>	NCEA/SEIG/EERG/ACSB	<ul style="list-style-type: none"> • Renewable energy technologies • Photovoltaic power systems • Solar water heating • Wind energy systems • Sea-waves electric energy generation • Interconnection of renewable energy generation systems to utility grids • Smart grid for electricity supply and distribution
Dr Alexander Kist PhD <i>RMIT</i>	CESRC/EERG	<ul style="list-style-type: none"> • Networking, routing • Teletraffic engineering, network optimisation • Network planning and design • Quality of service provisioning, wireless networks • Green information and communication technology (ICT)
Assoc Prof John Leis BEng <i>DDIAE</i> MEngSc, PhD <i>QUT</i>	CESRC	<ul style="list-style-type: none"> • Speech/video signal processing • Biomedical signal processing & biomedical engineering systems • Signal processing algorithms for tomography • Internet protocol engineering
Dr Andrew Maxwell BEng, PhD <i>USQ</i>	CESRC/EERG	<ul style="list-style-type: none"> • Measurement science and engineering • Acidity measurement in dairy processes • Remote sensing and distributed sensor networks • Radio frequency and microwave systems • GNSS applications
Mr Mark Norman BSc <i>Natal</i>	SEIG/EERG	<ul style="list-style-type: none"> • Networking protocols, web traffic efficiencies, remote access • Sustainable energy design, compact power supply development • Electronic engineering education (distance experience)

STAFF NAME	RESEARCH CENTRE/ GROUP AFFILIATION	RESEARCH INTEREST/TEACHING AREAS
Mr Mark Phythian BEng(Hons) <i>QIT</i> GCertTT&L <i>USQ</i> MEng <i>QUT</i>	EERG	<ul style="list-style-type: none"> • Embedded and real time systems • Engineering education
Dr Ron Sharma DipM&EEng <i>Derrick TI</i> BSc <i>BrightonPoly</i> PhD <i>USQ</i>	SEIG	<ul style="list-style-type: none"> • Utility – connected photovoltaic generation • Power systems for telephone and radio networks including solar, wind and diesel hybrid systems • Demand side energy management
Mr Bruce Varnes DipElec <i>Macquarie</i> BSc, BEd <i>Qld</i> MSc <i>Macquarie</i>		<ul style="list-style-type: none"> • Electronic engineering
Dr Paul Wen BEng, MEng, PhD <i>Huazhong</i> PhD <i>Flinders</i>	CSBi/CESRC	<ul style="list-style-type: none"> • Networked real-time control system • Biomedical and health engineering • Human head modeling and EEG
Dr Wei Xiang BEng, MEng ElecSciTech PhD <i>UniSA</i>	CESRC	<ul style="list-style-type: none"> • Wireless multimedia communications • Cooperative communications • Information theory • Cross-layer design
Dr Hong Zhou BEng <i>Fuxin MI</i> MEng <i>Shenyang IT</i> PhD <i>Curtin</i>	CESRC/ EERG	<ul style="list-style-type: none"> • Computer networking • Wireless Sensor Networks • Mobile communications • Software engineering
Mechanical and Mechatronic Engineering		
Prof John Billingsley BA, MA, PhD <i>Cambridge</i>	NCEA	<ul style="list-style-type: none"> • Robotics • Machine vision • Automation • Control theory • Simulation • Engineering research methodology
Assoc Prof David Buttsworth BEng(Hons), PhD <i>Qld</i>	CESRC/SEIG	<ul style="list-style-type: none"> • Hypersonic flow • Thermal energy system
Dr Jayantha Epaarachchi BScEng <i>Peradeniya</i> MEngSc <i>UNSW</i> PhD <i>Newcastle</i>	CEEFC	<ul style="list-style-type: none"> • Design and static/dynamic analysis of fibre composite structures • Fatigue, fracture and damage mechanics of composite materials • Experimental stress analysis and dynamic analysis of structures • Structural health monitoring (including the use of FBG sensors and MEM sensors) • Development of new composite materials • Fatigue testing of composite structures

STAFF NAME	RESEARCH CENTRE/ GROUP AFFILIATION	RESEARCH INTEREST/TEACHING AREAS
Mr Bob Fulcher BEng <i>DDIAE</i> BAppSc, GDipMgt <i>CIAE</i> MBA <i>USQ</i>	EERG	<ul style="list-style-type: none"> • Engineering management • Engineering education • Technology management • Energy management especially with respect to electricity production
Mr Steven Goh BEng(Hons) <i>Qld</i> MBA <i>Deakin</i> MProfAcc <i>USQ</i>	EERG/SEIG/CRTP/ACSBD	<ul style="list-style-type: none"> • Engineering education • Engineering management and leadership • Innovation in SME • Sustainability & renewable convergence • Manufacturing & materials
Dr Mainul Islam BScEng <i>Bangladesh IT Khulna</i> MEng <i>Kyushu</i> PhD <i>Newcastle</i>	CEEFC	<ul style="list-style-type: none"> • Behaviour of fibre composite sandwich panels • Effects of temperature on FRP components • Fibre composite piles for replacement or rehabilitation • Syntactic foams and foam-core sandwich composites
Dr Michael Jokic BEng, PhD <i>Qld</i>	EERG/CESRC	<ul style="list-style-type: none"> • Risk hazard analysis for high speed vehicles • Hypersonic flight and atmospheric re-entry • Technology for teaching • Course re-vitalisation
Dr Harry Ku AP(HK) <i>HongKongPoly</i> PGCertEd, MScEng <i>Hong Kong</i> PhD <i>SwinburneUT</i>	CEEFC	<ul style="list-style-type: none"> • Manufacturing engineering • Microwave processing of materials • Engineering education • Manufacturing processes • Composite materials
Dr Nam Mai-Duy MEng <i>HoChiMinhUT</i> PhD <i>USQ</i>	CESRC	<ul style="list-style-type: none"> • Computational rheology and mechanics • Meshless methods • Meshless, numerical modelling for polymer processing • Particulate fluids and solids • Multiscale calculations
Dr Ruth Mossad BEng, MEng <i>Cairo</i> PhD <i>New Mexico SU</i>	ACSC/CESRC/SEIG	<ul style="list-style-type: none"> • Use of CFD in the following applications: ventilation, renewable energy, erosion and other environmental applications like desalination and evaporation • Fluid mechanics • Heat transfer
Dr Selvan Pather DipMEng <i>ML Sultan Tech</i> MDipMEngTech <i>Natal</i> MSc <i>Strathclyde</i> PhD <i>Imperial Coll</i>	EERG/SEIG	<ul style="list-style-type: none"> • Application of mechatronic technology in health care • Medical robotics • Industrial robotics • Mechanical engineering design • Engineering education
Mr Peter Penfold BTech, MEng <i>USQ</i>		<ul style="list-style-type: none"> • Mechanical Practice 1 & 3 • Machine dynamics • Solid modelling • Introduction to engineering design

STAFF NAME	RESEARCH CENTRE/ GROUP AFFILIATION	RESEARCH INTEREST/TEACHING AREAS
Prof David Ross ADegMgt <i>Cincinnati</i> BSc, MSc <i>Ohio</i> EdD <i>Cincinnati</i>	EERG	<ul style="list-style-type: none"> • Interactive educational courseware using • situational learning mythologies incorporating edutainment, games, simulations • Implementation of educational technologies • delivered through blended solutions
Dr Ahmad Sharifian -Barforoush BSc, MSc <i>Tehran</i> PhD <i>USQ</i>	CESRC/SEIG	<ul style="list-style-type: none"> • Fluid Mechanics • Rheology • Thermofluids
Mr Chris Snook BEng(Hons) <i>Adelaide</i>	EERG	<ul style="list-style-type: none"> • Biomechanics • Solid mechanics • Computational mechanics • Engineering design
Prof Thanh Tran-Cong BEng(Hons), PhD <i>Sydney</i>	CESRC	<ul style="list-style-type: none"> • Computational fluid and solid mechanics • Numerical methods • Computational engineering
Dr Andrew Wandel BEng(Hons), PhD <i>Qld</i>	CESRC/ EERG	<ul style="list-style-type: none"> • Turbulent combustion modeling • Multiple Mapping Conditioning (MMC) method • Droplet/spray combustion • Engineering education
Dr Hao Wang GCertEd, PhD <i>Qld</i>	CEEFC/ EERG	<ul style="list-style-type: none"> • Natural fibre composites • Natural polymer from vegetable oils • Geopolymer and concrete • Light alloys (Al and Mg)
Dr Talal Yusaf BSc(Hons) <i>UoT Baghdad</i> MEng, PhD <i>National Uni (UKM Malaysia)</i>	NCEA/SEIG	<ul style="list-style-type: none"> • Renewable energy and alternative fuels • Micro-organism treatment using unconventional techniques • Combustion technology
Surveying and Spatial Science		
Assoc Prof Armando Apan BSc <i>Phillippines</i> , MSc <i>Asian IT</i> PhD <i>Monash</i>	ACSC	<ul style="list-style-type: none"> • Remote sensing and GIS to observe terrestrial ecosystems and their responses to environmental/ climate change • Mapping and monitoring of crops, forest vegetation, floods and land cover using hyperspectral and multispectral imagery • Spatial analysis and modeling for resource and environment management
Dr Badri Basnet MEng <i>Asian IT</i> , PhD <i>USQ</i>	ACSC	<ul style="list-style-type: none"> • Precision agriculture • Engineering education research
Mr Glenn Campbell BSc <i>Qld</i> BAppSc <i>QUT</i>	ACSC	<ul style="list-style-type: none"> • Remote sensing of water quality • Land administration

STAFF NAME	RESEARCH CENTRE/ GROUP AFFILIATION	RESEARCH INTEREST/TEACHING AREAS
Dr Albert Chong PhD <i>Washington</i>	ACSC	<ul style="list-style-type: none"> • Digital photogrammetry (digital cameras, HD camcorders, ERDAS LPS, Australis, iWitness) • GISs (historical artefact/craniofacial database) • Traffic accident (iWitness, Australis). • Imaging sensor calibration (Australis) • Other types of imaging: biosignal study; muscle movement, sport injury study, X-Ray, CT and MRI scans. • Laser scanning.
Prof David Dowling BAppSc <i>RMIT</i> MSurv & Map <i>Qld</i>	CRTP/EERG	<ul style="list-style-type: none"> • Engineering education: graduate attributes; curriculum design, workplace learning: assessment of workplace learning. • Transition to university: factors that influence student success; transition from school; transition from work. • Pathways to university: articulation from VET and other providers.
Dr Peter Gibbings BSurv <i>Qld</i> GCertTT&L <i>USQ</i> GDipMgt <i>Deakin</i> MGeo <i>USQ</i> , EdD <i>QUT</i>	ACSC/ EERG	<ul style="list-style-type: none"> • GPS • GNSS • VRS • Engineering and surveying education
Dr Xiaoye Liu BEng, MEng <i>Wuhan</i> MApplT <i>Monash</i>	ACSC	<ul style="list-style-type: none"> • GIS and remote sensing • Digital terrain modelling and feature extraction from LiDAR and other spatial data • Surveying and Global Positioning Systems (GPS) • Spatial database and programming
Assoc Prof Kevin McDougall BSurv(Hons), MSurv&Map <i>Qld</i> PhD <i>Melbourne</i>	ACSC	<ul style="list-style-type: none"> • Geographical information systems • Spatial data infrastructures • Land administration
Dr Kithsiri Perera MEng, PhD <i>Chiba</i>	ACSC	<ul style="list-style-type: none"> • Remote sensing and processing of satellite data for land cover and land use mapping • Catchments area mapping and standardizing the classification scheme. • GIS • Modelling with spatial data for resources management • Spatial data visualization and media contents of natural disasters and significant environmental issues.
Mr Shane Simmons BSurv <i>Qld</i> GDipSurvPr <i>QUT</i> GDipBus <i>Qld</i>		<ul style="list-style-type: none"> • Professional issues • Surveying education • Land development • Land law and administration
Mr Zhenyu Zhang BSc <i>CentSthUT</i> DipGeoInfoSys <i>Massey</i> MEng <i>Tsinghua</i> MTech <i>RMIT</i>		<ul style="list-style-type: none"> • Applications of LiDAR and remotely sensed images for land use/land cover change monitoring and forest management. • GPS, spatial database and programming

New Staff Profile

Dr Michael Jokic



Michael graduated from the University of Queensland with a BEng in Mechanical and Space Engineering and a Ph.D. in Aerospace Engineering. He completed twelve months of his undergraduate program at the University of Illinois and attended Purdue University for twelve months as a Visiting Research Scholar. Michael spent almost five years working at DSTO in the fields of air vehicle modelling and simulation, and risk hazard analysis. He commenced employment with the University of Southern Queensland in November 2009 as a postdoctoral fellow. Michael has nineteen research publications in the areas of risk hazard analysis for high speed vehicles, interplanetary mission design, and modelling of tethered satellite systems. Michael is currently pursuing research in engineering education through the USQ Engineering Education Research Group, and high speed flight within the Computational Engineering and Science Research Centre at USQ.

2009 Faculty Research Committee

The Faculty Research Committee is responsible for the programs of study and research leading to a research higher degree. The functions of the Committee are to advise on matters relating to graduate research, and to manage graduate research candidature. The Research Committee thus approves admission to candidature, appoints supervisors, monitors the progress of all candidates, appoints examiners, and recommends if candidates should be awarded degrees.

Chair:	Assoc Prof David Buttsworth	
Members:	Dr Tony Ahfock	Prof Thanh Tran-Cong
	Assoc Prof Armando Apan	Dr Hao Wang
	Assoc Prof Thiru Aravinthan	Dr Paul Wen
	Mr Dean Beliveau	Dr Hong Zhou
	Dr Ian Brodie	Mr Gavin Brink (Student Rep)
	Mrs Lyn Brodie	Mrs Juanita Ryan (Secretary)
	Mr Erik Schmidt	

USQ successfully organised The Fourth International Conference on Rough Set and Knowledge Technology (RSKT2009)

The Fourth International Conference on Rough Set and Knowledge Technology (RSKT2009) was held from 14–16 July 2009 on the Gold Coast. The conference was hosted by USQ and organised by the RSKT2009 organising committee lead by the Conference Chairperson, Pro Vice-Chancellor (Research), Dean of Faculty of Engineering and Surveying, Professor Frank Bullen.



Higher Degree Research Students: Successful Completions

Dorner, Wolfgang

PhD

Dissertation title	Environmental economic aspects of river basins and their catchment – identification and quantification of flood related land use externalities
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Supervisor(s)	Associate Professor Mark Porter
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Land use such as agriculture or housing can have negative effects on water run-off and floods. Increased surface run-off results in increased flood peaks. From an economic point of view flood damages can be partially called a negative externality of upstream land use. The thesis investigated these effects through a combination of hydrological models and economic assessment for a small catchment. It was found that in this small catchment land use can have significant negative economic effects. Floods are increased and as a consequence flood damages or mitigation costs.

Jensen, Troy

PhD

Dissertation Title	Using a remotely controlled platform to acquire low-altitude imagery for grain crop mapping
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Supervisor(s)	Associate Professor Armando Apan Associate Professor Frank Young
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A low-cost low-altitude remote sensing system was developed using two digital cameras, one to capture colour information and the other near-infrared. The sensor was suspended underneath either a helium balloon or a remotely controlled aircraft.

The system had great capacity to quantify variability in cereal grain crops. Excellent relationships were found between the 'at-harvest' yield and protein content of wheat using a single image recorded at flowering. The system also accurately discriminated between different nutrition levels, crop maturities and grain species. The fully autonomous remotely controlled aircraft used in the later part of this study, showed great promise, and warrants further development.

Mai-Cao, Lan

PhD

Dissertation Title	Meshless radial basis function method for unsteady incompressible viscous flows
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Supervisor(s)	Professor Thanh Tran-Cong Dr Ruth Mossad
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This dissertation reports the development of new meshless schemes based on the Indirect/Integrated Radial Basis Function (IRBFN) method for solving time-dependent partial differential equations (PDEs) and for the numerical simulation of some typical unsteady incompressible viscous flows. First of all, two new meshless schemes have been devised to extend the IRBFN method to dealing with time-dependent PDEs such as parabolic, hyperbolic and convection-diffusion equations. In addition, a novel meshless approach to capturing moving interfaces in passive transport problems has been developed based on high order time stepping methods and the level set method. Furthermore, two new numerical schemes have been proposed for solving the unsteady incompressible Navier-Stokes equations using pressure-correction methods within the meshless framework of the IRBFN method. Finally, all of the 'ingredients' mentioned above are brought together into a novel meshless approach to the numerical simulation of interfacial flows in which the motion and deformation of the interface between two immiscible fluids as well as the interaction between the moving interface and the surrounding fluids are fully captured.

McCarthy, Cheryl Louise

PhD

Dissertation Title	Automatic non-destructive dimensional measurement of cotton plants in real-time by machine vision.
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Supervisor(s)	Associate Professor Nigel Hancock Professor Steven Raine
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A non-destructive sensing system was developed to measure the cotton plant attribute of internode length. Internode length is the distance between branch junctions on the plant's main stem and is a significant indicator of plant irrigation requirement. The sensing system consisted of a moving camera enclosure which non-destructively contacted the plant's flexible upper main stem. Custom algorithms were written to analyse plant images captured from the camera enclosure. Using the devised system, internode lengths were automatically detected in a cotton field. It is concluded that the devised system has potential application in variable-rate irrigation.



Dr Cheryl McCarthy (centre) with supervisors Prof Steven Raine (left) and Assoc Prof Nigel Hancock (right)

Potgieter, Andries Bernardus

PhD

Dissertation Title : Determining broad acre crop area estimates through the use of multi-temporal modis satellite imagery for major Australian winter crops

Supervisor(s) : Associate Professor Armando Apan
Dr Peter Dunn

This dissertation elucidated the use of multi-temporal remote sensing imagery to determine crop area estimates well before harvest. The availability of early-season and ensuing end-of-season crop area estimates at shire scale, when combined with yield estimates, provides the means to bridge the information gap. Significantly high accuracies were obtained in determining total winter crop area as well as area estimates for specific winter crops across regions and seasons. Reliable, timely and detailed production estimates underpin industry decisions on commodity handling logistics, commodity marketing and government decisions. It is anticipated that the application of early-season crop estimates, will increase the accuracy and objectivity of crop information utilised in current forecasting systems around the world.

Nawi, Nazmi Mat

MEng

Dissertation Title : Development of a climate-based computer model to reduce wheat harvest losses in Australia

Supervisor(s) : Dr Guangnan Chen

Grain harvest represents a period of high risk and is also a bottleneck in a grain production. Thus, this study developed The Wheat Harvest System Simulation Model (WHSSM) to investigate the economics of high moisture grain harvesting in Australia. The optimum harvesting and drying strategies were determined. This model was run using 15 years of historical weather data (1991-2005) for three main wheat production areas in Australia, represented by Goondiwindi (QLD), Tamworth (NSW) and Scaddan (WA). The model has been used to predict and compare the possible return for different harvesting and postharvest management strategies. It was demonstrated that local weather conditions especially rainfall patterns can have a very significant influence on grower returns. Growers in dry and warm location (e.g. Goondiwindi) will gain better return. It is predicted that at the given model control values, the long-term optimum harvest moisture contents for Goondiwindi, Scaddan and Tamworth are 14, 15 and 17% respectively.

Suntharavadivel, Thuraichamy Guganesan

PhD

Dissertation Title: Behaviour of shear damaged reinforced concrete beams strengthened with external post-tensioning and clamping

Supervisor(s) : Associate Professor Karu Karuansena
Associate Professor Thiru Aravinthan
Dr Santhi Santhikumar

This research study was carried out to investigate the behaviour of reinforced concrete beams with existing shear cracks when strengthened by external means. The study consists of two parts: experimental investigations of reinforced concrete beams with different parameters and numerical analysis of reinforced concrete beams using simplified theoretical formulation and finite element modelling. Based on this research study it can be concluded that existing shear cracks have a substantial effect on the behaviour of reinforced concrete beams strengthened by external post-tensioning. The simplified mathematical approach developed in this study can be used to estimate the capacity of such beams.



Supervisor Dr Guangnan Chen and Mr Nazmi Mat Nawi

Ratray, Dan

MEng

Dissertation Title	Modelling herbicide movement from the farm to catchment using the SWAT model
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Supervisor(s)	Associate Professor Mark Porter Dr Peter Dunn
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The use of residual herbicides by the farming industry is linked to surface water quality often exceeding nationally agreed trigger values. This study investigated the suitability of the Soil and Water Assessment Tool (SWAT) to depict farm management practices at a paddock scale to estimate resultant catchment water quality outcomes. The model was tested in the Hodgson Creek Catchment (South East Queensland) against data from both paddock and catchment studies including: cultivation management practices on runoff and erosion; herbicide dissipation in soil and loss in paddock runoff and; event based water quality for suspended sediments and herbicides from a nested catchment study. The model performed well in representing hydrology and sediment transport across a range of scales, but performed poorly in representing herbicide transport processes at all scales tested.

Zeller, Les

MEng

Dissertation Title	Development of automated turf testing equipment for playing surfaces.
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Supervisor(s)	Associate Professor Nigel Hancock Dr Selvan Pather
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Research has shown that a significant percentage of sporting injuries can be attributed to the sporting surface. A correlation exists between knee injuries and the traction properties of sporting surfaces.

Current equipment to measure turf traction has limited accuracy and repeatability. This thesis reports the development of a device which measures turf traction with improved accuracy, repeatability and operator safety. The design incorporates automating those measurement processes that require a high degree of accuracy and repeatability. Software was developed to analyse, display and record the traction data and produce a traction profile which is unique for this type of equipment.

Student Profiles**Mr Shahab Anna Abdulla (PhD student)**

I began studying my Doctor of Philosophy at the University of Southern Queensland (USQ) in 2008. My project area covers medical informatics, neural technology and computer modeling. My Project title is "Robust model-based predictive control of depth of anaesthesia." I completed my master's research project and undergraduate project at the University of Technology, Baghdad, Iraq. .

Since joining the University of Southern Queensland in 2009 - 2010, I have gained experience in teaching at the Faculty of Engineering and Surveying and Open Access College. During this period, I have conducted about 100 hrs lecturing in Mathematics. I am the Iraqi student representative and help support Arabic students in the Open Access College.

Ms Duaa Adeeb Mohamed Al-Shadli (MSSR student)

I am currently enrolled in the Masters of Spatial Science Research program. My current proposed research topic is the "3D data capture of the human lower limb for medical mapping applications". This project determines whether photogrammetry can be applied to capture spatial data of patients legs and feet for the study of Charcot-Marie-Tooth Muscular Dystrophy disease. The study will help to design and constructs artificial devises which assists the mobility of the patient.

I was born in the United Arab Emirates and moved to New Zealand when I was 13 years old where I completed my undergraduate studies and have been working as a Project Surveyor for the last two years.

I aspire to carry on with a Doctor of Philosophy in the future where I can use my skills to develop my career as a researcher.

Higher Degree Research Supervision (ongoing)

Research postgraduate programs incorporate the research strengths of the Faculty. Students may study on-campus or off-campus in the development of different areas in engineering or spatial science. Research programs include:

- Doctor of Philosophy
- Engineering Doctorate
- Master of Engineering Research
- Master of Spatial Science Research

The following are postgraduate students conducting research under the supervision of the Faculty of Engineering and Surveying staff members and are affiliated with a research centre.

Doctor of Philosophy

NAME	SUPERVISOR/S	THESIS TITLE
Abdulla, Shahab Anna	Wen, P. Xiang, W.	Robust model based predictive control of depth of anaesthesia
Achmad, Mahmud	Porter, M. Smith, R.	Predicting the effects of mechanical destratifiers on water quality in Toowoomba's reservoirs
Agrira, Abdalla	Buttsworth, D. Yusaf, T.	Internal combustion engine heat transfer – transient thermal analysis
Akbar, Ghani	Raine, S. McHugh, J.	Identifying strategies to improve water use productivity of furrow irrigation using permanent raised beds
Alajel, Khalid	Xiang, W. Leis, J.	Error control techniques for wireless video transmission using H.264/SVC and H.264/MVC standards
Aldoori, Ghassan Fadil	Buttsworth, D. Wandell, A.	Investigation of refrigeration system steam ejector performance using experimental and computational simulations
Aldraho, Abdelnour Alnour	Kist, A. Maxwell, A.	Energy efficient traffic management in communication networks
Al Mahdi, Abdurazag Mostafa	Raine, S. Misra, R.	Strategies for maintaining sustainable irrigated crop root zones with saline-sodic water
Andrews, David	Pather, S. Cubero, S.	Intelligent controls using stress feedback and forecasting in draglines
Awad, Ziad	Aravinthan, T. Zhuge, Y.	Optimum design of fibre composite structures under static and dynamic loads
Baillie, Justine Nicole	Brodie, I Porter, M	Dynamic water sharing arrangements to address increased streamflow variability in the Northern Murray Darling Basin
Balaka, Ridway	Yusaf, T. Ross, D.	The potential utilisation of environmentally benign energy sources for reducing dependence on fossil fuel energy resources in Indonesia (River current energy as a case study)
Bowtell, Leslie Alan	Ahfock, T. Wen, P.	Powerful quality and efficiency improvements for transformerless grid-connected photo-voltaic systems
Brink, Gavin Neil	Hancock, N. Pather, S.	Autonomous system for the optimal application of chemical monolayer to open water surfaces: design approach
Burgess, Robert	Ahfock, T. Kamel, F.	Earth fault protection in high voltage electricity power distribution systems
Butcher, Peter James	Thorpe, D. Ross, D.	A methodology for successful integrating of academic, industry and regional development functions in engineering industries in New Zealand
Ezlit, Younes	Smith, R. Raine, S.	Modelling the change in conductivity of soil associated with the application of saline-sodic water

NAME	SUPERVISOR/S	THESIS TITLE
Foley, Joseph	Smith, R.	Performance improvement of centre pivots and lateral moves
Gambetta, Daniele	Ahfock, T. Wen, P.	New design methodologies for printed circuit axial field brushless DC motor
Ghude, Sarang	Billingsley, J. Wen, P.	Analysis and development of predictive control strategies for system with constraints
Grabham, Michael Kevin	Raine, S. Smith, R.	Evaluation, design and management tools for bankless irrigation systems in Eastern Australia
Helwig, Andreas	Ahfock, T. Kamel, F.	Optimising energy storage for remote area power supply
Ho, Dao Minh	Mai-Duy, N. Tran-Cong, T.	Numerical modelling of polymer processing
Hoque, Muhammad Azizul	Aravinthan, V. Porter, M.	Development and calibration of bio-kinetic models for organic carbon and nitrogen biodegradation in aerobic activated sludge system.
Hughes, Rami	Thorpe, D. Ayers, R.	The crucial factors that promote successful innovation of the productivity of the construction industry between 1980 and 2005: the project manager's perception
Hussain, Amjed	Raine, S. Misra, R.	Quantifying the role of irrigation uniformity on lettuce production and profitability in the Lockyer Valley, Queensland
Huweg, Abdurrahman	Kamel, F. Raine, S.	Of electro-osmosis on the hydrological state and soil solution chemistry of unsaturated soil irrigated agriculture
Jin, Tom	Apan, A. Gibbings, P.	The design and evaluation of web-based GIS technology in support of secondary school geography education
Kabir, Mazedul Mohammad	Wang, H. Aravinthan, T.	Development of natural fibre thermoset composites
Kahandawa Appuhamillage, Gayan Chanaka	Epaarachchi, J. Birt, P.	Monitoring damage in advanced composite structures using embedded multiplexed fibre optic sensors
Koech, Richard	Smith, R. Gillies, M.	Automation and real time control of furrow irrigation
Lam-Dao, Nguyen	Apan, A. Young, F.	Rice crop monitoring using new generation synthetic aperture radar (SAR) imagery
Le, Bui Hong Phong	Tran-Cong, T. Mai-Duy, N.	RBF-Based meshless modelling of strain localisation and fracture
Le, Khoa Cao	Mai-Duy, N. Tran-Cong, T.	Numerical modelling of the macroscopic rheological properties of particulate suspension
Mahadi, Muhammad Razif	Billingsley, J. Cubero, S.	Precise machining of large moulds in polystyrene foam
Malpress, Ray	Buttsworth, D. Pather, S.	Spark ignition internal combustion engine efficiency improvement
Manalo, Allan	Aravinthan, T. Karunasena, K.	Behaviour of fibre composite sandwich structure and its application for replacement railway sleepers
Marwan, Marwan	Kamel, F. Kist, A.	End-user-controlled electrical energy consumption based on public price demand information to mitigate peak demands
McCarthy, Alison Christine	Hancock, N. Raine, S.	Improved irrigation of cotton via real-time , adaptive control of large mobile irrigation machines

NAME	SUPERVISOR/S	THESIS TITLE
McLatchey, Graham James	Billingsley, J. Cubero, S.	Advances in pneumatically powered , statically stable legged robot
Meor Said, Mior Azman	Yusaf, T. Buttsworth, D.	Instantaneous in-cylinder radiant heat transfer of direct injection compression ignition engine
Mohan, Meera	Shiau, J. Bullen, F.	Durability of FRC products
Nawi, Nazmi Mat	Chen, G.	Development of an in-field sugarcane quality measurement system
Ngo, Cong Duc	Tran-Cong, T. Karunasena, K. Mai-Duy, N.	Computational technology for fluid – composite structure interaction analysis
Nguyen,Ky Tai	Wen. P. Li, Y.	Monitoring the depth of anaesthesia accurately using simplified electroencephalogram
Nguyen-Van, Hieu	Tran-Cong, T. Mai-Duy, N.	Development and application of assumed strain smoothing finite element technique for composite plate and shell structures
Padhi, Jyotiprakash	Misra, R. Raine, S.	Incorporating spatial variability in soil and crop properties for effective irrigation
Pattarachaiyakoop, Noppadon	Ku, H. Wang, H.	Natural fibre reinforced thermoplastics
Paudyal, Dev Raj	McDougall, K. Apan, A.	Facilitating sustainable catchment management through spatial data infrastructure design and development
Peake, Allan	Raine, S. Smith, R. Carberry, P.	Improving water use efficiency of irrigated wheat in the northern grain production region of Australia
Salcedo, Precila	McDougall, K. Maraseni, T.	Site suitability assessment of forestry plantation for carbon sequestration
Saleh, Khalid Hashim	Yusaf, T. Buttsworth, D.	Initial development of solid ice accretion at conditions relevant to turbofan operation at high altitude
Shahid, Syed Salman	Wen, P. Leis, J.	Design and development of human head model for transcranial stimulation
Sharifi, Behrooz	Leis, J. Xiang, W.	Sensors and real-time guidance algorithms to augment 3D biopsy needle control
Shrestha, Roshani	Brodie, I. Aravinthan, V.	A treatment decision framework for urban stormwater based on particle count
Sileh, Ibrahim Khalil	Xiang, W. Zhou, H.	Cooperative MIMO-OFDM for future wireless communication
Supeni, Eris Elianddy	Yusaf, T. Buttsworth, D.	Experimental investigation of the performance characteristics of diesel HCCL engines with hydrogen
Suriadi, Ahmad	Misra, R. Abawi, Y.	Modelling nitrogen and water management to improve rice-based production systems under tropical climate
Teng, Lanzhi	Wen, P. Zhou, H.	The modelling and optimisation of networked real-time control system over packet drop communication networks in industrial environment.
Thorp, Stuart Bruce	Ross, D. McFarlane, M.	Configuration management system – Black Hawk helicopter

NAME	SUPERVISOR/S	THESIS TITLE
Uddin, Md Jasim	Smith, R. Hancock, N.	Evaporation losses during sprinkler irrigation
Agung, Sugeng Widodo	Buttsworth, D. Sharifian, A.	Temperature fluctuations in a free piston compression wind tunnel facility
Witherspoon, Robert	Wang, H. Aravinthan, T. Omar, T.	Fibre-reinforced light-weight geopolymer concrete
Yusaf, Talal	Buttsworth, D.	Microbe disruption via ultrasound – pressure or shear

Engineering Doctorate

NAME	SUPERVISOR/S	THESIS TITLE
Brodie, Lynette Meryl	Bullen, F. Dowling, D.	Problem based learning in virtual teams
Deo, Bharatendu	Thorpe, D. Drysdale, T.	Challenges and lessons from life cycle management of a mega infrastructure project from front end design to initial days of operation – case study of an LNG plant
Durack, James Mahoney	Karuansena, K. Tranberg, C.	Research and design for industrial structures
Kemp, Michael	Aravinthan, T. Islam, Md. M.	Commercialisation of fibre composite structural elements in civil engineering applications
Meynink, William John	Brodie, I. Hancock, N.	Parsimonious hydrologic modelling for resource development
Mustapha, Umar Musa	Ku, H. Goh, S.	An investigation of manufacturing systems, product design and environmental uncertainty in the Nigerian manufacturing organisations
Patel, Keyurkumar	Xiang, W. Hancock, N.	Development and implementation of innovative and pervasive emerging communication technologies for highly mobile organisations
Robinson, Douglas Bruce	Thorpe, D. Ross, D.	A risk management model for the maritime industry
Simpson, John Stanley	Brodie, I. Aravinthan, V.	On-site waste water treatment and disposal in Australia

Master in Philosophy

NAME	SUPERVISOR/S	THESIS TITLE
Boh, Tjasa	Billingsley, J. Bradbeer, R.	Traction of underwater wheeled vehicles

Master in Engineering Research

NAME	SUPERVISOR/S	THESIS TITLE
Atzeni, Michael	Hancock, N. Smith, R.	Influence of broiler flock activity on odour emission rates
Bagshaw, Kevin Michael	Foley, J. Gordon, S.	Improving ginning efficiency
Bolt, Jason	Zhuge, Y. Bullen, F.	The study of organic pollution degradation through photo catalytic pervious concrete
Chan, Auc Fai	Leis, J. Kist, A.	Improved wireless TCP/IP performance using the median filter algorithm
Dias-Wanigasekera, Deepthi Jayatha	Worden, J. De Costa, G.	A study on the groundwater quality changes of the hautere and coastal groundwater zones, Wellington, New Zealand
Goh, Steven Chingnam	Thorpe, D. Fulcher, B.	A qualitative study into the innovation and technology transfer process in a micro-manufacturer within a university-industry collaboration context in regional south-east Queensland
Hasna, Abdallah	Thorpe, D. Fulcher, B.	Sustainability philosophy in engineering context review and discussion
Ismail, Siti Amni	Chen, G. Schmidt, E.	Evaluation of opportunities of energy saving in cotton ginning process
Ivanovich, Grujica	Thorpe, D. Sharma, R.	Airport distribution network strategic planning
Khabbaz, Borzoo Ghareei	Guangnan, C. Bailey, C.	Energy usage and greenhouse gas emissions of Australian cotton: from field to the port
Mahmood, Raed Ahmed	Yusaf, T. Aravinthan, V.	Disinfecting the upstream of reverse osmosis membrane by ultrasound
Trethewey, Mark	Hancock, N. Maxwell, A.	Strain measurement buy distortion of microwave resonant cavities
Winter, Michelle	Smith, R. Hancock, N.	Channel evaporation mitigation project
Wong, Kwok Yeung Peter	Ku, H. Epaarachchi, J.	Measurement and modelling of mechanical properties of glass powder reinforced epoxy composites

Masters in Spatial Science Research

NAME	SUPERVISOR/S	THESIS TITLE
Harris, Bruce	McDougall, K. Barry, M.	Estimating lengths of waterways within catchments, land and land use areas
Karki, Sudarshan	McDougall, K.	Analysis and classification of 3D cadastral occurrences based on homogeneous issues
Ong, Gerry	Gibbings, P. McDougall, K.	Structural movement detection and monitoring systems using GPS
Parikh, Dhaval	Misra, R. Young, F	Desertification – land degradation – modelling using remote sensing and GIS

Masters in Geomatics

NAME	SUPERVISOR/S	THESIS TITLE
Nicholls, Angela	Young, F.	Utilising spatial technology for hospital bed management

Research Grants

The different Faculty Research Centres and Staff won a significant value in research grants from a variety of government and industry bodies.

RESEARCHER(S)	PROJECT DESCRIPTION	AMOUNT
Apan, A.	Queensland floods. National Climate Change Adaptation Research Facility (NCCARF)	\$42,496
Aravinthan, T. and Cater, R.	Fibre composites online – industry focus. Australian Flexible Learning Framework (AFLF)	\$45,000
Aravinthan, T. and Islam, M.	Fibre composites in civil infrastructure – road show in Japan. Australia Japan Foundation (AJF)	\$10,000
Aravinthan, T., Watt, N. and Islam, M.	Fibre composite pile and girder system for replacement/rehabilitation of timber, concrete or steel piles and girders. Queensland Government Smart Futures Fund (Proof of Concept)	\$47,500
Brodie, L.	Professional development and support resources for new and part time staff: an introduction to PBL, virtual teams and facilitated learning. USQ Performance Learning and Teaching Performance Grant	\$28,459
Buttsworth, D. (with others)	Hypervelocity re-entry. Australian Research Council (ARC) Discovery Project	\$30,000
Dowling, D.	DYD: Defining your discipline to facilitate curriculum renewal in undergraduate programs. USQ Performance Learning and Teaching Performance Grant	\$220,000
Epaarachchi, J.	Multiplexed fibre optic sensors for damage in advanced composite structures monitoring. Boeing Research and Technology	\$30,000
Grey, R., Li, Y. and Wen, P.	Reliable depth of anaesthesia monitoring and improvement. Toowoomba Hospital Foundation	\$48,141
Gibbins, P.	Developing and deploying remote access laboratories to promote student learning: a cross faculty collaboration. USQ Performance Learning and Teaching Performance Grant	\$50,000
Gibbins, P.	Database for graduate attribute mapping. USQ Performance Learning and Teaching Performance Grant	\$10,000
Jensen, T.	Waterjet technologies for agriculture. Grains Research and Development Corporation (GRDC) and South Australian No-Till Farmers Association (SANTFA)	\$20,000
Loch, B. and Brodie, L.	Enhancing learning and teaching through a cascading approach to sharing knowledge and experience for flexible application of technology in support of learning. USQ Performance Learning and Teaching Performance Grant	\$50,000
Perera, K.	Cooperative research grant, Centre for Environmental Remote Sensing (CEReS), Chiba University	\$2,250
Raine, S.	Nutrient calculator. Department of Environment and Resource Management (DERM)	\$25,000
Raine, S.	Support for permanent raised bed farming systems – Pakistan. Australian Centre for International Agricultural Research (ACIAR)	\$100,000
Raine, S.	Coal Seam Gas Water Laboratory Assessment. Santos Water Management	\$100,000
Raine, S.	Nursery Production Farm Management System. Nursery and Garden Industry Queensland (NGIQ)	\$14,000
Raine, S.	Coal seam gas irrigation of soils. Queensland Gas Co.	\$50,000
Raine, S.	Coal seam gas water evaluations. Queensland Gas Co.	\$54,000
Schmidt, E. and Smith, R.	Sustaining the Basin – Irrigation Technology Demonstration. Cooperative Research Centre on Irrigation Futures (CRCIF) / NSW Department of Primary Industries (DPI)	\$100,000
Smith, R.	Delivery of Hydraulic Practice Classes via a remote access laboratory. USQ.	\$100,000
Smith, R.	Northern Victoria Irrigation renewal project – Business case. Northern Victoria Irrigation Renewal Project (NVIRP)	\$50,000

RESEARCHER(S)	PROJECT DESCRIPTION	AMOUNT
Smith, R.	Surface irrigation Goulburn Murray Irrigation District (GMID). Cooperative Research Centre for Irrigation Futures (CRCIF)	\$28,000
Talal, Y.	Biofuel for Internal combustion engine. Honda Peter Robert, Toowoomba, QLD	\$19,000
Thorpe, D.	Identifying low SES USQ students and maximising their educational pathways.	\$15,000
Tran-Cong, T.	USQ High Performance Computing Cluster. Queensland Cyber-Infrastructure Foundation (QCIF)	\$200,000
Tran-Cong, T., Mai-Duy, N., Buttsworth, D., Mossad, R. and Boucher, J.	Queensland Cyber-Infrastructure Foundation (QCIF) Tech Diffusion grant	\$49,796
Tran-Cong, T. and Mai-Duy N.	High-order conservative multiscale computation of elliptic problems in composite materials and porous media, Australian Research Council (ARC) Discovery Project	\$130,000
Wang, H.	Sustainable and environmental-friendly biopolymers and biocomposites from renewable resources. Queensland International Fellowship Program	\$25,000
Wandel, A. and Loch, B.	Scaffolding distance learning in mathematics and statistics. USQ Performance Learning and Teaching Performance Grant	\$49,910
Xiang, W. ,	Joint MIMO and VLC coding for robust video transmission, QLD Smart State International Visiting Fellowship	\$22,000
Xiang, W. and Leis, J. <i>et al.</i>	Research laboratory infrastructure for emerging communications technologies for regional Australia. USQ Research Infrastructure Program (RIP)	\$56,651
Gururajan, R., Leis, J. and Xiang, W. <i>et al.</i>	Wireless handheld technology connectivity using bluetooth standards for health technologies. USQ Research Infrastructure Program (RIP)	\$40,000

Surveying Staff Conducts Remote Sensing Training in Vietnam



Surveying and Spatial Science staff served as trainers for the 30 Vietnamese who attended the training-workshop on "Imagery Products and Applications of Moderate Resolution and Hyperspectral Remote Sensing" on 4-6 November 2009. Organised and sponsored by the Vietnamese Academy of Science and Technology (VAST) at Ho Chi Minh City, the workshop was led by Associate Professor Armando Apan and Dr. Kithsiri Perera. This event provided opportunities to develop research collaboration and the promote USQ research and degree programs.

The Head of the GIS and Remote Sensing Section at VAST, Dr Nguyen Lam Dao, is a USQ-FOES PhD candidate.



Research Awards

A number of the Faculty of Engineering and Surveying students and staff have been recognised by the following awards and citations for excellence in research.

2009 Dean's Award for Graduate Research Excellence
Mr Allan Manalo
Mr Tai Nguyen-Ky
Commendations for Graduate Research Excellence
Mr Dev Raj Paudyal
Mr Khoa Cao Le
Research Excellence Awards
Dr Nam Mai-Duy
Dr Hao Wang
Dr Ian Brodie (early career)
Research Associate Fellowships
Dr Paul Wen
Dr Albert Chong

Editorial Board Membership

Assoc Prof Armando Apan	<ul style="list-style-type: none"> • Open Geography Journal • Open Remote Sensing Journal
Dr Badri Basnet	<ul style="list-style-type: none"> • International Journal of Applied Geospatial Research (IJAGR)
Prof John Billingsley	<ul style="list-style-type: none"> • Journal of Field Robotics (special issue: June/July 09) • International Journal on Industrial Electronics, Technology and Automation • Sensor Review, Industrial Robot
Dr Albert Chong	<ul style="list-style-type: none"> • New Zealand Surveyor • Geoinformation Science Journal
Prof David Dowling	<ul style="list-style-type: none"> • Engineering Education: Journal of the Higher Education Academy • Engineering Subject Centre
Assoc Prof Nigel Hancock	<ul style="list-style-type: none"> • Computers and Electronics in Agriculture
Dr Rabi Misra	<ul style="list-style-type: none"> • Soil and Tillage Research
Prof Steven Raine	<ul style="list-style-type: none"> • Irrigation Science
Mr Shane Simmons	<ul style="list-style-type: none"> • Spatial Science Queensland
Prof Rod Smith	<ul style="list-style-type: none"> • Biosystems Engineering
Dr David Thorpe	<ul style="list-style-type: none"> • Construction Innovation Journal
Prof Thanh Tran-Cong	<ul style="list-style-type: none"> • CMC: Computers, Materials & Continua • Engineering Analysis with Boundary Elements
Dr Hao Wang	<ul style="list-style-type: none"> • The Open Corrosion Journal • Special Casting and Non-ferrous Alloys

Publications for 2009

Refereed journal articles

- Ahfock, T. & Gambetta, D. (2009) *A new sensorless commutation technique for brushless DC motors*. IET Electric Power Applications, 3(1). pp.40-49. Ahfock, T. & Gambetta, D. (2009) *Designing printed circuit stators for brushless permanent magnet motors*. IET Electric Power Applications, 3(5), pp.482-490.
- Al-Falahi, A., Yusoff, M., Shuaib, N. & Yusaf, T. (2009) *Flow instability in shock tube due to shock wave-boundary layer-contact surface interactions, a numerical study*. European Journal of Scientific Research, 30 (1). pp.164-176. ISSN 1450-216X.
- Billingsley, J., Oetomo, D. & Reid, J. (2009) *TC spotlight: Agricultural robotics*. IEEE Robotics and Automation Magazine, 16 (4). 16, cont-19. ISSN 1070-9932.
- Brodie, I. (2009) *Australian examples of residential integrated water cycle planning – accepted current practice and a suggested alternative*. Desalination and Water Treatment, 12, pp.324-330.
- Brodie, I. & Brodie, L. (2009) *A knowledge-information-data concept model for engineering education*. Australasian Journal of Engineering Education, 15 (3). pp.137-144. ISSN: 1324-5821.
- Brodie, I. & Dunn, P. (2009) *Suspended particle characteristics in storm runoff from urban impervious surfaces in Toowoomba, Australia*. Urban Water Journal, 6 (2). pp.137-146. ISSN 1573-062X.
- Brodie, I. & Misra, R. (2009) *Evaluation of green waste mulch to control runoff quality from landfill sites during frequent storms*. Water, Air and Soil Pollution, 201 (1-4). pp.75-85. ISSN 1573 2932.
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- Brodie, L. & Porter, M. (2009) *Transitions to first year Engineering – diversity as an asset*. Studies in Learning, Evaluation, Innovation and Development, 6 (2). pp.1-15. ISSN 1832-2050.
- Burton, L., Taylor, J., Dowling, D. & Lawrence, J. (2009) *Learning approaches, personality and concepts of knowledge of first-year students: Mature-age versus school leavers*.
- Campbell, G. & Phinn, S. (2009) *An assessment of the accuracy and precision of water quality parameters retrieved with the Matrix Inversion Method*. Limnology and Oceanography Methods, vol. 8, pp.16-29. ISSN: 1541-5856.
- Cardona, F., Rogers, D., Gurney, R., Trada, M. & Ku, H. (2009) *Flexural tests of phenol formaldehyde and Slg composites: preliminary results*. Journal of Reinforced Plastics and Composites, 28 (22). pp.2761-2769. ISSN 0731-6844.
- Chen, G. & Baillie, C. (2009) *Development of a framework and tool to assess on-farm energy uses of cotton production*. Energy Conversion & Management, 50(5), pp.1256-1263. ISSN: 0196-8904.
- Chen, G., Baillie, C. & Kupke, P. (2009) *Evaluating on-farm energy performance in agriculture*. Australian Journal of Multi-Disciplinary Engineering, 7 (1). pp.55-62. ISSN 1448-8388.
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- Cheung, H.-Y., Ho, M.-P., Lau, K.-T., Cardona, F. & Hui, D. (2009) *Natural fibre-reinforced composites for bioengineering and environmental engineering*. Composites Part B: Engineering, 40 (7). pp.655-663. ISSN 1359-8368.
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- Chong, A. & Croft, H. (2009) *A photogrammetric application in virtual sport training*. The Photogrammetric Record: An International Journal of Photogrammetry, 24 (125). pp.51-65. ISSN 0031-868X.
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- de Almeida, B., da Silva, A., Raine, S. & Figueiredo, G. (2009) *Evaluation of automotive varnish as a coating for density measurements of soil clods*. Journal of the Soil Science Society of America , 73 (2). pp.449-452. ISSN 0361-5995.
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- Epaarachchi, J. & Ku, H. (2009) *A simplified empirical model for prediction of mechanical properties of random short fibre vinyl ester composites*. Journal of Composite Materials.
- Gambetta, D. & Ahfock, T. (2009) *A new sensorless commutation technique for brushless DC Motors*. IET Electric Power Applications, 3 (1). pp.40-49. ISSN 1751-8660.
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- Genet, M., Yan, W. & Tran-Cong, T. (2009) *Investigation of a hydraulic impact: a technology in rock breaking*. Archive of Applied Mechanics, 79 (9). pp.825-841. ISSN 0939-1533.
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- Gibbins, P., Bruce, C. & Lidstone, J. (2009) *Problem-based learning (PBL) in virtual space: developing experiences for professional development*. VDM Verlag , Berlin, Germany. ISBN 978-3-639-16314-8.
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Conference Papers

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