



THE 3RD AUSTRALASIAN CONFERENCE ON COMPUTATIONAL MECHANICS

12-14 FEBRUARY 2018

DEAKIN UNIVERSITY WAURN PONDS CAMPUS

IN THE

CENTRE FOR **ADVANCED DESIGN** IN **ENGINEERING TRAINING**



SPONSORS



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The 3rd Australasian Conference on Computational Mechanics 2018

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WELCOME FROM THE ACCM-3 CONFERENCE CO-CHAIRS

Dear Friends and Colleagues,

On behalf of the organising committee and as the co-chairs, we would like to welcome you to the 3rd Australian Conference on Computational Mechanics (ACCM-3) held in Geelong, Australia from 12-14 February, 2018.

The Australian Association for Computational Mechanics (AACM) facilitates the organisation of this premier biennial conference. The conference aims to provide an international forum for researchers, industry practitioners, engineers and postgraduate scholars to promote, exchange and disseminate recent findings on contemporary and wide-ranging topics in Computational Mechanics.

Computational Mechanics is a fundamental subject of engineering science. It underpins all of the primary engineering disciplines, including Mechanical, Civil, Chemical, and Materials Engineering. Computational Mechanics addresses a broad range of areas, from conventional structural and mechanical designs, failure analysis, dynamic and vibration analysis, and fluid mechanics to cutting-edge computational mechanics, nano-micro mechanics, multiscale mechanics, coupled multiphysics problems and novel materials. This is truly reflected in the variety of fields featured in the conference topics. One key aim of ACCM is to retain and engage high quality graduate students in Computational Mechanics research. ACCM aims to nurture the talent of young researchers through its best paper awards.

The ACCM series started in 2013 with the ACCM-1 and ACCM-2 held in Sydney and Brisbane, respectively. The ACCM conference has become a flagship activity of AACM and will be regularly organised. ACCM will accommodate presentations on a wide range of topics to facilitate inter-disciplinary exchange of ideas in science, engineering and allied disciplines, and helps to foster collaborations.

The ACCM conference is unique in that it showcases the current trends and research developments in Computational Mechanics in the Australasian region and its relationship to national and regional priorities. The papers to be presented at ACCM-3 will address many grand challenges in modern engineering. The full papers to be presented at ACCM-3 will be peer-reviewed by expert reviewers including members of the National Scientific and Local Organising Committees for ACCM-3. The topics of these papers will range from nano- to macro-mechanics of materials, dynamics, sustainable manufacturing, biomechanics and computational mechanics.

We are thankful for the contributions of all ACCM-3 participants and presenters at this event. In particular, we gratefully acknowledge the contributions from the Local Organising Committee, National Scientific Committee, and the expert reviewers.

Finally, we thank you for your contribution to the ACCM-3 conference, and we hope you have a wonderful and richly rewarding conference experience in Geelong, Australia. We look forward to your participation and continued engagement at future ACCM conferences.

Raj Das and Bernard Rolfe
(ACCM-3 Conference Co-Chairs)

BIOGRAPHY – CONFERENCE CO-CHAIRS

DR. RAJ DAS, RMIT UNIVERSITY



Dr Raj Das is an Associate Professor in Aerospace and Aviation discipline and a principal investigator of the Aerospace Materials and Structures group of the Sir Lawrence Wackett Aerospace Research Centre of RMIT University. His current areas of interest include numerical modelling using finite element and meshless methods, advanced architected and metamaterials, impact behaviour and failure of composite materials, dynamic fracture and fatigue, and structural optimisation. Before joining RMIT, Dr Das has work experience in the University of Auckland (New Zealand), CSIRO (Australia), and University of Manchester (UK). Dr Das has published over 150 peer-reviewed journal and conference papers. He has received various awards and fellowships, such as ‘Jim & Hazel D. Lord Emerging Faculty Fellowship’, ‘Early Career Research Excellence Award’, and ‘AUEA Emerging Researcher Award’ from the University of Auckland, ‘CONICYT Fellowship’ from the Government of Chile, ‘UQAC Visiting Fellowship’ from the University of Quebec, and ‘Merit Award’ from the International Association of Engineers, Hong Kong. Dr Das is an elected member of several international committees and professional societies, and serves on editorial boards and reviewing panels of many journals

DR. BERNARD ROLFE, DEAKIN UNIVERSITY



Dr Bernard Rolfe is currently an Associate Professor (Mechanical) and Associate Head of School (Research) at the School of Engineering – Deakin University. He completed a combined Economics and Engineering degree with honours in 1995 from the Australian National University (ANU). After working in industry for 3 years, he returned to the ANU and completed a PhD in advanced manufacturing in 2002. Bernard joined Deakin as a Lecturer in Mechanical Engineering in 2005. He is still at Deakin, and part of the School of Engineering executive team. He was the General Secretary for the 9th International Conference and Workshop on Numerical Simulation of 3D Sheet Forming Processes (Numisheet 2014) held in Melbourne. He is on the Academic Advisory Board of FISITA (Federation of International Societies of Automotive Engineers). He has been part of over fifteen successful nationally competitive large research projects (over \$18 million in funding), and he has published over 150 refereed articles. His current research focus is the forming of light weight structures, including the development of better material models for metal forming.

ACCM-3 CONFERENCE SCIENTIFIC COMMITTEE

NAME	UNIVERSITY
Bernard Rolfe – Co Chair	Deakin University
Raj Das – Co Chair	RMIT University
Abdul Hamid Shiekh	The University of Adelaide
Ali Daliri	RMIT University
Ali Entezari	The University of Sydney
Andrew Chan	University of Tasmania
Baolin Wang	Western Sydney University
Chengwang Lei	The University of Sydney
Chi-King Lee	The Australian Defence Force Academy
Chiu Wing	Monash University
Chongmin Song	The University of New South Wales
Chun Wang	The University of New South Wales
Ean Ooi	Federation University
Fang-Bao Tian	The University of New South Wales
Giang Nguyen	The University of Adelaide
Grand Roman Joldes	The University of New South Wales
Grant Steven	Strand7
Guan Heng Yeoh	The University of New South Wales
Guaxing Lu	Swinburne University
Ha Bui	Monash University
Hong Hao	Curtin University
Itai Einav	The University of Sydney
Jie Yang	RMIT University
Jonathan Tran	The University of Melbourne
Justin Fernandez	University of Auckland
Klaus Thoeni	University of New Castle
Liangchi Zhnag	University of New South Wales
Lihai Zhang	University of Melbourne
Ling Tong	The University of Sydney
Luming Shen	The University of Sydney
Majidrezw Naxem	RMIT University
Nam Mai-Duy	University of Southern Queensland
Nhu Nguyen	Monash University
Peter Pivonka	Queensland University of Technology
Peter Vee Sin Lee	The University of Melbourne
Qinghua Qin	Australian National University

Richard Yang	Western Sydney University
Saeed Miramini	The University of Melbourne
Shiwei Zhou	RMIT University
Somayeh Behradfar	University of Queensland
Tracie Barber	The University of New South Wales
Tracy Dong Ruan	Swinburne University
Tuan Doc Ngo	The University of Sydney
Wei Gao	The University of New South Wales
Weihua Li	University Of Wollongong
Wenxian Lin	James Cook University
Wenyi Yang	Monash University
Xin Ren	RMIT University
Yang Yu	University of Technology Sydney
Yi Qian	Macquarie University
Yi-Min (Mike) Xie	RMIT University
Yixia (Sarah) Zhang	The Australian Defence Force Academy
Yixiang Gan	The University of Sydney
Yuantong Gu	Queensland University of Technology
Zhen (Jeff) Luo	University of Technology Sydney
Zhengyi Jiang	University of Wollongong
Zhi-Yong Li	Queensland University of Technology

ACKNOWLEDGEMENT OF COUNTRY

We would like to acknowledge the Wadawurrung people, the traditional owners of the land on which we are gathered today. We pay our respects to the local people for allowing us to have our gathering on their land and to their Elders; past, present and future.

AUSTRALIAN ASSOCIATION FOR COMPUTATIONAL MECHANICS

The Australian Association for Computational Mechanics (AACM) facilitates the organisation of this premier biennial conference. The conference aims to provide an international forum for researchers, industry practitioners, engineers and postgraduate scholars to promote, exchange and disseminate recent findings on contemporary and wide-ranging topics in Computational Mechanics.

The ACCM conference is unique in that it showcases the current trends and research developments in Computational Mechanics in the Australasian region and its relationship to national and regional priorities. The papers to be presented at ACCM-3 will address many grand challenges in modern engineering. The full papers to be presented at ACCM-3 will be peer-reviewed by expert reviewers including members of the National Scientific and Local Organising Committees for ACCM-3. The topics of these papers will range from nano to macro-mechanics of materials, dynamics, sustainable manufacturing, biomechanics and computational mechanics.

Deakin University is proud to host The Third Australian Conference on Computational Mechanics. The Conference will be at our Waurin Ponds Campus, at the state-of-the-art Centre for Advanced Design in Engineering Training (CADET) building.

CONFERENCE VENUE

The ACCM-3 Conference will be held at Deakin University's Waurn Ponds Campus, Geelong. Geelong is home to more than 200,000 people and offers a diverse range of cuisine, wine and activities.

Deakin University's Geelong Waurn Ponds Campus is located on the western edge of Geelong and is home to the Geelong Technology Precinct, an area which provides research and development capabilities and opportunities for university-industry partnerships and new enterprises in the Geelong region.

Within the Geelong Technology Precinct sits the Centre for Advanced Design in Engineering Training (CADET), a multimillion dollar facility comprised of state of the art equipment, cutting edge technologies, specialist aids, laboratories and learning environments to enable the creativity, imagination and research required to solve modern engineering problems.

This facility enables students, researchers and industry to experience and master the tools and techniques that will propel Australian manufacturing beyond the 21st century.

CADET provides some of the best future-focused engineering and design facilities including:

- High Voltage Laboratory
- Virtual Reality Laboratory
- 3D Printing Laboratory
- Materials Science Corrosion and Polymer Laboratory
- Mechatronics and electronics laboratory



The Centre for Advanced Design in Engineering Training (CADET) Building – High Voltage Lab.

TRAVEL INFORMATION

The ACCM-3 Conference venue is located approximately just one hour south of Melbourne at Deakin's Waurm Ponds CADET building.

AIR

Domestic travelers can fly direct with Jet Star to Avalon Airport and then drive or take a shuttle bus to the Waurm Ponds Campus (see below for details).

All visitors can choose to fly to Melbourne's Tullamarine Airport and drive, take a shuttle bus or train to the Waurm Ponds Campus (see below for details).

AIRPORT SHUTTLE

From Avalon Airport you can use the Sky Bus service to travel. All information can be found on their website but the shuttle will pick you up from Avalon Airport and can drop you either at the Geelong Railway Station, which is Geelong's main station, or at the South Geelong station. From both stations you can catch a connecting taxi to your accommodation.

From Tullamarine Airport you can use the Gull Airport Service to travel direct to Geelong. Contact, booking, price and timetable information can be found on their website. The pick-up and drop off point for this service is the Geelong Railway Station. From the station you can catch a taxi to your accommodation or the conference at Waurm Ponds directly.

DRIVING

Avalon Airport is approximately 20 minute drive from Geelong's central business district.

The Waurm Ponds Campus is located approximately one and a half hour's drive from Melbourne (Tullamarine) Airport.

Rental car companies are available to both airports.

TRAIN

From Melbourne's Southern Cross Station you can take a V/Line train service to Waurm Ponds Railway Station. See the V/Line website for the Geelong timetable, details about fares, tickets and bookings. The Waurm Ponds campus is a 10 minute taxi ride from the station.

TAXIS

The Geelong Taxi Network website has information on estimating taxi fares and booking online. The contact number for Geelong taxis is 131 008.

ACCOMMODATION INFORMATION

The below are an array of recommended hotels are for your reference only. There is many diverse accommodations in Geelong that you can select from booking websites such as; <http://au.hotels.com/> , <http://expedia.com.au> , <http://hotelscombined.com.au> .

WAURN PONDS ESTATE

The Waurn Ponds Estate is a spectacular conference centre, which offers business facilities alongside quality hotel rooms. The Waurn Ponds Estate is the most convenient accommodation for the ACCM-3 Conference as it is on-site the Waurn Ponds Deakin Campus.

Waurn Ponds Estate (from \$145 per night)
Deakin Geelong, Nicol Drive South, Waurn Ponds VIC 3216
Please phone 03 5227 3000 for more information

QUEST GEELONG

Quest Geelong offers quality 4 star serviced apartment accommodation. It is ideal for those with extended stays or those who enjoy having self-contained accommodation.

Quest Geelong (\$199 per night)
16-18 The Esplanade Sth, Geelong VIC 3220
Please phone 03 5228 2000 for more information

BAYSIDE GEELONG

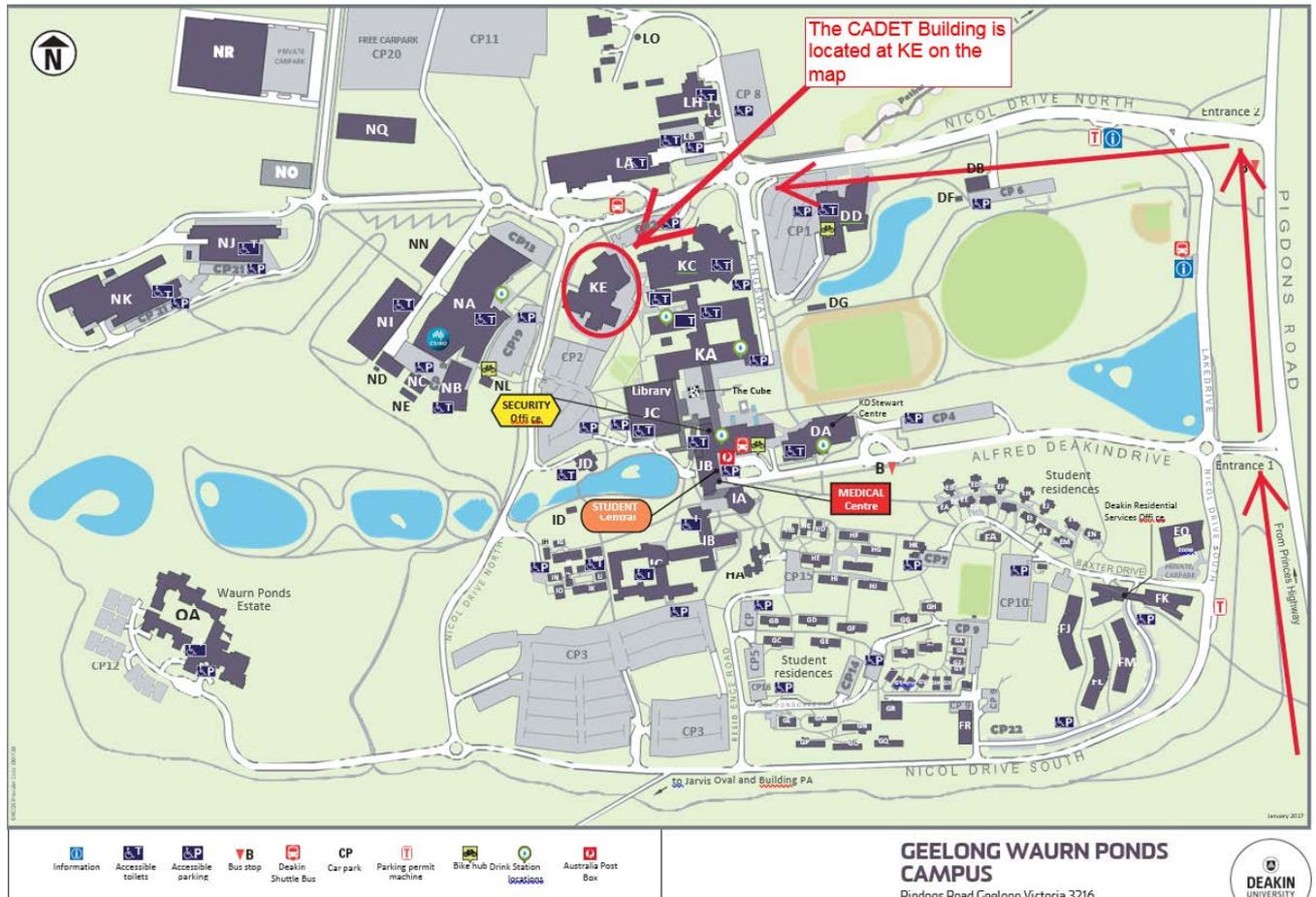
The Bayside Geelong, located on The Esplanade's Waterfront, is perfect for all your Geelong accommodation needs with options for the business and leisure travelers. Bayside Geelong provides a diverse range of room types from comfortable budget rooms to multiple bedroom apartments.

Bayside Geelong (\$165 per night)
13-15 The Esplanade, Geelong, Vic 3220
Please phone 03 5244 7700

ARRIVING AT THE VENUE

The conference is held in The Centre for Advanced Design in Engineering Training (CADET) building 'KE' at Deakin Waurn Ponds campus. Please refer to the conference website for general [travel](#) information. On arrival at Deakin Waurn Ponds Campus, please enter at **Entrance 2** and refer to the campus [map](#) to make your way to the CADET Building (KE).

Please follow the map provided for a visual representation.

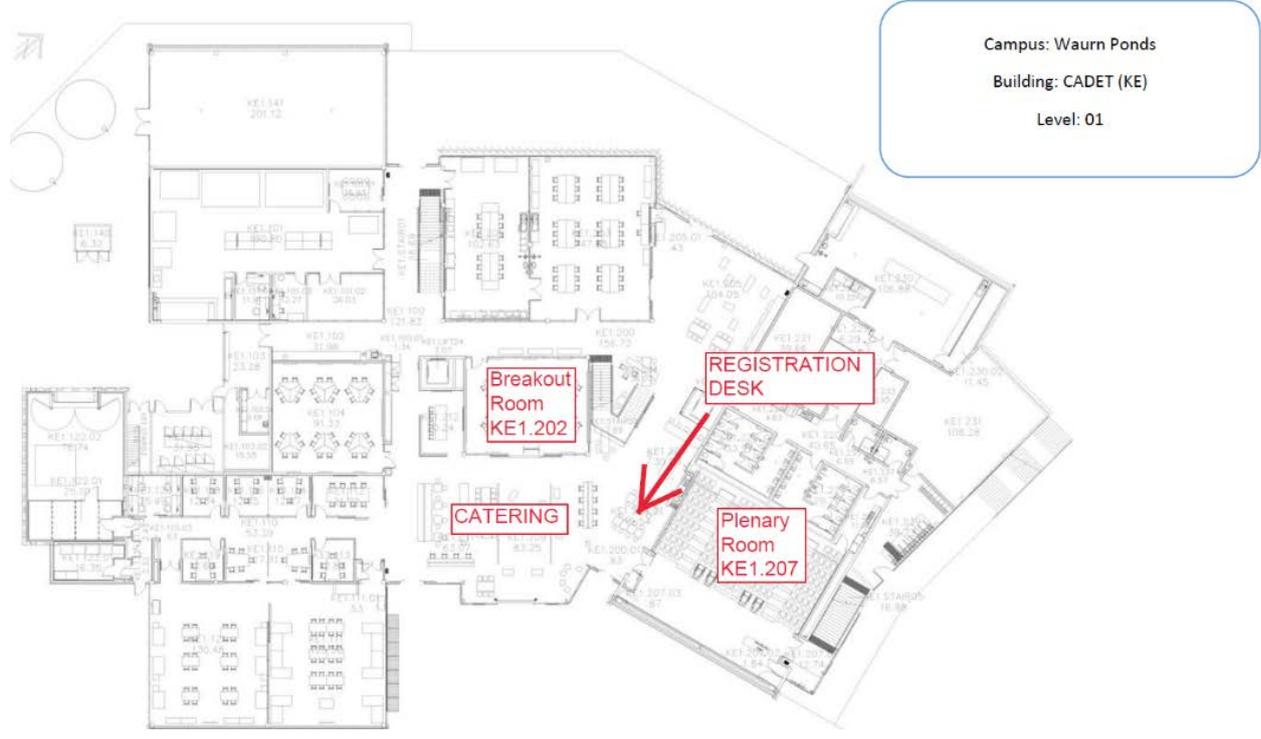


PARKING INFORMATION

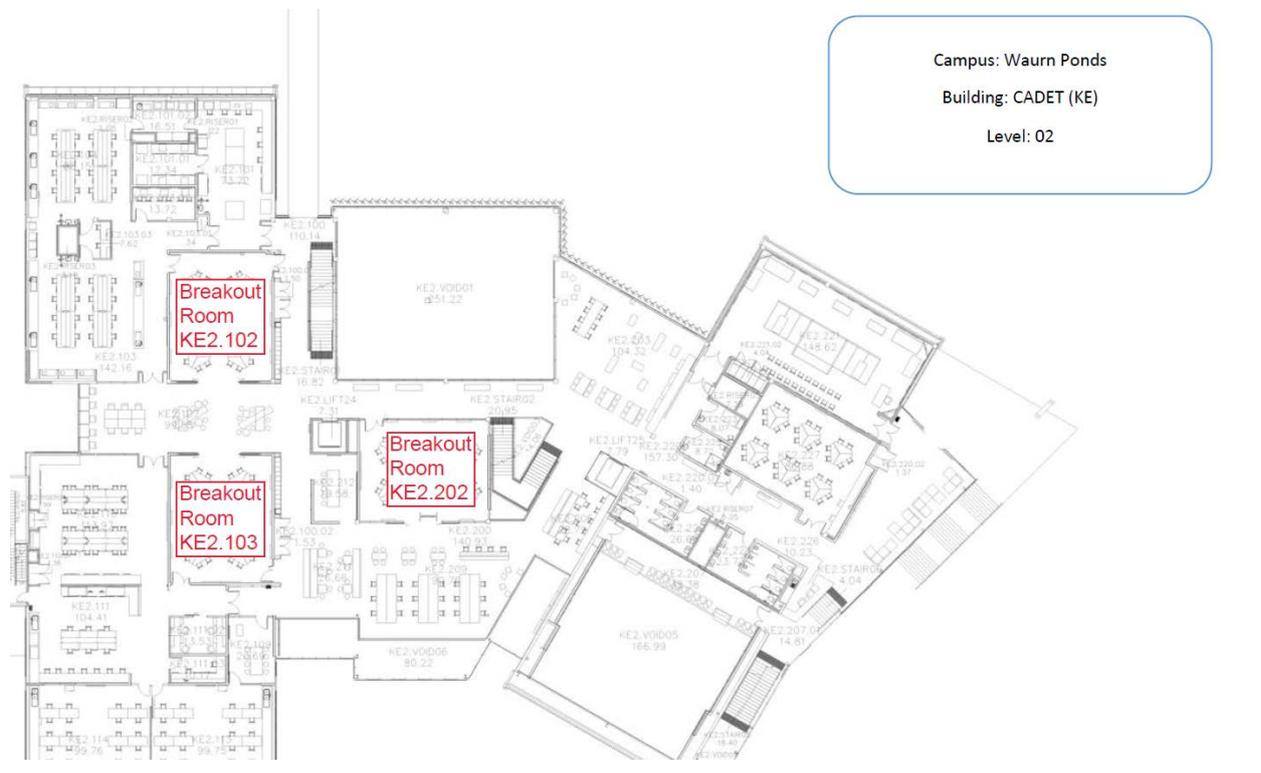
Geelong Waurn Ponds has a free car park just for visitors (CP20 – refer to campus map). Alternatively, paid parking is available on campus. Please use the [CelloPark](#) app. Parking costs \$1.60 for one hour or \$6.40 for the entire day. The system requires your registration number and car model. If your location services are active the app will recognize that you are at Deakin Waurn Ponds, but if it doesn't please select zone number 1040100.

We recommend paying conference delegates use CP2.

CONFERENCE VENUE FLOORPLAN



Campus: Waurm Ponds
Building: CADET (KE)
Level: 01



Campus: Waurm Ponds
Building: CADET (KE)
Level: 02

CONFERENCE STRUCTURE

GUIDELINES FOR CONCURRENT SESSIONS

Program sessions have been carefully programmed by topic and we encourage you to commit to the full session rather than changing rooms within session timeslots.

To ensure the smooth running of the very full conference program, it is important that all presenters keep to time. **Your presentation should be 15 minutes long to allow for a 5 minute Q and A session at the end.**

TOURS

Tours will take place on the afternoon of Tuesday 13 February visiting CADET, The Innovations Building and Carbon Nexus. Please sign up at the registration desk to secure your place.

POST CONFERENCE WORKSHOP

The workshop will cover developing a plasticity model and a fracture model for ABAQUS using UMAT. The structure of an ABAQUS user subroutine will be introduced in the work shop. It will review the elastic and elasto-plastic stiffness, the stress integration with Euler forward and backward methods. A UMAT will be developed and tested on a one shell element with Hill 1948 yield criterion, with the possibility for more advanced models if time permits.

The second part of this workshop will introduce basic ductile fracture criteria, experimental design for the calibration of fracture coefficients, matlab codes for the calibration of fracture coefficients and drawing of fracture envelopes in various stress and strain space, leading to the development of a UMAT for fracture prediction in ABAQUS. A simple application will be given based on the von Mises yield function for the predication of ductile fracture with element deletion.

Workshop attendees should meet at Building NA (opposite CADET) in the café at 8.45am on Wednesday 7 February.

SOCIAL ACTIVITIES AND EVENTS

CONFERENCE DINNER

Date: Monday, 12 February 2018
Time: Drinks commence at 6.30pm and delegates will sit down for dinner at 7pm
Venue: Waurm Ponds Estate, Nicol Drive South Waurm Ponds VIC 3216
Fee: Included in all full registrations

This event is a great opportunity to connect with your fellow delegates over drinks and dinner after the completion of your first day of the conference.

****To assist with catering numbers, please inform Event staff of your plans to attend this function as soon as possible.**

GENERAL INFORMATION

REGISTRATION DESK

All delegates must be registered in order to attend the 2018 ACCM Conference. The Registration Desk will be located in the foyer of the CADET building and will open at 8am daily.

ALTERATIONS TO THE PROGRAM

The Conference Committee reserves the right to make alterations to the program as circumstances dictate and will not accept responsibility for any errors, omissions or changes made to the program. All alterations to the program will be advised by the Events staff.

MOBILE PHONES

As a courtesy to other participants, please ensure that all mobile phones are turned off or on silent mode during all presentations.

WIRELESS INTERNET ACCESS

Wireless internet access will be available for all delegates. To access Deakin University's guest WiFi network please select **Guest WiFi Deakin**. In your browser please create an account, and then use those details to log in. Deakin University also has "eduroam" wireless internet available.

BAGS, LUGGAGE AND COATS

Delegates who wish to bring bags, luggage or coats with them on any of the conference days are asked to take their items to the Registration Desk for storage.

CATERING

Conference catering is included for all attendees including a conference dinner on the evening of Monday, 12 February.

All catering will take place in foyer of the CADET building, opposite to where the delegates will register.

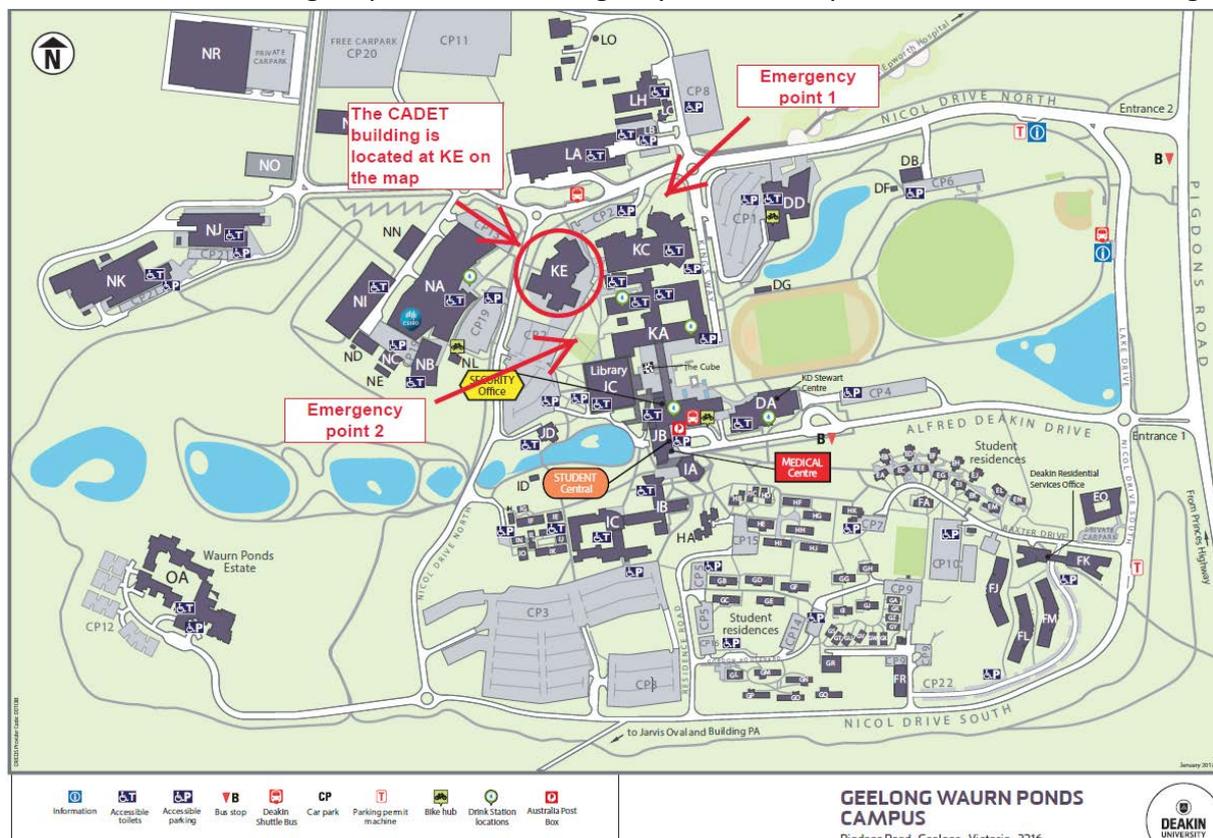
SMOKING RESTRICTIONS

Deakin University is a smoke-free environment. This policy has been implemented to create a healthy and safe environment for all Deakin students, staff and associates. If you wish to participate in smoking you must leave campus by heading across to Pigdons Road. Security enforce this regulation so please obey this request.

EMERGENCY EVACUATION PROCEDURES

In the event of an emergency, delegates will be advised of the status of the emergency via loudspeaker. Please only evacuate when advised to do so. Deakin University staff will be on hand to advise you of any action that needs to be taken. When asked to evacuate, please calmly make your way to the nearest assembly area and await further instructions. Deakin University's Waterfront Campus emergency assembly points are shown on the following page.

Please see the following map below for emergency evacuation point for the CADET building.



2018 ACCM-3 CONFERENCE PROGRAM OUTLINE

The featured schedule was accurate as of the final print date 9/02/2018. Please be aware that this program outline is therefore subject to unforeseen last minute changes.

MONDAY 12 FEBRUARY 2018 – DAY 1		
8.00 am	Registrations open	CADET level one foyer
9.00 am	Conference open and welcome	KE1.207
9.20 am	Keynote 1 – Professor Mike Xie	KE1.207
10.15 am	Morning tea break	CADET level one foyer
10.40 am	Concurrent sessions	See full program
12.40 pm	Lunch	CADET level one foyer
1.20pm	Concurrent sessions	See full program
3.20pm	Afternoon tea break	CADET level one foyer
3.40pm	Concurrent sessions	See full program
5.40pm	Day 1 conference close	
6.30pm	Conference dinner commences	Waurm Ponds Estate
TUESDAY 13 FEBRUARY 2018 – DAY 2		
8.00 am	Registrations open	CADET level one foyer
9.00am	Conference Open and Welcome	KE1.207
9.15am	Keynote 2- Professor Jeong Yoon	KE1.207
10.15am	Morning tea break	CADET level one foyer
10.40am	Concurrent sessions	See full program
12.20pm	Lunch	CADET level one foyer
1.20pm	Concurrent Sessions	See full program
3.20pm	Announcement of awards and conference close	KE1.207
3.30pm	Tour of CADET, Carbon Nexus and Innovations Building	
WEDNESDAY 14 FEBRUARY 2018 – DAY 3 WORKSHOP		
8.45 am	Meet at Building NA café	See campus map
9.00 am	Developing UMATs for plastic behavior	NA1.210
11.00 am	Morning Tea	N1 Cafe
11.20 am	Developing UMATs for failure behaviour	NA1.210
1.20pm	Light lunch	N1 Cafe
1.40pm	Workshop Close	

SPEAKERS

MIKE XIE



RMIT Distinguished Professor and Director of Centre for Innovative Structures and Materials

After 10 years as the Head of Civil Engineering discipline at RMIT University, Prof. Xie is now serving as the Director of RMIT Center for Innovative Structures and Materials.

He was elected Fellow of the Australian Academy of Technological Sciences and Engineering (ASTE) in 2011 for his outstanding contributions to the theory and application of structural optimization techniques. His primary research interest is the design and manufacture of novel and efficient structures and materials. Prof. Xie has collaborated with many companies, including Boeing, Arup, and Smith & Nephew.

He is one of the most highly cited researchers in the civil engineering discipline in Australia, with over 10,000 citations (Google Scholar). He was awarded the title of “RMIT Distinguished Professor” in 2016. In addition to his academic engineering practice known as XIE Architecture Design (Shanghai) Co., Ltd.

He was the winner of the 2017 Clunies Ross Innovation Award, a prestigious national prize administered by the ATSE to recognize research innovation and practical impact. He is also the winner of the 2017 AGM Michell Medal, awarded by Engineers Australia in recognition of his outstanding contribution to the field of mechanical engineering.

JEONG WHAN YOON



Professor of Applied Mechanics at Deakin University

Jeong Whan Yoon is currently Professor of Applied Mechanics at Deakin University, and also Professor of Mechanical Engineering at KAIST, Korea.

He is leading the International Consortium for Innovative Manufacturing (ICIM) with General Motors toward high reliability design and manufacturing for lightweight materials and structures. The consortium includes six Tier-1 members, and one Tier-2 and three Tier-3 industry members. He led Boeing-chaired manufacturing research (AusAMRC) at Swinburne University from 2010 to 2013.

He has published over 200 technical papers for international journals and conferences with over 4000 citations (H-index: 33, Scopus). He received “2008 International Journal of Plasticity Award” for outstanding contributions in the field of plasticity. He has been serving as an “Editorial-Board” member for International Journal of Plasticity since 2008. As guest editors, he edited seven special issues at Int. J. Plasticity and two special issues at Int. J. Solids & Structures.

He also has diverse industry experiences including LG Electronics (Korea) for product development, MSC Software Corporation (USA) for MSC. Nastran & Marc source code development and Alcoa Technical Centre (USA). He served as the Chairman of NUMISHEET 2014 held in Melbourne, Australia. He received his PhD at KAIST in 1997.

WARRNAMBOOL CAMPUS

Princes Highway, Warrnambool
Victoria

GEELONG WAURN PONDS CAMPUS

Pigdons Road, Waurn Ponds
Victoria

GEELONG WATERFRONT CAMPUS

1 Gheringhap Street, Geelong
Victoria

MELBOURNE BURWOOD CAMPUS

221 Burwood Highway, Burwood
Victoria

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