Technical Workshop

Computational Continuum Mechanics Research Group
Department of Civil Engineering
University of Cape Town

Practical application of FEM-based analysis, modelling and design of concrete structures

Cape Town (University of Cape Town): 03 - 04.09.2015, 08:00 – 17:00
Johannesburg (Radisson Blue Gautrain Hotel, Sandton): 07 - 08.09.2015, 07:00 – 16:00
Introduction

Finite element analysis and design of reinforced concrete structures has become a standard tool in engineering practice. This applies not only to non-standard 3-dimensional beam-to-column sub-assemblages and slabs, shear walls or shells of complicated shape, but also to normal beams, columns and frames. However, accurate FEM modelling of concrete structures is not an easy task, given the complex behaviour of reinforced concrete as a composite material exhibiting a highly non-linear response due to effects such as bond-slip, cracking, biaxial stiffening and strain softening.

Generally, the complexity and scale of the analysis varies considerably, from simple linear analysis combined with code of practice rules to determine strength and deflection, to highly non-linear analysis that aims to predict strength and damage under static or dynamic loading directly. Detailed concrete simulations, where the objective is to understand true behaviour as opposed to ensuring conservative and approximate design solutions, has gained particular interest in the assessment of existing structures and in designing components for repeated application.

In structural design, the finite-element software usually interfaces with a CAD database where its graphical surface data are automatically translated into meshes of millions of interconnected nodes. The accuracy of analysis as well as the efficiency of the design is intimately linked to the spatially varying density of the nodal distribution – the so-called discretization. It must be ensured that it adequately reflects the prevalent structural design situation as previously determined by informed judgement.

The focal point of this workshop is hands-on training in finite element analysis and design of real reinforced concrete structures. Every participant will perform on his personal laptop FE model generation, verification, analysis and interpretation of the results following step-by-step directions by the instructors. The practical design examples will be based on the South African structural design standards. The knowledge and skills obtained during this 2-day workshop will help participants in developing and analyzing complex FE models using any of the commercially available software packages. The software used in the workshop will be supplied by SOFiSTiK, but the principles taught will be applicable to other packages as well.

Participant target groups

Structural engineers involved in analysis and design of concrete members and structures, students and academics.

Contact

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Dr. Sebastian Skatulla, Dept. of Civil Engineering, University of Cape Town
Phone: (021) 650 2595, Email: Sebastian.Skatulla@uct.ac.za
Programme overview

The core aim of this workshop is to familiarize the delegates in the practical use of finite-element analysis in structural concrete design. The commonly used material models and modelling principles are briefly introduced followed by a hands-on training on the computer. For this, each participant will be provided with the structural analysis and design software SOFiSTiK which will be installed on the participant's personal laptop including a 3-month license. A range of practice examples will be worked through under guidance of the instructors.

The workshop will be held over two days. Day 1 will cover fundamental problems in structural concrete design whereas day 2 is dedicated to selected specialised topics. The participants may choose to enrol for both days of the workshop, or only for one day (either day 1 or 2), depending on personal interest and skill level.

Detailed program day 1:
- Preparing a project, collecting relevant data
- Overview of concrete and reinforcement material models
- Multi-storey concrete frame structures, step-by-step structural modelling using CAD tools
- From 2D to 3D

Detailed program day 2:
- Defining loading and load combinations
- Considerations for concrete member design
- Slab and plate design
- Beam design
- Punching, stability, buckling
- Deep beams – shells or beams?
- Cracked concrete

Registration fees

2-day participation on workshop

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<th>Delegates</th>
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<td>Full-time students</td>
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<td>R 2,600</td>
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Registration covers attendance of all sessions of both days of the workshop, teas and lunches, a set of printed notes, electronic copies of presentations, and a professional license of the SOFiSTiK FEM package for 3 months.

1-day participation on workshop

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<th>Delegates</th>
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Registration covers attendance of all sessions of one day of the workshop, teas and lunches, a set of printed notes, electronic copies of presentations, and a professional license of the SOFiSTiK FEM package for 3 months.

Company discount for multiple registrations: 25% on total fees for 4 or more delegates
Instructor details

Georg Pircher was born in Austria in 1968 and obtained his Structural Engineering Degree at the EPFL in Lausanne, Switzerland and a Master Degree at the University of Western Sydney, Australia. He was responsible for software specification and development of the modules “geoCon”, “preTee”, “voidSlab” part of the structural FE software SOFiSTiK. He was founder, shareholder, managing director of ABES Bridge Engineering Software Solutions, Austria, from 2005 to 2012. Since 2012 he has been international sales manager for SOFiSTiK AG, Germany.

He has eight years’ experience as a structural design engineer for high-rise buildings, industrial structures, tunnels and bridges. Specifically, he provided training and project support for 3D modelling and design of concrete members in accordance with local design code regulations. Noteworthy examples are: Z-Tower in Riga, Latvia; Monte Laa Tower in Vienna, Austria; Elbphilharmony in Hamburg, Germany; Chernobyl Sacrphag in Kiev, Ukraine; Suspension bridge KwangAn in Pusan, Korea; Masan Cable stayed bridge in Korea.

Within the consulting engineering industry and also in academia, he acts as instructor for specific software applications for structural analysis and design and as part-time lecturer at the University of Technology in Graz, Austria.

Gerhard du Plessis was born 1971 in South Africa and obtained his Civil Engineering Degree (1993) and Master Degree in Structural Engineering (2002) at the University of Pretoria. He joined the Consulting Engineering firm Keeve Steyn in 1995 after a year on site with the Lesotho Highlands Water Project. He was responsible for the planning and design of several civil and commercial structures but became more involved in the design of bridges. In 2004 he became a Technical Director and assumed responsibility for the Bridge Design Section in the Johannesburg head office. In 2008 he founded Superstructures Consulting Engineers and also joined ARQ consulting engineers as a Director in the bridge department. In February 2014 he committed himself full time on the activities of SOFiSTiK Southern Africa and Superstructures Consulting Engineers.

Gerhard has 20 years of structural design experience of which the majority was related to bridges. He has been involved in a number of signature projects including the Farris Cable Stay Bridge in Norway (Structural Modelling), the Nelson Mandela Cable Stayed Bridge in South Africa (Project Engineer - Structures), the King Faisal Precast Segmental Bridge in Saudi Arabia (Construction Design Engineer), the Al Azizia I/C Bridge in Saudi Arabia (Design Review Engineer) and the Mbombela World Cup Soccer Stadium in South Africa (Design Coordinator).
Continuing Professional Development Programme  Registration Form 2014

To be completed and returned via email to Sandra Jemaar or Heidi Tait at UCT:
ebe-cpd@uct.ac.za

Venue and days
(please tick)

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Course Name

Practical application of FEM-based analysis, modelling and design of concrete structures

Personal Details

Title:
Surname:
Full names:
Student No (if applicable):
ID Number:
Highest educational qualification:
Occupation:
Company:

The following information is required for UCT reporting purposes:

Gender (please tick): M F
Disability (please tick): Yes No If yes, please specify:
Race:
How did you hear about this course:

Contact details

Postal address:
Postal Code:
Home tel:        Cell:
Work tel:        Fax:
Email:

Please see next page also
Payment information:

Please note: Bank account details are different for individuals and for company payments.

Company payments:
If you require an invoice for a company payment indicate this below.

Invoice required: Yes  No  If an invoice is required, you will be sent an SD004 form to complete

Personal payments (payment information for individuals paying the fees personally)
Bank: Standard Bank, Account name: UCT EBE CPD Program, Branch: Rondebosch, Branch Code: 025009
Account Number: 270 654 275

It is essential that you use your student number as a reference when making this payment.
Proof of payment to be emailed to ebe-cpd@uct.ac.za or faxed to 021 650 3082, for attention Sandra or Heidi

Cheque Payments: Made payable to University of Cape Town
Cheque payments can be made at registration by arrangement with the administrators

Financial Assistance
Eduloan is a registered financial services provider specialising in student loans.
More details are available on the website www.eduloan.co.za
Download the Eduloan application form

Terms and Conditions

1. On submission of this registration form you will receive confirmation of acceptance on to the course and your unique student number. If there are no available spaces you will receive notice of this and your name will go on a waiting list.
2. Closing date for registrations is one week before the start of a course. Fees are due one week before the start of a course. In the event that you are still awaiting an invoice, please supply a letter from your company stating their intention to pay the fee on receipt of an invoice.
3. We must be informed of cancellations in writing at least one week prior to the start of a course or the full fee will be charged. If the fee has been paid and the registration is cancelled in time, a R500 admin fee will be charged for a refund
4. You may not cancel your registration after registrations have closed. If you do not arrive for a course you will be marked as absent and this will be reflected on your Professional Development Career at UCT.
5. Certificates will only be issued if payment has been received in full. Certificates will be issued in the name supplied on the application form. Where possible, certificates will be handed out at the final lecture. If not, they will be posted via registered mail to the address on this form.
6. UCT reserves the right to take any legal proceedings to recover the full fees payable, and to recover the costs in connection with such recovery
7. UCT reserves the right to cancel the course if insufficient registrations are received, in which case the course fee will be refunded in full if already paid.

I have read and accept these terms and conditions

Signature:                                          Date: