



# Modelling, analysis and stability of steel structures



The design of metal structures differs from that of concrete structures in that buckling has to be expressly considered on the levels of the global structure, the members of the structure, and the elements of each member. This course aims to improve the understanding of all these stability phenomena in order to apply the code correctly, thereby yielding sound structures in reasonably easy manner.

Stellenbosch  
StiαS  
23 & 24 March 2017

Johannesburg  
Tsogo Sun OR Tambo Int. Airport  
(Garden Court Hotel)  
27 & 28 March 2017

Durban  
Premier Hotel Pinetown  
30 & 31 March 2017

**2 CPD**  
CREDITS

**R5900**  
EARLY BIRD





## SEMINAR OBJECTIVES

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- Developing a “feel” for the behaviour and failure of steel structures.
- Understanding the stability of steel structures on the level of the whole structure and individual members, and how to ensure stability by choice of geometry and members, and by providing effective bracing.
- Knowledge of correct modelling of steel structures to meet the requirements of SANS 10162-1.

## SEMINAR FOCUS AREAS

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- Behaviour of steel structures under increasing load, up to failure with interaction of yielding and instability
- Avoiding instability by design and correct application of the code
- Bracing of structures and elements
- Modelling and analysis

# SEMINAR PROGRAMME

- Introduction – Objectives and arrangements, programme, the responsibilities of the structural engineer/steel designer and doing calculations, standards, the material steel, types of steel structures, economic structures.
- How structures fail – strength, stability, ductility, redundancy, upper and lower bounds
- Approximate methods of analysis, getting a feel for structural behaviour and for stiffness, the approximations we make when analysing structures, including behaviour of connections.
- In-plane elastic stability (Euler buckling) of ideal columns and structures. Effective length method to get buckling load of a frame.
- Second order elastic analysis, including  $P - \Delta$  and  $P - \delta$  effect, and alternative ways of obtaining the amplified member forces.
- Torsion – understanding warping and Saint Venant torsion.
- Defects in real structures – out of plumb, lack of straightness, residual stresses, yield stress and strain hardening, distributed plasticity, semi-rigid connections.
- Introduction to plastic design – first order plastic analysis and redistribution of moments.
- Resistance of columns to axial load – from Euler load (including out of plane and torsional buckling) to ultimate resistance, taking “defects” into account
- Elastic buckling of beams in bending: lateral torsional buckling with various end support conditions, end moments, loading, and positions of load. Effective lengths, including cantilevers and overhanging beams.
- Ultimate resistance of beams based on elastic buckling.
- Direct analysis and getting the “actual” failure load of a structure.
- Analysing and designing a structure according to the code, with notional loads and second order analysis, and member design as specified to achieve safe, economic designs.
- Beam-columns
- Bracing of beams and columns.
- Lateral bracing of structures, and analysis of structure to achieve desired results.
- Modelling frames in 2D and 3D.
- Checking computer output.
- Design of a portal frame

# PRESENTERS



## Dr Hennie de Clercq

Hennie has a BSc in Civil Engineering from the University of Pretoria and a MS and PhD from the University of California (Berkeley). He also has qualifications in business management.

He spent 24 years of his career in consulting engineering (the majority with Africon, now Aurecon) and a large number of buildings, bridges and industrial projects were designed and built under his supervision and guidance. For the rest of his career he was CEO of the SA Institute of Steel Construction, guiding it towards being an organization internationally respected for its expertise and influence and a strong force in making the industry it serves stronger and better. He is the principal author of the updated SAISC Red and Green Books and many other publications, chairman of the SABS committee responsible for design codes for metal structures, and a member of the committee responsible for the updating of the Canadian steel design code.

He is a recipient of the President's Award of the SA Institution of Civil Engineers for service to the engineering profession and was awarded honorary life membership of the American Institute of Steel Construction in recognition of his service to the international steel construction industry.



## Mr Etienne van der Klashorst

Etienne received his B.Eng and M.Eng degrees in Civil Engineering from Stellenbosch University. After graduation he held a position as part of the structural engineering team at Jeffares & Green consulting, Cape Town branch.

Etienne is currently full time lecturer at Stellenbosch University where he teaches an undergraduate course on structural analysis using the Finite Element Method. In the past he also presented courses on the design of concrete and steel structures. On postgraduate level he has acted as study leader for a number of Masters Degree students and has presented post graduate lectures on the design of steel structures, structural reliability analysis and robustness as well as the design of cold-formed steel structures.

Etienne has a special interest in the field of slender and lightweight steel structures where stability plays a key role in structural capacity. He is enrolled as a PhD candidate where he is doing research on the reliability based design for vibration of lightweight floor structures.

# CPD CREDITS

The seminar is accredited for 2 Continued Professional Development credits with the ECSA.



# REGISTRATION

To register, please provide your details on the online registration template provided at:

**Stellenbosch:** <http://shortcourses.sun.ac.za/application-form.html?offeringid=24614ede-7af2-e611-99f0-0050568000ff>

**Johannesburg:** <http://shortcourses.sun.ac.za/application-form.html?offeringid=26614ede-7af2-e611-99f0-0050568000ff>

**Durban:** <http://shortcourses.sun.ac.za/application-form.html?offeringid=25614ede-7af2-e611-99f0-0050568000ff>

**Please Note:** Our system will only generate an invoice for your records if you request an invoice before payment.



# PAYMENT

**Early Bird: R5900.00** Payment must be received by 7 March 2017

**Normal Bird: R7200.00** Payment must be received 5 working days prior to the course date



## PAYMENT INSTRUCTIONS:

On registering for a course you will receive an automated email featuring our bank details for payment. If you are paying your own registration and do not require an invoice, please use this method.

If however your company is making payment on your behalf and requires an official tax **invoice**, please contact [natalies@sun.ac.za](mailto:natalies@sun.ac.za) **before** making payment.

## PLEASE EMAIL PROOF OF PAYMENT TO:

**Ms. Natalie Scheepers**

Stellenbosch University, Department of Civil Engineering

**Email:** [natalies@sun.ac.za](mailto:natalies@sun.ac.za)

**Enquiries:** 021 808 4360

Please indicate which course date or city you plan to attend

## WE LOOK FORWARD TO WELCOMING YOU AT THIS COURSE



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jou kennisennoot • your knowledge partner



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ENGINEERING