ADVANCED DESIGN OF CONCRETE STRUCTURES
- POST-GRADUATE COURSE / CPD COURSE

A design course covering theory and application of reinforced and prestressed concrete topics to equip students and structural engineers for the design of real world structures

- Stellenbosch University: Decanting Building, Board Room 3030, in hybrid mode over MS Teams

4 CPD CREDITS
R10000 / 4 days
R5000 / 2 days

25-29 April 2022
This course aims to provide a good technical and practical basis for the design of concrete structures. The fundamental principles of a wide variety of topics applicable to real-world structural engineering problems are addressed, along with the underlying theory. Participants will be able to learn about concrete design methods outside of typical under-graduate courses and general design textbooks, but important for structural engineers in practice. Bridge structures are covered over the last two days. Specific topics covered in the course are:

- Analysis and modelling of concrete structures
- Serviceability Limit State Design: crack widths, deflection
- Plastic analysis of reinforced concrete structures
- Concepts of reliability
- Prestressing - basic principles, losses, feasible domain, continuous beams
- Strut and tie method
- Bridge loads
- Bridge analysis and example
- Bridges - slab and girder, precast girder, integral
- Bridges - incremental launching

The course is presented by Prof Pierre van der Spuy (Pr.Eng.), a professional engineer and Associate at Zutari. He is also appointed as Adjunct Associate Professor in the Department of Civil Engineering at Stellenbosch University, where he supervises final year and postgraduate civil engineering research students, and teaches Advanced Design (Structures) to final year BEng(Civil) students. Pierre has designed a wide variety of structures, including wind turbine tower foundations and bridges.

The course has been designed as a post-graduate module in structural engineering on Master’s level, but opened to industry based on demand in past years.
DAY 1: Monday 25 April

- Modelling and analysis of concrete structures

After a quick introduction to the use of concrete, the theory and application of modelling concrete structures will be presented. After characterising the constituent materials for concrete, the concepts of moment-curvature and plastic analysis are discussed and demonstrated.

The influence of modelling decisions in structural analysis on the obtained results is presented. The aim is to give engineers simpler, technically correct tools for design.

DAY 2: Tuesday 26 April

- Prestressing

The principles of prestressed concrete is presented. Topics including sources and calculation of losses of prestress to design for, considerations for the feasible domain for prestressing, and prestressing in continuous beams, will be elaborated.

- Strut and tie method

The strut and tie method is a useful and powerful method of analysis and design of reinforced concrete structures. This includes simple calculations up to detailed numerical analysis. In this course, numerical analysis will be mentioned, but the use of the strut and tie method and stress fields for simple calculations will be demonstrated in detail.
DAY 3: Thursday 28 April

- **Bridges Part 1**

After the public holiday on 27 April, we return to consider the design of concrete bridges. An overview of bridge types is presented including selection for conceptual design. Then, bridge loading is elaborated including traffic loading, temperature loading, differential shrinkage and support settlement. Bridge analysis is subsequently presented with a detailed discussion of grillage analysis and higher order finite element analysis. An elaborate example is presented.

DAY 4: Friday 29 April

- **Bridges Part 2**

Various bridge structural types are treated on day 4. Slab and girder bridges are presented in the first lecture of the day, followed by two lecture hours on precast girder bridges. Box girders are treated next, and a lecture hour is spent on incremental launching in bridge construction.

Integral bridges have become popular in the South African market, which justifies a lecture presentation of this class of bridges. Two full lecture hours will be spent on an example of bridge analysis and design.

**Daily Schedule**

- Registration: 07:30
  (venue open from +-07:00)
- Start of sessions: 08:00
- MORNING SESSION
- Lunch: 13:00-13:45
- AFTERNOON SESSION
- End of sessions: 17:00

Schedule subject to change depending on the length of each topic.
CPD CREDITS
The seminar will be accredited for 1 Continued Professional Development credit per day with ECSA.

REGISTRATION
To register, please contact civilcourses@sun.ac.za

PAYMENT
Course fees: R10000 for all 4 days / R5000 for first or last 2 days
Students: Please email civilcourses@sun.ac.za to register

Payment must be received 5 working days prior to the course start date

NOTE: On registering online you will receive an automated mail. Bank details will be given if you have indicated payment responsibility as "SELF". An invoice will be created if you have indicated payment responsibility as "COMPANY".

PARKING:
Enter from Hammanshand Road at the traffic circle.

PLEASE EMAIL PROOF OF PAYMENT TO:
Mrs. Janine Myburgh
Stellenbosch University, Department of Civil Engineering
Email: civilcourses@sun.ac.za
Enquiries: 021 808 2080
Please indicate which course dates you plan to attend

WE LOOK FORWARD TO WELCOMING YOU AT THIS COURSE