

Pre-stressed Reinforced Concrete with CivilFEM for ANSYS

1. Program overview

Title: Pre-stressed Reinforced Concrete with CivilFEM for ANSYS – online course.

Director: Professor Juan José Benito Muñoz.

Department: Construction & Manufacturing Engineering (UNED University).

2. Eligibility and requirements

A degree is required, although university students in the last year of their course may be admitted with proof of their academic status. Some prior experience with the software is recommended or else previous enrollment in the CivilFEM for ANSYS Introductory Course.

3. Goals

The Pre-stressed Reinforced Concrete course provides many tools enabling engineers to readily and easily take into account the pre-stressing forces over structures when conducting advanced analyses and design processes.

The goal of this course is to provide a utility that allows the study of pre-stressing effects on concrete structures. CivilFEM calculates post-tensioned and pre-tensioned adherent inner tendons.

The module also provides the possibility to check by code cracking the axial load plus biaxial bending, shear and torsion.

This course originated as a collaboration project between UNED and Ingeciber, S.A., a company specializing in Computer Aided Engineering (CAE).

4. Contents

This course offers best-in-class features providing an easy-to-use interface to handle any type of pre-stressed concrete structure.

Based on this goal, the course comes with the following utilities:

- Pre-stressing steel materials library
- Pre-stressing tendon editing as second order Bezier curves in elevation and plan view
- Graphic geometric tendon editor
- Automatic calculation of short-term losses
- Automatic calculation long-term losses
- Automatic transfer of pre-stressing loads to the finite element model
- Load combinations
- Construction process (tendon activation and deactivation)
- Axial + bending check
- Cracking check
- Interaction diagram for pre-stressed cross sections

The content of each subject is detailed below:

- **PRE-STRESSED REINFORCED CONCRETE**

1. Introduction
2. Materials
3. Model generation
4. Support beam
5. Tendon editor
6. Losses calculation
7. Load transference
8. Combinations
9. Code checking and design

- **PRACTICAL APPLICATION EXERCISES WITH CivilFEM FOR ANSYS**

The exercises represent a review of the concepts introduced in the subjects taken until now, as well as the orderly use of the CivilFEM for ANSYS.

These exercises will be delivered to the tutor in order to get feedback and recommendations.

1. Pre-stressed slab bridge
2. Pre-stressed box bridge
3. Pre-stressed cylinder
4. Tendons in solid models
5. Code checking and design
6. Cracking

5. Schedule

35 hours of study. The course lasts from 1 to 6 weeks with full flexibility since no specific delivery date is indicated.

6. Methodology

Distance learning methodology, including pre-prepared study materials and bibliography, tutorials, audiovisual resources and practical application exercises.

7. Teaching Materials

Attendees will receive the teaching guide and the corresponding materials for each module, which will basically consist of the subject texts.

Furthermore, in order to complete the practical exercises and training, the educational version of CivilFEM for ANSYS will be provided by the course.

The course uses a virtual classroom as a training facility where study tools can be found, and also as the main communication channel with the attendees.

Other tools will also be used including audiovisual resources as well as other complementary documentation.

8. Attendee services

The teaching staff will respond to attendee inquiries via telephone, email, or in person. Phone tutorships will be available within the following hours:

Monday to Friday during office hours and always subject to tutor's availability.

9. Evaluation and grading criteria

Attendee evaluation will be performed through the Practical Application Exercises.

10. Certification

Certification will consist of a diploma from ICAEEC & Ingeciber indicating successful completion of the subject by the attendee as well as the grade obtained in the practical application exercises.

11. Teaching staff

Professor Juan José Benito Muñoz (director). Construction & Manufacturing Engineering Department (UNED).

Mr. Ronald Siat (tutor & coordinator). Ingeciber S.A.

Mr. Román Martín (tutor). Ingeciber, S.A.

12. Fees

Tuition fees are 450,00 €.

Current and former attendees of the UNED *Master's in Theoretical and Practical Application of the Finite Element Method and CAE Simulation* are eligible for a 33% discount.