

# Reinforced and Prestressed Concrete I

**Calendar:** 1st Year 2nd Semester

**Contact Hours:** 15h00T +30h00T/P +7h30EL/OT

## **Syllabus:**

Introduction to prestressing. Concepts related to prestressing. Prestressing design of isostatic beams (generalities; materials; conception and pressizing and detailing). Tension losses (Instant: by friction, by concrete deformation and at anchorage. Loss over time: creep, shrinkage and relaxation). Verification of safety for ultimate limit states. Verification of security to limit states. Models strut and tie: Zones of discontinuity and Bernoulli; calculation models, security checks, nodes; examples of models. Hyperstatic structures of prestressed concrete. Durability of concrete structures, with the analysis of the effects of carbonation, chlorides, corrosion, cracking, sulfates, alkalis and protective measures.

## **Intended learning outcomes of the curricular unit:**

It is intended that students become eligible for sizing of prestressed beams. Students must understand all procedures related to the security to the design limit states and service limit states of prestressed beams, including design and detail. Some basic knowledge about concrete structures are also revised to complement syllabus contents of Structural Concrete I (strut and tie models, punching shear

## **Demonstration of the syllabus coherence with the curricular unit's intended learning outcomes:**

It's an objective that students acquire skills to design prestressed beams, check punching, models strut and tie, the syllabus of the course addresses in detail:

- Review of concepts associated with the design of beams and columns to prestressing (acquired in the 1st cycle of studies), to ensure the base knowledge;
- The methodologies adopted in the design of prestressed beams;
- The methodologies adopted in the models strut and tie;
- The methodologies adopted in the punching design.

The contents lectured enable students to acquire the skills required for the domain associated with the stages of a design independently.

the built heritage, the mechanisms of degradation of buildings, materials and intervention technologies are fundamental to the practice of engineering acts related to the maintenance and rehabilitation of buildings.

The syllabus of the course allow you to develop the skills of students in the areas considered essential under the maintenance and rehabilitation of buildings, including giving them the knowledge and skills required to describe and characterize the materials and construction processes, define the objectives and methodologies of assistance, select appropriate rehabilitation and maintenance techniques.

## **Teaching methodologies (including evaluation):**

The teaching methodologies used are based on the expository method, using audiovisual media, to the theoretical contents complemented with the analysis of case studies related to constructive pathology with the technologies, the design and the execution of maintenance and rehabilitation works.

Case studies. A script will be prepared, by the Professor, with specific guidelines for the development of practical work. Throughout the semester, these will be accompanied by the teacher to clarify doubts and to foster critical analysis, developing the technical autonomy.

Conducting study visits to maintenance work or rehabilitation. Technical seminars. E-learning activities will be encouraged to research, analysis and comment on themes related to the syllabus.

Evaluation: test or written examination (60%); group work (40%). Minimum required value, 9.50, in each component of the evaluation.