

Subject Title: Prestressed Concrete

Basic information on the subject	
Academic unit:	Faculty of Civil Engineering
Subject title:	Prestressed Concrete
Level:	Master
Subject status:	Elective
Year of studies:	First year
Number of classes per week:	2+2
Credits - ECTS:	6
Time / location:	According to time table
Teacher:	Prof.ass. Dr. Kadri Morina
Contact details:	e-mail: kadri.morina@uni-pr.edu
Course description:	
Course description:	<p>History of prestressed concrete, ways of prestressing RC elements, types of prestressing of RC elements, materials used in Prestressed Concrete elements.</p> <p>Pre-stress force losses in pre-tensioning and in posttensioning. Losses due to friction, anchorage slip during the process of anchorage, losses due to elastic shortening, relaxation, time dependent losses - losses due to shrinkage and creep.</p> <p>Selection of cross section of the prestressed concrete element based on the criteria of Ultimate Limit State of the compression zone, criteria of crack width limitation.</p> <p>Design of prestressed members to EC2; design of members subject to shear, stress limitation in service life stage, steps required when checking the stresses.</p> <p>Securing the transfer zone of prestress force at both pretensioning and posttensioning.</p> <p>The limiting zone of the position of resultant force in prestressing tendons.</p> <p>Deformations (deflections) of prestressed members; approximate calculation of deflections in prestressed members.</p> <p>Restoration forces and the equivalent loads.</p> <p>Prestressing of statically indeterminate beams (continuous beams, single span frames).</p>
Subject objectives:	
Subject objectives:	<ul style="list-style-type: none"> • Understanding the advantages of prestressed concrete, reduction of tensions in RC. • Students are introduced with the ways and methodologies of prestressing, their application in construction practice, and enabled to understand the prestressing effect on stresses and cracks of certain RC members. • Students to be able to design in details a prestressed member for both the pretensioning and posttensioning and of different cross sections such as I, TT, U shape, or any other shape including hollow core sections. • Students to be trained to understand and calculate various effects contributing to losses of prestress force. • Students to be able to check stresses in elements both the phase of serviceability and throughout various construction

	<p>stages, to calculate the ultimate limit states of deformations as well as of shear forces.</p> <ul style="list-style-type: none"> • Students to be introduced with the overall concepts of design of prestressed elements by calculating in details a roof structural element and the main girder of the roof of prestressed concrete.
Expected learning outcomes:	<ul style="list-style-type: none"> - By the end of the course on the above mentioned program, the students shall be able to: - get involved in various assignments related to the design of RC pre-stressed structures. - in a timely manner and as in the initial design stage propose appropriate concepts and appropriate solutions for building structures. - to design an in detail completed roof cover of pretensioned concrete, design a roof main girder of posttensioned concrete, a continuous beam as well as a structural frame.

Workload that falls on the student (shall correspond with Student Learning Outcomes)			
Activity	Class hours	Days / Weeks	Total
Lectures	2	1	30
Theory / Laboratory work / Exercises	2	1	30
Practical work	-	-	-
Preparation for intermediate test	-	-	-
Consultation with the teacher	1	1	15
Field work			4
Test, seminar paper			2
Home work	2	1	30
Individual learning (in the library or at home)	2	1	25
Preparing for the final exam			10
Evaluation time (test, quiz, final exam)			1
Projects, presentations, etc.			3
Add any other activity that is not on the chart ...			
Total			150
Teaching methods:	Lectures, exercises and individual seminar work		
Evaluation methods:	First test: 10% Second test 10% Semester assignments / projects or other commitments 25% Regular attendance 5% Final exam 50% Total 100%		
Basic literature:	<ul style="list-style-type: none"> - Authorized lectures - EC-1 , Ec-2 		

Additional literature:	1. <i>Ivan Tomičić</i> : Betonske konstrukcije Zagreb 2. <i>J.Radić</i> : Betonske konstrukcije Zagreb
-------------------------------	---

Curriculum development	
Week	Lecture title
Week 1:	History of phenomenon of prestress
Week 2:	Ways of prestressing (Bonded pre-tensioning, cable post-tensioning, Thermo Electric Prestressing), Types of prestressing, Materials used in prestressed concrete.
Week 3:	Initial stage losses and second stage losses at pre-tensioning and posttensioning. Pre-stress force losses due to friction, due anchorage slip during the process of anchorage.
Week 4:	Losses due to elastic shortening, losses due to steel relaxation.
Week 5:	Time dependent losses – shrinkage and creep.
Week 6:	First evaluation test.
Week 7:	Second stage losses, time dependent losses, creep, shrinkage and steel relaxation.
Week 8:	Selection of cross section of the prestressed concrete element
Week 9:	Criteria of Ultimate Limit State of the compression zone, Criteria of crack width limitation.
Week 10:	Design of pre-stressed concrete members subject to bending and shear according to EC2.
Week 11:	Limiting stresses under condition of service life, steps required to check stresses.
Week 12:	Ensuring the transfer zone of the prestress force.
Week 13:	The limiting zone of the position of resultant force and of prestressing tendons – prestressing steel. Deformations (deflections) of prestressed concrete members; approximate calculation of deflections in prestressed members.
Week 14:	Restoration forces and the equivalent loads. Prestressing of the statically indeterminate systems.
Week 15:	Second evaluation test

Academic Policies and Code of Conduct
<p>Tools used during lessons should be cleaned and appropriately stored at the end of the class lesson.</p> <p>Mobile / smart phones and other electronic devices (eg iPods) should be turned off (or silent mode) and not exposed during school hours.</p> <p>Laptops and tablet computers are only allowed to be used silently; other activities such as checking personal email or browsing websites are prohibited.</p>