

Course: Seismic Design of Reinforced and Prestressed Concrete Structures

Lecturer: Professor Michael P. Collins

Tutor : Giorgio T. Proestos

Date: 03/04/2017 – 28/04/2017

Classroom: 1-17@ IUSS

Week	Date	Subject	Time	Tutorial	Time
1	April 3, 2017 Sala del Camino	1. Introduction Class Details First principles approach Three Basic Principles of Engineering Three Tool Boxes of Structural Engineers	9:00 12:00	2. Material Properties and Prestressing Techniques Plane sections hypothesis Six Stress Resultants and Six Deformation Components	13:30 15:30
	April 4, 2017 Sala del Camino	3. Axial load-deformation response comparison Prestressed Concrete, PC, members versus Reinforced Concrete, RC, members. Average strains and local strains. Reversed cyclic loading.	9:00 12:00	4. Linear Elastic Uncracked Response Predictions Accounting for creep, shrinkage and thermal strains. Influence of concrete tensile stresses in cracked reinforced concrete. 1. Examples of RC and PC calculations of axial response Assignment 1 out	13:30 15:30 15:30 16:30
	April 5, 2017 Sala del Camino	5. Moment-curvature response of RC and PC. Linear elastic uncracked response and non-linear response.	9:00 12:00	2. Assignment 1 in Assignment 2 out	13:30 15:30
	April 6, 2017 Sala del Camino	6. Stresses at service loads. Influence of non-linear thermal strains and shrinkage strains.	9:00 12:00	3. Examples of RC and PC calculations of flexural response	13:30 15:30
	April 7, 2017 Sala del Camino	7. Calculating deflections from curvatures. Members under combined P and M. Reversed cyclic loading.	9:00 12:00	4. Assignment 2 in Assignment 3 out	13:30 15:30
2	April 10, 2017 Sala del Camino, Classroom 1-17	8. The $P\Delta$ effect. Euler buckling for slender members	9:00 12:00	5. Examples of moment-area calculations	13:30 15:30
	April 11, 2017 Sala del Camino	9. Introduction to shear design and evaluation of reinforced and prestressed concrete structures	9:00 12:00	6. Assignment 3 in Assignment 4 out	13:30 15:30
	April 12, 2017 Sala del Camino	10. The compression field theory (CFT) for elements subjected to pure shear or shear and axial load	9:00 12:00	7. Example calculations CFT	13:30 15:30

	April 13, 2017 Sala del Camino	11. The modified compression field theory (MCFT) for shear. Program Membrane and program Response. Simplified MCFT for design and evaluation.	9:00 12:00	12. Use of CFT to predict shear response of beams. 8. Assignment 4 in Assignment 5 out	13:30 15:30 15:30 16:30
	April 14, 2017 Sala del Camino	13. Introduction to torsion. Torsional stiffness post- cracking. Equilibrium torsion and compatibility torsion definitions	9:00 12:00	9. Assign. 5 in and 6 out.	13:30 14:00
3	April 17, 2017	Holiday			
	April 18, 2017 Sala del Camino	14. The Truss Model for torsion and torsion in indeterminate structures	9:00 12:00	10. Assign. 6 in and 7 out Examples of torsion calculations	13:30 15:30
	April 19, 2017 Classroom 1-15	15. Design of disturbed regions. Influence of clamping stresses. Strut-and-tie models.	9:00 12:00	11. Sample calculations strut-and-tie models	13:30 15:30
	April 20, 2017 Sala del Camino	16. Restraint moments in statically indeterminate structures.	9:00 12:00	12. Assignment 7 in and Assignment 8 out	13:30 15:30
	April 21, 2017 Sala del Camino	17. Hardy Cross moment distribution and Muto analysis of frames. Fixed end moments caused by prestressing. Influence of sequence of construction.	9:00 12:00	13. Assignment 8 in and Assignment 9 out Sample calculations	13:30 15:30
4	April 24, 2017	Offices Closed			
	April 25, 2017	Holiday			
	April 26, 2017 Sala del Camino (morning)	18. Tools for the evaluation of shear critical structures. Critical element analysis.	9:00 12:00	19. Recent research on the response of reinforced concrete elements to reversed cyclic loading.	13:30 15:30
	Classroom 1-15 (afternoon)			14. Assignment 9 in and Assignment 10 out Sample critical element analysis with Membrane	15:30 16:30
	April 27, 2017 Sala del Camino	20. In search of elegance, reflections on the art of structural engineering.	9:00 12:00	15. Assignment 10 in Review Tutorial	13:30 15:30
April 28, 2017 Sala del Camino	Final Exam	13:00 16:00			

Notes: Class Final Mark Calculation

Final Grade = 0.5 FE + 0.5 A > or = FE

Total: 56 hours of lecture

25 hours of tutorial