

Plastic Analysis of Structures

1. Course number and name: 020PLSGS4 Plastic Analysis of Structures

2. Credits and contact hours: 2 ECTS credits, 1x1.25 hours

3. Name(s) of instructor(s) or course coordinator(s): Fouad KAADAH

4. Instructional Materials:

- a. Instructor's class notes
- b. Traite de Genie Civil de l'Ecole polytechnique federale de Lausanne Volume 2: Analyse des structures et milieux continus ; Mecanique des structures; Auteurs Francois Frey.
- c. Structural Analysis: A unified classical and matrix approach sixth edition; A Ghali, A. M. Neville and T. G. Brown; Spon Press 2009
- d. Structural and Stress analysis, second edition ; Dr T. G. H. Megson; Elsevier 2005
- e. Engineering mechanics of solids; Auteur: Popov, Prentice Hall 1990

5. Specific course information

- a. **Catalog description:** Introduce the plasticity criteria, the plastic hinge theory and the strategy to evaluate the plastic load factor.
- b. **Prerequisites or co-requisites:** 020RDMGS2 Strength of Materials
- c. **Required:** Required for Public Works and Transportation Specialty students.

6. Educational objectives for the course

a. Specific outcomes of instruction:

- Understand the conditions required to apply the theory of plasticity
- know how to calculate the plastic failure mechanism of a construction and to calculate the plastic failure load in order to evaluate its bearing capacity
- understand how plasticity theory is used in the verification of ultimate limit state of a construction

b. PI addressed by the course:

PI	1.1	1.2	1.3	1.4
Covered	yes	yes	yes	yes
Assessed				

7. Brief list of topics to be covered:

1. General introduction to plastic theory (1 hours)
2. Plastic traction-compression (3 hours)
3. Plastic bending (4 hours)

4. Plastic load capacity of indeterminate structure: Step by step method (2 hours)
5. Plastic load capacity of indeterminate structure: fundamentals theorems of plasticity (4 hours)
6. Calculation of reinforced concrete slabs by the yield-line method (1 hours)