Structures

1. **Course number and name:** 020STRGS4 Structures

2. **Credits and contact hours:** 6 ECTS credits, 3x1.25 hours

3. **Name(s) of instructor(s) or course coordinator(s):** Wassim RAPHAEL – Fouad KADDAH

4. **Instructional Materials:**
   a. Instructor class notes
   b. Traite de Genie Civil de l'Ecole polytechnique federale de Lausanne Volume 6: Analyse des structures et milieux continus ; Methode des elements finis ; Auteurs Francois Frey et Jaroslav Jirousek
   c. Modelisation de structures par elements finis Tome 2 : Poutres et plaques ; Auteurs : Gouri Dhatt et Jean Louis Battoz Hermes 1990
   d. Resistance des materiaux par la pratique, Tome 2 ; Jean Roux, Eyrolles 1995
   e. Calcul de structures, Jean Courbon, Dunod 1970
   f. Structural Analysis: A unified classical and matrix approach seventh edition; A Ghali, A. M. Neville, CRC Press Taylor & Francis Group 2017.
   g. Structural Analysis Fundamentals by Ramez Gayed and Amin Ghali, CRC Press Taylor & Francis Group 2022.

5. **Specific course information**
   a. **Catalog description:** Structural forms; influence lines; Rotations and Hardy-Cross Based Methods, Effect of temperature loads on structures, Analysis of Arches, Trusses, Continuous Beams, Plane Frames, Grids and spatial frames

   b. **Prerequisites or co-requisites:** 020RDMGS2 Strength of Materials

   c. **Required:** Required for all Civil Engineering students.

6. **Educational objectives for the course**
   a. **Specific outcomes of instruction:**
      - Identify the effect of a moving load on structures
      - Analyze structures with different methods
      - Study the influence of temperature loads on structures
      - Analyze different forms of structures such as arches
      - Learn how to properly model plane and spatial structures composed of wire elements such that trusses, continuous beams, plane and spatial frames, arches, and grids
      - Assimilate the numerical and computer implementation of the displacement method in order to create its own program
      - Use commercial structural analysis software reliably and efficiently

b. PI addressed by the course:

PI	1.1	1.2	1.3	1.4	6.3	6.4
Covered	yes	yes	yes	yes	yes	yes
Assessed						

7. Brief list of topics to be covered:
   a. Introduction (1.25 hours)
   b. Structural forms; influence lines (5 hours)
   c. Rotations Based Method (7.5 hours)
   d. Hardy-Cross Based Method (7.5 hours)
   e. Effect of temperature loads on structures (5 hours)
   f. Analysis of Arches (1.25 hours)
   g. General introduction to the displacement method (2 hours)
   h. Plane and spatial trusses (4 hours)
   i. Continuous beams (2 hours)
   j. Plane frames (6 hours)
   k. Grids (3 hours)
   l. Spatial frames (2 hours)
   m. Elastic stability of plane frames (3 hours)
   n. Software Structural analysis (1 hour)