Syllabus of Course 424 (CIV-ENV 424) STABILITY OF STRUCTURES

29 Class Hours
Winter 2023, MWF 12:30-1:45pm, Room F281

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DATE	HOURS	SUBJECT
		I. Buckling of Columns
Tu 1/3	1.5	Euler load, adjacent equilibrium and bifurcation (1.2).
F 1/6	1.5	Differential equation of beam-column (1.3).
M 1/9	1.5	Critical loads of perfect columns with various end conditions (1.4). Imperfect columns and the Southwell plot (1.5). Code specifications (1.6). Effect of shear (1.7p).
		II. Buckling of Frames
F 1/13	1.5	Stiffness and flexibility matrices of beam columns (2.1). Critical loads of frames (2.2). Large regular frames (2.4). Built-up columns (2.7p).
M 1/16		MLK Jr. Day – NO CLASS
W 1/18	1.5	Postcritical behavior (2.6p). High arches (2.8p).
		III. Dynamic Analysis of Stability
F 1/20	1.5	Vibrations of columns and divergence (3.1). Non-conservative loads and flutter (3.2p).
M 1/23	1.5	Pulsating loads and parametric resonance (3.3p). Definition of stability (3.5).
F 1/27	1.5	Theorems of Lagrange-Dirichlet and Liapunov (3.7p).
		IV. Energy Methods for Discrete Structures
M 1/30	1.5	Potential energy of discrete elastic systems (4.2p). Bifurcation buckling (4.3). Snapthrough and flat arches (4.4p).
F 2/3	1.5	Large-deflection postcritical behavior. Imperfection sensitivity (4.5p, 4.6p, 2.6p, 1.9r). Variational methods (5.1).
M 2/6	1.5	Beam on elastic foundation and axisymmetric shell buckling – variational (5.1).
F 2/10	1.5	Differential equation and potential energy of plates (7.1, 7.2p).
M 2/13	1.5	Rayleigh and Timoshenko quotients (5.3p, 5.40, 5.5p).
F 2/17	1.5	Large deflections of columns (5.9p).
		V. Thin Walled Beams, Plates and Shells
M 2/20	1.5	Potential energy and differential equation (6.1p).
F 2/24	1.5	Axial-torsional buckling and lateral buckling (6.2p, 6.3p).
M 2/27	1.5	Buckling of plates (7.3p).
F 3/3	1.5	Buckling of cylindrical shells (7.5, 7.7p). Elasto-plastic buckling, reduced and tangent modulus loads (8.1p).
M 3/6	1	**QUIZ** (60 minutes).
		VI. Non-Elastic Stability Problems
W 3/8	1	Steel and concrete codes (8.4c, 8.5c). Effect of creep (9.2c, 9.3c). Localization due to softening (13.2c).
W 3/15	**2**	**FINAL EXAMINATION 12:00 – 2:00pm – location TBD**

Notes: p = partial coverage only, c = comments only, r = read only, * = class will be taught by TA. TEXT: Zdenek P. Bazant and Luigi Cedolin, Stability of Structures: Elastic, Inelastic Fracture and Damage Theories, 3rd ed. World Scientific, New York 2010 (or 2nd ed., Dover Publications 2003, 1st ed., Oxford University Press 1991).

HOMEWORK: is assigned automatically as soon as the subject has been covered in the class. The homeworks are due within one week of the assignment. The grade will be based on a written final (120 min., 50% weight), a written midterm quiz (60 min., 25% weight) (no use of book of notes for both, except if virtual) and homeworks (25% weight).