AE 6101: Elastic Stability II
School of Aerospace Engineering
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Tuesdays and Thursdays, 1:30-2:45 p.m., Guggenheim 246

Dates	Topics	Source	Due Dates
Week of	**Elastica Theory for Beams**	**Article 3.7**	
Jan. 16	Equilibrium equations; constitutive equations and strain energy		
	Kinematical equations		
	Example of using elastica theory		
	Buckling of Thin-Walled Beam-Columns	**Article 3.8**	
23	Vlasov Theory for Thin-walled Prismatic Beams – I		
	Vlasov Theory for Thin-walled Prismatic Beams – II		
	Torsional-Flexural Buckling		
	Buckling of Beams on Elastic Foundations	**Chapter 6**	
30	Exact solution for simply-supported case		Problems 3: 15 – 18
	General case		

	Go over homework		
Feb. 6	Exact solution for fixed-fixed case		
	Exact solution for free-free case		
	Buckling of Rings and Arches	**Chapter 7**	
	Thin circular rings		
13	High circular arches		
	Alternate approach to rings and arches		Problems 6:1 – 5
	Energy approach based on geometrically exact equations		
20	Go over homework		
	Alternative formulation based on elastica theory		
	Shallow arches		
	Torsional Buckling of Shafts	**Chapter 8**	
27	Governing equations		
	Governing equations; strain energy		
	Clamped-clamped boundary conditions; applied loads and potential energy; nonconservative torques (tangential, axial)		
	Applied conservative torques (semi-tangential, quasi-tangential, pseudo-tangential); Cardan joint		Problems 7:2 – 5, 8, 9
Mar. 6	Go over homework		

	Boundary conditions when bending slopes of the ends are allowed to change (e.g. pinned ends and free ends); paradox of the axial and tangential torques		
	Effect of axial force – cantilever case with semi-tangential torque		
	Lateral-Torsional Buckling of Deep Beams	**Chapter 9**	
13	Pinned-pinned boundary conditions on out-of-plane bending, applied tip moment; restrained warping effect (a refinement)		
	Effect of initial curvature		
	Cantilever under applied tip moment: nonconservative moments (tangential, space-fixed); conservative moments (semi-tangential, quasi-tangential, pseudo-tangential)		
27	Cantilever under applied tip moment: conservative moments (semi-tangential, quasi-tangential, pseudo-tangential); Cantilevered, isotropic strip under applied tip force		Problems 8:1 – 7
	Cantilevered, isotropic strip under applied tip force		
	Go over homework problems		
Apr. 3	Cantilevered composite strip under applied, offset tip force		
	Cantilevered composite I-beam under applied, offset tip force		
	Rotating Rods, Beams	**Chapter 10**	
	Buckling of inwardly directed rotating beams		
10	Buckling of inwardly directed rotating beams		
	Nonconservative Problems	**Chapter 11**	

	Simple mechanical system: coalescence of frequencies		Problems 9:1 – 3, 5
	Go over homework set; cantilever beam under tangential force (Beck's problem)		
17	Beck's problem		
	Approximate solutions: Beck's and Leipholz's problems		
	Shaft instability under axial torque (various boundary conditions) – another paradox		Problems 10:1 – 4
	Deep beam lateral-torsional flutter instability under follower force		
24	Fully intrinsic equations		
	Examples: Beck's column and lateral-torsional flutter instability		
	Examples: lateral-torsional flutter instability – static solution		Problems 11:1 – 6
30	Final exam period, 2:50 – 5:40 p.m.		

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