FLORIDA INTERNATIONAL UNIVERSITY
Mechanical and Materials Engineering Department

Spring 2017 Advanced Vibration Analysis EML6223

The FIU Civility Initiative is a collaborative effort by students, faculty, and staff to promote civility as a cornerstone of the FIU Community. We believe that civility is an essential component of the core values of our University. We strive to include civility in our daily actions and look to promote the efforts of others that do the same. Show respect to all people, regardless of differences; always act with integrity, even when no one is watching; be a positive contributing member of the FIU community.

— Review:
- one degree of freedom systems.
- Free, forced, damped and undamped vibrations.
- Forced support vibration,

— Newton's law in non-inertial coordinate frame.
— Effective stiffness calculation for combined bar-beam-string-plate systems.
— Systems with multiple degrees of freedom. Some models. General analysis. Frequencies and mode shapes for undamped systems. Principal or normal coordinates. Damping in multidegree systems.
— Continuous systems with infinite number of degrees of freedom. Longitudinal vibrations of prismatic bars. Free and forced vibrations. Prismatic bar with a mass or spring at the end. The problem of bar impact.
— Torsional vibrations of shafts.
— Transverse vibrations of beams.
— Transverse vibrations of membranes and plates.
— Stability analysis. Introduction to Liapunoffs method.
— Non-linear conservative systems. Free and forced vibrations. Piecewise-linear systems. Numerical solution.
— Non-linear non-conservative systems. Self-excited vibrations. Van der Pol's equation.
— Parametric resonance. Mathieu's equation. The Ince-Strutt diagram.
— Inelastic (especially, viscoelastic) material damping and vibration attenuation using VEM

Book to be used S.S. Rao, Mechanical Vibrations, 5th Edition, Pearson-Prentice Hall Publishers.
Also notes will be provided from other books as well.

GRADES

Grades will be determined on the basis of

1 Midterm Exam	40 % each
HW	20 %
Final Exam	40 %

Letter Grades will be based as follows:

(A) 95 & above	(B+) 85-89	(C+) 73-76	(D) 60-66
(A-) 90-94	(B) 80-84	(C) 67-72	(F) below 60
	(B-) 77-79		

Please be on time to class and keep up with the work. There is a lot of work to cover and it will be difficult for you if you do not do the homework assignments. My office hours will be posted during the first week of classes. Please come to see me if you are having problems or have suggestions on how to improve this course.

We will be meeting twice a week T-R from 1230-145pm. Our meeting room will be EC1116, though that may change.

Office hours: **T-R: 2-330; W: 3-430 or by appointment**

THIS IS A PRELIMINARY SYLLABUS. ALL CHANGES WILL BE ANNOUNCED IN CLASS, INCLUDING ANY CHANGES IN CLASSROOM.