DYNAMICS OF STRUCTURES

CEE 744

Description:

3 credits, Introduction to basics of dynamics: lumped mass dynamics with various loading functions to develop the dynamic equations of motion, dynamics of multi-degree of freedom systems, dynamic analysis of structural systems, introduction to earthquake engineering,

Reference:

Dynamics of Structures, Anil K. Chopra, Prentice-Hall

Tentative course schedule:

(We start by looking at dynamics of a lump of mass - because actual buildings are generally modelled for structural analysis by using discreet degrees of freedom. -In CEE440 or in programs such asRISA, STAAD-II or SAP and ETABS a structure is modelled by defining "nodes" and "elements". The nodes have discreet degrees of freedom in movement and the elements are like springs that connect nodes together. *Each single degree of freedom can be considered as a "lump of mass" that has a unique degree of freedom in movement*.)

Dynamic equilibrium of unloaded lumped mass

Dynamics of lumped mass under harmonic loading

Dynamics of lumped mass under random dynamic loadings

(Now with the equations developed for solving how a lump of mass will move - we consider an entire structure to just be a bunch of lumps of mass connected together by spring elements. For each lump we have the equations describing how it moves. *We can combine those equations to define how the whole structure moves.)*

Multi-degree of freedom systems - equations of motion

Analysis of structural systems - natural frequencies
response under loading

Introduction to earthquake engineering

CLASS GUIDE

Problems:
Completed home problems are a required part of this course. Problem due date will vary depending on the length of the assignment. **The due dates will be absolutely definite - 50% maximum credit for late assignments!** *All problems must be completed by the end of the semester.*

Problem layout: I have to read your assignments so I like to see them in a form which is easy to follow.

1. Reserve the right margin of each sheet for comments to me describing what you are trying to do. (Similar to providing comments in a computer program.)

2. Results of particular steps or conclusions should be boxed to set them off from regular calculations.

3. Use only 8-1/2 by 11 paper, lined, unlined or the green structural grid paper.

Reading:
I generally cover material in lectures which I feel is the material you should understand. Many of the lectures will be based on material that is very well presented in the reference and you should consult references for detailed further information if desired. Many lectures will be based on material which is not in the reference.

Grading:
Grading will be proportionally based upon the following:

Final exam...30%
homework..70%

Text:
The following chapters/sections or topics will be studied from the Chopra reference.

Chapter 1: introduction and equation of motion
Chapter 2: response in free vibration
Chapter 3: response to harmonic loading, Parts A and B, response to periodic loads, Part D
Chapter 4: response to impulse, pulse
Chapter 5: time stepping methods
Chapter 6: response spectrum concept
Chapter 8: generalized systems
Chapter 9: multi-dof equation of motion
Chapter 10: natural freqs and mode shapes
Chapter 11: modal analysis