

Faculty of Engineering & Technology

Advanced Structural Analysis

Information :

Course Code : SCM 513

Level : Undergraduate

Course Hours : 3.00- Hours

Department : Department of Structural Engineering & Construction Management

Instructor Information :

Title	Name	Office hours
Associate Professor	MOHAMED GALAL KHALIL IBRAHIM ELSHERBINI	17
Assistant Lecturer	MOHAMMED TAHER ABDELHAMID MOHAMMED YOUSSEF	8

Area Of Study :

At the end of the course, the students will be able to:

Define the difference between the static and dynamic analysis.

Identify the dynamic properties of the structure.

Obtain the response of a SDOF system subjected to harmonic, rectangular pulse and general load.

Identify areas of high, medium and low seismicity in Egypt.

Identify the arrivals of P- and S- seismic waves using the record (time history) of an earthquake.

Calculate, analytically, the seismic response of SDOF systems to idealized ground accelerations (harmonic and rectangular pulses).

Recognize the peak-displacement, peak-velocity, and peak-acceleration portions of a seismic design response spectrum.

List the causes of plan- and vertical- structural irregularities of buildings.

Apply the simplified and multi modal response spectrum methods in seismic design of domestic structures using Egyptian Code for loads.

Description :

Cases of stress and strain in plane and in space, Stress-strain relation, Energy and variational principles, Introduction to the finite element method (element stiffness matrix and force vector, general equations of equilibrium, desemesterination of stresses).

Course outcomes :

a.Knowledge and Understanding: :

1 -	Explain the characteristics of earthquake ground motion
2 -	Outline earthquake quantification
3 -	Define Seismic terminology (glossary).
4 -	List causes of earthquake
5 -	Explain damage mechanics of earthquake
6 -	Define the structural dynamics properties

b.Intellectual Skills: :

1 -	Revise the structural systems of domestic structures critically to avoid plan and vertical irregularities.
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2 -	Evaluate, qualitatively, the effects of earthquakes with different magnitudes on structures.
3 -	Distinguish the effects of structure's dynamic properties on its seismic response.
c. Professional and Practical Skills: :	
1 -	Analyze domestic structures using the simplified response spectrum method
2 -	Analyze of domestic structures using the multi modal response spectrum method
d. General and Transferable Skills: :	
1 -	Manage time and meet deadlines

Course Topic And Contents :

Topic	No. of hours	Lecture	Tutorial / Practical
Introduction to structural dynamics.	4	3	1
Undamped free vibration analysis of SDOF systems.	4	3	1
Damped free vibration analysis of SDOF systems.	4	3	1
Response of SDOF system to harmonic loading	8	6	2
Free vibration analysis of MDOF systems.	4	3	1
The nature of earthquake ground motion. Seismicity of the world and of Egypt. Causes of earthquakes, basic glossary and terminology. Seismic waves.	4	3	1
Quantification of earthquakes. Characteristics of earthquake ground motions.	4	3	1
Damage mechanism of E.Q.	4	3	1
Seismic response spectral analysis of SDOF systems.	4	3	1
Seismic response spectral analysis of MDOF systems.	4	3	1
Linear static seismic lateral force procedures.	4	3	1
Architectural considerations.	4	3	1
ECP-201. Philosophy of design Egyptian Code for loads	8	6	2

Teaching And Learning Methodologies :

Lecture
Class Work

Course Assessment :

Methods of assessment	Relative weight %	Week No	Assess What
Assignments	10.00		
Final exam	40.00		
Mid Term Exam	30.00		
Participation	10.00		
Performance	10.00		

Course Notes :

Handouts by the lectures

Recommended books :

Structural Dynamics, Theory and Computations, Mario Paz
The Seismic Design Handbook, 2nd Edition, F. Naeim (ed.), Van Nostrand Reinhold, New York, 2003.