Module 1:- Introduction	
1	General.
2	Earthquake Loading.
3	Equivalent dynamic load to an actual earthquake load.
4	Cause of earthquakes. Magnitude, epicentre, p-waves, s-waves, Rayleigh waves, Richter scale.

LECTURE 1

INTRODUCTION:

- Deals with behavior of soil and foundations under dynamic loads (construction operations, mining, blasting etc.)
- Dynamic loads vary in their magnitude, direction or position with time.
- Analysis of the stability of earth supported/ retaining structures.
- Deals with material properties of soil under dynamic stress.
- Classical dynamics of elastic continuum and theory of vibrations are exclusive dynamic soil properties.
- Foundations designed w.r.t. dynamic loads constitute the “Dynamic Soil Structure Interaction” (SSI) studies.
- SSI encompasses two phenomena, studying-
    - Inertia forces developed in superstructure
    - Soil deformations caused by passage of seismic waves imposed on foundations.
- Approaches for Earthquake resistant design considering dispersal of ground properties, taking account into seismic data:
    - DETERMINISTIC METHOD
    - PROBABILISTIC METHOD
- Representative ground properties (values) are used for design in deterministic method.
- Ground property values are considered as stochastic variables and are used in design equation in form of distribution function in probabilistic method.

- During dynamic analysis, it is necessary to determine :
    - Seismic input force
    - Material properties
    - Method of analysis
    - Safety valuation on basis of analytical results.

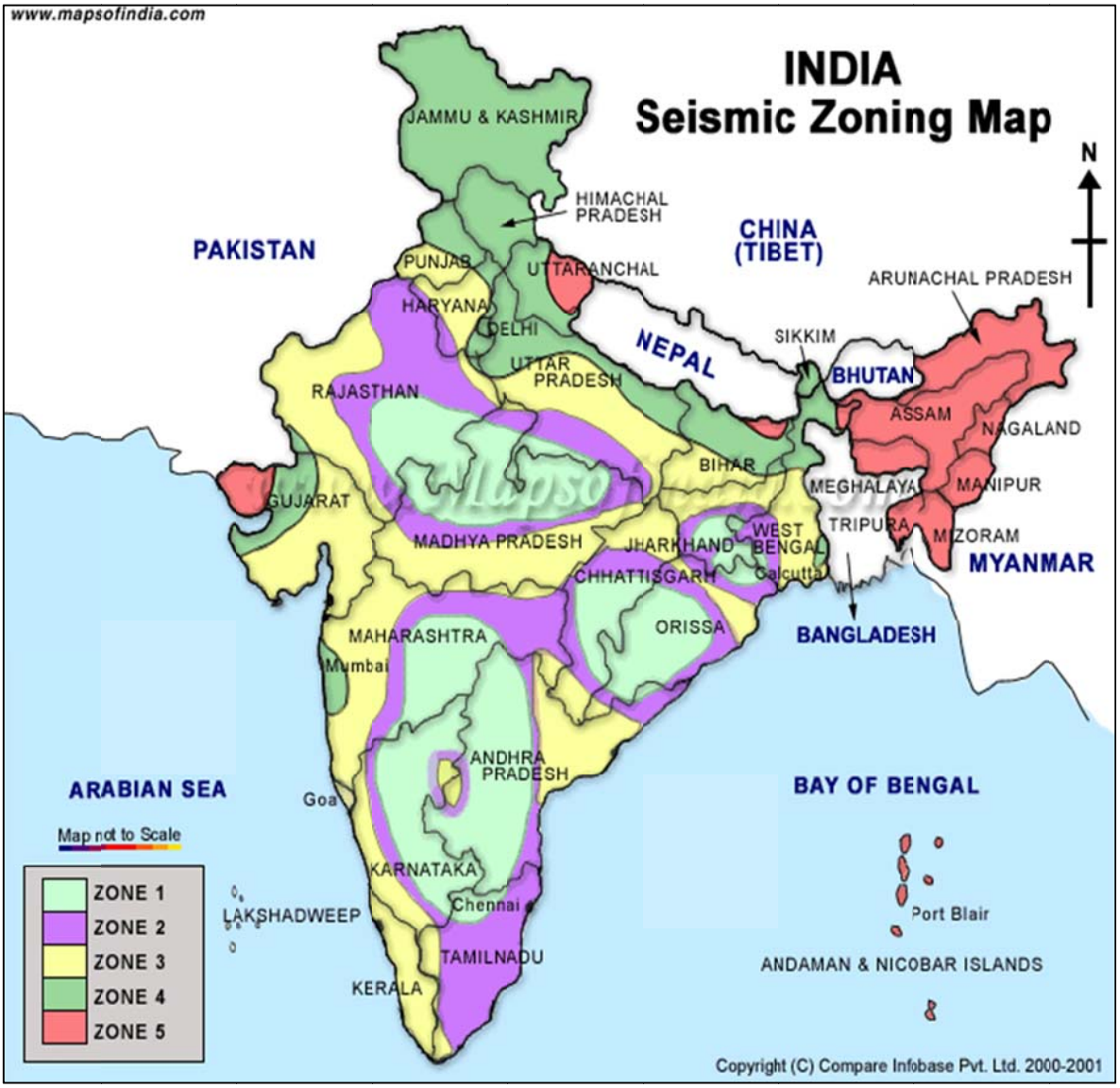

Fig. Seismic earthquake zoning map of India.

EARTHQUAKE LOADING :

- **Earthquake:** Phenomenon associated with shaking /movement in ground resulting from a sudden release of energy. It occurs when stresses building up within rocks of the earth's crust is released in a sudden jolt.

- A complete specification of design (future) earth quake motion comprises information on :
  - Severity of shaking
  - Spectral distribution of seismic wave energy
  - Duration of strong shaking
- The expected earthquake motion at any given site varies tremendously and a zoning map gives an idea of the size of earthquake to be used for design.
- Zoning maps usually give the magnitude of a design ground motion such as peak ground acceleration (PGA) for a certain probability of exceedence.
- In fact, spectral acceleration (SA) is far more significant for the response quantities of structure.
- The dynamic response of building to earthquake ground motion is cause of the earthquake –induced damage.
- Reducing the mass that earthquake could convert into high inertial forces, would have been the most reliable approach in seismic resistant design.