PHYSICS OF MATERIALS

Physics School Autumn 2024

Series 3 **27 September 2024**

Exercise 1 Elastic equilibrium condition in a two-phase material

Demonstrate that in a two-phase material (phases 1 and 2), the equilibrium condition is:

$$(1-f)\langle\sigma_1\rangle + f\langle\sigma_2\rangle = 0$$

where f is the volume fraction of phase 2.

This form of the general rule says that the volume average of stresses in a solid at equilibrium under no external forces equals zero.

Exercise 2 Strain tensor: cylindrical and spherical coordinates

Calculate the strain tensor in cylindrical and spherical coordinates.