

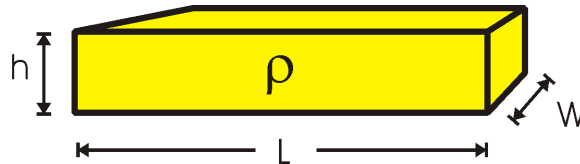
# Electronic Instrumentation

## Problem sheet: Gauge

2011/2012 module 2  
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MIEET 3º ano



A strip resistor of length  $L$ , width  $W$  and height  $h$ , made of a material with resistivity  $\rho$  (see picture above) has a resistance value of

$$R = \frac{\rho L}{Wh}.$$

The gauge factor is defined as

$$k \equiv \frac{dR/R}{dL/L}$$

- Show that the gauge factor  $k$  for a strip resistor with all parameters  $W$ ,  $h$  and  $\rho$  functions of  $L$  is equal to

$$k = 1 + 2\nu + \frac{d\rho/\rho}{\varepsilon_L},$$

with  $\varepsilon_L$  the strain along  $L$  ( $\varepsilon_L = dL/L$ ), and  $\nu$  Poisson's ratio defined as

$$\nu \equiv -\frac{dW/W}{dL/L} = -\frac{dh/h}{dL/L}.$$

- What is the gauge factor  $k$  for a material that has the property that the volume doesn't change when its length is altered (assume constant  $\rho$ ),

$$\frac{dV}{dL} = 0.$$

- A strip resistor of 1 k $\Omega$  is extended 1% in length. What is the new resistance value? (Assume constant volume and no Piëzo effect).