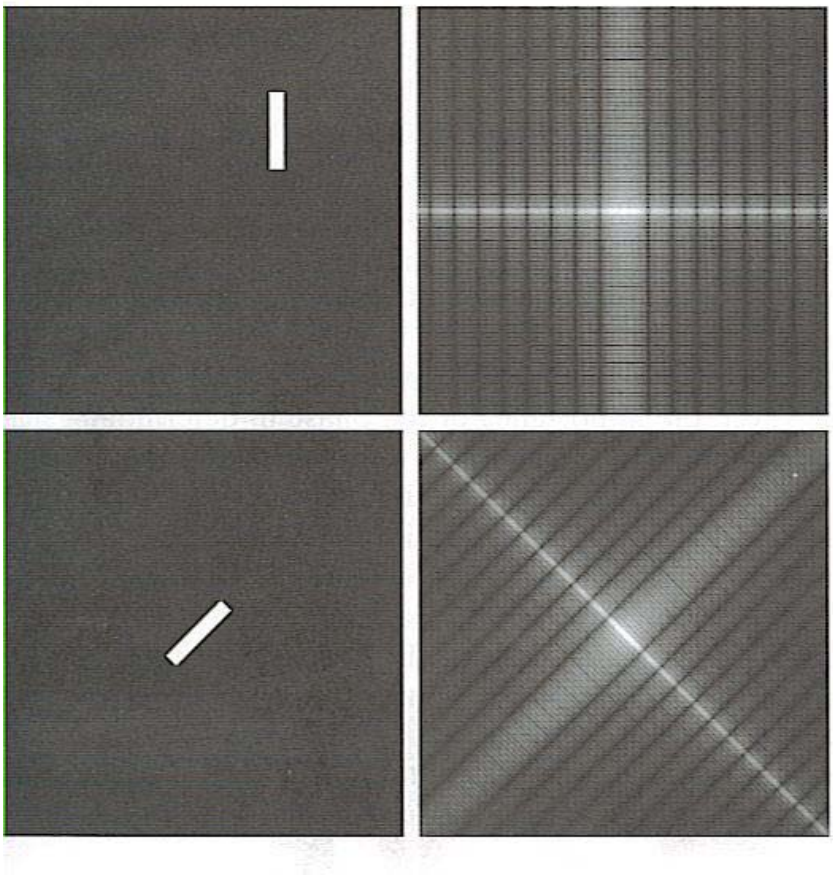
Meeting 6

Lectures 12 and 13- 1D/2D Fourier and Inverse Fourier Transforms

The present lectures are theoretical and aim to introduce the continuous and discrete Fourier transforms in 1D and 2D and to derive and prove their main properties such as periodicity, shifts and conjugate symmetry.

The work will require knowledge and skills of working with complex functions.

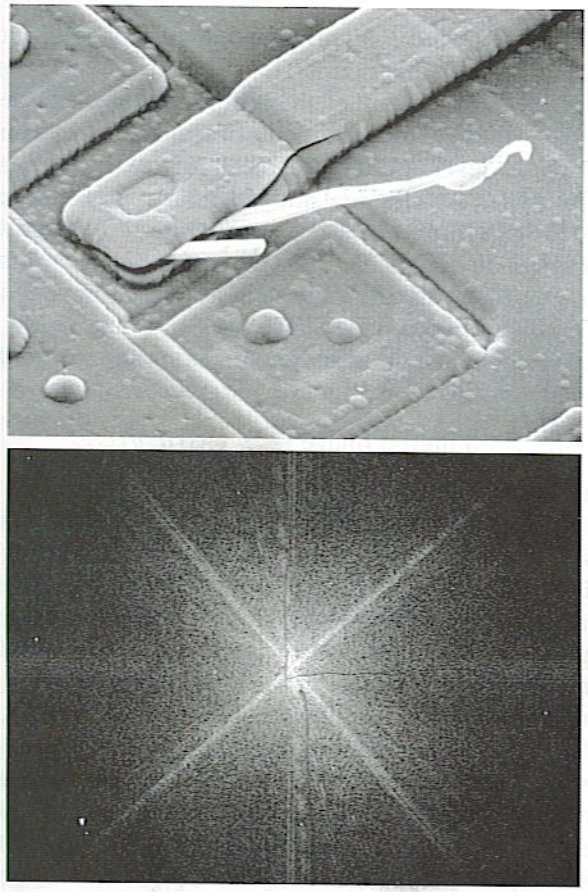


a b
c d

FIGURE 4.25
(a) The rectangle in Fig. 4.24(a) translated, and (b) the corresponding spectrum. (c) Rotated rectangle, and (d) the corresponding spectrum. The spectrum corresponding to the translated rectangle is identical to the spectrum corresponding to the original image in Fig. 4.24(a).

Figure 1. a) An image; **b)** the spectrum, of the image, in the frequency domain; **c)** The image from a, rotated on 45%; **d)** the spectrum in the frequency domain. (The image is a courtesy of Digital Image Processing-R.C.Gonzalez, R.E.Woods, 2nd Ed, Prentice Hull, 2002)

As one may tell the rotation of the image leads to rotation of the image in the frequency domain. A translation will keep the image in the frequency domain without any change.



a
b

FIGURE 4.4
(a) SEM image of a damaged integrated circuit. (b) Fourier spectrum of (a). (Original image courtesy of Dr. J. M. Hudak, Brockhouse Institute for Materials Research, McMaster University, Hamilton, Ontario, Canada.)

The image is a courtesy of Digital Image Processing-R.C.Gonzalez, R.E.Woods, 2nd Ed, Prentice Hull, 2002.