



F-06 Principles of Superposition & Reciprocity in Flexure

(1 **BM-01** Beam Material Set1; 1 **PC-01** Pin-Support Column-1; 1 **RC-1** Roller-Support Column-1)

Aims: This experiment is designed to allow students to observe, measure and compare the static displacements of beams (simply supported or cantilevered) under the action of two or more loads (point loads, moments and/or distributed loads) when these loads are applied individually and when they are applied simultaneously.

Learning Outcomes:

After performing this experiment students will be able to:

- (i) Use the Spreadsheet supplied to compare the predicted displaced shape (based upon the double integration method) with its experimentally observed counterpart.
- (ii) Verify that the principle of reciprocity holds for any paired combination of point load results from the number of point loads used to perform the experiment, (eg if only two point loads used, there is one instance of verification possible; with three point loads used, there are three instances of verification possible; with four point loads used, there are ${}^4C_2 = 6$ instances of verification possible)
- (iii) Reinforce their understanding of equilibrium of forces in the context of flexure, through measurement of reaction forces

Equipment/Resources Required:

- (i) TM-00 (Pixi with window frame in “landscape” configuration with transparent film & pens; Set of two adjustable assemblies of stainless steel weights; Digital Scales for weight force evaluation)
- (ii) Specimen set of beams and cantilevers
- (iii) A digital camera – Better than 8Mega Pixel preferred (Hi-Res phone cameras are suitable)
- (iv) **xyRectify** photogrammetric software on a suitable Notebook, Laptop or PC – if desired.

