

# ESTIMATING MONTHLY MEAN DAILY GLOBAL AND DIFFUSE SOLAR RADIATION (CASE STUDY: CONSTANTINE)

T.E.BOUKELIA and M.S.MECIBAH

*Laboratory of Mechanics, Mechanical Engineering Department, University of Constantine 1  
Constantine, Algeria*

**ABSTRACT.** In this study, with Constantine station (Algeria) as a case study, five generalized empirical models taken from the literature correlating the clearness index data with the sunshine fraction records for estimating the global solar radiation in the first part, and diffuse fraction data with clearness index records for estimating diffuse solar radiation. The new regression constants of these ten models were estimated by the curve estimation technique. Using five statistical parameters, comparison between measured and calculated values of global and diffuse solar radiation has been performed. According to the results; the cubic model is found as the most accurate model for the prediction of global and diffuse solar radiation on a horizontal surface in Constantine in which:

$$\left(\frac{H_G}{H_0}\right) = 6.616 - 30.720\left(\frac{S}{S_0}\right) + 50.107\left(\frac{S}{S_0}\right)^2 - 26.424\left(\frac{S}{S_0}\right)^3$$
$$\left(\frac{H_D}{H_G}\right) = 1.460 - 5.326\left(\frac{H_G}{H_0}\right) + 9.726\left(\frac{H_G}{H_0}\right)^2 - 6.736\left(\frac{H_G}{H_0}\right)^3$$

Moreover, this model with the new developed coefficients may then be used for locations in Algeria with similar meteorological and geographical characteristics at which solar data are not available.

**KEYWORDS:** *Global radiation, Diffuse radiation, Regression coefficients, Statistical analysis.*