Istanbul Technical University
Department of Civil Engineering
Hydraulics and Water Resources Engineering Graduate Program
Stochastic Modelling Techniques in Hydrology
Spring Semester

## Assignment Five

Fourier function in order to remove periodicity of a time series data is shown as

$$x_{ij} = \sum_{j=1}^{h} A_j \sin\left(\frac{2\pi ij}{n}\right) + B_j \cos\left(\frac{2\pi ij}{n}\right)$$

1. Derive coefficients $A_j$ and $B_j$ of Fourier's Formula by using the Least Square Method.
2. Plot the graph of harmonic number versus Mean Square Deviation $(\frac{A_j^2+B_j^2}{2})$
3. Find the optimal harmonic number for training (calibration) data.
4. Use fitted function to predict values of time series for the remaining (testing) data.
5. Show the performance of the model by plotting the 1:1 line between observed and predicted values, by determining the Mean Square Error (MSE) and by calculating the Coefficient Efficiency (CE).