CE669: Term/ Project Assignment (Weightage: 10%)

A. A city administration is planning to establish an industrial infrastructure. For this purpose, it has to conduct the meteorological study (wind speed and direction) of region using WRF model. You are advised to submit a proposal/report to employ WRF model that should include model description, objective, methodology, and procedures for model validation. The methodology should describe working principle, installation, domain and parameter setup, model execution, data post-processing in WRF.

B. Now imagine that the WRF model has given you the wind speed and direction data (see xL sheet – showing your Roll number, and corresponding data sheet number). The data shows both observed and WRF-generated data (wind speed and wind direction). Report the following:

(i) Validation of WRF data (only for wind speed) against observed data on the following criteria (Table 1; see more details in references (a) https://www.sciencedirect.com/science/article/pii/S1309104215000720?via%3Dihub and (2) https://www.sciencedirect.com/science/article/pii/S2212095522000025

Table 1
Statistical parameters

Parameter	Formula
Slope	$\text{Slope} = \frac{\sum(Cp-\overline{Cp})(Co-\overline{Co})}{\sum(Cp-\overline{Cp})^2}$
Intercept	$\text{Intercept} = \overline{Co} - slope*\overline{Cp}$
FB	$FB = 2*\frac{(\overline{Co}-\overline{Cp})}{(\overline{Co}+\overline{Cp})}$
NMSE	$NMSE = \frac{\overline{(Co-Cp)^2}}{\overline{Co}*\overline{Cp}}$
r	$r = \frac{(Co-\overline{Co})(Cp-\overline{Cp})}{\sigma_{Cp}*\sigma_{Co}}$
d	$d = 1 - \frac{[(\sum((Co-Cp)^2)]}{\sum((abs(Cp-\overline{Co})+abs(Co-\overline{Co})))^2}$

Cp is model generated data and Co is observed data, σ is the standard deviation

(ii) Plot the wind-rose (described in class) from your WRF data. Software link: https://www.weblakes.com/software/freeware/wrplot-view/

(iii) Interpret the above wind-rose for prevalent wind direction and suggest where should the industrial infrastructure be located with respect to the city centre to have the minimal impact of industries on the city population.

Deadline for submission of report in pdf by 24.4.2025. Report should not be more than 7 pages.