

ENGN8120 System Modelling Assignment

Due: 5th October, 2018 at 5pm

Photovoltaic (PV) Solar Panel Modelling [50 marks]

Given the increasing deployment of renewable energy generation like solar PV, it is important to be able to accurately forecast the power and energy generation from these assets. In this assignment we are investigating the **clear-sky** forecasting of solar PV using whatever techniques you believe are most appropriate. Please complete the following questions to the best of your ability:

- What do you believe are the modelling variables that need to be taken into account when developing a model for the clear-sky forecasting of solar PV power and energy generation? [5 marks]
- Based on your answer to (a), develop a mathematical model that allows you to forecast the instantaneous clear-sky power generation of a solar PV panel of arbitrary area, at any time of day, in any location on earth. [20 marks]
- Based on your answer to (b), calculate and plot the instantaneous clear-sky power generation of a 1m² solar PV panel for the entire day of the equinox in Canberra. [5 marks]
- Based on your answer to (c), calculate the clear-sky energy generated by a 1m² solar PV panel for the entire day of the equinox in Canberra. [5 marks]
- If an average home in Canberra consumes 7500kWh per year, and assuming clear-sky conditions are always present, how large would the solar array have to be in order to satisfy their energy generation needs? [10 marks]
- What additional modelling variables would need to be taken into account to developing a more general model for the forecasting of solar PV when clear-sky conditions may not be present? [5 marks]

Important notes:

- Please detail any assumptions you make in order to complete this assignment.
- Please cite any resources you use in order to complete this assignment.