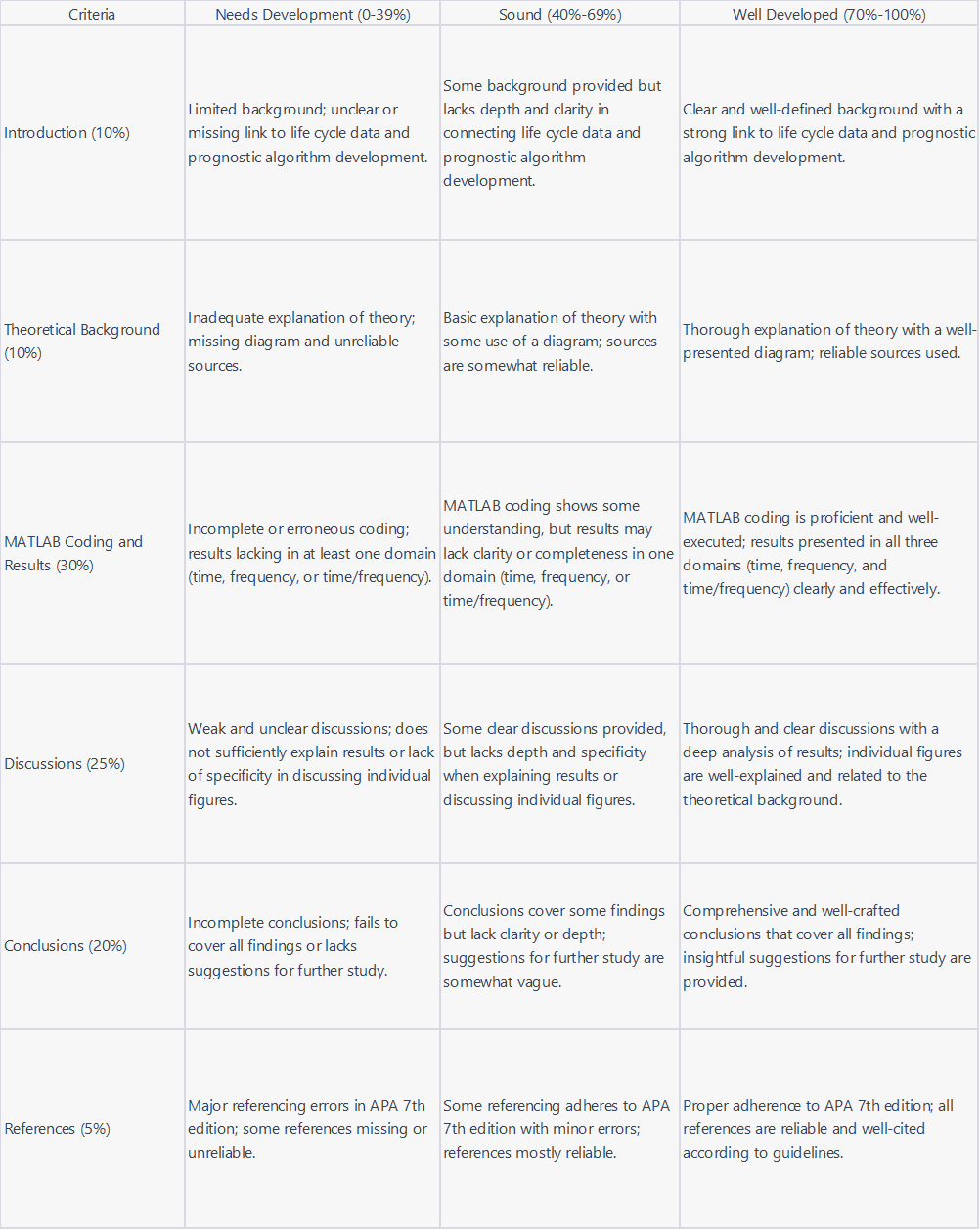
|  |  |
| --- | --- |
| Module title | **ENGINEERING COMPUTATION** |
| title | **“Wind Turbine Bearing Prognostic Data Analysis”** |
| Assessment task details and instructions | **See Appendix 1** |
| Assessment Criteria | **See Appendix 1**  You should look at the assessment criteria to find out what we are specifically looking at during the assessment. |
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**APPENDIX 1**

**“Wind Turbine Bearing Prognostic Data Analysis”**

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| Assessment Task: Wind Turbine Bearing Prognostic Data Analysis  Instructions: In this assignment, you will be analysing data collected from a wind turbine bearing to develop a prognostic algorithm for predicting its Remaining Useful Life (RUL) in real time. The dataset contains vibration signals from a 2MW wind turbine high-speed shaft with a 20-tooth pinion gear [1]. The goal is to predict the RUL using the exponential degradation model and real-time measurements.  Dataset: The dataset comprises vibration signals acquired each day for 50 consecutive days, with a time step of 24 hours (one day). The sampling rate of the vibration signal is 97656 Hz. You can access the wind turbine bearing data from the following  link: https://github.com/mathworks/WindTurbineHighSpeedBearingPrognosis-Data  Task Instructions:  1. Data Exploration: a. Import the dataset and explore the vibration signals in the time domain. b. Calculate the mean value and peak-to-peak value for each day and plot these values sequentially.  2. Spectral Kurtosis Analysis: Plot the spectral kurtosis values for the vibration signals.  3. Time-Domain Analysis: Plot the following statistical parameters (Mean, Standard Deviation, Kurtosis, Peak-to-Peak, and RMS) as functions of time.  Note:  • The exponential degradation model will predict the Remaining Useful Life (RUL) based on parameter priors and the latest measurements.  • Historical run-to-failure data can be used to estimate the model parameter priors, but it is not mandatory for this assignment.  • The model should be able to detect significant degradation trends in real time and update its parameter priors when new observations become available.  • The typical prognosis workflow includes data import and exploration, feature extraction and postprocessing, feature importance ranking and fusion, model fitting and prediction, and performance analysis.  Please ensure you follow the instructions carefully and provide well-organized plots and analyses for each step of the assessment task.  [1] Bechhoefer, Eric, Brandon Van Hecke, and David He. "Processing for improved spectral analysis." Annual Conference of the Prognostics and Health Management Society, New Orleans, LA, Oct. 2013. |

**Marking Criteria**

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