

ACMA6000 Coursework Feedback

Student	Iona Cousins
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Assessment	Manufacture of Wind Turbine Blade
Final mark	62 / 100

1. Engagement with Literature Skills — 12/20

The report demonstrates relevant independent research covering aerodynamics, NACA profiles, existing turbine designs, materials, manufacturing, cost and environmental considerations. Sources are used to support several design decisions, including lift-to-drag behaviour, tip-speed ratio, blade dimensions, material properties and manufacturing processes. There is also use of recognised technical information from organisations such as NASA and the US Department of Energy. However, the reference base relies heavily on general websites and manufacturer or commercial sources, with relatively limited peer-reviewed engineering literature. Source presentation is also inconsistent in places. A stronger proportion of journal, textbook and recognised technical literature, used more critically throughout the report, would significantly improve this criterion.

2. Knowledge and Understanding Skills — 18/30

The submission demonstrates a sound basic understanding of blade aerodynamics, NACA 4412 geometry, tip-speed ratio, chord variation, blade twist, material behaviour and composite manufacturing. The spanwise twist development is a useful feature, and the report explains why twist decreases towards the tip. The manufacturing discussion also demonstrates understanding of aluminium processing and GFRP vacuum infusion/RTM, including relevant defects and mitigation. However, the treatment is incomplete across the required material families because an equivalent ceramic manufacturing route is not developed. More importantly, the mechanical analysis does not progress from aerodynamic loading to bending stress, torsional stress and design-specific safety factors. This limits the depth of demonstrated technical understanding.

3. Cognitive and Intellectual Skills — 11/20

There is evidence of decision-making through the weighted decision matrix and subsequent comparison of materials. When aluminium and GFRP obtain the same initial score, the report uses strength-to-weight ratio, fatigue behaviour, manufacturing considerations and cost to justify the final GFRP choice rather than selecting arbitrarily. This shows some engineering judgement. However, several conclusions remain qualitative because the aerodynamic loading results are not carried through into a complete structural assessment, and the cost estimates are not developed into a design-specific blade cost. The comparative analysis therefore provides a reasonable basis for the recommendation but lacks the quantitative depth and critical integration evident in stronger submissions.

4. Practical Application Skills — 14/20

The submission contains genuine practical work, including detailed NACA 4412 coordinate calculations, five radial blade stations, chord and twist distributions, aerodynamic loading, bending-force, bending-moment and torque calculations, and CAD development. The calculated geometry is transferred into a SolidWorks blade model, which satisfactorily demonstrates the required external blade skin and prior CAD competence; no internal blade structures were required. The principal limitation is that the practical analysis stops before calculating bending stress, torsional stress and safety factors, despite these being required by the coursework. The cost analysis also relies mainly on approximate online ranges rather than linking material cost to the calculated quantity of material in the blade. These omissions significantly reduce the completeness of the engineering workflow.

5. Transferable Skills for Life and Professional Practice — 7/10

The report follows a recognisable engineering structure with an abstract, contents, literature review, design specification, material selection, manufacturing, cost analysis, mechanical analysis, comparative analysis, CAD section, conclusion, references and appendices. Figures, calculation tables, manufacturing diagrams and SolidWorks images support the written discussion. The conclusion states the final GFRP and vacuum-infusion recommendation clearly. Professional presentation is reduced by grammatical and formatting inconsistencies, reference errors and a relatively brief recommendations section. More rigorous proofreading and clearer presentation of the technical evidence would improve the overall standard.

Mark Summary

Assessment category	Maximum mark	Mark awarded
Engagement with Literature Skills	20	12
Knowledge and Understanding Skills	30	18
Cognitive and Intellectual Skills	20	11
Practical Application Skills	20	14
Transferable Skills for Life and Professional Practice	10	7
Total	100	62

Overall Feedback

The submission demonstrates genuine engineering effort, particularly through the NACA 4412 coordinate calculations, spanwise chord and twist development, aerodynamic loading calculations and SolidWorks blade-skin modelling. The weighted material-selection process is also used thoughtfully to support the final GFRP choice. However, the work remains incomplete in several important areas. The literature base is less academically robust than stronger submissions, a ceramic manufacturing route is not developed, the cost analysis is not tied closely to the actual blade material quantity, and the mechanical analysis stops before bending stress, torsional stress and safety-factor calculations. The most important improvement would be to complete the structural verification using the existing load calculations and then use those results to confirm or refine the proposed design.