

ACMA6000 Coursework Feedback

Student	Charlie Williams-Richards
Student ID	2307328
Assessment	Manufacture of Wind Turbine Blade
Final mark	78 / 100

1. Engagement with Literature Skills — 16/20

The submission demonstrates a broad and generally strong body of independent research covering aerodynamic profiles, blade dimensions, composite behaviour, environmental effects, manufacturing routes, cost modelling and structural performance. Sources include relevant academic research, technical publications, Granta EduPack data and recognised industry material, and the literature is frequently used to establish actual design inputs rather than simply providing descriptive background. The references also include recent work on composite blade development and ceramic processing together with established wind-turbine cost and materials literature. The principal limitation is that the quality and referencing format are not completely consistent across all sources, with some general online material alongside stronger scholarly evidence.

2. Knowledge and Understanding Skills — 23/30

The report demonstrates very good breadth of technical understanding across the areas required by the assignment. Aerodynamic principles are applied to calculate the rotor radius and geometry from a justified 2 MW design target, 8 m/s wind speed, air density and power coefficient, producing a calculated radius of 71.24 m. The submission also demonstrates sound understanding of NACA 4412 geometry, chord and thickness variation, environmental exposure, fatigue, density and material performance. Importantly, the manufacturing investigation covers all three required material families: aluminium casting/extrusion, silicon-carbide sintering/additive manufacture, and CFRP vacuum infusion/RTM, with process limitations and defects related specifically to blade manufacture. A higher mark would require more complete technical development of some assumptions and stronger integration between the structural results and subsequent design refinement.

3. Cognitive and Intellectual Skills — 15/20

There is good evidence of analysis, comparison and justified engineering judgement. The material-selection process first uses technical weighting based on density, tensile strength and fatigue resistance and then separately considers cost, environmental impact, manufacturability and recyclability. CFRP ranks first technically, while aluminium performs better practically, and the final choice is justified by the structural priorities of the blade rather than by a single score alone. The comparative analysis also evaluates mechanical performance, scalability, environmental impact, defects and safety before confirming CFRP and vacuum infusion. The main limitation is that the calculated structural and cost results are primarily used to confirm the initial concept rather than to perform a clear second design iteration.

4. Practical Application Skills — 16/20

There is substantial evidence of completed practical engineering work. The appendices contain rotor-sizing calculations, chord and thickness distributions, NACA 4412 coordinates, Granta screening, weighted material calculations, lift and drag calculations, bending stress, torsional stress and material safety-factor calculations. The student also develops the calculated geometry into Autodesk Inventor using five scaled NACA 4412 profiles and produces the required blade skin/shell through a loft operation. This fully satisfies the intended CAD requirement; there is no deduction for not modelling internal spar caps, shear webs or detailed laminate structure. The main limitations are that the stress calculations use simplified solid-section approximations and that the raw-material cost comparison is presented mainly per cubic metre rather than being fully connected to the calculated material quantity of the proposed blade.

5. Transferable Skills for Life and Professional Practice — 8/10

The report is professionally organised, with an abstract, clearly numbered sections, figures and tables, appendices for aerodynamic calculations, material selection, mechanical analysis and CAD development, and a conclusion that brings the different strands of the work together. The student clearly distinguishes preliminary analysis from final design validation, which is good professional engineering practice, and the recommendations identify sensible areas for further development. The main presentational limitations are recurring grammatical issues, some equation-formatting problems and occasional awkward phrasing.

Mark Summary

Assessment category	Maximum mark	Mark awarded
Engagement with Literature Skills	20	16
Knowledge and Understanding Skills	30	23
Cognitive and Intellectual Skills	20	15
Practical Application Skills	20	16
Transferable Skills for Life and Professional Practice	10	8
Total	100	78

Overall Feedback

This is a strong and well-evidenced submission with good integration of independent research, Granta-based material selection, manufacturing-route comparison, aerodynamic calculations, stress analysis and CAD blade-skin development. A particular strength is the complete consideration of metal, ceramic and composite manufacturing routes together with a structured material-selection process that distinguishes technical performance from practical and environmental considerations. The main limitations are the simplified structural assumptions, the relatively limited link between raw-material cost calculations and the actual material quantity of the proposed blade, and the absence of a clear redesign stage after the analysis. The strongest improvement would be to use the completed calculations to refine one or more design parameters and demonstrate quantitatively how the revised design improves performance or cost.