

ACMA6000 Coursework Feedback

Student	Bethan Dubber
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Assessment	Manufacture of Wind Turbine Blade
Final mark	77 / 100

1. Engagement with Literature Skills — 15/20

The report demonstrates a wide range of relevant independent research across aerodynamics, existing wind turbines, material properties, environmental conditions, manufacturing, cost and structural behaviour. Academic and technical sources are used to support specific design decisions and numerical inputs rather than appearing only as background reading. Published GFRP strength data are subsequently used as benchmarks within the safety-factor assessment, while vacuum-infusion cost information supports the manufacturing discussion. This demonstrates effective engagement with research-informed literature. The mark is limited mainly by uneven source quality and some inconsistencies in citation and reference presentation. More consistent use of authoritative academic and technical sources, together with tighter referencing, would strengthen this criterion further.

2. Knowledge and Understanding Skills — 22/30

The submission demonstrates strong understanding of blade aerodynamics, NACA 4412 geometry, rotor sizing, chord variation, material behaviour, environmental effects and structural loading. The design assumptions are clearly stated, including the 5 MW output, wind speed, power coefficient, lift coefficient, air density and NACA 4412 camber and thickness parameters. These inputs are then applied to ten spanwise sections, showing that the concepts have been understood and used rather than merely described. Material selection also considers strength, stiffness, fatigue, density, cost, manufacturability and environmental considerations. The main limitation is that the manufacturing discussion focuses much more strongly on composite processes, particularly vacuum infusion and RTM, while the coursework requires consideration of metals, ceramics and polymer composites. Fuller technical treatment of metal and ceramic routes would strengthen this criterion.

3. Cognitive and Intellectual Skills — 15/20

There is clear evidence of engineering judgement and comparison. The weighted decision matrix considers several candidate materials and selects GFRP because it provides the best balance of mechanical performance, density, durability and cost rather than simply choosing the strongest material. The cost section also shows good judgement by recognising that the solid-blade model overestimates actual blade mass and cost and therefore using the result comparatively rather than presenting it as an exact final cost. Importantly, the structural analysis identifies sections with safety factors below unity and acknowledges the limitations of the simplified analysis. This demonstrates critical awareness. A higher mark would require the next step: using those findings to modify the design assumptions or geometry and then showing quantitatively how the revised design performs.

4. Practical Application Skills — 17/20

This is the strongest element of the submission. The work includes rotor sizing, chord calculations over ten sections, camber and thickness calculations, upper and lower airfoil coordinates, blade-section graphs, aerodynamic forces, bending moments, bending stresses, torsional moments, safety factors and SolidWorks modelling. The CAD requirement is well met: the calculated ten-section geometry is transferred into SolidWorks to create the blade skin/shell, demonstrating the intended application of prior CAD competence. No internal blade structures were required for this assessment. Section properties from the CAD model are also used in the bending-stress calculations, strengthening the connection between analysis and design. The

principal improvement would be to use the structural results to refine the external blade design or assumptions and then demonstrate the effect of that change.

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

The report is logically structured and professionally organised, with an abstract, contents, literature review, design specification, material selection, manufacturing, cost, mechanical analysis, comparative analysis, CAD section, conclusion and appendices. Figures, equations, graphs and CAD images are used effectively to communicate the engineering process, and the report follows a clear progression from research to design and analysis. Some grammatical issues, inconsistent table and figure references, and unresolved labels reduce the professional finish. More careful proofreading and final document checking would improve this criterion.

Mark Summary

Assessment category	Maximum mark	Mark awarded
Engagement with Literature Skills	20	15
Knowledge and Understanding Skills	30	22
Cognitive and Intellectual Skills	20	15
Practical Application Skills	20	17
Transferable Skills for Life and Professional Practice	10	8
Total	100	77

Overall Feedback

This is a strong engineering submission with particularly good evidence of completed technical work. The report develops from justified design assumptions through ten-section NACA 4412 calculations into CAD blade-skin modelling, cost comparison, aerodynamic loading, bending and torsional calculations and safety-factor evaluation. The material and process decisions are generally supported by evidence and engineering reasoning. The main limitations are the comparatively limited treatment of metal and ceramic manufacturing routes and the fact that the structural analysis identifies inadequate safety factors in some sections without then completing a redesign or recalculation. The most important improvement would be to use those results to refine the design and demonstrate quantitatively how the revised geometry or assumptions improve performance.