

ACMA6000 Coursework Feedback

Student	Luke Huzzey-Evans
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Assessment	Manufacture of Wind Turbine Blade
Final mark	82 / 100

1. Engagement with Literature Skills — 16/20

The report demonstrates strong independent engagement with relevant literature across aerodynamics, materials, environmental effects, manufacturing, blade cost and mechanical behaviour. The source base includes recognised textbooks, NACA technical literature, NREL and Sandia reports, recent peer-reviewed papers, manufacturer data and wind-industry studies. Particularly good use is made of recent literature to support selective CFRP reinforcement, rain erosion, VARTM manufacture and end-of-life considerations rather than relying only on lecture examples. Sources are also used to establish quantitative material properties and production assumptions. The mark is not higher because some commercial supplier information is necessarily used for material costs and there are a few areas where the literature could be integrated more critically rather than primarily supporting chosen inputs.

2. Knowledge and Understanding Skills — 24/30

The submission demonstrates very good understanding of the full design-manufacture problem. Aerodynamic principles are used to convert the assumed demand into a calculated rotor radius before adopting a practical nominal radius. The design uses five NACA 4412 sections with justified aerodynamic parameters, and the theoretical zero tip chord is deliberately replaced by a finite value to produce a workable CAD geometry. Material behaviour is understood beyond simple strength ranking: aluminium, silicon carbide, GFRP and CFRP are compared using density, stiffness, strength, fatigue, cost and manufacturability, and the report recognises that the material with the highest individual property is not necessarily the best overall blade material. Manufacturing knowledge is also strong across metal, ceramic and composite routes. The remaining limitation is that the final hybrid laminate is still conceptual; fibre orientation, laminate thickness and actual composite section properties are not developed sufficiently to produce a final composite safety factor.

3. Cognitive and Intellectual Skills — 16/20

The submission contains good evidence of genuine engineering judgement. The weighted decision matrix gives CFRP the highest numerical score, yet the report does not simply choose a full CFRP blade. Instead, its higher material cost is considered alongside performance, leading to the more balanced recommendation of GFRP for the main blade and CFRP only in high-stiffness regions. This is a good example of using the decision matrix as a decision-support tool rather than allowing it to dictate the outcome. The cost analysis reinforces this trade-off quantitatively, while the comparative analysis clearly explains why aluminium and silicon carbide are rejected for the main structure. A higher mark would require a more explicit optimisation or sensitivity study showing how changing material distribution, geometry or laminate assumptions affects the final design.

4. Practical Application Skills — 18/20

This is an especially strong area of the submission. The report demonstrates a complete engineering workflow from design input through geometry, material selection, cost, structural analysis and CAD. Five NACA 4412 profiles are generated in Excel and transferred into Siemens NX to produce the external blade geometry. The CAD evidence fully satisfies the intended requirement; no internal blade detail is required for this criterion. The cost analysis is also particularly strong because it estimates planform area, laminate volume, mass and actual raw-material costs rather than stopping at generic price comparisons. Mechanical analysis includes relative velocity, sectional lift/drag, root bending moment, bending stress, torsional stress

and a screening safety factor. The only significant limitation is that the stress demonstration uses an assumed root geometry and screening material strength, while the final design is a hybrid composite.

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

The report is clearly structured and professionally presented. It contains a focused abstract, logical sectioning, tables, equations, graphs, Siemens NX evidence, appendices and a concise conclusion and recommendation section. Technical information is generally communicated efficiently, and assumptions are distinguished from validated results. The conclusion appropriately describes the design as preliminary and recommends subsequent structural, fatigue, CFD, erosion and experimental validation rather than overstating the results. There are some minor formatting and presentation inconsistencies, and some calculation equations are not rendered as clearly as they could be, but the overall professional standard is good.

Mark Summary

Assessment category	Maximum mark	Mark awarded
Engagement with Literature Skills	20	16
Knowledge and Understanding Skills	30	24
Cognitive and Intellectual Skills	20	16
Practical Application Skills	20	18
Transferable Skills for Life and Professional Practice	10	8
Total	100	82

Overall Feedback

This is a very strong and well-integrated engineering submission. Its principal strengths are the justified hybrid GFRP/CFRP material strategy, broad manufacturing comparison, geometry-linked raw-material costing, complete preliminary aerodynamic and structural calculations, and clear Siemens NX blade development. The work consistently demonstrates that design decisions have been made from evidence rather than simply copied from standard examples. The principal limitation is that the final structural verification still uses a simplified assumed root geometry and screening strength rather than the actual proposed composite laminate. The strongest next step would therefore be to define the hybrid laminate and section properties and repeat the structural assessment using those final design values.