

ACMA6000 Coursework Feedback

Student	Samuel Roberts
Student ID	2316051
Assessment	Manufacture of Wind Turbine Blade
Final mark	84 / 100

1. Engagement with Literature Skills — 18/20

This is one of the strongest literature bases in the cohort. The report uses recognised engineering textbooks, British and international standards, government publications, peer-reviewed research, manufacturer data and specialist wind-industry sources. The material-property comparison is particularly well grounded, with metals supported by standards and product data, composites by recognised materials literature and wind-blade research, and silicon carbide by specialist ceramic literature. The student also independently introduces IEC 61400-2 and explains why it is relevant to the proposed small wind turbine rather than using a standard without context. Literature is repeatedly converted into design decisions, including fatigue data, erosion evidence and commercial turbine benchmarks. The only limitation is that a small number of cost inputs rely on commercial websites, although this is reasonable for current supplier pricing.

2. Knowledge and Understanding Skills — 25/30

The submission demonstrates excellent technical understanding across aerodynamics, materials, manufacturing, operating conditions, fatigue and small-wind design. Rotor geometry, chord and twist are derived using a recognised aerodynamic approach rather than simply assumed, and the manufacturing consequences of simplifying the theoretical chord distribution are explained. Material behaviour is treated particularly well: specific properties, fatigue behaviour and fracture toughness are distinguished from simple absolute strength, and this understanding is used to explain why a ceramic can have excellent stiffness yet remain unsuitable for the blade. Manufacturing knowledge is similarly strong across metals, ceramics and composites. The main limitation is that the mechanical analysis does not include the explicit spanwise lift/drag calculations and torsional-stress calculation specified in the coursework, although the alternative standards-based thrust and root-load analysis is technically well justified.

3. Cognitive and Intellectual Skills — 18/20

The quality of engineering judgement is particularly strong. CFRP obtains the highest weighted decision-matrix score, but the student does not automatically select it. Instead, the relatively small reduction in blade mass is weighed against a raw-material cost more than three times that of GFRP, leading to the justified selection of E-glass/epoxy. This is exactly the kind of critical use of a decision matrix expected at this level: the numerical ranking informs the decision but does not replace engineering judgement. Similar reasoning is applied to manufacturing, where process capability, defects, tooling and production volume are compared before VARTM is selected. The comparative analysis also integrates mechanical performance, productivity, defects, health and safety and end-of-life. The work could move higher with a completed design iteration or sensitivity study.

4. Practical Application Skills — 15/20

There is substantial and sophisticated practical engineering evidence. The submission includes rotor sizing, annual-energy estimation, five-station chord and twist derivation, NACA 4412 geometry, material masses, detailed raw-material costing, a standards-based root-load model, centrifugal loading, bending stress and material-specific safety factors. Cost analysis is unusually well developed, connecting calculated blade mass and constituent material prices directly to cost per blade and rotor. The CAD requirement is fully satisfied through multiple external blade views showing the complete blade skin and geometry. However, the coursework explicitly asks for lift/drag calculations and torsional stress. The report discusses lift-to-drag behaviour but does not calculate sectional lift/drag forces, and no completed torsional-stress analysis is

evidenced. Those omissions prevent this criterion from matching the otherwise exceptional standard of the practical work.

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

The report is exceptionally clear in its organisation and generally professional in presentation. The technical argument progresses logically from the form requirement through aerodynamic design, material selection, manufacturing, costing and structural assessment to the final recommendation. The report also distinguishes clearly between assumptions, standards, calculated values and limitations. The recommendations are specific rather than generic, identifying root-joint FEA, fatigue coupon testing, leading-edge protection and recyclable resin or fibre-recovery research as appropriate next steps. Tables and figures are purposeful and generally well captioned. A slightly stronger final visual integration of CAD dimensions and more consistent graphical presentation would be required for the highest mark in this category.

Mark Summary

Assessment category	Maximum mark	Mark awarded
Engagement with Literature Skills	20	18
Knowledge and Understanding Skills	30	25
Cognitive and Intellectual Skills	20	18
Practical Application Skills	20	15
Transferable Skills for Life and Professional Practice	10	8
Total	100	84

Overall Feedback

This is one of the strongest submissions assessed. Its major strengths are the quality of independent research, use of relevant engineering standards, technically derived chord and twist geometry, strong material-selection reasoning, detailed manufacturing evaluation, design-specific cost modelling and well-justified structural screening. Particularly strong is the decision to reject CFRP despite its highest weighted score because the relatively small additional mass benefit does not justify the substantially higher material cost. The main limitation is quite specific: the otherwise strong mechanical analysis does not include the sectional lift/drag and torsional-stress calculations requested in the coursework. Completing those calculations would make the engineering chain considerably more complete.