

# ACMA5002 Coursework Feedback

Student: Grant Brooks

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Selected topic/product/project: Injection-Moulded TPU Smartphone Protective Case

Final mark: 86/100

## 1. Engagement with Literature Skills — 14/15

The report demonstrates excellent engagement with relevant academic, industrial and technical literature covering DFM, DFA, injection moulding, TPU behaviour, simulation, QFD, FMEA, DOE and manufacturing economics. Sources are used to establish measurable design requirements and support decisions concerning wall thickness, draft angles, impact behaviour, material grade, processing temperatures, tolerances and tooling assumptions. The literature review is analytical and directly connected to the subsequent design and validation work rather than being presented as general background. Recognised sources and material-manufacturer information are used effectively, and the discussion acknowledges the limitations of static FEA and generic simulation data. Only minor improvement is needed through greater use of formal standards and stronger verification of a small number of market and cost assumptions.

## 2. Knowledge and Understanding Skills — 27/30

The submission demonstrates excellent understanding of DFM, DFA, thin-wall injection moulding, polymer material behaviour, dimensional control and production economics. The CAD design applies a uniform 1 mm wall, 1.5° draft, large corner radii, snap-fit retention and functional cut-outs, while the shrinkage calculation determines compensated cavity dimensions. Material selection is particularly rigorous, using six progressive CES constraints to identify an ether-aromatic TPU grade that meets mechanical, environmental and processing requirements. The report also demonstrates detailed understanding of mould filling, warpage, surface quality, assembly efficiency, tolerance capability and end-of-life recovery. The main limitation is that the recommended 1.5 mm production wall thickness is not implemented in a revised final model, and the manufacturing route from material preparation through inspection is not presented as a single complete process plan.

## 3. Cognitive and Intellectual Skills — 27/30

The analytical work is comprehensive and well connected. QFD converts customer needs into quantified engineering targets, while the FMEA identifies priority risks and links the highest-risk items to simulation and process controls. The DOE systematically varies melt and mould temperatures across three runs and evaluates fill time and warpage, correctly identifying melt temperature as the dominant tested parameter. The report recognises that process optimisation alone cannot resolve the warpage of the 1 mm design and uses this evidence to recommend a geometry change. The DFA calculation provides quantified evidence of assembly efficiency, and the economic analysis evaluates tooling cost, unit cost, profit margin and payback volume. A higher mark would require implementation and re-simulation of the proposed 1.5 mm design and a broader DOE incorporating geometry or gate-location variables.

## 4. Practical Application Skills — 13/15

The submission demonstrates excellent practical application of Fusion 360, CES EduPack and engineering calculations. The CAD work includes a dimensioned drawing, specified tolerances, internal and external views, draft, radii and functional features. Shrinkage compensation is calculated for the critical cavity dimensions. The FEA includes a justified 50 N corner load, stated constraints, material definition, mesh refinement and a minimum safety factor of 2.73. Injection-moulding simulations compare three parameter combinations, achieve complete filling and evaluate warpage and visual defects. The results are interpreted and connected

to a clear design recommendation. Practical evidence would be stronger if the proposed thicker design had been modelled and re-tested, and if numerical stress, displacement and mesh results had been presented more fully alongside the safety-factor output.

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

The report is clearly structured and includes an abstract, contents page, lists of figures and tables, logically numbered sections, professional tables, technical figures, discussion, conclusion and bibliography. The writing communicates the engineering process effectively and maintains strong traceability from requirements to evidence and final decisions. The FMEA risk matrix, constraint tables, DOE summary and economic-analysis tables make the work accessible and professionally useful. However, the report would benefit from more concise synthesis, a dedicated recommendations section and a clearer final manufacturing process plan. Some claims about the anticipated effect of increasing wall thickness are presented with more certainty than the completed evidence supports, because the modified geometry was not actually simulated.

### Mark summary

| Assessment category                                    | Maximum mark | Mark awarded |
|--------------------------------------------------------|--------------|--------------|
| Engagement with Literature Skills                      | 15           | 14           |
| Knowledge and Understanding Skills                     | 30           | 27           |
| Cognitive and Intellectual Skills                      | 30           | 27           |
| Practical Application Skills                           | 15           | 13           |
| Transferable Skills for Life and Professional Practice | 10           | 5            |
| Total                                                  | 100          | 86           |