A2 Technology & Design Unit 2 Amplification – System Design

General

- Candidates following the system and control route are required to design and manufacture a technological product or system.
- Candidates following the product design route are required to design and manufacture a product.
- It is the responsibility of the teacher to ensure candidates identify a problem or need and ensure it provides sufficient scope to meet the assessment criteria and that the topic chosen allows sufficient scope and intellectual challenge appropriate to an A2 course.
- A technological product must have an energy source to make it function and include a control system comprising of an input, process and output. A product will draw on content of the Product Design unit.
- A portfolio should accompany the practical component with written and graphical information produced on not more than 20 A3 pages. Students can present the portfolio in an electronic format.
- This unit draws on the knowledge and skills covered in all units but must reflect the chosen option in A2 Unit 1. It represents approximately 60 hours of work and will be internally assessed and externally moderated.

Additional guidance to staff.

It is the responsibility of the teacher, alongside the candidate to ensure that the choice of **PROBLEM** is suitable and provides sufficient scope to enable the candidate to obtain top band marks in each section. Teachers should ensure that candidates present work within the stated 20 A3 page limit.

This Unit starts with a focus on a suitable **PROBLEM** to be solved. The candidate's work should reflect solutions to the identified problem as opposed to a **PRODUCT** redesign.

Well annotated Candidate Record Sheets can assist in the endorsement of marks.

Identification of problem, need and design specification
 	
High (5–6)
 	
• Problem/need clearly identified leading to precise brief.
 	
• A fully detailed design specification allowing development of ideas.
 	
Medium (3–4)
 	
• Problem/need identified with appropriate design brief.
 	
• A suitable design specification allowing some development of ideas.
	Identification of problem, need and design specification
	
	High (5–6)
	
	• Problem/need clearly identified leading to precise brief.
	
	• *Candidates could consider written, photographic and/or video evidence of:*
	  • *Client/end user interview;*
	  • *First hand experience of the problem identified;*
	  • *Case study review and analysis.*
	• *The Design Brief should be presented as a result of critical analysis and is a statement of the problem, clearly stipulating the candidate's intentions to design. It should also state the parameters of the solutions to be developed.*

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Low (1–2)
 	
• Problem/need superficially identified, imprecise brief.
 	
• An incomplete specification, allowing limiting design development.
 	
Zero should be awarded for a response which is not worthy of any credit.
	• A fully detailed design specification allowing development of ideas.
	
	The quality of the specification is integral to all sections within the unit. A highly detailed specification will ensure that the candidate can access high band marks for design, manufacture and ultimately testing and evaluation.
	
	• *The specification must include **quantifiable/ measureable/ specific** points which will assist candidates when they come to design, test and evaluate the product.*
	
	• *Suggested points for inclusion could include:*
	  • *Function/System*
	  • *Aesthetics*
	  • *Ergonomics*
	  • *Manufacture*
	  • *Anthropometrics*
	  • *Materials*
	  • *Safety*
	  • *Economics/Cost*
	  • *Maintenance*
	  • *Quality control and assurance*
	  • *Other appropriate points relating to the chosen problem area*

Initial Ideas – selection of idea(s) for development **High (14–20)** • Analyse in detail existing solutions. • Produce viable new solutions incorporating a broad range of control systems or product design features. • Produce viable new product outcomes integrating either system and application of function or product design features, displaying innovation. • Detailed evaluation of each idea based on relevant criteria.	**Initial Ideas – selection of idea(s) for development** **High (14–20)** Analyse in detail existing solutions. • Analysis of existing products (at least 3) should be closely related to the design specification and other relevant factors. • Suitable conclusions should be drawn to assist and focus. • Produce viable new solutions incorporating a broad range of control systems features • *Solutions and sub-systems should be of A2 complexity and reflect the content of Unit A2*

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• An appropriate selection of a solution for development. **Medium (7–13)** • Analyse with some detail existing solutions. • Produce some generally viable and new solutions incorporating a moderate range of control systems or product design functions. • Produce some generally viable and new product outcomes either with reasonable integration of system and development in application of function or reasonable product design features, displaying innovation. • Some evaluation of ideas based on generally appropriate criteria. • A potentially viable selection of solution for development. **Low (1–6)** • Limited analysis of existing products. • Produce some limited solutions incorporating control systems or product design functions. • Produce some product outcomes with either limited integration of system and application of function or limited product design features, displaying innovation. • Superficial evaluation of ideas based on limited criteria. • An inappropriate selection of solution for development. Zero should be awarded for a response which is not worthy of any credit.	*1:Systems and Control. Present a broad range (minimum 3) of viable concepts addressing all aspects of the design specification. Sub system design, to include block diagrams, partial circuit diagrams & key elements of the system are encouraged. These should be suitable for development in Section 3. Full systems are not required in this section.* • Produce viable new product outcomes integrating product design features, displaying innovation. • *Emphasis placed on both product and system.* • *Viable new outcomes should be presented and capable of being developed to be highly functional, of A2 standard and show aesthetic, ergonomic and innovative features.* • *Innovation should be incorporated within the system and the product* • Detailed evaluation of each idea based on relevant criteria. • *Evaluation could be on-going throughout this section or by presenting conclusions to direct and guide development.* • An appropriate selection of a solution for development. • *At the end of this section candidates should state which system(s)/concept(s) they intend to develop further. Conclusions should be presented to direct development.*

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Development **High (14–20)** • The control system or product is highly developed to outcome. • Clear evidence of numerical analysis in development. • The product is highly developed to integrate with the user and environment. • Clear evidence of ergonomic and aesthetic development. • Present a detailed plan of manufacture. • Produce at a high level working drawings for manufacture. **Medium (7–13)** • The control system or product is reasonably developed to outcome. • Some evidence of numerical analysis in development. • The product is developed with some integration with the user and environment. • Some evidence of ergonomic and aesthetic development. • Present with suitable detail a plan for manufacture. • Produce suitable working drawings for manufacture. **Low (1–6)** • The control system or product is superficially developed to outcome. • Limited evidence of analysis in development.	**Development** **High (14–20)** **All work within this section, by definition, should be <u>developmental</u>, focusing on the pathway to outcome of the concept(s) from the previous section. Whilst the focus of development should draw from the content of the chosen Unit A2:1 section, <u>credit can only be awarded</u> where candidates have <u>applied</u> subject knowledge <u>directly</u> to the <u>development</u> of their <u>solution</u>.** • The control system is highly developed to outcome. • *Development within this section should include investigative modelling to inform and support decisions taken by the candidate. Modelling (Platform modelling, Software simulations, bread boarding, PCB and flowchart development) is essential to assist candidates in the development of their chosen system(s).* • Clear evidence of numerical analysis in development. • *Ideally this data is best placed throughout all pages within the development section rather than segregated and presented in isolation from the developmental context in which it is to be used.* • *Numerical analysis could be presented through incorporating analysis of some of the following:* o *Refer to Unit A2:1 Systems Design* o *other related numerically focussed design characteristics pertinent to the presented outcome(s)* • The product is highly developed to integrate with the user and environment • Clear evidence of ergonomic and aesthetic development. • *The housing should be developed to A2 standard and include innovative characteristics taking consideration of manufacture and assembly, function, ergonomics and aesthetics.* • *The system and its housing should be highly developed to integrate with the user and the environment.* *A clear 3D pictorial representation of the housing should be presented together with the final circuit diagram, flowchart and PCB by this stage.* • Present a detailed plan of manufacture. 1 page • *This plan should identify specific materials and sizes, specific components and specific*

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• The product is developed with limited integration with the user and environment. • Limited evidence of ergonomic and aesthetic development. • Present with limited detail a plan for manufacture. • Produce with limited detail working drawings for manufacture. Zero should be awarded for a response which is not worthy of any credit.	*manufacturing processes, assembly and finish to be used.* • *This should be written in the future tense and outline in detail the sequence of the manufacturing process.* • Produce at a high level working drawings for manufacture. • *Produced in 1st or 3rd angle with appropriate, achievable dimensions for sub-assembly and/or full assembly. Details and dimensions should be provided and be sufficient to enable an independent party to manufacture the assembly and/or sub assemblies.* • *This should be produced and presented in conjunction with the plan for manufacture.*

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Manufacture **High (27–40)** • Produce a high quality outcome in an appropriate range of components or product design features and materials. • Demonstrate clear competence in a range of production skills and processes. • Produce a highly functional product. • Record in detail modifications made during manufacture. **Medium (13–26)** • Produce a good quality outcome in an appropriate range of materials and components or product design features. • Demonstrate reasonable competence in a range of production skills and processes. • Produce a functional product. • Record some detail of modifications made during manufacture. **Low (1–12)** • Produce a low quality outcome in an appropriate range of materials and components or product design features. • Demonstrate a limited competence in a range of production skills and processes. • Partly functional product. • Limited and superficial record of modifications made during manufacture.	**Direction from the teacher should allow for a range of skills and processes for high band marks.** • Produce a high quality outcome in an appropriate range of components and materials. • *A high quality outcome is considered to be highly functional and demonstrates aesthetic, ergonomic and innovative characteristics to A2 standard. The system must be fully integrated with the housing.* • Demonstrate clear competence in a range of production skills and processes. • *High quality work should be manufactured in appropriately justified materials using a range of making skills and processes.* • *Both hand and CAM skills are to be encouraged for candidates to access the top marks band.* • *Final outcome produced using eg. Router, Laser, 3D printer only will require additional workshop skills to achieve high quality and therefore access top band.* • Produce a highly functional product. • *The final outcome should be highly innovative in its function, capable of being tested as it fulfils its principal purposes. Video evidence, in situ, demonstrating its use is encouraged.* • *Video evidence can be used to support moderation.* • Record in detail modifications made during manufacture. • *Annotated photographic evidence may be used to record changes made during manufacture.* • *Hidden details of the product should be recorded in the portfolio to assist moderation.* • *Storyboards of manufacture are not required.* **Note: Manufacturing should take place within the candidate's own school or college. Accreditation cannot be given for manufacturing completed outside the school or college workshop unless the teacher has directly supervised such work**

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Zero should be awarded for a response which is not worthy of any credit.	
Evaluation **High (10–14)** • Produce a high level critical and objective evaluation of the outcome. • Carry out and present an extensive range of detailed testing, showing meaningful conclusions. • Make high level proposals for further development as an outcome of testing. **Medium (5–9)** • Produce a satisfactory evaluation of the outcome which is mainly objective. • Carry out and present some outcomes of tests, which show mostly meaningful conclusion. • Make appropriate proposals for further development. **Low (1–4)** • Produce a limited evaluation of the outcome. • Show limited evidence of meaningful testing with only simplistic conclusions. • Demonstrate limited awareness of possibilities for further development. Zero should be awarded for a response which is not worthy of any credit.	**Evaluation** **High (10–14)** **This section is worth 14% of the unit marks and should be afforded an appropriate time allocation** • Produce a high level critical and objective evaluation of the outcome. • *Objectivity could be driven by the content of the candidate's design specification.* • Carry out and present an extensive range of detailed testing, showing meaningful conclusions. • *Photographic evidence, in situ where appropriate, of appropriate user testing should be presented with supporting comments leading to high level proposals for modification.* • Make high level proposals for further development as an outcome of testing. • *High level proposals as a result of testing should demonstrate a significant level of modifications to the system/program/housing and be drawn and annotated in detail.*
Communication: All information presented for assessment should be presented in a coherent and concise manner using a range of ICT, illustrations, extensive photographs, annotated sketches, text and other appropriate means of communication. **Where work is submitted electronically, an A4 printout should be available to assist with assessment and moderation**	