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Moderators' Report/ Principal Moderator Feedback

Summer 2016

Pearson Edexcel GCE in

Engineering (6933)

Unit 3: Principles of Design, Planning and Prototyping

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Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:
http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

General comments

For this unit: Principals of design, Planning and Prototyping, students are required to produce a single design and make task using titles from those published by Edexcel, or by generating their own. They must produce evidence of a solution to their selected problem in a design folder, of engineering drawings, technical specification writing, designing and developing a solution to the selected task, planning for production, manufacturing and giving an oral presentation to peers. A design folder must be submitted for moderation, which must include photographic evidence of what has been manufactured.

As in previous years, some high quality, creative and well made work was seen, as well as work that was mediocre, unchallenging and not worthy of an AS qualification. All work submitted by students was potentially appropriate to the requirements of this course offering access to the full range of marks available.

Although a wide range of coursework projects was undertaken, Edexcel's approved titles such as PCB holder; mini-drill holder; TV bracket and can-crusher were ever popular. Where electronic type tasks were taken on, not many students demonstrated any detailed understanding of circuit function and it was rare to see alternative electronic solutions presented. Most electronic circuitry appeared to be taken from some technical source without any modification or further student input. Where this was the case, the level of challenge was low, limiting opportunities to score higher marks in the design section.

Quite a few projects included the use of mechanisms, but the range of alternatives explored to produce linear motion from rotary motion or reciprocating / oscillating motion was limited when this would have been a fertile area of graphical exploration.

A continuing problem is that when designing, students fail to explore a range of ideas in any detail, probably because they have already decided on a design proposal and any other designs are treated as superficial images to target marks.

Designs were hardly ever developed through further design input, which usually consisted of construction details and working drawings of an initial idea. Most students modelled products, but often for no valid reason i.e. to test design features. Most modelling was done for simple presentation purposes.

In a minority of cases students were allowed to over-use CNC machines and other CAM equipment such as laser cutters and 3D printers, which limited opportunities to demonstrate a range of other high level making skills.

Marks awarded by centre assessors were generally close to Edexcel's standards, but in some cases, especially in criterion 'C' marking was lenient where the evidence presented did not match the credit given.

Assessment criterion (a)

Despite, in the past, highlighting the use of automatically generated engineering drawings from 3D CAD sketches and consequential loss of marks. This year has once again seen an increase in this practice, limiting opportunities to score marks in the high band

The point of this section is to teach students how to produce and understand engineering drawings. To this end, it is expected that students will demonstrate formal drawing skills using hand techniques, or through the use of a 2D CAD drawing package, where drawing tools are used to produce technical drawings laid out appropriately. Generating orthographic views from a 3D CAD sketch develops no understanding of layout or drawing conventions and standards. There are eight marks to award in this section, but they cannot be gained where drawings are generated automatically.

Assessment criterion (b)

Once again, this year saw students scoring well in 'planning', where the vast majority were able to present an appropriate sequence of manufacturing tasks, including projected times and deadlines. Many students presented copious amounts of planning pages, which was unnecessary as they would have gained their marks for less work, as long as it demonstrated an ability to plan for manufacturing appropriately; this could have been done by limiting planning to a major component or two. A minority of students recorded units of time in days, weeks or lessons without qualifying how long these units of time were.

The best work seen in this section detailed tasks and sub-tasks and gave projected timings in hours and/or minutes. It is not expected that students should be able to predict accurately how long a task will take, but they should be aware that some processes and tasks will take longer than others to carry out.

The quality of specification writing varied considerably. Better examples of specifications contained statements that were technical, measurable and justified; statements that could be used to check ongoing designs against, and to evaluate the final practical outcome. Unfortunately, a lot of specification statements were superficial, vague and non-specific, lacking technical information that could have been used as testing and evaluation data. User requirements and Performance requirements are important sub-sections of a product specification, as this is where technical and measurable statements are made, but on many occasions these areas were more or less ignored.

Assessment criterion (c)

Since the beginning of this course this assessment section has been problematic for many students and has not been well done. Some high quality, detailed work was seen, but this was in the minority. Although students generated ideas, these were often limited in details of sub-systems. It is not enough to annotate a sketch to point out that a component part moves, rotates or adjusts; students need to demonstrate graphically how such design features would operate.

Many students failed to present alternative design solutions, or they included simplistic sketches that were no more than shapes presented to meet an assessment requirement. Often, it appeared that students had already decided what they were going to make and were producing 'alternatives' because it was an assessment criterion requirement. Not many designs were linked to specification points or research, which rendered this previous section pointless, and annotation often revealed a lack of understanding of materials and processes.

Development of designs was generally weak and students failed to illustrate how initial designs had been refined and developed into a final design proposal. There was often little or no evaluation of the final proposed design to check its viability or fitness for purpose.

Where electronic design ideas were presented it was rare to see alternative circuit designs being considered. Many students used 'found' circuits without making any attempt at development or modification. It is not expected that students should design circuits from first principles, but it is expected that electronic design solutions should be built using established electronic building blocks in creative ways to explore alternative ways of producing the desired performance for their intended product.

Assessment criterion (d)

Most practical work was complete and functioning and some very high quality outcomes were presented, demonstrating a range of challenging processes and high level skills. However some students were awarded leniently for poor quality work that was of low demand. A small minority of products, despite being well made, scored low marks because they were simplistic and did not meet the expected levels of response for this course.

A few students produced scale models of products, which in some instances would be acceptable where engineering materials and processes were used and the model functioned appropriately, and where the intention to produce an accurate scale model was stated in the design brief. However, a few students produced models using materials such as acrylic, balsa wood, MDF and expanded polystyrene instead of appropriate engineering materials. In such

cases, products did not function properly, so realistic testing could not be carried out.

Most marks awarded by centre assessors were agreed, but sometimes high marks were awarded where there was an over-reliance on CAM. In order to achieve high marks students must demonstrate high-level manufacturing skills, attention to detail and precision in their work, which cannot be done if their skills input is limited to the simple assembly of component parts that have been manufactured by computer controlled machinery.

Where electronic project work was submitted for moderation, there was often little evidence of the quality of making linked to the electronic circuitry. Credit can be gained for evidence of soldering neatly, dealing with flying leads, anchoring circuit boards inside cases etc, which are all creditworthy activities.

Despite submitting photographic images of practical work, this often consisted of vague or small images which made it difficult to see the detail necessary to show the complexity of task and the higher-order skills necessary to gain high marks. Some students presented a range of photographs illustrating some manufacturing stages, but failed to include any images of the fully assembled, completed product, which made it difficult to agree high marks, as a product must be fully functioning and finished to access the high marks band

A very small minority of students presented no evidence of making, relying on teacher witness statements. Unfortunately teacher witness statements are not acceptable without explicit evidence of student making activities.

Assessment criterion (e)

In this section marks are generally accepted based on teacher witness statements and the provision of some form of evidence of student presentations, such as photographs or hard copies of presentation slides. A few students provided little or no evidence of having carried out a presentation and in some cases high marks awarded were suspect, particularly where the rest of a student's folder was of limited quality. In such cases, marks were not fully accepted.

Administration

Administration tasks were generally well carried out and accurate. A few teacher assessors failed to include annotation or page numbers to guide the moderator to assessment evidence, and a minimal number of addition errors were discovered.