Moderators' Report/
Principal Moderator Feedback

January 2012

Principal Learning

Engineering
Level 3 Controlled Assessments

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Introduction

Units EG302, EG303 and EG307

A range of candidate performance was noted for these three units with some candidates presenting very limited portfolios whilst others provided substantial pieces of work.
Consequently the quality of work submitted was varied, often being largely dependent upon the suitability of the activities undertaken and assessment instruments being used.

As noted in previous series, where centres develop robust assessment instruments that are informed by the requirements of the unit specifications, candidates often provide evidence that allows them to access the full range of marks. Where inappropriate assessments are used, candidates often provide substantial portfolios that are not sufficiently focused and do not meet the requirements of the assessment grids.

Most candidate evidence was presented in such a way that it was a simple task to find the evidence for each learning outcome. Unfortunately a few centres did not include copies of assignment briefs, including these briefs would indicate the tasks/activities expected of candidates and would aid in the moderation process. Although not always clearly identified some centres are including an indication of internal moderation/verification activities, often using the Candidate Record Sheet (CRS) to record this process. This is a practice that is encouraged as an opportunity to internally quality check the validity of assessment decisions.

For the most part centres provided the correct samples in a timely manner. Tracking of the learning outcomes was mixed with some very clear signposting, usually on the CRS, making for a straightforward moderation process. In a few cases the cross-referencing and tracking of candidate evidence was less than obvious, leading to a substantial amount of time being required to track and verify that the evidence provided was being assessed correctly.

The majority of assessors are doing a good job of indicating where credit is being given and tracking candidate evidence, however on occasion there are still some issues with the annotation of candidate work. It would be helpful for assessors to annotate portfolios, indicating where marks have been awarded; this should be linked to the appropriate marking grid. Indications such as LO1 (MB2), LO3 (MB1) etc. are very helpful to moderators. Using this annotation along with subdividing units into separate learning outcomes, and using the page references on the CRS, promotes reliable and fair moderation of work.

Centres are reminded that each unit specification has a section entitled ‘guidance for allocating marks’, which should be referred to when designing/completing summative assessments. The “what you need to learn” section is also helpful in determining the content and evidence requirements of assessments. These elements articulate with the marking grid, which is the key component that assessors and moderators should refer to when allocating marks for each learning outcome and mark band.

During this series it is evident that many centres are adapting the use of materials, such as the Tutor Support Materials, for this qualification. Some good examples of extension activities and modification of tasks has been undertaken. This allows candidates to provide evidence that addresses all of the assessment requirements, in each of the three mark bands, for each learning outcome.

In some portfolios assessors are noting the use of plagiarism and, rightly, not awarding marks for this type of evidence. Most candidates do not sufficiently indicate references used and it is expected that candidates should acknowledge reference materials and websites, where used.

Units EG304, EG305, EG306 and EG309

The number of centres submitting portfolios for moderation this series was typical of any January series, with the total number of centres ranging from three to eight across these units. The work seen covered a broad range of performance by both candidate and assessor, although many centres now demonstrate a fuller understanding of what is required throughout the delivery of the unit contents and preparation, completion and marking of the controlled assessment.

Many of the centres which submitted work provided little evidence of the work being done as ‘applied delivery’ or ‘applied assessment’. It appeared for the most part, that centres had taken a theoretical approach to the course, with little involvement of real industry. This is more obvious in certain units, and these are mentioned in the respective sections of this report.

Presentation was generally good, with many of the portfolios now being compiled as portfolios, with page numbers and references to the location of the work being made on the Candidate Record Sheets (CRSs) at the front of each one, accompanied by relevant annotation alongside the candidates’ work to indicate where evidence of, say, ‘justification – MB3’ for that respective unit. This kind of annotation is helpful for a remote moderator, enabling them to readily locate the evidence awarded marks by the assessor.

Unit EG302_01

Applications of Computer Aided Designing

Assessment of this unit usually consists of a portfolio, containing a series of individual assignments that target specific learning outcomes. As seen in previous series the standard of assessment across centres is mixed. This series heralded an improvement in accuracy of assessment by centre assessors. There are a few occasions where assessors are awarding marks often in mark bands far above the standard of work presented. Where this over assessment occurs it is frequently due to flawed assessment instruments being used that do not match the requirements of the marking grid.

Learning Outcome 1

Most candidates were able to identify the component parts of a computer system (Mark Band 1) and describe their function/role. A key element to this first mark band is the relationship with data storage, which was not always clearly linked by candidates. The requirements of Mark Band 2 continue to be somewhat challenging with candidates unable to describe typical applications of data storage, particularly with reference to computer aided design. This requirement often results in a description of data storage devices and a comparison in terms of storage capacity and data retrieval speed, which adequately addresses Mark Band 3. Very often candidates moderated were assessed as being in Mark Band 2 using the best-fit approach.

Using a CAD system as a case study, particularly with reference to storage and transfer of data, could assist candidates in accessing marks across the three mark bands and put the data storage element in context.

Learning Outcome 2

A description of CAD software, in many cases the specific software being used by the candidates to generate evidence for Learning Outcome 3 and Learning Outcome 4, is often attempted. Whilst there is some evidence of investigation with simulation techniques, realistic visuals and CAD/CAM packages being described; the requirement to identify software packages that are used in design, presentation, testing and analysis often requires several packages to be investigated and this range is often not seen in candidate portfolios (Mark Band 1). Mark Band 2 requires candidates to prepare a case study of how software can be used in the pre-production of a simple engineered product. Very few candidates were able to provide evidence of this with many discussing how CAD systems are used more generally. Similarly the Mark Band 3 requirement to identify how software can be used for more complex products, which involve more than one engineering process, was also poorly addressed.

Learning Outcome 3

This element is supported by evidence of 2D drawings, with a wide range of abilities resulting in some good and some poor examples of layout and presentation. All candidates used appropriate templates, often with title blocks

and projection symbols. The use of appropriate projection systems and suitable dimensioning style was often missing or not in adherence with BS conventions (Mark Band 1). Assembly drawings are often fully dimensioned and candidates should understand that balloon referencing and parts lists are normally required with dimensions indicated if they relate to the fit of components.
Isometric drawings were well presented in the vast majority of examples (Mark Band 2). There is, however often insufficient evidence of circuit construction; as there is an expectation that an electrical/electronic diagram and a hydraulic/pneumatic diagram will be present to achieve all the marks in Mark Band 3. This is clearly defined in the “what you need to cover” section and “guidance for allocating marks” element in the unit specification.

Learning Outcome 4

In this series it is noticeable that many centres have extended the tasks required of candidates to allow access to all three mark bands. The use of 3D software is often demonstrated, with relatively straightforward components reproduced in different orientations and visual styles (Mark Band 1). Having produced a very straightforward 3D model, candidates often attempt to extend this to produce more complex models (Mark Band 2) with some 3D representation of an industrial component (Mark Band 3) being evidenced.

Learning Outcome 5

In the majority of samples moderated candidates completed the test required in Mark Band 1 and generally performed a suitable analysis (such as stress analysis) of a given product. The comparison with a specified standard is often not clearly stated or very brief (Mark Band 2) however some evidence is usually present. Evaluation and explanation of the approach taken in the case of non-compliance (Mark Band 3) is generally not sufficiently discussed, however it often goes somewhat beyond the trial and error process seen in previous series.

Unit EG303_01

Selection and Application of Engineering Material

The standard of assessment across centres was generally appropriate, although there is still limited evidence of some lenient assessment.
Assessment of this unit usually consists of a portfolio, containing a series of assignments that target specific learning outcomes.

Learning Outcome 1

Most candidates are able to provide an overview of the structure of metals and polymers and consequently address Mark Band 1, although sometimes forgetting to consider their effect on mechanical properties. Most candidates started to consider the electrical properties, required to access marks in Mark Band 2, and the thermal properties required of Mark Band 3. It is still surprising however to see these elements sometimes not being considered. Centres might consider instructing candidates to produce a table in order to encourage them to consider the properties required for Mark Band 1, Mark Band 2 and Mark Band 3.

Learning Outcome 2.1

The majority of candidates described a form of supply of a metal, polymer and composite. This allowed marks from Mark Band 1 to be awarded. The properties and application element, required for Mark Band 2, proved more challenging although most candidates provided responses allowing some marks to be awarded. Although candidates were able to provide some level of justification, required to access marks in Mark Band 3, the justification of the form of supply of material still proves to be challenging.

Learning Outcome 2.2

This learning outcome requires candidates to use a given information source, in order to select material for a given purpose. Previously the evidence of this source being used has been somewhat limited however and consequently it has been difficult to justify any marks being awarded from Mark Band 1. This issue has been largely resolved with some good examples/screen-shots of given and chosen sources (Mark Band 2). Discussion of the ease of use and relevance of the chosen source often allowed significant marks from Mark Band 3 to be awarded.

Learning Outcome 3.1

Candidates were usually able to describe work hardening, grain growth in metals and glass transition temperature in polymers. This allows considerable marks to be awarded from Mark Band 1. This should follow on to a description of the change in properties (Mark Band 2) and a reference to the micro-structure of the materials (Mark Band 3). Some candidates elaborated on the often useful descriptions provided for Mark Band 1 and consequently were unable to achieve marks in the higher mark bands.

Learning Outcome 3.2

Many candidates provided descriptions of heat treatment techniques in a reasonable amount of detail (Mark Band 1) and started to address the associated property changes (Mark Band 2). The description of property changes often lacked depth however, and the materials to which the heat treatment processes apply were either not mentioned or simply referred to as “metal” in many cases. The requirement to differentiate, between structural changes that occur during heat treatment (Mark Band 3), has proven challenging for all but the most able candidates.

Learning Outcome 4.1

This learning outcome requires a series of calculations to be performed to achieve marks across all three mark bands. Perhaps surprisingly not all candidates addressed all of the mark bands. Those that did, were able to access the full range of marks by correctly performing calculations for direct stress, factor of safety and shear stress (Mark Band 1), direct and shear strain (Mark Band 2), and modulus of elasticity and shear modulus (Mark Band 3). Full marks were often achieved with arithmetical errors usually being the main discriminator for this learning outcome.

Learning Outcome 4.2

Mark Band 1 requires modes of failure to be described and most candidates were able to provide brief descriptions. The service conditions under which this occurs (Mark Band 2) and the characteristic appearance of two failure modes (Mark Band 3) proved more challenging with the expected annotated diagrams not being used as often as would be anticipated for Mark Band 3. Centres might consider industrial visits or artefacts in order to contextualise this learning outcome.

Learning Outcome 4.3

Most candidates provided evidence of destructive and non-destructive testing, which is the key requirement of Mark Band 1. An issue that arose in many centres is the use of shared data, which is obtained by candidates seemingly observing a test being carried out. It is important to recognise that carrying out practical activities is a key component of this learning outcome. The analysis of the test data, by comparing test results with expected values for example, was often missing from portfolios (Mark Band 2). The industrial settings, where such tests might be used (Mark Band 3), also proved beyond the majority of candidates. Relatively simple tests can be used or a visit to a local provider who has the appropriate resources; such as an employer, College, or University could be considered.

Unit EG304_01

Instrumentation and Control Engineering

Many centres treat this unit with a general theory approach, and the few who try to link it with real industry or real applications always perform better. Some try to use a scenario, which may be relevant in part, but the candidates then tend not to focus on the topic, resulting in a report about the scenario, which may not include appropriate evidence for the assessment grids. Some assessors, then, tend to assess the portfolios against their tasks or questions, when assessment must be against the assessment grids only, supported by the 'guidance for allocating marks' section.

There seems to be a shortage of appropriate resources and subject experience reflected in the portfolios submitted from some centres, with many candidates apparently relying on internet searches to find items which appear to look like the material required. For the benefit of all future candidates, please be aware that an analogue signal does not necessarily have to be sinusoidal in nature, nor does it need to be alternating. It is a signal which is analogous to the quantity that it is representing. A digital signal is not analogous to the quantity it is representing, because it is digitised in step values and the signal can only have a value which approximates to the actual quantity, depending on the number of bits used by the system in question.

The majority of assessment decisions were generally accurate. Some centres appear to have limited resources and tend to rely on internet research work, not industrial visits and involvement with real engineers, which makes it difficult for candidates to relate to the topic. A copy of the assessment tasks used is always helpful for a remote moderator to see what the candidates have been asked to do, but not all centres submit these. Some centres produce portfolios, at least half of which contain paperwork associated with the tasks which have been set, the assessment criteria, support and guidance details, etc, when only one copy per pack is necessary.

Marks awarded ranged across the full spectrum, from just above single figures to scores in the higher mark bands. Very little evidence of internal moderation/domain assessor monitoring, etc, was seen in the samples moderated.

Unit EG305_1A

Maintaining Engineering Plant, Equipment and Systems

Some centres appear to be developing some good, realistic, applied tasks for this, but many still use a range of theoretical ‘what ifs’ which offer scenarios which are rather limited in terms of development. Fortunately, fewer centres are addressing simple car maintenance tasks, but at least one did this, which limits the candidates’ potential to evidence the full breadth of the learning outcomes.

Some portfolios contained work which combined Learning Outcome 1.1 and Learning Outcome 1.2, etc, and a combined mark was recorded. When assessing, centres need to provide a score for each individual assessment criterion/learning outcome to allow a moderator to understand where the marks have been awarded.

For Learning Outcome 2.2, many portfolios contained a simple checklist for a maintenance activity. This is only a very small part of a maintenance plan, as required for this learning outcome. Some centres are starting to develop a better understanding of what a maintenance plan should contain – as indicated in this unit of the specification.

Learning Outcome 4 requires work to be carried out on a closed loop engineering system. Many provide activities which involve real maintenance tasks to be carried out on electric motors, lathe gearboxes, sensors, etc, and where good links are established with local industry, any real industrial maintenance programme would provide a more than adequate solution for investigation.

Assessment tended to be a little inaccurate across most of the unit, with centres awarding marks for simply mentioning a particular item, when a description or explanation and justification is required.

Some portfolios suggest that candidates are being given open ended tasks, and some seem to have been given the specification and asked to find their own material/topic to write about, and these result in a ‘all I could find out about ....’, attracting few marks.

Unit EG306_1A

Investigating Modern Manufacturing Techniques used in Engineering

As with other units, most of the tasks set in the assessment did not relate to engineering outside of the centres and the notion of 'applied learning' and 'applied assessment' were not generally witnessed. Many portfolios contained details which appeared to be addressing tasks which were not 'applied' to real industry, most being tasks which required internet/theory research.

With regards to the 'data' section centres are advised to ensure that they fully understand what is required by this unit – according to the detail provided within the specification – and avoid the risk of good candidates trying their hardest to make good use of weak or inappropriate and inadequate data.

Learning Outcome 1 (Marking Grid A)

There was very little detail of the number of products, volume of production, real engineered product layout and processes, flow of materials and the processes – as indicated in the contents of the specification. Work was generally quite brief and limited to overviews of what the terms and types of engineering manufacture mean, with no explanation or an investigation of 'engineered products', other than by internet searches.

Learning Outcome 2 (Marking Grid A)

For this outcome, candidates have to explain real engineering processes used in two industries and the level of CAM used by each. Many candidates tended to provide general statements about using robots or computers, with no explanation of any real processes which they had observed or experienced. Many included several suggestions about what "would" be done, implying very limited actual knowledge or details relating to the engineering industry itself.

Learning Outcome 3 (Marking Grid A)

The learning outcome was addressed in a range of ways, and many of the required details were seen, but very few included everything required to evidence the whole learning outcome. Some had no production plan, some detailed plans. Some gave good introductions/overviews, followed by a production plan or project network diagram, or even a review. Some included a project network analysis, but some of the projects tended to be small scale and even trivial, not allowing candidates to demonstrate their fuller understanding. Some planned for, and made, a single item – not a quantity of them, as required by the specification.

Learning Outcome 4 (Marking Grid A)

Statistical production charts should be produced, and this provides good links with Learning Outcome 3.
Some candidates produced good descriptions of their graphs, but few went on to do any real analysis which could have explained any variations that occurred or how they could be addressed. None included any real evidence of making use of relevant parts of ISO9001, although some provided some detail of it, for no marks. Assessment proved to contain a mix of accuracies for Learning Outcome 4, and centres are reminded that a general discussion of Quality Assurance (QA) systems and processes is not sufficient.

Project network analysis appears to have been little understood by most of the centres which submitted portfolios for this series, and may be an area for training/research and development.

Unit EG307_1A

Innovative Design and Enterprise

Assessment of this unit usually consists of a portfolio, containing a series of assignments that target specific learning outcomes.

Learning Outcome 1 (Marking Grid A)

Candidates were often able to identify two innovative products and consider the design/operation of these. As previously seen some candidates did not sufficiently focus on the method of manufacturing and the marketing approach, required for Mark Band 1. It is worthy of note that not all candidates were able to compare the chosen products with traditional counterparts. By contrast the innovative features of the chosen products were often discussed in some detail (Mark Band 2), but the factors that made these products a success (Mark Band 3) was, frequently, not clearly identified.

Learning Outcome 2 (Marking Grid A)

Although individuals have often been identified and their career histories described (Mark Band 1), candidates continue to consider entrepreneurs who do not have a significant engineering background. Key factors that led to the success of the chosen entrepreneurs often focused on the products they developed rather than the individuals concerned (Mark Band 2). In general candidates did not sufficiently analyse the reasons for success in their chosen entrepreneurs' careers (Mark Band 3).

Learning Outcome 3 (Marking Grid A)

There is still some confusion between engineering activities and engineering companies or projects. Consequently the expected engineering activities, required for Mark Band 1, were often case studies of specific events or organisations. This somewhat restricted the scope and impact of the social activity and behaviour aspects. Environmental analysis however, was often fairly detailed (Mark Band 1). Given that environmental issues are often identified it is perhaps surprising that a significant number of candidates were unable to identify how these environmental issues are being addressed, by the use of innovative technology for example (Mark Band 2). The case studies required for Mark Band 3 were often missing, limited or confused with Mark Band 1 evidence.

Learning Outcome 4 (Marking Grid A)

During this series it was notable that much of the evidence presented by candidates displayed elements of innovation, although this was often in only one key product feature (Mark Band 1). Often candidates provided design sketches, CAD models or annotated diagrams and a significant amount of creative and innovative design was demonstrated. These innovative features were not always well described (Mark Band 2) however the research and thinking process was often evidenced in some detail (Mark Band 3).

Learning Outcome 5 (Marking Grid A)

Many candidates answered the process of how products are brought to market in varying degrees of complexity, with some improvement in the variety of factors considered. The ‘guidance for allocating marks’ indicates the expected range of activities with few candidates able to provide the amount of detail required to achieve full marks (Mark Band 1). Examples of successful products were generally well described with analysis, and comparisons (Mark Band 2). Whilst product features are often discussed, the majority of candidates need to understand that the focus of this learning outcome is on how the products were brought to the market and the different approaches taken in marketing terms (Mark Band 3).

Unit EG309_01

Principles and Applications of Engineering Science

As with most other units, there were only a few centres registered, and not all those submitted work for moderation. Centres are reminded to ensure that all the learning outcomes are being covered across the full mark bands. Principal Moderator reports such as this, and centre feedback (E9 moderator report), highlight the issues presented when all the learning outcomes are not covered across all the mark bands – this can cost a few marks, particularly for Learning Outcome 1, where no 'beam reactions' tasks were produced and for Learning Outcome 3, where the task offered for consideration did not ask for single source/load problem solving, thus missing Mark Band 1. Centres should always ensure that any task they use is fit for purpose, whatever the source of the task.

Occasionally, a centre will provide a copy of the mark scheme used by the assessor(s). This allows a remote moderator to evaluate the effectiveness of the processes used and provide feedback to help lead to improvements, where necessary. One common issue is that a centre may set a series of relevant tasks then assess each candidate against the mark scheme only, when they should be assessed solely against the assessment grids. Mark schemes are helpful, but some subjectivity can be allowed, without, for instance, knocking off a mark for not using SI units.

At least one centre used fractional marks, such as 7.5 when the work was not quite deserving of 8 marks. If the work is not deserving of 8 marks, then it should be awarded 7 marks.

Centres tend to assess this unit in four sections – Learning Outcomes 1 and 2, Learning Outcome 3, Learning Outcomes 4 and 6, then Learning Outcome 5, in the form of phase tests following the teaching. For this unit, the study of, say, Learning Outcome 3 will add little extra learning for Learning Outcomes 1 and 2, so this is acceptable.

When learning outcomes are combined together, the individual scores for each single learning outcome must be recorded separately on the Candidate Record Sheet as this is useful to the moderation process.

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