Gold - Unit 24 - Additive Manufacture (4 Credits)

Relevant LINKS

BACK TO ITQ UNITS **[1]**

Handbook home page **[2]**

Overview

Additive Manufacture at Gold Level requires the candidate to plan and create a 3D element using manufacturing equipment and best practices. As a result of reviewing their work, they will be able to identify and use automated methods or alternative ways of working to improve the finished products. Unfamiliar aspects will require support and advice from other people.

A work activity will typically be 'straightforward or routine' because:

The task or context will be familiar and involve few variable aspects. The techniques used will be familiar or commonly undertaken.

Example of context – Creating a simple 3D product or products for a local primary school.

Support for the assessment of this award [3]

Example of typical IT work at this level **[4] (coming)**

Assessor's guide to interpreting the criteria (under development)

General Information

QCF general description for Level 2 qualifications

- Achievement at QCF level 2 (EQF Level 3) reflects the ability to select and use relevant knowledge, ideas, skills and procedures to complete well-defined tasks and address straightforward problems. It includes taking responsibility for completing tasks and procedures and exercising autonomy and judgement subject to overall direction or guidance.
- Use understanding of facts, procedures and ideas to complete well-defined tasks and address straightforward problems. Interpret relevant information and ideas. Be aware of the types of information that are relevant to the area of study or work.
- Complete well-defined, generally routine tasks and address straightforward problems. Select and use relevant skills and procedures. Identify, gather and use relevant information to inform actions. Identify how effective actions have been.
- Take responsibility for completing tasks and procedures subject to direction or guidance as needed.

(function(i,s,o,g,r,a,m){i['GoogleAnalyticsObject']=r;i[r]=i[r]||function(){ (i[r].q=i[r].q||[]).push(arguments)},i[r].l=1*new Date();a=s.createElement(o), m=s.getElementsByTagName(o)[0];a.async=1;a.src=g;m.parentNode.insertBefore(a,m) })(window,document,'script','//www.google-analytics.com/analytics.js','ga'); ga('create', 'UA-46896377-2', 'auto'); ga('send', 'pageview');

Requirements

- Standards must be confirmed by a trained Gold Level Assessor or higher
- Assessors must at a minimum record assessment judgements as entries in the on-line mark book on the INGOTs.org certification site.
- Routine evidence of work used for judging assessment outcomes in the candidates' records of their day to day work will be available from their e-portfolios and on-line work. Assessors should ensure that relevant web pages are available to their Account Manager on request by supply of the URL.
- When the candidate provides evidence of matching all the criteria to the specification subject to the guidance below, the assessor can request the award using the link on the certification site. The Account Manager will request a random sample of evidence from candidates' work that verifies the assessor's judgement.
- When the Account Manager is satisfied that the evidence is sufficient to safely make an award, the candidate's success will be confirmed and the unit certificate will be printable from the web site.
- This unit should take an average level 2 learner 40 hours of work to complete.

Assessment Method

Assessors can score each of the criteria N, L, S or H. N indicates no evidence. L indicates some capability but some help still required. S indicates that the candidate can match the criterion to its required specification. H indicates performance that goes beyond the expected in at least some aspects. Candidates are required to achieve at least a S on all the criteria to achieve the full award.

Expansion of the assessment criteria

1. The candidate will use a brief to design 3D objects

1.1 I can identify the need for a specified design

Students may need some guidance and direction and a visit from local manufacturing companies would be useful to aide their understanding of what is possible. They should clearly show that their design is warranted with some justification.

Evidence: will be provided directly from the presentation of work and plans. Discussion with assessor.

Additional information and guidance

Learners can use various IT tools, as well as rough designs and notes, to flesh out their proposed idea and begin thinking about the complexities they might encounter. They can base their ideas on existing designs, or come up with their own, but will need some practical guidance so as not to work on designs which are not achievable from the outset.

1.2 I can describe design constraints

(function(i,s,o,g,r,a,m){i['GoogleAnalyticsObject']=r;i[r]=i[r]||function(){ (i[r].q=i[r].q||[]).push(arguments)},i[r].l=1*new Date();a=s.createElement(o), m=s.getElementsByTagName(o)[0];a.async=1;a.src=g;m.parentNode.insertBefore(a,m) })(window,document,'script','//www.google-analytics.com/analytics.js','ga'); ga('create', 'UA-46896377-2', 'auto'); ga('send', 'pageview');

Building on their planning and research, learners should demonstrate a clear understanding of what they are up against and describe these in detail.
Evidence: Directly from their reflective logs or write ups, day to day files and dialogue with assessor.

Additional information and guidance
Candidates should have some detailed descriptions of some of the range of constraints they will be facing. They should be as honest as possible. They can map out what design skills they can deploy, and therefore what restrictions this might impose. Time will be a large factor, so they need to be aware of what is possible in the time that they have. other constraints might be time in front of machines. 3D designs take a long time to create, so it is no good all of the cohort booking to print their designs a day before the deadline.

1.3 I can select appropriate software to develop the design.

Candidates show evidence of planning by listing the resources they will need and an overview of why they are the right tools.

Evidence: Plans documented on web pages or in document files.

Additional information and guidance.

Learners need to demonstrate that they know the right tools for the job at hand. They will require some guidance on the best design tools and also software design packages that are compatible with the printer they will use for output.

1.4 I can research information to support a design

Candidates should be able to show a detailed process of their research and development. They can gather physical and digital artifacts and compile them into a working portfolio to show where they are going in their thinking and actions.

Evidence: ePortfolio of evidence and commentary on suitability

Additional information and guidance

All physical materials can be scanned and added to an ePortfolio in order to collect and comment on their process of research and development. It should be possible for someone with no knowledge of what they are doing to quickly understand through their research process.

1.5 I can create a set of information on which to base a design, starting from a template, image trace or pre-existing object

Candidates should show evidence of working with a variety of source materials in order to achieve their goals.

Evidence: Documentation of plans and processes either in web pages or document files

Additional information and guidance

The learner's research will inform what they are hoping to achieve and how they believe they will achieve it. They can have pre-existing objects as guides or use templates as required. More complex objects may require a number of interlocking designs.

1.6 I can create a 3D design through customising existing templates or instructions

Using a template as reference, the learners should be able to demonstrate they can adapt and

(function(i,s,o,g,r,a,m){i['GoogleAnalyticsObject']=r;i[r]=i[r]||function(){ (i[r].q=i[r].q||[]).push(arguments)},i[r].l=1*new Date();a=s.createElement(o), m=s.getElementsByTagName(o)[0];a.async=1;a.src=g;m.parentNode.insertBefore(a,m) })(window,document,'script','//www.google-analytics.com/analytics.js','ga'); ga('create', 'UA-46896377-2', 'auto'); ga('send', 'pageview');

customise this design to their own purposes.
Evidence: Assessor feedback and reflective journal posts and the finished article.

Additional information and guidance

Candidates do not need to start from scratch as they are trying to understand the 3D process completely. Using an existing template or set of instructions, they can change and adapt it to make sure that it suits their own identified needs.

1.7 I can make checks and ensure the model will print

3D printing is time consuming and resource hungry. Learners must test this process so as to ensure efficiency and minimise wastage.
Evidence: Documentation of a test procedure prior to printing.

Additional information and guidance

Candidates need to demonstrate an awareness of the time and resource implications they are dealing with. It would be wasteful to do several production runs before realising that the plastic was the wrong colour or some aspects of the design were wrong. Quality checking and making sure the process is correct is essential.

1.8 I can amend errors and ensure design quality

The pre-testing above might identify errors which need to be resolved. Evidence of this process needs to be clear.
Evidence: Assessor feedback and learner documentation.

Additional information and guidance

Candidates should be able to identify and discuss the errors they encounter, regardless of how small. On a large industrial scale, a few small errors will quickly add up to £000s so has to be addressed quickly and as early as possible.

2. The candidate will enable 3D manufacture from a 3D design

2.1 I can export a file for additive manufacture
The printing devices require specific file types in order to work. It may not be an automatic process from the design software.

Evidence: will be samples of the file type and directions about it's type and properties for reference.

Additional information and guidance

Learners should be familiar with the process fo file export and also show a good understanding of the types of file output required in 3D printing and smart manufacturing in general.

2.2 I can explain the need for appropriate file formats and dimensions
Candidates should be able to demonstrate a clear awareness of the files they are working with and their purpose. They also need to be sensitive to dimensions.

Evidence: Direct observation and dialogue with the assessor, reflective notes and blogs.

Additional information and guidance

Learners need to be clear of what the 3D printer is capable of and therefore what dimensions they can deal with in terms of files and end product dimensions. A small printer will obviously not print a

(function(i,s,o,g,r,a,m){i['GoogleAnalyticsObject']=r;i[r]=i[r]||function(){ (i[r].q=i[r].q||[]).push(arguments)},i[r].l=1*new Date();a=s.createElement(o), m=s.getElementsByTagName(o)[0];a.async=1;a.src=g;m.parentNode.insertBefore(a,m) })(window,document,'script','//www.google-analytics.com/analytics.js','ga'); ga('create', 'UA-46896377-2', 'auto'); ga('send', 'pageview');

1/10th scale A380 airplane. Learners can explain, with examples, the different file formats they are using for both design and output purposes as they may be different.

2.3 I can import files into additive manufacture software
Candidates should be comfortable moving file into and out of their chosen software packages.

Evidence: Descriptions in day to day documentation, dialogue with assessor.

Additional information and guidance

The candidate will need to import their designs into the software control system and therefore understand the required format. Any problems encountered will need to be documented and addressed under 1.8.

2.4 I can use the appropriate settings to create a build file
Candidates should use their imported designs to build a file for the printer to output.

Evidence: Descriptions in day to day documentation, dialogue with assessor. Sample file on ePortfolio with descriptions.

Additional information and guidance

The candidate will show familiarity with the printer control software and be aware of the necessary settings so that the import of their design file, which is used to build the final model, is accurate and suitable.

2.5 I can explain possible issues related to print speed, quality, size and overall outcome
Candidates should be capable of explaining, in some detail, all of the potential issues that may arise as they near time to output and create their designs.

Evidence: Web pages providing details of their concerns and how they will deal with them.

Additional information and guidance

The candidate will explain each of these issues and why they might be potential bottlenecks or show stoppers. Print speed and quality are real problems with some printers and some work might need to be done in advance to ensure some consistency throughout. A test run will identify the timing issues, but also the quality of the production runs. Learners should be experienced enough with the printers to know other issues such as temperature and humidity and how these may affect the final versions. It may be useful for students to have some chart explaining time and output restrictions so they have an idea of how much time their designs will require to compete.

2.6 I can use the 3D printed final product to identify possible improvements
Candidates should provide evidence of their understanding and application of quality control and reflection.

Evidence: Web pages or documents explaining their design improvements once the final product is made

Additional information and guidance

No design is ever truly finished and everything can always be improved. Candidates need to show their appreciation of this process and apply constructive criticism to their work. They can also get feedback from 3rd parties where possible. This can be built back in to the next release of the design, whether or not this happens in reality, it is good to build this in.

(function(i,s,o,g,r,a,m){i['GoogleAnalyticsObject']=r;i[r]=i[r]||function(){ (i[r].q=i[r].q||[]).push(arguments)},i[r].l=1*new Date();a=s.createElement(o), m=s.getElementsByTagName(o)[0];a.async=1;a.src=g;m.parentNode.insertBefore(a,m) })(window,document,'script','//www.google-analytics.com/analytics.js','ga'); ga('create', 'UA-46896377-2', 'auto'); ga('send', 'pageview');

2.7 I can identify how an additive manufacture design can be used alongside or to aid existing design and manufacture processes or systems Candidates should provide evidence of their wider appreciation of smart manufacturing.

Evidence: ePortfolio or blog reflections on the topic.

Additional information and guidance

The candidate needs to show an overall appreciation of this technology in the wider context of manufacturing. 3D printing may not be the entire process, but only part of it. For example, recent developments in medicine have allowed surgeons to create 3D elements, such as synthetic limbs or skull fragments, and use these in their surgery. Can they identify and explain other areas where the technology has an advantage?

2.8 I can communicate a written evaluation of the design process to others
Candidates should provide evidence of documentation.

Evidence: Short piece of documentation, either web based or word processed.

Additional information and guidance

The key element for any product is for other people to be able to know how to use it, or for other companies to be able to manufacture it. Candidates may wish to either be designers of products for other companies, in which case they need to document clearly the manufacturing process, or they will be retailers selling the product, in which case a good user guide or product guide is essential. This could be combined with some English based work on clear writing for purpose.

Moderation/verification

The assessor should keep a record of assessment judgements made for each candidate guided by the above guidance. Criteria should be interpreted in the context of the general descriptors of QCF Level 1 qualifications. They should make notes of any significant issues for any candidate and be in a position to advise candidates on suitable routes for progression. They must be prepared to enter into dialogue with their Account Manager and provide their assessment records to the Account Manager through the on-line mark book. They should be prepared to provide evidence as a basis for their judgements through reference to candidate e-portfolios. Before authorising certification, the Account Manager must be satisfied that the assessors judgements are sound. In the event of missing evidence, the assessor will be requested to gather appropriate information before the award can be made.

Source URL: https://theingots.org/community/sml2u1x

Links
[1] http://theingots.org/community/ITQ_unit_development
[2] https://theingots.org/community/handbook2
[3] http://www.theingots.org/community/ITQcourse1
[4] https://theingots.org/community/sites/default/files/uploads/user4/pupila.pdf

(function(i,s,o,g,r,a,m){i['GoogleAnalyticsObject']=r;i[r]=i[r]||function(){ (i[r].q=i[r].q||[]).push(arguments)},i[r].l=1*new Date();a=s.createElement(o), m=s.getElementsByTagName(o)[0];a.async=1;a.src=g;m.parentNode.insertBefore(a,m) })(window,document,'script','//www.google-analytics.com/analytics.js','ga'); ga('create', 'UA-46896377-2', 'auto'); ga('send', 'pageview');