

Knowledge Organiser



Learners explore how processes are undertaken by to create engineered products or to deliver engineering services safely

Learning Aim A

learners will produce research evidence containing a series of at least three possible solutions to the given theme or initial idea. The research evidence and alternative solutions to an engineering problem will be realistic, accurate and concise. For example, a project to design and manufacture a scale model (1 : 43) body shell of a Formula 1® racing car will involve researching computer-aided design (CAD)/computer-aided manufacturing (CAM) processes, as well as manufacturing the model using a vacuum-forming process. Also, the CAD/CAM processes will be appropriate to the task, and problems relating to its integration with the moulding processes will be considered and resolved. Learners will provide an outline specification of the solution to include sketches, required processes, outline costs and technical information.

Learning Aim C

learners will produce evidence showing how the project solution was developed effectively and efficiently using project-management processes to produce a product/service, system or process. The implementation of tasks will be structured and carried out in an appropriate order. There will also be evidence of refinements being made to the solution during the process to optimise it. For example, during the moulding process for a model body shell of a Formula 1 racing car, bubbles may form within the skin of the polymer creating an undesirable finish. The solution to the issue would be to dry the polymer thoroughly prior to moulding the body shell. Appropriate tests will be completed on the product, system and process and against the test plan. For example, final measurements will be taken on the model body shell. If some of the measurements are marginally above learners' permitted tolerance they may decide that the product is fit for purpose and audience or they may rework the mould. Relevant behaviours will be applied to a professional standard throughout the process. For example, learners will anticipate risks before they arise, taking appropriate action to resolve risks and issues in a structured way and acting appropriately at all times in the workshop.

Unit Overview

Project management, and understanding the project life cycle, is a fundamental part of all engineering disciplines, from aerospace and computing – which may involve the development of new products and services – to the manufacturing sector, which may involve refurbishing or installing equipment. The output from a project is varied and could be a product/service, system or process that is relevant to your specialist area of study.

There are many approaches to project management, and in this unit you will understand and apply one project-management approach over the life cycle of a project to solve an engineering-based problem on a given theme or idea. This will involve you researching an engineering-based problem and using your creative skills to generate a range of solutions to the problem. You will produce a feasibility study to select the most appropriate solution given the known constraints. Over the life cycle of the project you will make use of project-management processes, such as monitoring progress and managing risks, to design and develop a solution that is fit for audience and purpose. You will demonstrate high-standard behaviours during the development of your solution and will present your solution in a portfolio of evidence. In this unit, you will draw on your learning from across your programme to complete assessment tasks.

The purpose of the specialist engineering project is for you to consolidate and build on the knowledge and skills gained throughout your BTEC National programme of study. The completion of this unit will help you to progress to employment as an engineering technician, or to an apprenticeship or higher education.

Learning Aims:

- A** Investigate an engineering project in a relevant specialist area
- B** Develop project-management processes and a design solution for the specialist engineering project as undertaken in industry
- C** Undertake the solution for a specialist engineering project and present the solution as undertaken in industry.

Learning Aim B

learners will produce an optimised project time and resource plan, outlining the critical path and suitable milestones and breaking down the activities in an appropriate way given the constraints, allowing a reasonable contingency. Most time and resource estimates will be reasonable and consideration will be given to optimising the plan so that it can be implemented in an efficient and effective way. Throughout the project, progress will be monitored and risks and issues managed by anticipating some problems before they become issues and categorising risks and issues appropriately. The technical specification will detail the customer's Operational requirements that link together to create a functioning and coherent solution given the known constraints. For example, the model body shell of a Formula 1 racing car will be vacuum formed, and details of appropriate mould materials, typically aluminium or wood, and working tolerances, such as draft angles, will be provided to an international standard.

Key Vocabulary

Polymers, Carbon, grains, ductility, brittleness, tensile

Numeracy links:

Manufacturing uses precise measurements to ensure that accuracy is at its highest.

Work Related Learning:

Gaining knowledge of how materials and their properties is key to working in any part of engineering

SMSC and British Values

Understanding the importance that good design can have to solve critical issues in the world.