Level 2 – Sample scheme of work
(7332)

ENGINEERING
Unit 8: Innovation, enterprise and technological advance

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Sample scheme of work

This is an example of a possible scheme of work. You can use it as it is, adjust it or extract content to create a scheme of work to suit your delivery needs. It can also be adjusted by adding theory workshops to support learners who have/need additional learning time.

This unit is assessed through a centre set and marked assignment, which will be externally moderated. A sample assignment brief is available at www.diplomainfo.org.uk

Total GLH	60
Aim	To provide learners with an understanding of the concepts of innovation and the development of ideas in engineering. Learners will be able to: • know about innovation and the impact of technology • understand design, research and development • understand enterprise in the world of engineering.
Notes	The scheme of work presented here uses an activity-based approach to teach the learning objectives for this unit. This means that several different assessment criteria may be integrated within a single case study. Under FS (functional skills): * indicates opportunities for assessment in English of speaking and listening and/or written communication + indicates opportunities for use of functional mathematics # indicates opportunities for the use of information and communication technology (ICT).

Session number	Topic and learning outcomes	Activities, assignments, assessments, resources	LO and AC	PLTS	FS	GLH	Other comments
1	**Introduction to the unit**	Provide an overview of the learning objectives and the tasks to be carried out for this unit. Present a 'then and now' case study based on a washing machine, looking at Victorian and modern products. This should lead to a group discussion, focusing on the following questions: • Why has the product changed? • How has the development of this product affected society and the environment?	LO1 AC1a	EP	*	1	The contribution of major engineering projects to social and economic development links to Unit 1: The engineered world.
2–7	**Innovation and the impact of technology** Aims/learning outcomes: • Be able to describe the benefits that innovation and creativity bring to engineering. • Be able to describe how different factors affect the process of innovation. • Be able to explain the social and environmental impact of different methods of generating energy.	Working in pairs, learners should use the internet or other resources to identify how mobile phones have changed over time, linking each change or development to the factor that led to it (including developments in materials, manufacturing technology, outsourcing, competitive advantages and entrepreneurs). The teams should then consolidate their efforts to produce a classroom display of their findings. This should be followed by a guided group discussion to identify the social and environmental impact of each development.	LO1 AC1a–c	IE CT RL TW SM EP	* + #	6	Mobile phones link to a suggested activity in the scheme of work for Unit 2: Engineering design.

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8–13	**Sustainability and energy** Aims/learning outcomes: • Be able to carry out research into the social and environmental impacts of different methods of energy generation. • Be able to explain the social and environmental impacts of different methods of energy generation.	Begin the topic with an exposition of the global demand for energy and the depletion of resources. Working in teams of four, each team should be allocated two methods of generating electricity. Using the internet and other resources, they should identify how these approaches generate electricity, their relative advantages and drawbacks, and how the use of these technologies will affect the home, workplace and the built environment. This should be followed by a group debate, where each team presents their findings and argues that their approaches are the most appropriate for use in the twenty-first century.	LO1 AC1c–e	IE, CT, RL, TW EP	* + #	6	

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14–20	**Innovation and design** Aims/learning outcomes: • Be able to describe research and development and design affect innovation. • Be able to describe the role of research and development during product design. • Be able to describe how engineering design resolves issues posed by differing requirements. • Be able to describe methods of protecting new ideas.	Choose a case study to illustrate this topic, such as the Dyson vacuum cleaners. Learners to conduct a product analysis of a Dyson vacuum cleaner to identify how it is innovative compared to its competitors. Undertake an exposition of the history of the development of the Dyson vacuum cleaners. As a whole group, learners to identify the needs that had to be addressed, and then present how these needs were researched and fulfilled. Then introduce the issues faced by Dyson with competitors adopting similar designs. Working in pairs, learners should be tasked with researching a designated method of protecting intellectual property (registered designs, copyright and trademarks) and presenting their findings to the group. This should be followed by a summary of what happened when Dyson sued the competitors, with an explanation of what the full implications of this were to the competitors.	LO1 LO2 LO3 AC1a, b AC2a–c AC3b, c	IE CT RL TW EP	* + #	8	Dyson have made a product analysis box containing one of their vacuum cleaners available to schools on loan. For more information and resources for this case study, see www.jamesdysonfoundation.com/education/default.asp A useful source of additional materials on the protection of intellectual property is www.ipo.gov.uk/whyuse/education/education-schoolsupport.htm The consideration of the design criteria links to Unit 2: Engineering design.

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21–34	**How research and development affects design** Aims/learning outcomes: • Be able to describe the role of research and development during product design. • Apply simple research and development techniques to the design and development of products. • Be able to describe how engineering design resolves issues posed by differing requirements, which may be conflicting.	Using a video case study on automotive design, give an overview of the diverse range of research and development carried out during the development of cars. Working in pairs, ask learners to consider one of the different types of research and development (use and methodology) and present their findings to the group. Learners should then be tasked with designing a new lightweight seat for use in domestic cars. As a group, they should identify all of the conflicting needs and then carry out research and development to clarify the possible solutions. This could include investigating customer preferences, taking measurements of anthropometric data, creating a virtual model or making a physical model.	LO1 LO2 LO3 AC1c, d AC2a–c AC3a, c	IE CT RL TW SM EP	* + #	14	Video case studies are available from a wide range of commercial sources. Alternatively, this could use the free resources provided by organisations such as SEMTA or extracts from satellite/cable TV programmes such as *How It's Made*. Many clips of these programmes are available through internet sites such as www.youtube.com Another relevant case study is the episode on airline seats in the series *Designs on Your …* featuring SeymourPowell. The consideration of the design criteria links to Unit 2: Engineering design. The use of CAD software for virtual modelling links to Unit 3: Engineering applications of computers.

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35–37	**Innovation and enterprise** Aims/learning outcomes: • Be able to describe how innovation and enterprise are affected by the market and competition. • Be able to describe how engineering design resolves issues posed by differing requirements. • Be able to describe ways in which finance can be raised for an innovative product.	Illustrate the topic with a case study, an example could be the Sinclair C5. Begin with the successful history of product development led by Sir Clive Sinclair. Then follow with a detailed review of the financing, development, launch and failure of the Sinclair C5. Conclude with a group discussion to identify why the product was not successful, linking this to the user and the needs of the market.	LO1 LO2 LO3 AC1b AC2b AC3a, c	IE EP	*	3	The consideration of the design criteria links to Unit 2: Engineering design.

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38–45	**Enterprise** Aims/learning outcomes: • Be able to explain how innovation is influenced by and influences the market. • Be able to describe methods of protecting new ideas • Be able to explain how new ideas may be financed and financially supported.	This is a *Dragons' Den* style activity. Learners should identify one innovative design from their coursework. They should then research and prepare a business case for it, including • a presentation drawing • an explanation of how it meets the needs of the market • a summary of any competitors' products • methods of protecting the product from being copied • how it could be financed. Learners will then present this to a selected panel of 'dragons' in front of the group.	LO3 AC3a–d	IE CT SM	* + #	8	Instead of a design generated in this unit, learners could use a design generated in Unit 2: Engineering design.
46–60	**Assessed assignment**	Learners to carry out the example assignment, focusing on the development of personal music systems. This includes: • creating a timeline to explain how personal music systems have developed over time • conducting a detailed product analysis of one system • presenting a business case for a new personal music system.	All	IE CT RL SM	* + #	15	This example assignment can be found at www.diplomainfo.org.uk