

Unit T11: Sustainability in Engineering

Unit code:	H/503/7383
QCF level:	6
Credit value:	15

Aim

This unit gives learners understanding of the principles of sustainable development in engineering and the impact of modern industrialisation on diversity. Learners will explore the surrounding issues of responsibility and citizenship, along with the politics and legislation of sustainability.

Unit abstract

It is increasingly recognised in public discussion and political discourse that many of the practices and lifestyles of modern society – particularly but not exclusively industrialised society – simply cannot be sustained indefinitely. We are exceeding the capacity of the planet to provide many of the resources we use and to accommodate our emissions, while many of the planet's inhabitants cannot meet even their most basic needs.

This unit is concerned with the responsible use of the world's finite natural resources in ways that will not compromise the ability of future generations to meet their own needs. This requires engineers to make optimum use of energy and materials, to mitigate any associated environmental impacts and to fully embrace concepts such as life cycle analysis, disassembly and recycling within the design process.

Learning outcomes

On successful completion of this unit a learner will:

- 1 understand the contexts and principles of sustainable development
- 2 understand the impact of globalisation on diversity
- 3 understand the impact of technological developments on diversity
- 4 understand the social concepts affecting the promotion of sustainable development
- 5 understand policies and legislation relating to engineering sustainability.

Unit content

1 Understand the contexts and principles of sustainable development

Contexts: the concept of sustainable development; contexts in which sustainable development can be placed; interdependence of contexts in which sustainable development can be placed

Values and beliefs: different attitudes towards sustainable development, eg values of differing cultural groups, values of differing income groups; the balance of power; vested interests

Needs and rights: imbalance of population and resource usage (local, global); wealth gaps between countries; wealth gaps within countries; measures of standard of living, eg GNP; developing measures of quality of life; the concept of social justice

2 Understand the impact of globalisation on diversity

Globalisation: impacts on diversity, eg biological, cultural, economic; of globalisation of production; of globalisation of trade; of globalisation of consumption; dominance of multinational enterprises in decision making; promotion of local trade, eg farmers' markets in the UK; evidence (qualitative indicators of changes, quantitative indicators of the changes, local evidence, global evidence)

3 Understand the impact of technological developments on diversity

Technological developments: in transport; in telecommunications; in biotechnology, eg genetic engineering; effects on trade; effects on production; impacts on cultural diversity; impacts on economic diversity; impacts on biodiversity; debate about genetically modified organisms (GMO); recent changes, eg wood burning stoves, mini-hydro electric power schemes; evidence (qualitative indicators of changes, quantitative indicators of the changes, local evidence, global evidence)

4 Understand the social concepts affecting the promotion of sustainable development

Stewardship: meaning of 'stewardship'; individual responsibility; collective responsibility; Local Agenda 21; development of the slogan 'think global act local'

Active citizenship: the need for individual participation; the contribution of voluntary personal controls; the use of resources towards sustainable development; the value of collective decision making (processes necessary to achieve this)

Social justice and equity: influence of different values and beliefs on behaviour and lifestyles; the need to promote sustainable lifestyles; the need for personal changes in lifestyles, eg in the home, workplace, educational institution; the ethical arguments for promoting sustainable development

5 **Understand policies and legislation relating to engineering sustainability**

Legislation and policies: regulations eg, to promote waste minimisation, to promote more sustainable uses of resources, regarding packaging; the landfill tax; environmental taxation; eco-labelling; incentives to re-use; incentives to re-cycle; Local Agenda 21

Pressure groups: groups, eg Royal Academy of Engineers, Engineering Council, Greenpeace; role of pressure groups in promoting change, eg renewable materials, ethical investments, fair trade

Sustainable engineering: engineering product design; production processes; forestry and woodland products; less intensive agricultural systems; organic production; resource minimisation in industry; resource minimisation in commerce

Learning outcomes and assessment criteria

Learning outcomes On successful completion of this unit a learner will:	Assessment criteria for pass The learner can:
LO1 Understand the contexts and principles of sustainable development	1.1 Critically appraise the different contexts in which sustainable development can be placed, recognising their interdependence 1.2 Critically appraise the effect of values and belief on sustainable development 1.3 Critically appraise the needs and rights relating to local and international sustainable development
LO2 Understand the impact of globalisation on diversity	2.1 Critically evaluate the impacts of globalisation on diversity
LO3 Understand the impact of technological developments on diversity	3.1 Critically evaluate the impacts of technology on diversity
LO4 Understand the social concepts affecting the promotion of sustainable development	4.1 Explain the concept of stewardship 4.2 Explain the factors that promote citizenship 4.3 Critically evaluate examples of social justice and equality with reference to sustainable behaviour
LO5 Understand policies and legislation relating to engineering sustainability	5.1 Critically evaluate recent changes in policies and legislation with reference to sustainable engineering 5.2 Critically appraise how a specific pressure group has promoted change in engineering sustainability 5.3 Critically evaluate sustainable production methods in an engineering organisation.

Guidance

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

Level 4	Level 5	Level 6
<i>Unit 11: Supply Chain Management</i>	<i>Unit 8: Engineering Design</i>	<i>Unit T1: Major Project</i>
	<i>Unit 17: Business Improvement Techniques</i>	
	<i>Unit 31: Value Management</i>	

Delivery

Learning outcome 1 can be taught using articles and by referring to textbooks and reliable websites.

For learning outcome 2 it is possible for learners to research different areas and then share findings formally with other members of the cohort.

For learning outcome 3, after an initial introduction to the concepts of citizenship, learners can explore the concepts of passive and active citizenship within their own employment, within the college where they study or within the environment within which they live.

For learning outcome 4, after an introduction to pressure groups, learners need to explore their own experience of such groups and to work together to explore how effective they can be – Learners will need to look at case studies or explore via research, an area of which they have some understanding.

Recent changes in legislation must be available so that their impact can be discussed.

Assessment

The assessment of each learning outcome is critical, though it might be sensible to group two learning outcomes into a single assessment. Practical work should be included that involves research of published material and low-level market research by the individual learner.

Resources

Books

Archer M – *Development and Health: Aspects of Applied Geography* (Hodder & Stoughton, 1991) ISBN 978-0340553954

Blewitt J – *Understanding Sustainable Development* (Earthscan Ltd, 2008) ISBN 978-1844074549

Desha C – *Engineering Education and Sustainable Development* (Earthscan Ltd, 2011) ISBN 978-1844078608

Dresner S – *The Principles of Sustainability* (Earthscan Ltd, 2002) ISBN 978-1853838422

Mitchell B – *Resource and Environmental Management* (Pearson Education Canada; 2 edition, 2001) ISBN 978-0130265326

Rogers P – *An Introduction to Sustainable Development* (Earthscan Ltd, 2007) ISBN 978-1844075201

Journals

International Journal of Sustainable Engineering

Subscribe online for print or online volumes (four issues per year):

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www.journalofsustainability.com

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Websites

www.iied.org

International Institute for Environment and Development

www.membes.aol.com/bowermanb

Geography World United Nations Conference on Environment

www.traidcraft.co.uk

Traidcraft

www.undp.org/sl/

United Nations Development Programme Sustainable Livelihoods

www.worldbank.org

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