Unit 97: Product Design

Unit code: A/502/5515

QCF Level 3: BTEC National

Credit value: 10

Guided learning hours: 60

Aim and purpose

The aim of the unit is to give learners knowledge, skills and understanding of the product design process, from development of initial ideas, through to realisation of a product.

Unit introduction

The product designer combines creative skills and technical knowledge to produce tangible design outcomes. Product design is different from industrial design, which involves a broader range of design and engineering activities. The practice of product design has been assisted by the evolution of new software and digital tools that permit dynamic and realistic 2D visuals and 3D models, effective analysis of ideas and concepts and enhanced communication within a realistically condensed project timescale. This suits the designer, the design-studio manager, the manufacturer, the product marketer and, of prime importance, the client! Learners will discover that product design is the initial stage of any physical product, of any type. They will learn what good product design means to the global consumer in the continual drive for innovation, facilitation, sustainability and overall progress.

Learners will be introduced to the process of product design, involving the design brief, ideas generation, concept design and development, analysis, testing, revision and design realisation.

They will learn about the breadth of activities and stages involved in product design and the range of aesthetic, creative and technical skills required to undertake this primary stage of a potentially wider remit for research, development, strategic planning and product/industrial design for manufacture.

They will understand about other important features of product design, ie innovation, strategic enquiry, marketing, manufacture and be aware that good design runs in tandem with good communication, professional presentation and reflective practice.

Product design could be defined as the creation of every type of three-dimensional goods or objects, which will eventually be promoted and distributed through the commercial market.

Learning outcomes

On completion of this unit a learner should:

1 Understand a product design brief

2 Know how to communicate product design ideas and concepts

3 Be able to develop product design proposals

4 Be able to realise outcomes to a design brief.

Unit content

1 Understand a product design brief

Analysis: eg establish briefing parameters, establish specific requirements and restrictions, discuss and determine definitions

Assess: any ambiguous areas, aesthetic and functional criteria

Discuss: any revisions to agree briefing definitions

2 Know how to communicate product design ideas and concepts

Source: others' visual styles, conventions, sketching, modelling

Research and develop ideas: eg relevant research, commercial examples, record ideas, written notes, sketches, concept models, ideas modification, consider alternative materials, aesthetic alterations, physical alterations, produce experimental or scale models

Record: ideas, written notes, sketches, concept models, consider materials, aesthetics

3 Be able to develop product design proposals

Visual communication: eg draft 2D computer-aided designs (CAD), hand-rendered technical, perspective, conceptual drawings, 3D physical and computer-generated scale, concept and expressive models

Ongoing analysis and evaluation: consider specific requirements, restrictions and definitions; establish common understanding of any ambiguities; discuss, select, reject, progress initial ideas as appropriate; propose, implement revisions

Review: eg periodic presentation for consult with clients, end users, interested parties, colleagues, check progress against project timelines, monitor resources

4 Be able to realise outcomes to a design brief

Working independently or in association: cooperate with a proposal team, work as an individual to realise product outcome

Consult with team and others: verbally, using appropriate language, professional terms, conventions (visual and written) work as part of a team or as an individual to assemble, present proposed design outcome

Methodology: compile visual and digital communication, eg 2D computer-aided designs (CAD), hand-rendered technical, perspective, conceptual drawings, isometric representations, 3D physical and computer-generated scale, concept and expressive models, computer modelling

Presentation: eg compile professional presentations, develop 3D models, physical and computer-generated scale, concept and expressive models, presentation to clients, end users, interested parties, colleagues

Strategy for review: eg check progress against project timelines, monitor resources, written analysis and evaluation of outcomes against briefing requirements

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	**To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:**	**To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:**
P1 explain requirements, parameters and constraints in a product design brief [IE, CT, TW, SM, EP]	**M1** demonstrate effective 2D, 3D communication of ideas and concepts to meet the requirements of the product design brief	**D1** create an innovative, sustainable, aesthetic and appropriate outcome for the product design brief.
P2 outline ideas and concepts through 2D and 3D visual communication [IE, CT, TW, SM, EP]	**M2** carry out purposeful design development to realise a final outcome that effectively meets requirements of the product design brief	
P3 demonstrate development of ideas and concepts [IE, CT, RL, TW, SM, EP]	**M3** use analysis, testing and evaluation throughout the project to produce a final outcome that addresses the product design briefing requirements.	
P4 realise a product design outcome against a brief. [IE, CT, RL, TW, SM, EP]		

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery

This unit provides tutors with the opportunity to engage learners in the analysis of simulated, realistic product design briefs. A range of hypothetical, realistic and/or professional client briefs should be included in the initial assignment relating to briefing analysis. This teaching and learning activity has a crucial, generic purpose across all art and design specialisms; if the range, content and guidance is set to reflect current practice, learners will experience developing confidence in analysing design briefs and understanding the parameters, constraints and outcomes in order to satisfy the briefing requirements – ie getting your design brief right!

Health and safety issues relating to studio, workshop and relevant specialist areas should be stressed throughout. Learners will need to be guided through current legislation such as the Disability Discrimination Act (DDA) and Building Regulations and Copyright Law.

It is important to ensure that learners are able to apply their understanding of the basic design process underpinning (any) the product design brief. In particular, they must demonstrate the capacity to convert conceptual ideas expressed in 2D into an appropriate 3D form, and vice versa. Model making and computer modelling will be integral to the ideas and development stages of the product design process.

This unit relates closely to a number of 3D Design specialist units and professional specialist units as well as the core units relating to research and communicating the design process. Tutors may consider presenting an integrated programme, with the units running either concurrently or consecutively. It will be possible to cross-reference assessment evidence in this instance. Every opportunity should be taken to introduce learners to relevant industrial and commercial practice in order to expand their knowledge, understanding and experience of professional design practice.

Learning outcome 1 covers the analysis of project briefs. In the context of product design. It is essential that briefing goals are clearly defined before any ideas and concept development can begin. It is crucial that the briefing content is comprehensive and agreed as this reduces the risk of inappropriate outcomes. A range of projects briefs should be offered to the leaner for investigation, analysis and conclusions. All evidence should be logged for effective recall.

Learning outcomes 2 and 3 are closely linked and cover the analysis and communication of ideas through appropriate 2D and 3D methods and media. Visual recording of ideas and concepts are integral to progress, design development and eventual outcomes. Tutors should pay particular attention to sketching and rendering and to the practical skills of model making and 3D computer modelling. Learners should also be encouraged to test their concepts regularly through prototypes, proofs, maquettes or other appropriate development and pre-production models and mock-ups.

Learning outcome 4 is closely linked to the three other unit learning outcomes and is based on the successful completion of the specific product design project. As with learning outcome 1, it is important that learners are encouraged to participate in analysing and questioning the effectiveness of their own and others' concepts and outcomes, working with a clear and proven reflective practice model to complete an appropriate design report.

Outline learning plan

The outline learning plan has been included in this unit as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan demonstrates one way in planning the delivery and assessment of this unit.

Topic and suggested assignments/activities and/assessment
Group introduction to *Unit content* and potential activities (which may involve working with a client). Group introduction to, and discussion with, specialist tutors, clients and work–related assessment provider(s). Group planning for generic activities and resources in self-managed, directed, team and professional context.
Discuss and promote learner-initiated research, experimentation, evaluation and revision methodology, techniques and 2D/3D processes. Discuss the importance of learner-directed methods for documenting research, experimentation, proposals, evaluations, revisions. Demonstrate the importance of learner-directed timelines, to include research, experimentation, recordings, proposals, evaluations, revisions.
Assignment 1: Analysing a Product Design Brief Learners and tutors conduct an initial appraisal of a sample (or hypothetical) product design brief, making notes on scenario, content and requirements. This may involve working as an individual or as part of a team and will include discussions with peers and specialist tutors. Learners (and teams) identify and clarify project parameters in consultation with any professional clients, end users, their peers and tutors. Learners document and record sample briefing discussions in a format for review and analysis and to develop a log of documents, diagrams and recordings, which demonstrate useful analysis of the initial brief. Learners research additional sample briefs, sourced through networking with peers, other study centres, direct contact with professional product designers, online case studies and conduct independent analysis. Learners develop an independent log of documents, diagrams and recordings, which demonstrate useful analysis of a number of product design briefs.
Assignment 2: Develop and Communicate Initial Ideas for Individual (Team) Product Design Brief Learners select and analyse, as an individual or as part of a team, a product design brief which can be hypothetical or involve working with a client from industry Reflecting from knowledge gained in **Assignment 1**, learners research examples of historical and contemporary examples of selected product design in selected briefing context. Learners produce and discuss their initial ideas with peers (team) and specialist tutors in product design context. Learners (team) develop ideas, producing 2D sketches and 3D concept models, demonstrating use of materials, techniques and processes, for initial ideas presentation. Learners (team) present ideas internally to specialist tutors for ideas modification. Learners (team) present ideas to professional client, tutors and peers for review and feedback.
Assignment 3: Communicate Development Work for Specific Product Design Project Learners communicate development work for a selected product design brief through 2D concept visuals and 3D concept models. Learners (team) discuss and agree revisions and confirm any variations with specialist tutors, peers, professional client. Learners (team) implement development revisions and any variations. Learners (team) demonstrate results of testing and analysis to underpin eventual design proposals.

Topic and suggested assignments/activities and/assessment
Assignment 4: Present Proposals to Realise a Product Design Outcome Learners (team) present revised final design proposals which include rendered visuals, scale representations of individual elements, a detailed model of final outcome, in context of demonstrating form, function, appropriation, sustainability and aesthetics. Learners (team) have taken guidance from peers, specialist tutors, through one to one, team critiques, to influence proposals. Learners include health and safety references and design report, for working on product design briefs.
Review of unit and assessment.

Assessment

For P1, they will be expected to demonstrate their awareness and understanding of factors relating to a product and design brief. They will need assistance to be able to analyse a product design brief to identify briefing parameters and constraints. They will need direction to develop a log, which demonstrates useful briefing analysis.

P2 requires learners to establish and communicate their ideas at all stages. They will need to demonstrate competence in visual and verbal communication as well as in 3D concept work. Initial ideas will be limited and tutor led.

P3 focuses on the learner's ability to develop original ideas and communicate the development process in 2D visuals and 3D models. Design development will be influenced by tutorial input.

To meet the requirements of P4 learners will produce product designed final outcomes which reflect analysis and action on guidance which will have been tutor driven. Assessment evidence for P2, P3 and P4 could come from a combination of written and visual sources such as:

- research and project notes and images of their own and others' work
- ideas, sketched and initial design drawings
- development drawings, models and computer modelling
- models and photographic records of the making process
- design development log
- witness statements of one-to-one and group critiques
- reflective practice model
- design analysis report.

For M1, learners are required to demonstrate consistency and purpose in the origination of ideas, design development and realisation of design outcomes that meet the requirements of a given brief. Learners must also exhibit a level of self-direction, independent and effective working.

M2 requires evidence that demonstrates clear, continuous and consistent links between independent research and meaningful ideas development in the briefing context, The evidence should make clear the learner's awareness of the design ideas in the context of perceived briefing outcomes, whilst recognising that amendments will transpire as ideas are tested and analysed.

M3 requires clear evidence of 2D and 3D design development in the context of amendments and design revisions, stemming from informed discussions with tutors, design team, end users and professional clients.

D1 requires a body of work that demonstrates the learner's understanding and individuality in the creation and presentation of design outcomes when designing to a specific product design brief. At this level learners are required to produce professional outcomes in response to extensive research and development. Work presented should show the learner's awareness and understanding of functional and aesthetic elements and their ability to meet briefing requirements, changes and amendments with independent, perceptive and creative responses. The tasks set may be the same as those for pass and merit criteria but should be carried out with greater comprehension, sophistication and a higher degree of independence.

Programme of suggested assignments

The following table shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1	**Assignment 1**: Analysing a Product Design Brief	The assignment involves appraisal of a range of product design briefs, making notes on scenario, content and requirements. Additional sample briefs, sourced through networking with peers, other study centres, direct contact with professional designers, and online case studies will be used in the analysis process.	Recordings of discussions with clients, end users, peers and tutors to review product design briefs, establish production aims, objectives parameters, consider any relevant standards and health and safety issues, compare briefing scenarios. Log to include, documents, diagrams and recordings, which show useful analysis of product design briefs.
P2, P3 M1	**Assignment 2**: Develop and Communicate Initial Ideas for Individual (Team) Design	This brief involves the communication of ideas for a specific product design project. It involves working as an individual or as part of a team. It involves presenting initial ideas to professional client and/or tutors, peers for review and feedback.	Visual and recorded evidence informed research including historical and contemporary examples relating to product design in the context of given brief. Proposed ideas, including sketches, concept models, ideas modification, use of alternative materials, aesthetic alterations, physical alterations, experimental or scale models.

Criteria covered	Assignment title	Scenario	Assessment method
P1, P2 M1, M2	**Assignment 3**: Communicate Development Work for Specific Product Design Project	This assignment involves the communication of development work for a selected product design brief through 2D concept visuals and 3D concept models. It involves implementation of concept revisions and any variations.	Development work for a selected product design brief through 2D concept visuals and 3D concept models. Log of any revisions, any variations agreed with specialist tutors, peers, professional client.
P1, P2, P3, P4 M1, M2, M3 D1	**Assignment 4**: Present Proposals to Realise a Product Design Outcome	The brief is to present the final product design outcome to meet the user client needs in an appropriate, aesthetic and sustainable way.	Rendered visuals. Scale representations of individual elements. Detailed model of final outcome, to demonstrate function and appropriation in the context of any variations. Health and safety references. Detailed design report (1000 words minimum) which includes evidence of product analysis and evaluation through use of reflective practice processes.

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

This unit forms part of the BTEC Art and Design sector suite. This unit has particular links with the following unit titles in the BTEC Art and Design suite:

Level 1	Level 2	Level 3
Introduction to 3D Design Products	Working in Spatial Design	Human-scale Design
Introduction to 3D Design Crafts	Working in 3D Design Crafts	Large-scale Design
Creative Use of Materials, Techniques and Processes	Working in Product Design	Small-scale Design
	Working with 3D Briefs	3D Computer Modelling

National Occupational Standards

This unit also provides development opportunities for some of the underpinning skills, knowledge and understanding of the following National Occupational Standards:

CCSkills Sector Skills Council

Design (revisions in draft form June 2009)

- DES1 Apply research on the history and theory of design to your own design activities
- DES2 Apply design industry knowledge to inform your own design work practice and work
- DES3 Use Critical Thinking Techniques in your design work
- DES4 Communicate the importance of the design brief
- DES5 Follow a design process
- DES6 Work effectively with others in a creative environment
- DES7 Contribute to the production of prototypes, models, mock-ups, samples or test pieces.

Essential resources

Learners need access to a range of visual and technical resources. Workshops should be equipped to a good standard for work with a wide range of materials and should include equipment for model making and prototyping and machinery for fabrication including glueing, cutting, shaping, forming, fixing and finishing.

Suitable studio facilities should also be available for clean work, drawing, preparation and computer modelling.

A critique area with visual aids presentation resources would be invaluable for demonstrating ideas, development and outcomes to peers, tutors and (any) professional clients engaged with the product design brief.

Resources for research should include a permanent department collection of reference material, display facilities, access to a library and the internet, as well as computer facilities.

Learners need access to general design studios to be able to discuss and draw up their initial ideas. Depending on the scope of the project, they may need access to specialist computer resources if these are available in the centre. Learners also need access to a range of different processes and technology, again dependent upon the specific product design project.

Employer engagement and vocational contexts

Centres should develop links with practising product and designers to deliver assignments to learners or to provide work experience.

Links with employers are essential to the delivery of the programme for work experience and future employment.

Vocational learning support resources:

- Learning and Skills Network – www.vocationallearning.org.uk

Business and finance advice:

- local and regional Business Link – www.businesslink.gov.uk

Assignments should be vocationally relevant; centres should consider the delivery of 'live projects', for example, to support the vocational content of the unit and programme.

Creative and Cultural Skills (www.ccskills.org.uk), the Sector Skills Council for Arts, Crafts and Design, has launched the web portal Creative Choices (www.creative-choices.co.uk). This portal has a range of information about careers in the arts, crafts and design sector, including job descriptions.

Skillset, the Sector Skills Council for Creative Media (www.skillset.org), provides details career www.skillset.org/careers) and the industry and has a regularly updated news and events page.

Skillfast-UK, the Sector Skills Council for Fashion and Textiles (www.skillfast-uk.org), provides details on careers (www.skillfast-uk.org/justthejob) and the industry and has regularly updated news and events pages.

Indicative reading for learners

Textbook

Fiell C and Fiell P – *Industrial Design A-Z* (Taschen, 2006) ISBN 978-3822850572

Forty A – *Objects of Desire: Design and Society 1750-1980* (Thames & Hudson, 1986) ISBN 978-0500234532

Grinyer C – *Smart Design: Products that Change our Lives* (RotoVision, 2001) ISBN 978- 2880465249

Marcus G – *What is Design Today?* (Harry N Abrams, 2002) ISBN 978-0810990814

McDermott C – *The Product Book* (RotoVision, 1999) ISBN 978-2880463947

Norman D – *The Design of Everyday Things* (Basic Books, 2002) ISBN 978-0465067107

Redhead D – *Products of our Time* (Birkhauser, 2000) ISBN 978-0817662349

Ulrich K and Eppinger S – *Product Design and Development* (McGraw-Hill Education, 2007) ISBN 978-0071259477

Urquiola P – *The International Design Yearbook 21* (Abbeville Press, 2007) ISBN 978-0789209221

Journals

Design Council Magazine

Design Week

Websites

www.design-technology.org/furnituredesignindexpage.htm	Furniture design links
www.designcouncil.org.uk	Design Council
www.productdesignproject.com	Product Design
www.esciencenews.com/dictionary/product.design.projects	Science news about product design projects

Delivery of personal, learning and thinking skills (PLTS)

The following table identifies the PLTS that have been included within the assessment criteria of this unit:

Skill	When learners are ...
Independent enquirers	planning and carrying out research into product design projects
Creative thinkers	exploring the product design process and generating ideas
Reflective learners	reviewing, reflecting on and evaluating their own and teamwork
Team workers	collaborating with others to develop ideas, concepts, proposals, techniques and processes involved in product design briefs
Self-managers	organising time, planning resources, handling budgets when working to a specialist product, furniture design project brief, whether working on their own or as part of a design team
Effective participators	allowing for their own and others' requirements and proposals to be respected, considered, reviewed and actioned where appropriate.

Functional Skills – Level 2

Skill	When learners are ...
ICT – Find and select information	
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	sourcing information from websites and electronic publications about product design and individual designers
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	solving design problems when producing mock-ups
Select and apply a range of skills to find solutions	estimate and quantify materials needed for a design solution
Interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations	present interim findings on scale and measurements
English	
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	sourcing and reading information about product design reading and absorbing information about health and safety/ COSHH data
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	gathering and recording relevant technical information about product design techniques and processes.