

Birmingham City University Technology Innovation Centre

Undergraduate Programme

Programme Specification including Student Guide and Employer Guide

BSc (Hons) Engineering Product Design

Date of Course Approval/Review	Version Number	Version Date
18 March 2004	2.06	22 June 2006



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Definitive Documents and Version Control

This document has a version number and reference date in the footer. Documents originating from the 1999 scheme follow the sequence 1.01, 1.02, 1.03 etc. Documents originating from the 2004 scheme begin with 2.01 as the first released version and follow the same sequence.

The process leading to introduction of new courses, and major changes to courses follows *tic* procedure QA 1 and culminates in approval by the University's Senate.

The process leading to introduction of minor changes to modules and courses follows *tic* procedure QA 5 and culminates in approval by the Dean.

The reference date will be that of the validation event, minor changes board, or other meeting at which formal consideration was given.

Further details about the course and document development may be obtained from minutes of the validation, or minor changes board. A history of the document is summarised in the table below and further information relating to past versions can be obtained from the *tic* Registry.

BSc Engineering Product Design Programme Specification, Student and Employer Guides			
Version	Event	Date of event	Authorised by
2.01	Scheme Validation/ Review	18 March 2004	Dean of Faculty
2.02	Scheme Validation/Review (corrections)	18 March 2004	Dean of Faculty
2.03	Scheme Validation/Review (revised Section 14 to meet conditions)	18 March 2004	Panel Chair
2.04	Minor Changes (to incorporate changes to the admissions section from later validations)	21 July 2004	Dean of Faculty
2.05	Minor changes and notification of IIE (now IET) accreditation	22 July 2005	Dean of Faculty
2.06	Minor changes board of Studies	22 June 2006	Dean of Faculty

BSc (Hons) Engineering Product Design

PROGRAMME SPECIFICATION

NOTE: This specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if s/he takes advantage of the learning opportunities that are provided. More detail on the specific learning outcomes, indicative content and the teaching, learning and assessment methods of each module can be found (1) at <https://web.tic.ac.uk>, (2) in the Module Specification Handbook, and (3) in the Student Handbook. The accuracy of the information contained in this document is reviewed by the University and may be checked within independent review processes undertaken by the Quality Assurance Agency.

The information from this specification may be selectively extracted and included in documents that are more appropriate for students, intending students and employers.

1	Awarding Institution / Body:	Birmingham City University
2	Teaching Institution:	Technology Innovation Centre
3	Programme accredited by:	Institution of Engineering and Technology * see note below
4	Final Award:	BSc (Hons)
5	Programme Title:	Engineering Product Design
6	UCAS Code:	H770
7	QAA Benchmarking Group:	Engineering

*** Application to Institution of Engineering and Technology for re-accreditation pending (May 2008).**

8 Aims of the programme

The programme aims to provide learners with:

- 1 A curriculum which provides a broad range of subjects to facilitate the development of abilities, pursuit of interests and promotion of career development
- 2 A course of study that develops student's intellectual and creative abilities by combining knowledge of new design technologies, modern design practices and commercial business skills relevant to the product design field.
- 3 A wide range of transferable and marketable skills and knowledge leading to a variety of employment opportunities within both the creative and engineering design sectors.
- 4 Teaching and learning techniques which place emphasis on active and participative education;
- 5 An opportunity to acquire skills for lifelong learning;
- 6 A qualification accredited by the relevant professional body

9 Intended learning outcomes and the means by which they are achieved and demonstrated: the programme provides learners with opportunities to develop and demonstrate knowledge and understanding, skills and other attributes as follows:

Knowledge and understanding

Knowledge and understanding of:	Teaching, learning and assessment methods used:
<ol style="list-style-type: none"> 1. The principal features of the product design and development process. 2. The changes and developments occurring within the product design field. 3. The challenges arising from the globalisation of design and manufacture capabilities. 4. The new methodologies and practices arising from advanced computer based technologies. 5. The need for multi-skilled product designers well versed and capable of operating in an integrated technological global environment. 6. The importance of visual design in effectively presenting design concepts and solutions to end users. 7. The concept and practice of the total product life cycle and the use of product life cycle management systems 8. Product information systems and the management of data. 9. The impact of social, economic and environmental factors on the industrial and consumer markets. 10. The organisational, teamwork and practical management approaches employed throughout a typical product design and development cycle. 	<p>Knowledge and understanding are acquired through formal lectures, design studio activities, craft modelling workshops, seminars, collaborative projects with industry, submissions to regional and national competitions and directed independent learning activities.</p> <p>Knowledge is assessed, formatively and summatively, by a range of practices, including coursework, examinations (seen and unseen, open- and closed- book), presentations, and design projects.</p> <p>A range of assessment methods is employed as described in each module guide.</p>

Skills and other attributes

Intellectual / cognitive skills:

1. Analyse and critically evaluate a variety of complementary and contrasting design solutions and concepts.
2. Use proficiently information and materials from a variety of sources.
3. Devise and develop effective design solutions to technical and non-technical scenarios.
4. Utilise modern computer based design methodologies in effective and creative ways to effect solutions.
5. Make critical decisions based on social, environmental and technical considerations for the effective development of solutions.
6. Evaluate competing methodologies, software systems and application frameworks; expose the strengths and weaknesses, and make reasoned choice between them, and offer alternative perspectives.
7. Demonstrate an understanding of the use of technical and business analysis and visual design applied to the product design processes, practice and applications.

Teaching, learning and assessment methods used:

Intellectual skills are developed through the teaching and learning programme previously outlined.

Analytical and problem solving skills are further developed using a range of appropriate case studies, problem-solving and task-based, and collaborative projects with industry.

Assessment includes design projects, individual and group presentations, written coursework, design portfolios, and examinations.

Skills and other attributes (cont.)

Practical, research and independent learning skills:

1. Craft modelling, CAD, Virtual Modelling and Simulation, design methodologies, concurrent simulations.
2. Act independently to develop design solutions, apply learning models, plan and undertake tasks, work to deadlines, and accept accountability for learning decisions.
3. Apply appropriate research methodologies to the realisation of a major project, using Internet and print sources.
4. Collect relevant information, assimilate knowledge, marshal a coherent and rational argument, and relate theory and practice.
5. Draw independent conclusions based on a rigorous, analytical and critical assessment of argument, opinion and data.
6. Use appropriate laboratory and workshop equipment to develop models and prototypes.
7. Follow best practice design techniques to ensure work meets quality standards.

Teaching, learning and assessment methods used:

The acquisition of appropriate and transferable practical skills is central to the learning strategy of the programme. Initiative and independence are fostered throughout, and develop incrementally as the course progresses. Emphasis is placed on guided, self-directed and student-centred learning, with increasing independence of approach, thought and process.

Learners are encouraged to plan their own work schedules and are required to meet strict deadlines. Diaries / logbooks are required to be kept in some modules. Learners undertake a major individual design project and complete a full portfolio presentation of solutions.

<p>Transferable / key skills:</p> <ol style="list-style-type: none"> 1. Work with, and relate effectively to, others. 2. Manage time and prioritise workloads. 3. Make effective oral and written presentations which are coherent and comprehensible to others. 4. Access and make appropriate use of relevant numerical and statistical information. 5. Make effective use of information and communications technologies, including word and data processing packages, graphical representations, the Internet, email and electronic information retrieval systems. 6. Understand career opportunities and begin to plan a career path. 7. Show confidence and self-awareness, reflect on own learning, and be self-reliant and constructively self-critical. 	<p>Teaching, learning and assessment methods used:</p> <p>Transferable/key skills are core to the learning strategy of the programme. They are pervasive and are incorporated into modules and assessments as appropriate, e.g. team-working skills are fostered via group, task-based practical projects. Reflection and self-awareness are fostered by keeping logbooks and submitting self-assessment documentation in support of personal performance.</p> <p>The use of information technology is fundamental to the course.</p> <p>Assessment methods include design projects, presentations, coursework, peer- and self-assessment.</p>
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10 Programme structure and requirements, levels, modules, credits and awards

The BSc (Hons) programme is normally studied over three years full-time or five years part-time, and students may if they wish move between full and part-time modes of attendance. The academic year runs from September to June. The course is divided into study units called modules, each of 24 credits. Students complete 120 credits at levels 4, 5 and 6 (corresponding to years 1, 2 and 3 of the full-time programme). Each 24 credit module represents 240 hours of student learning and assessment.

The Faculty's BSc (Hons) degrees can be studied in sandwich mode. Students who, in addition to satisfying requirements for an honours degree, successfully complete an approved industrial placement between levels 5 and 6 (full time year 2 and 3) obtain the award of a sandwich honours degree.

The structure of the course, the modules, levels and credit ratings, and the awards which can be gained are shown below.

Stage 1 Level 4

Module number	Module name	Credit
	Design in Business D1 Sketching, drawing; computer image manipulation; market-led business; report writing; presentations. Design modelling and modelling techniques; study skills; business environments.	24
	Design Theory D1 Visual perception, visual theory, aesthetics of design, product semantics, form and function, colour theory and practice, surface attributes. The process of design, the design brief, problem identification, analysis and solving, objective setting, creative thinking, concept generation and evaluation, concept development and finalisation, communication techniques.	24
	Materials and Manufacture D1 Materials properties and characteristics, mechanical testing methods, materials selection methods, manufacturing processes. Characteristics of polymers and composites, polymer and other processing techniques, surface modification techniques, origin and identification of common defects.	24
	Engineering Fundamentals D1 Mechanical fundamentals. Free Body diagrams. Introductory dynamics. Strength of materials. Analytical techniques. Electrical circuitry. Energy storage and conversion. Simple power transmission by torsion. Bending in structural members.	24
	Computer Aided Design D1 CAD drawing and modelling, 2D and 3D; orthographic drawing systems, projections and standards. Design process, CAD drawing systems, dimensioning, parts listing.	24

Award: Cert HE (120 credits)

Stage 2 Level 5

Module number	Module name	Credit
	<p>Market-led Enterprise D2 Business enterprise and careers; marketing planning; business environment and resource analysis, objective setting and basic strategy. Work planning. Financial planning: market-based budgets, risk analysis, financial forecasts & statements. Project planning.</p>	24
	<p>Human Factors D2 History of ergonomics, physiology and psychology, anthropometric theory, testing and modelling. Basic psychology, perception theory, man machine interfaces, product analysis.</p>	24
	<p>Design in Context D2 History of engineering and technology, industrial revolution, arts and craft movement, history of transport, history of architecture, history of design and contemporary practice. Business practice, marketing and design, market research, market and sector analysis techniques, Corporate Identity and brand image.</p>	24
	<p>Product Development D2 Electronics technology, joining methods, economics of design, component selection, identification and selection of standard parts. Introduction to FMEA, DFx, VE and FTA techniques, risk and hazard analysis, reliability, electronic systems, failure of materials, PDM, rapid prototyping and tooling, concurrent engineering.</p>	24
	<p>Creative Modelling D2 CAD as an advanced design and visualisation tool, wire-frame, formwork, surfacing, shading, rendering, applied graphics, creating CAD models of engineering/design solutions. Surface modelling, solid modelling systems. Colour, texture, reflections, shadows. Constructing large complex assemblies.</p>	24

Award: Dip HE (240 credits)

Stage 3 Level 6

Module number	Module name	Credit
	Elective Project D3 A major product design project from inception to realisation, involving research, analysis, problem identification, objectives setting, product design specification, concept generation and selection, selected concept development and evaluation, design detailing and finalisation, deliverables preparation and presentation.	48
	Design Management D3 Management of design, design reviews, design planning, design information systems, design optimisation. Design portfolio preparation, the commercial practice of design, career considerations.	24
	Product Visualisation D3 3D surface and solid modelling, 3D animated graphics, virtual reality, commercial visualisation systems.	24
	Visual Engineering D3 Computer Aided Design systems, CAD/CAM, Rapid Prototyping.	24

Award: BSc (Hons) (360 credits)

Course Structure – BSc Engineering Product Design (FC0207)

Level 6

Elective Project D3 FM6018	Design Management D3 FM6013	Product Visualisation D3 FM6031	Visual Engineering D3 FM6038
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Level 5

Market-led Enterprise D2 FM5057	Human Factors D2 FM5054	Design in Context D2 FM5046	Product Development D2 FM5066	Creative Modelling D2 FM5040
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Level 4

Design in Business D1 FM4022	Design Theory D1 FM4023	Materials and Manufacture D1 FM4035	Engineering Fundamentals D1 FM4028	Computer Aided Design D1 FM4018
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Business Management Theme

Industrial Design Theme

Design Management Theme

Product Development Theme

CAD Theme

11 Support for Learning

Students are encouraged to identify and, with guidance, to reflect on their own learning needs and are offered the following support as appropriate to those needs:

An induction programme dealing with orientation and the dissemination of essential information.

A dedicated Learning Centre with open access learning materials, resources and full-time staff specialising in a variety of support areas.

A Student Handbook, containing information relating to the University, Faculty, course and modules.

Access to administrative staff and to academic staff, including the Tutors, Course Director and Head of Division, at reasonable times.

Support staff to advise on pastoral and academic issues, and to offer support and assistance with the keeping of Students' Progress Files.

Access to Faculty resources, including the Faculty Resource Centre, and a range of supported IT equipment.

Access to the services of the Learning Centre and IT support staff.

Access to the University's Student Services, including those offered by the careers service, financial advisers, medical centre, disability service, crèche, counselling service and chaplaincy.

12 Criteria for admission

Entry requirements are in accordance with section D of the University's Academic Regulations and Policies.

All applicants must have GCSE (grade C or above) in Mathematics and English Language, or equivalent. In addition, applicants should have one of the following, for which the typical tariff offer is 220 points for Curriculum 2000, or equivalent for other qualifications. Actual tariff offers may vary from 220 points.

Qualification	Requirements
Curriculum 2000, A Levels	Five GCSEs/GCEs including at least two subjects at A2 level. Points tariff can include AS level
Curriculum 2000, AVC.	Two 6-unit or one 12-unit AVCE.
Irish Leaving Certificate	Passes in four subjects at the higher grade.
Scottish Certificate of Education	Passes in four subjects at the higher grade.
International Baccalaureate or European Baccalaureate	
BTEC/Edexcel National Certificate/National Diploma	
A pass in a recognised Access or Foundation Year course	
An appropriate Advanced General National Vocational Qualification	
A professional qualification of an appropriate standard	
A qualification deemed equivalent to one of the above	

Other learning and experience may be considered for entry to the programme. A student may be allowed entry to the course if he or she does not have the standard entry qualifications but can provide evidence of necessary knowledge and skills to successfully enter and complete the programme.

Applicants with a Higher National Certificate or Higher National Diploma, including Merits, in an appropriate subject, or an equivalent qualification, may be offered entry with advanced standing.

UCAS applicants are invited to visit the **tic** during open days held through the academic year. Open day programmes include a tour of facilities and an introduction to the **tic**'s courses and activities. Meetings are arranged between course tutors and prospective students to ensure opportunity is provided for individual questions and clarification of the course content.

13 Evaluation and improvement of quality and standards

Committees: Course Committee Board of Studies Examination Board Learning Management Committee Faculty Board Academic Quality and Support	Mechanisms for review and evaluation: Review and validation events Accreditation by professional bodies Annual Monitoring Report Student feedback questionnaires Annual staff appraisal External Examiners' Reports Course team meetings
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14 Regulation of assessment

Details of the mechanisms and criteria for assessment in individual modules, and the means of determining final degree classifications, are published widely. Students are able to access the University's Standard Undergraduate Assessment Regulations on the Intranet and individual and collective guidance is given by academic staff on their operation at appropriate times throughout the course.

To qualify for an Honours degree a student must successfully complete all required modules and obtain 360 credits (each module has a 24 credit value). Only assessments at levels 5 and 6 (that is second and third year modules on the 3-year full-time programme) are used to calculate the degree classification. The pass-mark in all modules is 40%.

The Degree classification for BSc Engineering Product Design is determined, after successful completion of all the course modules, from whichever is the best of:

1. The average of the marks for the level 5 and level 6 modules, with double modules being counted twice and the level 6 four-module Elective Project counted four times, or
2. The average of the marks for the level 6 modules, with the Elective Project module counted twice, or
3. The average of the Elective Project module marks counted twice plus the best two from the remaining three level 6 modules.

The highest average is used to obtain the degree classification according to the following bands:

First class honours	aggregate mark of 70% or above
Upper second class honours	aggregate mark of 60%-69%
Lower second class honours	aggregate mark of 50%-59%
Third class honours	aggregate mark of 40%-49%

External Examiners are appointed. Their work includes:

- Reviewing coursework assignments and assessment criteria
- Approving examination papers
- Monitoring standards through moderation of completed assessments
- Attending Examination Boards
- Participating in the course review processes.

BSc (Hons) Engineering Product Design

Student's Guide

Background

The field of Product Design is continuing to experience rapid technological change driven by the use of modern computer based design and manufacturing technologies. Changes in the way in which creative and commercial business is being undertaken through increased competition and the globalisation of design and manufacturing activities are driving the adoption of more new technologies and the focus to value added activities. There is a growing shortage of young product designers who have the skills of virtual modelling and simulation of components and whole product assemblies and who can enable companies to increase the value added content of design activity.

This degree combines a study of the modern advanced computer technologies of visualisation for style and form with concept evaluation, and performance appraisal. The strong emphasis upon virtual modelling and simulation equips the product designer with the new multi-skilled tools increasingly being demanded by the profession.

Graduates will be versatile, adaptable, technically literate, creative and acquire practical design skills relevant to the specification, design, simulation and test of product design solutions.

What does the industry want?

To remain competitive in the world market place there is a constant demand for well-qualified graduate product designers. The creative and commercial industries requires design graduates who are versatile, adaptable and who possess technical knowledge, analytical capability with practical skills in computer aided design, coupled with business and commercial awareness. These qualities will provide the foundation for a successful and rewarding career.

What type of work will I do?

The programme combines a number of key themes; Computer Aided Design Technologies, product design and styling, business and product development, and virtual modelling and simulation.

Assignments include: Technical specification, design, prototype and test as well as final integration and implementation of a design solution.

Is the course accredited?

The BSc (Hons) Engineering Product Design is accredited by the Institution of Engineering and Technology as satisfying full academic requirements for IEng. (Subject to confirmation of re-accreditation)

Are there Sandwich Placements and Opportunities?

Of course, as with most other degree programmes, Sandwich Options are available. The Technology Innovation Centre has a placements office, which manages a scheme designed to give the students an opportunity to work in industry as a part of their studies. These are real jobs in leading design companies paying real money. Industry placements offers students stimulating challenges and the chance to put theory into practice, to take on some responsibility and gain valuable experience of commercial life in a variety of organisations.

Employment prospects?

The philosophy of the programme is the development of multi-skilled and versatile graduates. The course equips graduates for careers in the following areas of the design field,

- Design and product development,
- Testing and evaluation,
- Product data management,
- Supplier and customer relations,
- Marketing

How do I apply?

University: Birmingham City University
Faculty: [Technology Innovation Centre](#)
Millennium Point, Curzon Street, Digbeth
Birmingham B4 7XG
Telephone: (+44) (0)121 331 5400
<http://www.tic.ac.uk>

Applications: UCAS
Rosehill
New Barn Lane
Cheltenham
Gloucestershire GL52 3LZ
Telephone (+44) (0)1242 223707
<http://www.ucas.ac.uk/>

UCAS code: H770

Course Length: 3 years full-time
4 years sandwich
3 years part-time for stage 2 entry with appropriate
HNC or equivalent, 5 years if no exemptions apply

Location: Millennium Point, Birmingham

Enquiries: Information Officer (at the above address)
Telephone: (+44) (0)121 331 5400
Email: enquiries@tic.ac.uk

BSc (Hons) Engineering Product Design

Employer's Guide

Introduction

The Technology Innovation Centre (*tic*) was established in January 2000 as a wholly owned subsidiary of the University of Central England, now Birmingham City University, located at the prestigious Millennium Point complex near Birmingham city centre. The *tic* is founded on the knowledge, expertise and market relationships established by the Faculty of Engineering and Computer Technology of the University. These relationships have been built over many years meeting the needs of a wide range of clients. The *tic* draws upon strong partnerships with national and international industry, small and medium sized enterprises, commerce, universities, schools and research institutes. In particular, the *tic* has established strong commercial partnerships with companies at the forefront of technological innovation.

The product design field has experienced significant cultural changes in the manner and form of the product development cycle. The driving factor has been the introduction of advanced integrated computer technologies encompassing the use of virtual modelling and simulation techniques. These techniques have in themselves produced further drivers to manage, control and process design data and information and necessitated the extension of the existing CAD activities into the concept of Product Data Models that encapsulates the total design process management activity.

There is a growing commercial pressure being exerted on design departments and design houses to adopt similar systems and develop an integrated information database supply chain. The industry faces a challenge to upskill the indigenous design resource base and capability, and to establish a human resource supply chain for the future.

The degree in Engineering Product Design has been developed to reflect the changing nature of the product design field arising from the growing competition from globalisation of design and manufacturing capabilities. The programme is designed to develop a more broad based product designer with knowledge and applications ability related to the new design technologies and business practices, and capable of working in a multi-skilled, multi-disciplined environment.

Facilities / Partnerships

The Technology Innovation Centre has committed significant resources over recent years for the development of technology-based courses. There are major facilities for CAD, Simulation and Product Data Management through a

range of advanced PCs using professional standard software connected to the *tic* network.

In the design area, the Technology Innovation Centre has an extensive range of CAD and Analysis software including CATIA, IDEAS, PRO-Engineer, Adams, Ansys, Wave, LS-DYNA, Radios, Easi-crash etc.

To support teaching and learning activity, there will be a dedicated web site provided for students on this course. The content will keep students up to date with relevant events both within the Technology Innovation Centre and in the wider world of the Internet. Students will be able to contribute to the server with their own content, assignment work and through participation in discussion forums.

The tic's Learning Centre has subscriptions to academic journals in the Design and CAD area and access to a range of complementary Journals and publications, furthermore UCEEL, the University's Digital Library, provides electronic versions of exam papers, book chapters and previous student projects, which can be accessed from off-site.

The Curriculum

The degree provides a balance of modules that will enable graduates to make a significant contribution throughout the industry. The course is developed in a themed approach. The course comprises five themes:

- Computer Aided Design
- Product Development
- Business Management
- Industrial Design
- Design Management

The themes of Computer Aided Design, Product Development and Design Management permeate through all semesters and levels of the programme and are regarded as the focal areas of the course. The CAD theme provides the database of the product design tools and evolves at level 3 into the virtual test and validation resource to fully evaluate product designs and concepts. The Industrial Design theme integrates through to the CAD theme with concepts of shape and form and geometry definitions and at level 3 evolves into a design process management role.

The remaining two themes provide complementary knowledge to inform the key processes of the key themes. The Business theme contains and employability content and provides the supportive knowledge for personal development.

Programme Aims

To produce graduates who are versatile, adaptable and possess technical knowledge, and business awareness of the practices, systems and factors that are the modern requirements for the engineering product design sector.

To produce graduates whose wide range of skills and knowledge equips them for a variety of roles that comprise the engineering and product design fields and to deliver business value by the use of appropriate technology.

Expected Outcomes

On completion of the course students will have:

1. Understanding of the total design process
2. The ability to respond to commercial design briefs creatively, practically, and the ability to define and follow schedules and achieve deadlines
3. Knowledge of the underlying principles and applications of industrial design,
4. A sound grasp of the basics of engineering design and skills in computer aided design,
5. Awareness of the needs of manufacturing industry in terms of designing products that are cost effective to manufacture and assemble,
6. Knowledge of the theory and practice of designing products to suit the needs of the user both ergonomically and from the marketing viewpoint,
7. Knowledge and skills in the management of the design process, running design projects and the ability to work both individually and within teams

Accreditation

The BSc (Hons) Engineering Product Design is accredited by the Institution of Engineering and Technology as satisfying full academic requirements for IEng. (Subject to confirmation of re-accreditation)