



The Institution of Engineering Designers

Engineering Design Specific Learning Outcomes for EC(UK) Accredited Degree Programmes

Graduates from IED accredited degree programmes must achieve the following learning outcomes incorporating the key skills of knowledge and understanding, intellectual abilities, practical skills, and general transferable skills. The learning outcomes are expressed in terms of underpinning science and mathematics and associated disciplines; engineering analysis; design; economic, social and environmental context; and engineering practice. The weighting given to these different broad areas of learning will vary according to the nature and aims of the particular degree programme. In the table below the central column related to BEng (Hons) for CEng is the reference column and the columns to the left and right show limitations or enhancements to it respectively. Where no limitation or enhancement is shown the statement in the central column applies.

1. Underpinning Science and Mathematics and Associated Engineering Disciplines (US)					
IEng degree as limitation to BEng (Hons)		BEng (Hons) degree for CEng		Integrated MEng degree as enhancement of BEng (Hons)	
US1i	<ul style="list-style-type: none"> Knowledge and understanding of the scientific principles underpinning relevant technologies, to enable the modelling of routine engineering systems, processes and products, and collect and interpret data and draw conclusions in the solution of practical engineering design problems. 	US1	<ul style="list-style-type: none"> Knowledge and understanding of scientific principles and methods necessary to underpin education in engineering, to enable the modelling and analysis of non-routine engineering systems, processes and products, and collect and interpret data and draw conclusions in the solution of familiar engineering design problems, recognising the limitations. 	US1m	<ul style="list-style-type: none"> Comprehensive knowledge and understanding of scientific principles and related engineering disciplines to enable the modelling and analyse complex engineering systems, processes and products and collect and interpret data and draw comprehensive conclusions for the innovative solution of unfamiliar or novel engineering design problems using future developments and technologies.

US2i	<ul style="list-style-type: none"> • Knowledge and understanding of mathematics necessary to support the application of key engineering design principles. 	US2	<ul style="list-style-type: none"> • Knowledge and understanding of mathematical principles necessary to underpin education in engineering design and other disciplines to enable the identification and application of mathematical methods, tools and notations proficiently in the analysis and solution of engineering problems in a practical situation identifying inconsistencies and limitations of data extrapolation. 	US2m	<ul style="list-style-type: none"> • Comprehensive knowledge and understanding of a wide range of mathematical models relevant to engineering design to be able to apply them in areas outside previous experience and researching and using new mathematical methods required for novel solutions.
US3i	<ul style="list-style-type: none"> • Ability to apply knowledge of non-engineering disciplines in engineering design. 	US3	<ul style="list-style-type: none"> • Ability to apply and integrate knowledge and understanding of other engineering and non-engineering disciplines to support engineering design activities. 	US3m	<ul style="list-style-type: none"> • Understand concepts from a range of fields including those outside engineering, and the ability to apply them effectively in engineering design projects.
US4i	<ul style="list-style-type: none"> • Knowledge and understanding of the functionality of common ICT tools and able to select and apply appropriate computer-based engineering design tools to solve problems. 	US4	<ul style="list-style-type: none"> • Knowledge and understanding of the role and limitations of common ICT tools and ability to specify requirements for computer-based engineering design tools to solve unfamiliar problems. 	US4m	<ul style="list-style-type: none"> • Comprehensive knowledge and understanding of the role and limitations of ICT and awareness of other developing technologies related to engineering design.

2. Engineering Analysis (E)					
IEng degree as limitation to BEng (Hons)		BEng (Hons) degree for CEng		Integrated MEng degree as enhancement of BEng (Hons)	
E1i	<ul style="list-style-type: none"> Ability to monitor, interpret and apply the results of analyses and modelling in order to bring about continuous improvement. 	E1	<ul style="list-style-type: none"> Understanding of engineering principles and the ability to apply them to analyse key engineering processes. 	E1m	<ul style="list-style-type: none"> Ability to use fundamental engineering knowledge to investigate new and emerging technologies.
E2i	<ul style="list-style-type: none"> Ability to use the results of analysis to solve engineering design problems, apply technology and implement engineering processes. 	E2	<ul style="list-style-type: none"> Ability to identify, classify and describe the performance of products, systems and components through the use of analytical methods and modelling techniques. 	E2m	<ul style="list-style-type: none"> Ability to extract and use data for unfamiliar engineering design problems, and use computer-based tools when appropriate.
E3i	<ul style="list-style-type: none"> Ability to apply quantitative methods and computer software relevant to engineering design technology within a multidisciplinary context. 	E3	<ul style="list-style-type: none"> Ability to apply quantitative methods and computer software relevant to engineering design, to solve engineering problems. 	E3m	<ul style="list-style-type: none"> Ability to apply mathematical and computer-based models for solving problems in engineering design, and the ability to assess the limitations of particular cases.
E4i	<ul style="list-style-type: none"> Ability to apply a systems approach to engineering design problems through knowledge of the application of relevant technologies. 	E4	<ul style="list-style-type: none"> Understanding of and ability to apply a systems approach to engineering design problem solving. 	E4m	<ul style="list-style-type: none"> Detailed understanding and application of a systems approach to solving complex engineering design problems.

3. Design (D)					
IEng degree as limitation to BEng (Hons)		BEng (Hons) degree for CEng		Integrated MEng degree as enhancement of BEng (Hons)	
D1i	<ul style="list-style-type: none"> Ability to define an engineering problem and identify the constraints. 	D1	<ul style="list-style-type: none"> Ability to investigate and define an engineering problem and identify constraints, expressing as a design brief. 	D1	
D2i	<ul style="list-style-type: none"> Ability to design solutions according to customer and user requirements, and generating a product design specification (PDS). 	D2	<ul style="list-style-type: none"> Understanding of customer and user functional needs and the importance of form considerations such as aesthetics and ergonomics and generating a PDS. 	D2	
D3i	<ul style="list-style-type: none"> Awareness of the influence of cost drivers on engineering design decision-making. 	D3	<ul style="list-style-type: none"> Ability to identify and manage cost drivers within the context of engineering design. 	D3	
D4i	<ul style="list-style-type: none"> Ability to generate ideas to solve problems and design new products, systems, components or processes, synthesising from those already in existence. 	D4	<ul style="list-style-type: none"> Ability to use creativity to establish innovative engineering design solutions, justifying the selection of ideas. 	D4m	<ul style="list-style-type: none"> Ability to generate innovative designs for products, systems, components or processes to fulfil new needs or purposes.
D5i	<ul style="list-style-type: none"> Ability to confirm fitness for purpose for engineering products including their operation and maintenance. 	D5	<ul style="list-style-type: none"> Ability to ensure fitness for purpose for all aspects of the engineering product life cycle, i.e. manufacture, operation, maintenance, disposal and/or recycling. 	D5m	<ul style="list-style-type: none"> Ability to generate ideas for new engineering products and develop and evaluate a range of solutions.
D6i	<ul style="list-style-type: none"> Ability to use engineering design methods and tools to adapt engineering designs to meet new purposes or applications. 	D6	<ul style="list-style-type: none"> Knowledge and understanding of engineering design methods and tools and the ability to apply them to adapt new designs. 	D6m	<ul style="list-style-type: none"> Extensive knowledge and understanding of engineering design methods and tools and the ability to apply and adapt them to unfamiliar engineering problems.
D7i	<ul style="list-style-type: none"> Ability to plan and execute practical and/or simulation tests of design solutions and present reports containing analysis and discussion of the results. 	D7	<ul style="list-style-type: none"> Ability to plan and execute practical and/or simulation tests of design solutions and present reports containing critical analysis of the results and recommendations of actions for redesign and development. 	D7	

D8		D8 <ul style="list-style-type: none"> Ability to provide visualisations such as physical prototypes or models, or computer models or renderings of a product, system, component or process. 	D8
D9		D9 <ul style="list-style-type: none"> Ability to participate in the planning and execution of practical or simulation tests of design solutions and present reports containing analysis and discussion of results. 	D9m <ul style="list-style-type: none"> Ability to plan and execute practical or simulation tests of design solutions and present reports containing critical analysis of the results and make recommendations of actions for redesign and development.

4. Economic, Social and Environmental Context (S)					
IEng degree as limitation to BEng (Hons)		BEng (Hons) degree for CEng		Integrated MEng degree as enhancement of BEng (Hons)	
S1		S1	<ul style="list-style-type: none"> Knowledge and understanding of the commercial and economic context of engineering processes. 	S1m	<ul style="list-style-type: none"> Ability to make general evaluations of commercial and economic risks and can take appropriate action.
S2		S2	<ul style="list-style-type: none"> Understanding of management and business practises that may be used to achieve engineering design objectives including finance, law, marketing, personnel and quality. 	S2m	<ul style="list-style-type: none"> Extensive knowledge and understanding of management and business practices, and their limitations, and how these may be applied appropriately in engineering design.
S3i	<ul style="list-style-type: none"> Understanding of the requirement for engineering activities to promote sustainable development. 	S3	<ul style="list-style-type: none"> Ability to make social and environmental evaluations and take appropriate action. 	S3	
S4		S4	<ul style="list-style-type: none"> Awareness of the framework of relevant legal requirements governing engineering activities, including personnel, health, safety, and risk assessment issues. 	S4	
S5		S5	<ul style="list-style-type: none"> Awareness and application of a high level of professional conduct and ethical responsibility including the global and social context of engineering design. 	S5	

5. Engineering Practice (P)					
IEng degree as limitation to BEng (Hons)		BEng (Hons) degree for CEng		Integrated MEng degree as enhancement of BEng (Hons)	
P1i	<ul style="list-style-type: none"> Understanding of and ability to use relevant materials, equipment, tools, processes and products. 	P1	<ul style="list-style-type: none"> Knowledge of the characteristics of particular materials, equipment, processes and products. 	P1m	<ul style="list-style-type: none"> Extensive knowledge and understanding of a wide range of engineering materials and components.
P2i	<ul style="list-style-type: none"> Knowledge and understanding of standard engineering workshop and laboratory practice. 	P2	<ul style="list-style-type: none"> Particular engineering workshop and laboratory skills allied to engineering design. 	P2m	<ul style="list-style-type: none"> Thorough understanding of current practice and its limitations and an appreciation of likely new developments.
P3i	<ul style="list-style-type: none"> Knowledge of contexts in which engineering design knowledge can be applied to solving engineering problems. 	P3	<ul style="list-style-type: none"> Understanding of contexts in which engineering design knowledge can be applied such as operations management and technology development. 	P3	
P4i	<ul style="list-style-type: none"> Ability to use and apply information from a range of technical literature. 	P4	<ul style="list-style-type: none"> Understanding the use of technical literature and other information sources including electronic media. 	P4	
P5i	<ul style="list-style-type: none"> Understanding and application of intellectual property rights (IPR) including patent search and principles of copyright and design registration. 	P5	<ul style="list-style-type: none"> Understanding and application of IPR, including patent application and nature of associated legal and contractual issues. 	P5	
P6i	<ul style="list-style-type: none"> Understanding of specific engineering design codes of practice and industry standards, with some knowledge of design factors and requirements for safe operation. 	P6	<ul style="list-style-type: none"> Understanding of appropriate engineering design codes of practice, regulatory framework and industry standards, with wide knowledge of design factors and requirements for safe operation. 	P6m	<ul style="list-style-type: none"> Understanding of engineering design codes of practice, regulatory framework and industry standards, with comprehensive knowledge of design factors and requirements for safe operation and their application to a wide range of situations.
P7i	<ul style="list-style-type: none"> Awareness of quality issues in engineering design. 	P7	<ul style="list-style-type: none"> Understanding of quality issues and its application to continuous improvement. 	P7m	<ul style="list-style-type: none"> Understanding of quality management and its role and use in ensuring product

					conformance.
P8i	<ul style="list-style-type: none"> Understanding of the principles of managing engineering design projects, being able to work in a team. 	P8	<ul style="list-style-type: none"> Ability to apply standard management techniques to engineering design projects; planning and allocating resources and evaluating outcomes, undertaking most team roles. 	P8m	<ul style="list-style-type: none"> Ability to apply management techniques to the engineering design projects; planning and allocating resources and developing, delegating, monitoring and updating a plan to reflect changing environments, taking on responsibility of team leader.
P9		P9	<ul style="list-style-type: none"> Ability to apply engineering design techniques, taking account of a selection of commercial and industrial constraints. 	P9m	<ul style="list-style-type: none"> Ability to apply engineering design techniques, taking account of a wide range of commercial and industrial constraints.
P10i	<ul style="list-style-type: none"> Ability to work with technical uncertainty, limited or contradictory information, being able to make value judgements in the solution of engineering design problems. 	P10	<ul style="list-style-type: none"> Ability to work with technical uncertainty, limited or contradictory information, being able to make value judgements in the solution of unfamiliar engineering design problems, understanding the limitations. 	P10	
P11i	<ul style="list-style-type: none"> Ability to evaluate technical risks. 	P11	<ul style="list-style-type: none"> Ability to evaluate technical risk with an awareness of the limitations of possible solutions. 	P11	
P12		P12	<ul style="list-style-type: none"> Ability to write, structure and present technical reports and specifications. 	P12	