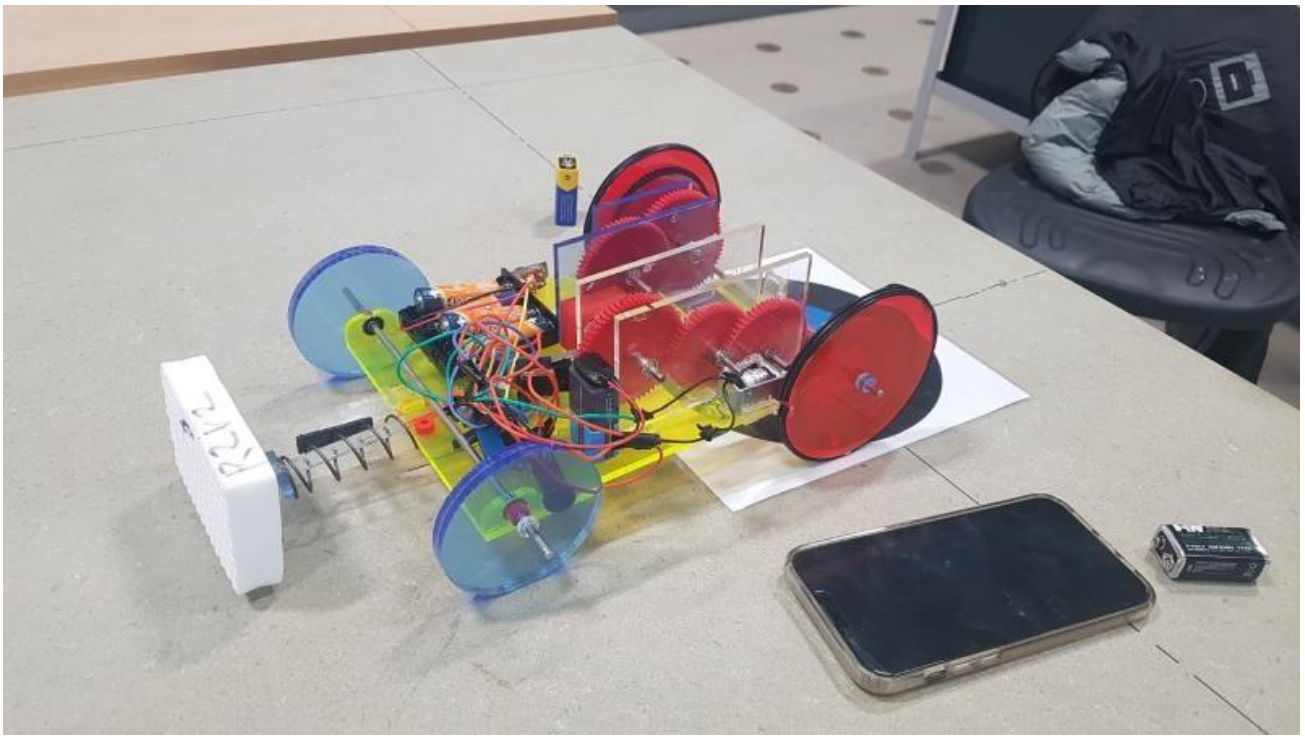
DESIGN CHALLENGE GENERAL SPECIFICATION 2025

IMechE DESIGN CHALLENGE

GUIDANCE FOR ALL PROJECTS



General Specification for the 2025 Design Challenge

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Note: this specification must be read in conjunction with the respective document
"IMechE Design Challenge - Project Specification and Rules 2025"
available on the IMechE Design Challenge website.

Please check the IMechE Design Challenge website for updates.

Contents

List of Amendments:

Version	Page	Details	Date
0.1	-	First release	17/09/2024
1.0	-	Minor amendments and typo; scrutineering checklist amended	11/11/2024
1.1	-	Prices for each category corrected to reflect updated 2025 pricing; see section 1.10	26/02/2025

List of Major Changes Since 2024

- Clarified categories, requirements and eligibility as overall winner – Sect 1
- New device added
- Clarified energy source – single battery
- Included Appendix 4 – Checklist for submission
- Included Appendix 5 – Academic leader check sheet

Please report any errors to *designchallenge@imeche.org* so that corrections can be made.

1. Introduction and Purpose of the Design Challenge

The purpose of the Design Challenge competition is to simulate a real-world project, allowing students to develop cross-functional skills sets which enable success in post academic employment.

Working in teams, students design, build, test and assess a self-contained device from a precise Project Specification.

The annual event takes place in three stages. Universities, Colleges and other engineering sciences educational institutes run internal qualifiers to select up to two teams per each category to progress to their respective Regional Finals. The winning team from each region progresses to the national final.

The competition is open to teams of three to six students in engineering or engineering related sciences (with competing categories allocated by academic year). There are five competition elements to the Design Challenge at the Regional Competition and National Final:

1.1.1 Design Competition: Create a complete and representative 3D model (virtual prototype) of the device along with a comprehensive Bill of Materials (BoM)

1.1.2 Poster Competition: Produce an A3 (portrait) poster to summarise and publicise the team's work. The poster allows the team to think creatively, whilst communicating their design solution to a prospective customer.

1.1.3 Presentation Competition: Give a time bound video recorded presentation, explaining the design and development of their device. Highlight any underpinning engineering calculation and show any simulations and considerations that influenced the design. This will demonstrate the presentational and communication skills. At regional and national finals, the three highest scoring entries will present live, answering questions from the judging panel.

1.1.4 Peer Review (Regional Competition Only): The competing students at the regional and national finals will be asked to score all the other competing teams, based on a series of criteria, and submit a peer review, scoring from their perspective the first three teams. Not applicable to all categories, not applicable if three or less teams are competing, excludes 4.15.1.1.

1.1.5 Design Excellence (National Competition Only): The Industry representative (or a different member, nominated by the judging panel, if an Industry representative is not available) will evaluate and assess the design, based on both engineering and design principles. Key factors are clarity of the design to satisfy product requirements, process adherence, prototype robustness, overall appearance. Not applicable to all categories, not applicable if three or less teams are competing, excludes 4.15.1.1.

1.1.6 The Challenge: on the day of the competition, demonstrate the device capability meets the specification requirement; through a scored practical assessment (as defined in the Project Specifications and Rules). Not applicable to all categories, excludes 4.15.1.1.

1.2 The format of the regional and national finals is as follows:

- Regional Final

  Closure of the documentation and files submissions 1 week before the event date; see Appendix 4 – Submission checklist for teams.

On the competition day:

- ⇨ Formal opening and outline of the day
- ⇨ Presentation competition for the 3 highest scoring presentations
- ⇨ Device scrutineering - excludes 4.15.1.1
- ⇨ Peer Review scoring and submission
- ⇨ The Challenge – heats and finals
- ⇨ Judges meeting and deliberation
- ⇨ Final announcements, prizes and closure of the day

- National Final

Closure of the documentation and files submissions 1 weeks before the event date; see Appendix 4 – Submission checklist for teams.

On the competition day:

- ⇨ Formal opening and outline of the day
- ⇨ Presentation competition for the 3 highest scoring presentations
- ⇨ Device scrutineering
- ⇨ Design excellence scoring
- ⇨ The Challenge – heats and finals
- ⇨ Judges meeting and deliberation
- ⇨ Final announcements, prizes and closure of the day

1.3 Points will be awarded for all sections of the competition.

1.4 All the points scored for each section of the competition will be totalled (normalised to 100) as shown below. An outright champion will be awarded for each competing category, based on the overall score.

1.4.1	Design	10/100
1.4.2	Poster	10/100
1.4.3	Presentation	10/100
1.4.4	Peer Review (regional only) *	10/100
1.4.5	Design Excellence (national only) *	10/100
1.4.6	The Challenge *	60/100

* Not applicable to 4.15.1.1

In each category (see 4.15) the team that accumulates more points overall will be declared the overall winner of the Design Challenge Competition event, subject to the following conditions:

1.5 Teams must compete and have a valid score in sections 1.4.1, 1.4.2, 1.4.3 and 1.4.6 - excludes 4.15.1.1 - to be the winner overall.

1.6 The overall winner at regional finals will automatically qualify for the national finals. This applies to each competition category (Foundation, Advanced etc).

1.7 Between the regional and national finals, adjustments, refinements and overall project development are permitted. If a team makes design changes before competing in the national finals, the details of these changes must be presented to the judges alongside the other required submissions. Any evidence of plagiarism will result in disqualification.

1.8 In the event of a tied overall score, the judges may award the overall winner to the team with the highest points in the practical challenge.

1.9 Teams' subscriptions are open between November and February. The regional finals are held between March and June; the national final is held in October of each year.

1.10 Registration fees: to attend the regional final, each competing team shall pay the following registration fees

- *Concept Challenge (*see 4.15.1.1) - *£30 inc VAT*
- *Foundation Challenge (*see 4.15.1.2) - £60 inc VAT
- *Advanced Challenge (*see 4.15.1.3) - £72 inc VAT

The IMechE will inform the teams interested in attending about deadlines and other subscription requirements.

2. Prizes and Certificates

In the Regional Competitions, the overall winning team in each category (see 4.15) will receive their Regional Design Challenge Trophy to keep until the next Regional Competition. All members of the winning team will receive a certificate, see below.

In the National Final, the overall winning team in each category (see 4.15) will receive the Design Challenge Trophy to keep until the next National competition, and a certificate. All members of the winning team will receive a replica trophy to keep, together with a certificate.

2.1 Certificates

Certificates will be available for the following, in both regional and national finals:

The winning team of the Design Competition (1.4.1)
The winning team of the Poster Competition (1.4.2)
The winning team of the Presentation Competition (1.4.3)
The winning team of the Peer Review (1.4.4)
The winning team of the Design Excellence Competition (1.4.5)
The winning team of The Challenge (1.4.6)
The overall winner of the Design Challenge Competition (1.4)

All members of the other participating teams will receive certificates. Certificates will only be awarded to participating team members and not to team supervisors or other staff members.

2.2 Prize money

Cash prizes will be awarded to the winners of the competition sections. For the regional finals is as follow:

1st *Concept Challenge (*see 4.15.1.1) - *£75.00*
2nd *Concept Challenge (*see 4.15.1.1) - *£40.00*
3rd *Concept Challenge (*see 4.15.1.1) - *£20.00*

1st *Foundation Challenge (*see 4.15.1.2) - *£100.00*
2nd *Foundation Challenge (*see 4.15.1.2) - *£75.00*
3rd *Foundation Challenge (*see 4.15.1.2) - *£50.00*

1st *Advanced Challenge (*see 4.15.1.3) - *£150.00*
2nd *Advanced Challenge (*see 4.15.1.3) - *£100.00*
3rd *Advanced Challenge (*see 4.15.1.3) - *£75.00*

For the national final is as follow:

1st *Foundation Challenge (*see 4.15.1.2) - *£200.00*
2nd *Foundation Challenge (*see 4.15.1.2) - *£150.00*
3rd *Foundation Challenge (*see 4.15.1.2) - *£100.00*

1st *Advanced Challenge (*see 4.15.1.3) - *£300.00*
2nd *Advanced Challenge (*see 4.15.1.3) - *£250.00*
3rd *Advanced Challenge (*see 4.15.1.3) - *£200.00*

3. Sponsor Awards

In addition to the IMechE prizes, the Sponsor Awards will be given by the competition sponsors. These awards can be for specific aspects of the challenge, for teams and individuals. They may also include opportunities for industrial visits or placements with the sponsor. Please check for full details on the IMechE Design Challenge website for up-to-date information.

Please note that the Sponsor Awards are not a formal, or obligatory, part of the competition, and do not affect the scoring of submissions.

4. Rules for The Challenge

General

4.1 Each team shall produce one single device.

4.2 The device shall remain self-contained within a given envelope at any time of the inspection and during the competition for 5.1 and 5.5. Some projects may deploy external devices such as chains or lines, see 5.2, 5.3 and 5.4. Some projects may require to be operated via a cable-controlled switch (not a remote control), see 5.2.

4.3 Nothing used by the device to move, navigate or perform the mission can be outside that volume or added at any point. Examples, but not limited to, are remote control, power leads, laid tracks, left behind markers, external aerials, laser pointers, set-squares, ropes, switches, etc.

4.4 No proprietary, pre-programmed control units or devices may be used. Examples, but not limited to, are Lego Technic modules, vision camera – scanning systems for industrial applications, etc.

4.5 The device must be fully autonomous. The device cannot be operated with a remote control of any sort.

4.6 Devices should be manufactured using available facilities and materials, using processes that students can undertake themselves (e.g. no manufacturing is to be outsourced).

4.7 Off the Shelf (OtS) components may also be purchased, such as motors, batteries, gears, bearings, fasteners and so on.

4.8 All components, whether manufactured or bought, must comply with the *Design Challenge Project Specifications and Rules* associated to the competing year and to this document.

4.9 All devices must be 'signed off' by the University, College or institute staff member the team belongs to. Clear details of the name and contact for the member shall be provided. Each team should ensure that the internal sign off for the team to compete covers all the files and submission to the DC specifications. A risk and device safety assessment is also required for the categories where a physical prototype is produced (see 4.15.1.2 and 4.15.1.3).

4.10 All devices must be available for scrutineering prior to commencement of the competition - excludes 4.15.1.1.

4.11 On the day of the competition, and after successfully completing the scrutineering process, teams will be given a sticker to be attached to the device as proof of scrutineering passed by the IMechE DC judging panel. Any team which tries to enter a heat without this sticker will not be allowed to compete.

4.12 If a device does not meet these requirements, and modification cannot be made within the allocated time to allow it to comply, then it will be deemed withdrawn from the competition.

4.13 Photographic and filming activities may take place to monitor the activities in the competition lanes so that if there is a dispute it can easily be resolved.

4.14 Costs, mass, calculations and numbers in general shall be presented together with the Units of measurements that identifies them and rounded accordingly (see 16.1).

Categories

4.15 The Design Challenge is open to three categories for project submission: Concept, Foundation and Advanced prototypes. High level description of the categories:

4.15.1.1 *Concept Challenge*: Virtual project only - no physical prototype. Sections from 0 to 1.1.4 and 1.2 will apply. This category is open to technical college level up to first year university undergraduates (English System Level 4 - Year 1 / Scottish System SCQF level 8 - Year 2), see Appendix 3 – College and university academic equivalence.

4.15.1.2 *Foundation Challenge:* Device without any programmable element; based only on mechanical and passive systems, with analogue electronic circuit – electronic architecture. Sections 0 and 1.2 will apply. This category is open to technical college level up to first year university undergraduates (English System Level 4 - Year 1 / Scottish System SCQF level 8 - Year 2), see Appendix 3 – College and university academic equivalence.

4.15.1.3 *Advanced Challenge:* Device with programmable element(s); competition with multiple targets / complex mission. Sections 0 and 1.2 will apply. This category is open to any team.

Design and technical requirements per each category will be detailed in the *Design Challenge Project Specifications and Rules.*

Project budget and device cost

4.16 A full parts list with all itemised costs must be produced: this is the Bill of Materials (BoM). See sections 6, 7 and Appendix 1 – BoM examples for further details.

4.17 Costs shall be clearly presented and accounted as inclusive of VAT.

4.18 The BoM consists of two different levels: the total cost, including any consumable used and the IMechE BoM cost, where items with an individual value below 20p (£0.20) are not included.

4.19 Depending on the categories, the IMechE BoM cost – max budget is as follows:

For categories *4.15.1.1* Concept Challenge *and 4.15.1.2 Foundation Challenge:* IMechE BoM cost max £50.00 (including VAT)

For category 4.15.1.3 *Advanced Challenge*: IMechE BoM cost max £90.00 (including VAT)

4.20 All materials, parts and commodities shall be listed in the BOM, with the as-new normal retail purchase price detailed N.B. this must be as quoted by a VAT

registered company and include VAT but not carriage costs. If any materials are instead available as "consumable items" i.e. provided to the student through the University/Institute lab facilities, then the team shall find a reliable online source to show an equivalent cost – value for the same commodity consumed.

4.21 Invoices, receipts, proof of purchase, or cost estimate evidence shall be made available as part of the submission of the BoM and costing element. Cost estimate evidence could be quotation from third parties or links to websites where the purchase of such component or material could be done.

4.22 Elements required to perform the mission (such as chains, ropes, balls, and similar) shall not be included in the BoM. Items necessary to connect such elements to the devices shall be included in the virtual model (see 6) and in the BoM.

4.23 A component or material is 'in-kind' if it is not commercially available for purchase by other teams or cannot be supplied at the same price. Components or materials 'in-kind' or provided free by the university or from any other source, must be included in the parts list, and costed as appropriate at its as-new price. (Further refer to 4.20 and 4.21).

4.24 All elements, products and materials used to propose the design (4.15.1.1) or to propose and produce the design (4.15.1.2 and 4.15.1.3) shall be included in the BoM. Items missed / not costed in BoM or present in the physical device (4.15.1.2 and 4.15.1.3) but not includes in the BoM analysis will be considered equally as BoM over budget and penalised accordingly.

4.25 Parts from existing commercial devices (i.e. chassis, complete drive systems, suspension system modules, etc.) are not permitted. In case of doubt, please consult the Design Challenge Steering committee before the submission.

4.26 Any replacement, or substitute parts, used during the heats and final of The Challenge shall be included. Examples, but not limited to, are spare sets of batteries (if changed during heats or between heats and final), different sets of springs or wheels; frames or transmission components used for fine tuning. All the above and any other component delivering similar function, if factored in during the design phase, shall be accounted as BoM item. In case of use of rechargeable batteries, chargers shall not be included in BoM.

4.27 Any team not ready to compete within the time allowed, including but not limited to the installation of spares will be disqualified.

4.28 Rapid prototyping or additive manufacturing is permitted. Teams should use this method for making individual parts and not for producing the whole assembly.

4.29 The cost of generic tools and machining – manufacturing consumables related to the execution or assembly of parts (drills, saws, files, drill bits, etc.) shall not be included. Any tool used, either self-produced or purchased, used to setup the device and that don't remain together with the device during the competition and transport, shall not be included in the BoM costing.

4.30 Refer to sections 6, 7 for further details on the BoM management, examples and how to extract summaries from it. BoM templates and summary examples available in Appendix 1 – BoM examples.

Safety

4.31 When a physical prototype is part of the competition, a comprehensive risk assessment, signed by a representative of the institution the team belongs to, shall be provided. Each individual educational institution shall provide their own risk assessment – no standardised template is provided by the IMechE Design Challenge organisation.

4.32 Fuses, electrical cables and joint protections, and any other safety related item shall be present on the device at any point and not come loose in any phase of the competition. All electrical joints shall be protected from finger contact at any time. Example of protection is by enclosing those in part of the device, using suitable insulative tape, heat shrinks, insulative coating or industrial connections.

4.33 A single main fuse shall be installed between the battery and any other wiring. If the maximum current draw cannot be proven, a maximum current fuse of 10A is permitted.

4.34 If an electric energy accumulation is installed (battery or capacitors), a single bank – pack shall be installed and a single main electric fused connection - line shall be provided to all services and systems on the device.

4.35 Gears, belts and movable items that could cause finger trapping or tangling with other devices shall be managed via the use of fences, protection, or enclosed inside the device chassis element. Cables, ropes and other flexible element shall not rub at any time against any movable item.

4.36 Consideration must be given to guarding if there is risk of entanglement or entrapment. Any cord, line, chain or similar devices shall be included in the design, assessed and its deployment during the mission evaluated carefully.

4.37 Teams must supply their own safety glasses and any other relevant Personal Protection Equipment (PPE) as specified within their Risk Assessment. Teams that fail to provide suitable PPE or wear those when required will have the score of the run involved erased / not accounted for. Two PPE fault in the same event will lead to the team disqualified from The Challenge section of the event.

4.38 Lithium batteries are not permitted. Other types of safe, rechargeable batteries may be used if not altered in any way (no direct soldering, no overcharging and similar operations).

4.39 Pressurised air systems may be allowed. They must be safe and assessed ahead of the project submission by the institute the team belongs to and by the DC Steering committee. A guideline for maximum energy storage for pressurised vessel is as per "Pressure Equipment Directive" (Directive 97/23/EC). An example could be volume <0.1l, PS <25bar·l and fluid used Group 2 (air).

4.40 No explosive charges or fluid combustion systems can be used.

4.41 Spring loaded devices may be allowed. They must be safe and assessed ahead of the project submission by the institute the team belongs to and by the DC Steering committee. A guideline for maximum energy released is 2J max – from

calculation, excluding any loss in the calculation. An example is the impact of 0.5kg mass dropped vertically from 400mm distance.

5. Project Specification

The adopted project will change every year to prevent ongoing development and convergence in performance. In each case this General Specification will apply for the competition and the rules of engagement.

The recurrent projects proposed for the DC competition are:

5.1 Repeatable device
5.2 Line launcher
5.3 Internal pipe climbing device
5.4 External pipe climbing device
5.5 Automatic EV Charging

The Steering Committee is constantly looking to introduce new challenges i.e. new devices with a different mission. New projects will be outlined with time to be evaluated by the students involved or potentially involved in the Design Challenge.

6. Rules for the Design Competition

The Design Competition consists of different elements: a virtual prototype, a BoM and a comprehensive design review where the solutions shown and the alignment between the virtual model and the BoM are evaluated.

To demonstrate their ability to create a concept capable of fulfilling the mission, teams are required to produce a Computer Aided Design (CAD) model in 3D and submit the virtual prototype of their design. The aim should be to represent all details of the product, including consumables and minor elements, as listed in the BoM associated to the prototype.

6.1 Teams are required to submit a detailed 3D model of the device that will complete the IMechE Design Challenge.

6.2 The file submission shall be either in "**.STEP*" (AP203 file spec.) or "**.X_T*" (Parasolid) format, to represent the whole assembly in a single file. The submission shall be done via the IMechE Design Challenge website.

6.3 Submitted models must be an assembly of individual solid bodies, and not one single entity. Individual parts within the assembly must be solids where mass and density could be applied, at a later stage, if not preserved during the translation and export phase. Each individual body shall be identifiable at least by part number and revision, see 6.19 and 6.21.

6.4 The virtual prototype must match the device that competes in the Main Competition and will be judged for similarity on the day. The individual bodies should have the same part number, revision and part name (if applicable) as the associated BoM.

6.5 The CAD model will be projected onto the screen during the review by the judges at the finals.

6.6 In terms of physical similarity, assemblies should include all the details needed to produce a physical prototype, such as fasteners and fixings. Liquid adhesives, solder, solder flux are examples of items that shall not be modelled but should be accounted for in the BoM.

6.7 The mass estimate from CAD – virtual model shall be provided.

6.8 Any design changes or iteration made between the regional and national finals must also be presented with the other submissions within the same timeline prior to the national final.

The BoM element should help young students to appreciate better how all the aspects of a project can be managed in the industry. The BoM should collate all the items used and materials consumed to produce a device, in this case the DC prototype. A BoM should offer the students be an easy way to track part maturity and device design and development stages.

Teams must also submit a BoM to accompany their design. This is a detailed parts list which also includes information such as materials, cost and suppliers.

6.9 Teams must submit a BoM to accompany their virtual prototype. Each BoM item shall be numbered and detailed with the following information, see *Appendix 1* for examples:

Part Number
Design iteration / revision
Part Name / Part description
Quantity (units; g; mm)
Unit cost (£/unit; £/g; £/mm - VAT inc.)
Total Cost (£ - VAT inc.)
IMechE BoM Cost (£ - VAT inc.)
Material Density (kg/m^3)
Unit mass (g)
Total Mass (g)
Manufacturing technique / purchased item
Supplier / hyperlink
Invoice (if available)

6.10 Every individual item installed or part of the prototype must be included in the BoM, with a realistic cost and a link to a potential (VAT registered) supplier, regardless of if it is the actual supplier or a reliable third part the item or material could be sourced form.

6.11 The BoM should be organised to deliver two totals: one for items costing more than £0.20 (the IMechE BoM cost) and one for all items installed and consumed, including items of less than £0.20 (the total BoM cost), see 4.18 and 4.19.

6.12 The total cost shall not exceed the IMechE BoM cost more than 10%

6.13 Standard materials bought in bulk (sheet, bar, cable reels, etc.) should be included in BoM cost charged as a proportion used per device. Example: 1m of M8 threaded rod that costs £4.80 (VAT included), consumed in 50mm lengths per each item, shall be costed as (£4.80 / 1000 x 50) = £0,24 per item.

6.14 If additive manufacturing (3D printing) is available as "in house" facility, a standard – flat cost of £0.10 /g shall be applied to any component produced this way.

6.15 Milling and turning (subtractive manufacturing) shall be costed at 5 times the ration of the billet consumed, to account for the costs of machine set up and skilled operator times. For example: an axle turned from a drawn aluminium, where 1 m of raw material costs £18.80, consumed in 80mm, it shall be costed as (£18.80 / 1000 x 80 x 5) = £7.52.

6.16 If laser cutting is available as "in house" facility, no additional cost shall be applied. The cost of the component produced this way shall be just a direct proportion of the overall cost of the sheet material consumed. For example, if a component is manufactured from 5mm hardwood plywood, where the whole board (1220 x 2440mm) costs £45.00, but the final item is only 2400mm^2 net surface area, it shall be costed as [£45.00/(1220 x 2440) x 2400]=£0.04.

6.17 If a component is outsourced, the BoM cost shall be shown as bought-in component and evidence of invoicing shall be provided.

6.18 Material and density properties shall be included so that judges can verify the accuracy of the model by applying material properties to individual components to check the calculated masses provided in the BoM, in case these metadata are lost during the translation-export of the 3D file.

6.19 The part number is one of the key elements and it shall be a unique identifier for each individual items. In industry, different strategies are implemented to structure a part number, varying from intelligent coding (where each section of the code has a technical content and meaning) to progressively generated numbers by a database management system. For the IMechE DC we suggest using a simple alpha-numeric structure. The following section will detail more the basic content of the item identification structure. Part number is the unique identifier for an item, used in a product - duplication of part numbers is not permitted.

6.20 BoM item index: this is the identifier of the level of the list associated to the item. In case of producing detailed assembly drawings, the item index is the number shown in the balloon, associated to the item shown in the assembly view. Note: the Design Challenge does not have a requirement to produce technical drawings, assembly drawings or assembly exploded view drawings.

6.21 Design iteration – revision index – release index: in a formal release process, an item is frozen when its design phase is completed, and it could be procured in batches to be part of an assembly or a serial production. The purpose of this index is to align CAD development, BoM and prototype as manufactured, to show an appreciation for the alignment between these three elements. Note: in industry version, design iteration, revision index and release index may or may not have the same meaning and function or may or may not be present at the same time. The DC doe does not have a requirement to have a formal release process for designed parts.

6.22 Part name / part description: usually a short string is associated to each item, to give a more expanded but still brief description of the element. For example, if a device has a chassis made by different elements, the names “Chassis upper”, “Chassis lower”, “Chassis central”, associated with the part number will help in identifying the component of concern or under development.

6.23 OtS components, also called standard parts, also called Commercial Off-the-Shelf (COtS), also called commercial items are different names for commercially available parts, with very similar function, manufactured following an industrial specification (or standard) and procurable through third party vendors. OtS means consumed as bought. Those are commonly used in any product and may be named in various ways. Depending on industry or the company philosophy, the definitions above could be interchangeable and referred to the same type of component or not. For the purposes of the DC, OtS commercial elements are any item that could be bought easily and is not proprietary or modified in any way by the team.

6.24 For OtS parts it is suggested to use the same part number listed by the vendor where the item has been purchased from. Item revision - version may not be available / not applicable.

6.25 If an OtS component is modified in any way so that it can no longer be interchanged with the unmodified purchased item, it becomes equivalent to any other proprietary designed part, such as bespoke structures. Any machining operation applied to it shall be costed accordingly.

6.26 Consumables are elements or products that are used to contribute to the assembly or the manufacturing of the device. The BoM shall track only consumables that are left as part of the device, such as adhesive tapes or liquid adhesives, but should not include or account for any other product required to maintain the workspace or prepare the items for assembly, such as surface degreasers.

7. Scoring for the Design Competition

The virtual prototype CAD model and the associated BoM will be scored in accordance with the requirements listed below. Unless specified differently, this applies to all three categories *4.15.1.1* Concept Challenge, *4.15.1.2 Foundation Challenge* and 4.15.1.3 *Advanced Challenge*.

7.1 Overall quality and level of details of the virtual prototype – CAD model.

7.2 Within capacity and time available, the students are encouraged to model and detail all the components listed in the associated BoM.

7.3 Compliance with the DC rules in terms of submitted CAD file (file format and integrity of the model).

7.4 Overall accuracy of the BoM, to show and include all the items present in the 3D model and any spare or tuning part that will be intended to be used during the competition. Invoices, website links, proof of purchase shall be available.

7.5 Accuracy of cost of both manufactured and bought-in elements. The cost of parts manufactured in house must be calculated based on the raw materials used, see 6.9 - 6.18.

7.6 Accuracy of the 3D model compared to the physical prototype (see 7.11 - 7.12).

7.7 Overall mass of the final device, ready to start the competition, compared with the CAD and BoM listed mass (see 7.11 - 7.12).

7.8 The length of the design review will last max for 5 minutes per team, but this may vary depending on the number of teams taking part.

7.9 CAD models shall be submitted electronically in "**.STEP*" (AP203 file spec.) or "**.X_T*" (Parasolid) format, BoM shall be submitted in .PDF and .xlsx format.

7.10 The submitted files are the version that will be judged.

7.11 Scoring table:

	No	Description	Points
3D model	1	Overall quality of the virtual prototype - CAD model	20
	2	Inclusion of the finer details such as fasteners and standard parts	10
	3	Compliance with Design Challenge rules - CAD format and integrity of the file submitted	5
Bill of Materials	4	Overall accuracy of the BOM - including all items in the assembly	15
	5	Cost analysis for the entire device (items above £0.20, items below £0.20, prices inclusive of VAT, BoM organised to show the two different costing)	10
	6	Accuracy of costs for manufactured parts and bought components, including spares. Availability of invoices.	5
Review at competition - Regional & National (Live)	7	Accuracy of the virtual model compared to the real device on display, including fasteners and standard parts (*see 7.12)	10
	8	Mass of the actual device compared to the calculated BOM mass (*see 7.12)	5
	9	Design review	20
	Max points available - *Concept Challenge*		85
	Max points – *Foundation and Advanced Challenge*		100

7.12 Elements identified with *are not applicable the category *4.15.1.1* Concept Challenge, hence the difference in available max score.

7.13 For the category *4.15.1.1* Concept Challenge the score will be normalised to 100 pt max.

8. Rules for the Poster Competition

The poster is a demonstration of the team's ability to communicate their design solution graphically, with the aim of engaging with the judging panel, other competing students and any attendee of the event.

8.1 The poster should be A3 size in portrait format (297 × 420mm / 11.7 × 16.5").

8.2 It should clearly display the logos of the team's university, college or educational institution and of the IMechE, the names of all the team members and if it is a curricular or an extra-curricular activity.

8.3 The poster should briefly introduce the purpose of the competition, describe concisely the competing version of the device, how it operates and the engineering principles it is based on. It should include as minimum:

8.3.1 sketch, 3D visualisation or 2D technical drawings representing the device;
8.3.2 text to explain important features shown in the drawings;
8.3.3 details of how and why the device works, using diagrams if necessary;
8.3.4 the total cost of the final design with a BoM summary, showing the IMechE (budget) cost and the overall cost;
8.3.5 Summary of the engineering principles and performance underpinning the design of the device.

8.4 Each team should display their poster on the board provided and display their device on the table with their poster (for the category *4.15.1.1 Concept Challenge*, only the poster is to be displayed).

8.5 Posters must also be submitted electronically in .PDF format.

8.6 The submitted poster is the version that will be judged.

9. Scoring for the Poster Competition

The poster will be scored in accordance with the requirements listed below. Unless specified differently, this applies to all three categories *4.15.1.1* Concept Challenge, *4.15.1.2 Foundation Challenge* and 4.15.1.3 *Advanced Challenge*.

9.1 Compliance with rules – size (A3) and orientation (portrait) and file format. Score for this line will be 0 if any of the two requirements are not fulfilled.
9.2 Obvious information on the educational institution represented and the IMechE (logos), the team members' names, if it is a curricula or extra curricula activity.
9.3 Creative use of colour, layout, text and space to convey meaning, correct and uniform number of decimal digits, evidence of Measurements Units close to any number or formula, no grammar or spelling errors.
9.4 Clear but brief textual description of the competing device.
9.5 Clear diagram(s) – sketch, rendering or CAD model – of the final competing device.
9.6 Evidence of the engineering science underpinning the device.
9.7 Summary costing of major components of the device.

9.8 Scoring table:

	No	Description	Points
Visual Impact	1	Compliance with rules – size (A3) and orientation (portrait) and file format	10
	2	Obvious information on the educational institution represented and the IMechE (logos), the team members' names, competing category, curricula or extra curricula activity	10
	3	Good use of colour, layout, text and space to convey meaning, correct and uniform number of decimal digits, evidence of Measurements Units close to any number or formula, no grammar or spelling errors, etc.	15
Technical Content	4	Introduction of the competition, clear but brief textual description of the competing device	20
	5	Clear diagram(s) – sketch, rendering or CAD model – of the final competing device	15
	6	Evidence of the engineering science underpinning the device	15
	7	Summary costing of major components of the device	15
		Max points	100

10. Rules for the Presentation Competition

The purpose of the presentation is to explain to an audience the product designed, its development genesis, costing and any major scientific calculation that underpinned the design and development. The ideal outcome would be that anyone with a technical background, not exposed before to the DC or this project would understand the purpose of the challenge, the steps that led to the final product, the estimated performances behind the design and the costs.

10.1 The presentation shall be submitted in electronic – video format, .MP4. Maximum length of the presentation is five minutes.

10.2 The presentation should be delivered by all the team members.

10.3 The presentation should include, but is not limited to:

10.3.1 the principal features of the final design,
10.3.2 Introduce the DC and describe briefly the final competing device
10.3.3 the steps the team followed to arrive at the design
10.3.4 the engineering science that underpins the device,
10.3.5 the total cost of the final design and if/how costs influenced the final design

10.4 The presentation must be recorded and submitted electronically no later than 1 week ahead of the date of the Regional Competition or National Final. Details will be circulated to teams at the time.

10.5 The submitted presentation is the version that will be judged.

10.6 At the regional and national finals, the top three teams per each category will be announced at the event and their presentations will be given live. The live presentation shall last maximum of 5 minutes. Category 4.15.1.1 not included in the national finals.

10.7 The top three teams will answer questions on their design for up to three minutes.

11. Scoring for the Presentation Competition

The poster will be scored in accordance with the requirements listed below. Unless specified differently, this applies to all three categories *4.15.1.1* Concept Challenge, *4.15.1.2 Foundation Challenge* and 4.15.1.3 *Advanced Challenge*.

11.1 Overall quality of presentation: well structured, fluent speech, clear, within the maximum allowed time, correct format for the file submitted, etc. Excessive length of the presentation or video recording not in the correct file format will result 0 in this score

11.2 Quality of visual aids: clear and easily readable, integrating but not duplicating the spoken part of the presentation, no grammar or spelling errors; logos of the team's university, college or educational institution and of the IMechE, names of all the team members, etc.

11.3 Introduction of the competition, summary of the competition intent (summary of the mission) and principal features of the final design

11.4 Steps followed to reach the final design, including costing of the device (BoM details and summary)

11.5 Engineering science that underpins the final design, including correct and uniform number of decimal digits, evidence of Measurements Units close to any number or formula, etc.

11.6 Answer to judges' questions applicable only to the three finalists, during the live section of the event.

11.7 Scoring table:

	No	Description	Points
Presentation Style	1	Overall quality of presentation (well structured, fluent speech, clear, within the maximum allowed time, correct format for the file submitted, etc.)	15
	2	Quality of visual aids (clear and easily readable, integrating but not duplicating the spoken part of the presentation, no grammar or spelling errors; logos of the team's university, college or educational institution and of the IMechE, names of all the team members, etc.)	15
Technical Content	3	Introduction of the competition, summary of the competition intent (summary of the mission), competing category and type of activity (curricula / extra curricula) and principal features of the final design	15
	4	Steps followed to reach the final design, including costing of the device (BoM analysis)	15
	5	Engineering science that underpins the final design (including correct and uniform number of decimal digits, evidence of Measurements Units close to any number or formula, etc)	20
Review at competition - Regional & National (Live)	6	Answer to judges' questions * (see 11.8)	20
		Max points	100

11.8 Answer to judges questions (see *) is reserved only to the 3 best presentation that will present live on the day of the regional or national final, refer also to 1.2, 10.6 and 11.6.

12. Rules for the Peer Review Competition

The peer review purpose is the opportunity for students to learn from other teams' devices and express their view on the design and prototype proposed. It is as well a good moment for a positive networking event. It is held at regional finals only and it applies to the categories *4.15.1.2 Foundation Challenge* and 4.15.1.3 *Advanced Challenge*.

12.1 The students will rank according to the requisites listed in section 13 on a slip provided by the IMechE.

12.2 The students will then rank the top three teams (if 4 or more team are competing in the same category) and submit the slip with the results.

12.3 The students cannot score themselves – their own team and teams belonging to another category.

12.4 If there are less than three teams entering, there will be no peer review competition.

12.5 The students cannot directly express judgements on the adherence to the DC rules or to the safety of the competing device. If any of those doubt may arise, it shall be flagged directly to the judging panel present at the event, without discussing with the competing team.

13. Scoring for the Peer Review Competition

The peer review shall be scored in accordance with the requirements listed below. This applies to the categories *4.15.1.2 Foundation Challenge* and 4.15.1.3 *Advanced Challenge*.

13.1 Design principles applied: sound, clear, well explained

13.2 Simplicity of design

13.3 Robustness of the design and of the prototype. Does it feel it can repeat multiple missions and attempt, at least to successfully perform the heats and finals?

13.4 Manufacturing excellence: does if looks well assembled? Do fixings solution appear to have been designed or just added at the last second?

13.5 Appearance: does it look appealing? Would it potentially attract a customer?

13.6 Scoring table:

	No	Description	Points
Design Excellence	1	Design principles applied	20
	2	Simplicity of design	20
	3	Robustness	20
	4	Manufacturing excellence	20
	5	Appearance	20
		Max points	100

The judging panel present at the event will collate the slips submitted, sum all the scoring received per each team and normalise to 100.

The result of the calculation will determine the final ranking for this section.

14. Rules for the Design Excellence Competition

The design excellence review is the opportunity for students to get external feedback from an industry representative, over the whole project and the prototype proposed. It is held at national finals only and it applies to the categories *4.15.1.2 Foundation Challenge* and 4.15.1.3 *Advanced Challenge*.

14.1 The students will be scored by an industry representative. If not available, the DC judging panel will appoint an independent advisor, among the attendees.

14.2 The industry representative will rank according to the requisites listed in section 15. Criteria are the same as to the peer review element, section 12 and 13.

14.3 Whilst the design excellence judging is being carried out, there must be at least one member of each team present to answer questions.

15. Scoring for the Design Excellence Competition

The Design Excellence shall be scored in accordance with the requirements listed below. This applies to the categories *4.15.1.2 Foundation Challenge* and 4.15.1.3 *Advanced Challenge*.

15.1 Design principles applied: sound, clear, well explained

15.2 Simplicity of design

15.3 Robustness of the design and of the prototype. Does it feel it can repeat multiple missions and attempt, at least to successfully perform the heats and finals?

15.4 Manufacturing excellence: does if looks well assembled? Do fixings solution appear to have been designed or just added at the last second?

15.5 Appearance: does it look appealing? Would it potentially attract a customer?

15.6 Scoring table:

	No	Description	Points
Design Excellence	1	Design principles applied	20
	2	Simplicity of design	20
	3	Robustness	20
	4	Manufacturing excellence	20
	5	Appearance	20
		Max points	100

16. General notes and enforcement of the rules

16.1 Whenever a calculation requires rounding, the decimals will be rounded as follows: 0, 1, 2, 3, or 4 will be rounded down; 5, 6, 7, 8, or 9 will be rounded up.

16.2 On matters relating to test equipment and procedure, the authority will be the Chair of the IMechE Design Challenge organising committee, or his/her delegated representative(s).

16.3 The panel of judges for the competition consists of impartial IMechE, university and industry representatives, depending on availability.

16.4 In addition to the IMechE outlined above, universities are responsible for internally ensuring that the spirit of the competition is adhered to during all stages.

16.5 Appeals: if a team wishes to lodge a complaint, to query a procedure or rule infringement, they must do so through the Chair of the IMechE Design Challenge organising committee, or his/her delegated representative(s). Any complaint will be investigated immediately, by at least two judges, and a response will be issued within a reasonable time. This decision will be final and not subject to further appeal.

16.6 Appeals must be raised by a nominated team leader. The remaining team members, team supervisors, or staff members, can only contribute to an appeal if requested to do so by the Chair of the IMechE Design Challenge organising committee, or his/her delegated representative(s).

16.7 The decisions of the panel of judges will be final. Judges may consult and vary the execution and development of the day slightly from the high-level planning to maintain the smooth running of the competition.

16.8 If a particular region decides to authorise deviation(s) from these rules without agreement of the DC Steering Committee, the winner(s) of that regional final will not be eligible for the national final.

16.9 Late submissions will be considered an unfair advantage. Any entries submitted between the 1-week deadline and 24 hours before the start of the competition will have their scores reduced by 50% and any entries submitted less than 24 hours before the start of the competition will not be assessed and will score 0. Any significant changes to submitted entries will also be treated as late submissions.

16.10 Devices designed over budget will be considered having an unfair advantage. This includes a difference between total BoM and IMechE BoM greater than 10%, see 6.12 and incomplete BoM, see 6.10, 7.4and 7.5. For such devices, the score in each section of the competition will be reduced by 50%.

16.11 If applicable, penalties 16.9 and 16.10 can be cumulated.

16.12 The device will be disqualified from the competition if it interferes with other devices on adjacent lanes. In this event, the run affected will be repeated, with the exclusion of the device disqualified.

16.13 Breach of any rule during competition will forfeit that heat or final.

16.14 If at any point the device is considered unsafe, it loses some safety protections such as electrical protections, safety pins (whenever applicable), locking mechanism or any other safety related concern, it will be withdrawn from the Challenge competition and disqualified.

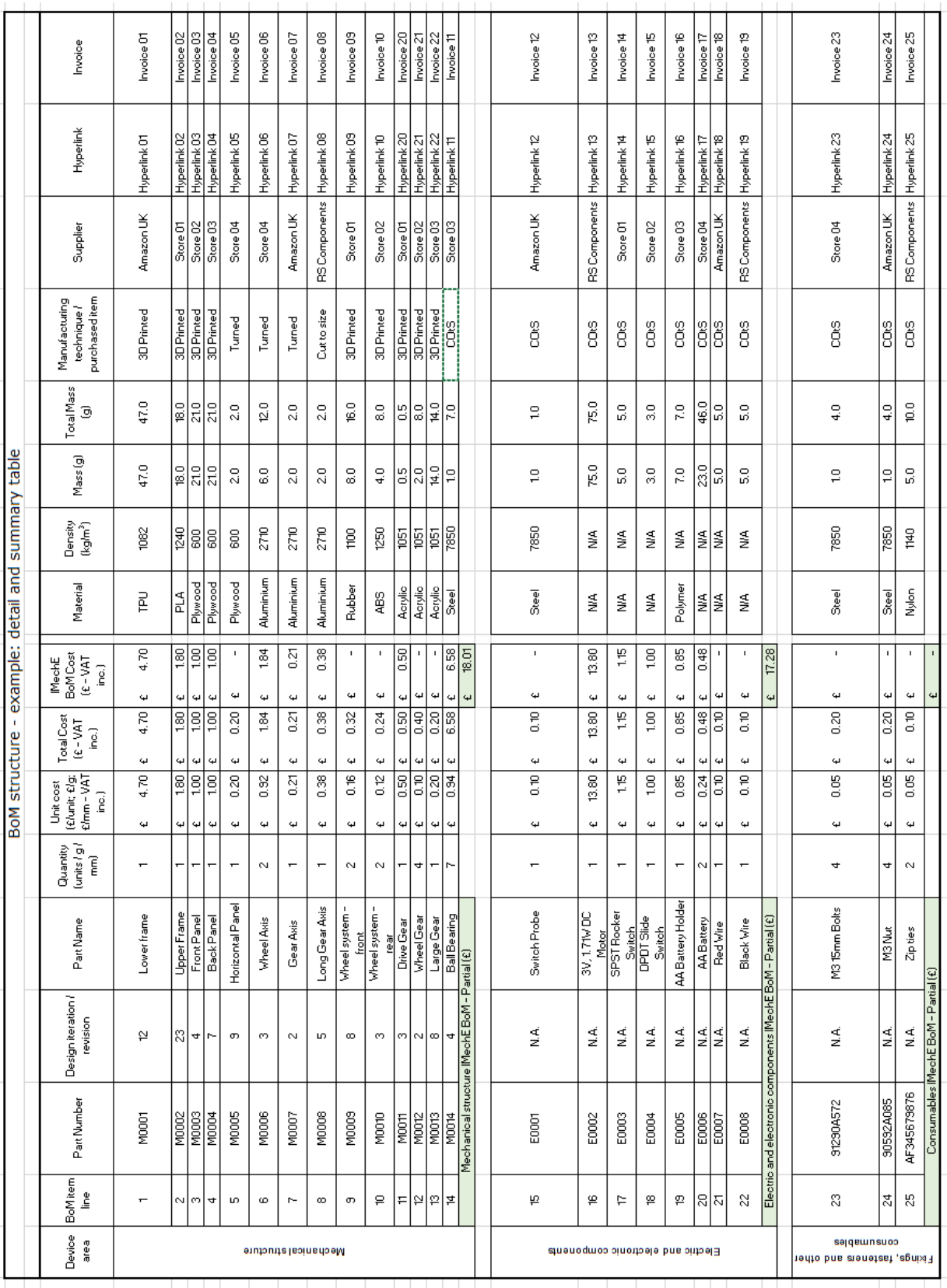
16.15 Continued breaches or behaviour unbefitting of the spirit of the challenge will result in the team being disqualified from the whole competition.

16.16 Any queries about the equipment during the competition must be raised with the head judge. Only the team leader is allowed to approach the official and the team must abide by any decision made.

16.17 Only teams that have a valid entry in all the applicable elements of the competition (see 1.4, will be scored as contender of the overall winner of the competition. 0 (zero) is considered a valid score, no submission is not considered a valid entry.

Appendix 1 – BoM examples

BoM structure example

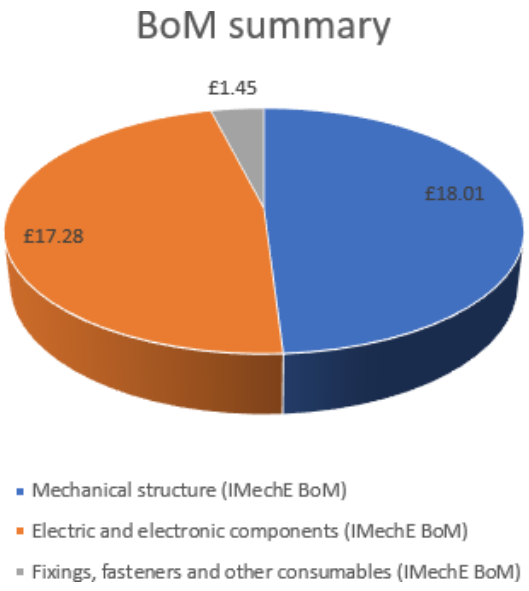


BoM structure - example: detail and summary table

Device area	BoM item line	Part Number	Design iteration / revision	Part Name	Quantity (units / g / mm)	Unit cost (£/unit; £/g; £/mm - VAT inc.)	Total Cost (£ - VAT inc.)	IMechE BoM Cost (£ - VAT inc.)	Material	Density (kg/m³)	Mass (g)	Total Mass (g)	Manufacturing technique / purchased item	Supplier	Hyperlink	Invoice
Mechanical structure	1	M0001	12	Lower frame	1	£ 4.70	£ 4.70	£ 4.70	TPU	1082	47.0	47.0	3D Printed	Amazon UK	Hyperlink 01	Invoice 01
	2	M0002	23	Upper Frame	1	£ 1.80	£ 1.80	£ 1.80	PLA	1240	18.0	18.0	3D Printed	Store 01	Hyperlink 02	Invoice 02
	3	M0003	4	Front Panel	1	£ 1.00	£ 1.00	£ 1.00	Plywood	600	21.0	21.0	3D Printed	Store 02	Hyperlink 03	Invoice 03
	4	M0004	7	Back Panel	1	£ 1.00	£ 1.00	£ 1.00	Plywood	600	21.0	21.0	3D Printed	Store 03	Hyperlink 04	Invoice 04
	5	M0005	9	Horizontal Panel	1	£ 0.20	£ 0.20	£ -	Plywood	600	2.0	2.0	Turned	Store 04	Hyperlink 05	Invoice 05
	6	M0006	3	Wheel Axis	2	£ 0.92	£ 1.84	£ 1.84	Aluminium	2710	6.0	12.0	Turned	Store 04	Hyperlink 06	Invoice 06
	7	M0007	2	Gear Axis	1	£ 0.21	£ 0.21	£ 0.21	Aluminium	2710	2.0	2.0	Turned	Amazon UK	Hyperlink 07	Invoice 07
	8	M0008	5	Long Gear Axis	1	£ 0.38	£ 0.38	£ 0.38	Aluminium	2710	2.0	2.0	Cut to size	RS Components	Hyperlink 08	Invoice 08
	9	M0009	8	Wheel system - front	2	£ 0.16	£ 0.32	£ -	Rubber	1100	8.0	16.0	3D Printed	Store 01	Hyperlink 09	Invoice 09
	10	M0010	3	Wheel system - rear	2	£ 0.12	£ 0.24	£ -	ABS	1250	4.0	8.0	3D Printed	Store 02	Hyperlink 10	Invoice 10
	11	M0011	3	Drive Gear	1	£ 0.50	£ 0.50	£ 0.50	Acrylic	1051	0.5	0.5	3D Printed	Store 01	Hyperlink 20	Invoice 20
	12	M0012	2	Wheel Gear	4	£ 0.10	£ 0.40	£ -	Acrylic	1051	2.0	8.0	3D Printed	Store 02	Hyperlink 21	Invoice 21
	13	M0013	8	Large Gear	1	£ 0.20	£ 0.20	£ -	Acrylic	1051	14.0	14.0	3D Printed	Store 03	Hyperlink 22	Invoice 22
	14	M0014	4	Ball Bearing	7	£ 0.94	£ 6.58	£ 6.58	Steel	7850	1.0	7.0	CDiS	Store 03	Hyperlink 11	Invoice 11
		Mechanical structure IMechE BoM - Partial (£)						£ 18.01								
Electric and electronic components	15	E0001	N.A.	Switch Probe	1	£ 0.10	£ 0.10	£ -	Steel	7850	1.0	1.0	CDiS	Amazon UK	Hyperlink 12	Invoice 12
	16	E0002	N.A.	3V, 1.71W DC Motor	1	£ 13.80	£ 13.80	£ 13.80	N/A	N/A	75.0	75.0	CDiS	RS Components	Hyperlink 13	Invoice 13
	17	E0003	N.A.	SPST Rocker Switch	1	£ 1.15	£ 1.15	£ 1.15	N/A	N/A	5.0	5.0	CDiS	Store 01	Hyperlink 14	Invoice 14
	18	E0004	N.A.	DPDT Slide Switch	1	£ 1.00	£ 1.00	£ 1.00	N/A	N/A	3.0	3.0	CDiS	Store 02	Hyperlink 15	Invoice 15
	19	E0005	N.A.	AA Battery Holder	1	£ 0.85	£ 0.85	£ 0.85	Polymer	N/A	7.0	7.0	CDiS	Store 03	Hyperlink 16	Invoice 16
	20	E0006	N.A.	AA Battery	2	£ 0.24	£ 0.48	£ 0.48	N/A	N/A	23.0	46.0	CDiS	Store 04	Hyperlink 17	Invoice 17
	21	E0007	N.A.	Red Wire	1	£ 0.10	£ 0.10	£ -	N/A	N/A	5.0	5.0	CDiS	Amazon UK	Hyperlink 18	Invoice 18
	22	E0008	N.A.	Black Wire	1	£ 0.10	£ 0.10	£ -	N/A	N/A	5.0	5.0	CDiS	RS Components	Hyperlink 19	Invoice 19
		Electric and electronic components IMechE BoM - Partial (£)						£ 17.28								
Fixings, fasteners and other consumables	23	91290A572	N.A.	M3 15mm Bolts	4	£ 0.05	£ 0.20	£ -	Steel	7850	1.0	4.0	CDiS	Store 04	Hyperlink 23	Invoice 23
	24	90532A085	N.A.	M3 Nut	4	£ 0.05	£ 0.20	£ -	Steel	7850	1.0	4.0	CDiS	Amazon UK	Hyperlink 24	Invoice 24
	25	AF3456879876	N.A.	Zip ties	2	£ 0.05	£ 0.10	£ -	Nylon	1140	5.0	10.0	CDiS	RS Components	Hyperlink 25	Invoice 25
		Consumables IMechE BoM - Partial (£)						£ -								

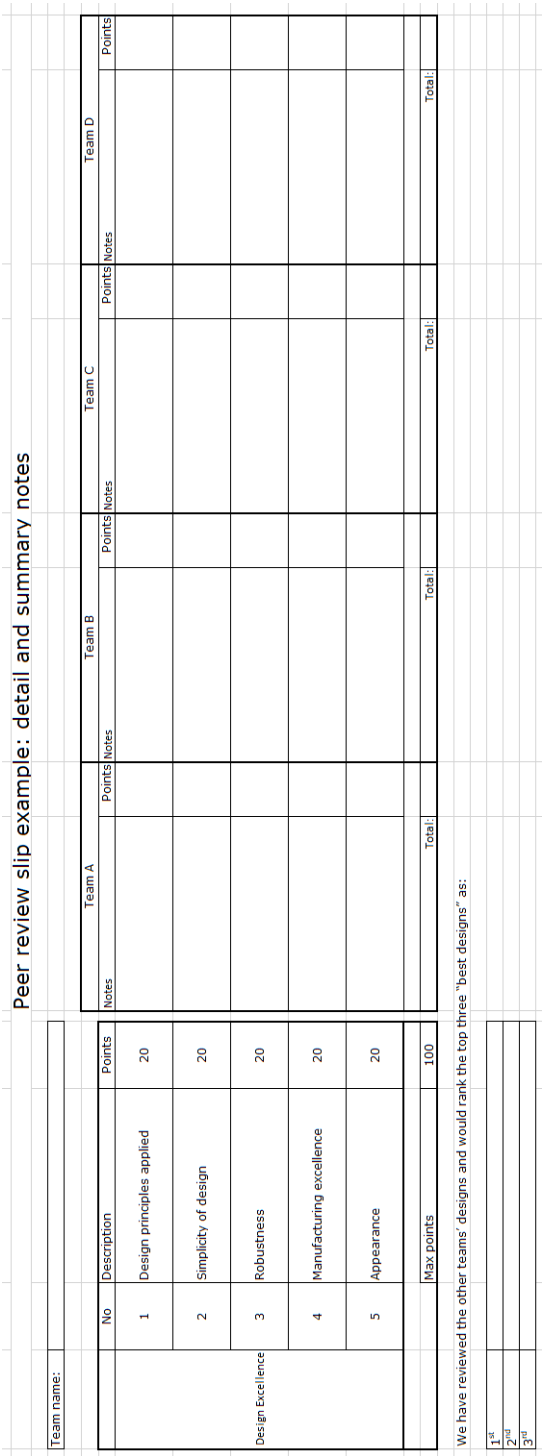
BoM summary examples

BoM summary table	
Mechanical structure (IMechE BoM)	£ 18.01
Electric and electronic components (IMechE BoM)	£ 17.28
Fixings, fasteners and other consumables (IMechE BoM)	£ 1.45
IMechE BoM cost	£ 36.74
Total device cost (comprehensive)	£ 37.45
Total mass (g)	343.5



Appendix 2 – Peer review slip example

On the day of the regional final each competing team will receive a peer review scoring slip like the one shown below.



Peer review slip example: detail and summary notes

Team name:

	No	Description	Points	Team A Notes	Team A Points	Team B Notes	Team B Points	Team C Notes	Team C Points	Team D Notes	Team D Points
Design Excellence	1	Design principles applied	20								
	2	Simplicity of design	20								
	3	Robustness	20								
	4	Manufacturing excellence	20								
	5	Appearance	20								
		Max points	100		Total:		Total:		Total:		Total:

We have reviewed the other teams' designs and would rank the top three "best designs" as:

1st	
2nd	
3rd	

Appendix 3 – College and university academic equivalence

The following table is considered as equivalence between university levels between the English and the Scottish Systems.

English System		Scottish System	
Level 3	A - Level	SCQF level 7	Year 1 / AH @ school
Level 4	Year 1	SCQF level 8	Year 2 – Direct entry from A-levels or AH
Level 5	Year 2	SCQF level 9	Year 3
Level 6	Year 3 BEng(hons)	SCQF level 10	Year 4 BEng(hons)
Level 7	Year 4 MEng	SCQF level 11	Year 5 MEng

Any college plus the levels highlighted in green are considered the max threshold for competing in *4.15.1.1* Concept Challenge and *4.15.1.2 Foundation Challenge*. Any team could compete in 4.15.1.3 *Advanced Challenge*, if desired.

Appendix 4 – Submission checklist for teams

Submission on IMechE website – 1 week ahead of the event

- Design Competition - virtual prototype CAD model - in "**.STEP*" (AP203 file spec.) or "**.X_T*" (Parasolid) format
- Design Competition - Bill of Materials (BOM) (including receipts - links to website) – PDF and Excel format
- Poster Competition** – A3 portrait – PDF
- Presentation Competition*** - Presentation shall be submitted in video format – MP4

Submission on IMechE website – ahead of the event (within 24 hrs of the event)

- Pre-scrutineering form / device sign off by Academic Advisor - PDF

Available on the day – in paper or USB

- Team and university logo with names – A4 printed (better if laminated)
- Project presentation slides – PowerPoint - USB drive
- Bill of Materials (including receipts - links to website) - USB drive and printed A3
- A3 poster - Printed
- Risk Assessment signed by academic lead - printed
- Pre-scrutineering form signed by academic lead - printed

Appendix 5 – Scrutineering check sheet

The scrutineering checklist contributes to Design Competition and does not constitute a pass / fail criteria entry, with the exception of the areas dedicated to safety and integrity.

UNIVERSITY NAME	
TEAM NAME	

Section/ Rule #	Description of check	Pass [✓]
1.2	Check that the team is eligible for the overall win. Are all the static sections of the competition been delivered in the correct format and within the deadlines?	
4.2	The device shall remain self-contained within a given envelope.	
4.4	No pre-programmed electronics allowed	
4.5	The device must be fully autonomous, no remote control system should be present.	
4.9	Check that the design has been signed off by a staff member.	
4.16	A full parts list - BoM is supplied.	
4.18	A full BoM and a summary one are supplied in the sections identified.	
4.19	The device BoM cost is within allowed budget – depend on category. Over budget is considered unfair advantage.	
4.24	All elements, parts and materials are correctly costed in BoM.	
4.25	Spares used during the competition for tuning or adjustments and additional batteries are included in BoM.	
4.31	A risk assessment is available when a physical device is part of the competition.	
4.32	Check that fuses, electrical cables, joint protections, are present on the and cannot come loose in any phase of the competition.	
4.33	At least single electrical fuse is present – when an electrical energy source is installed	

4.34	When a n electrical energy source is installed, there is only an individual one (e.g. single battery / single battery pack).	
4.35	Gears, shafts and movable parts shall not pose a risk for finger trapping and shall not risk tangling with internal cables, belts or other elements of the device.	
4.37	Check the team has supplied their own PPE and is using them accordingly to the agreed procedures. Two PPE fault in the same event will lead to the team disqualified from The Challenge section of the event.	
4.38	Check that no lithium batteries are installed	
4.39	Check if a pressurised system is being used it complies with the regulations.	
4.40	Check that no explosive charges or combustion is being used.	
6.7	The mass estimate from CAD – virtual model has been provided.	

Academic / UTC / Institute Advisor declaration:

I have thoroughly reviewed the team's device ahead of the Regional/National Finals submission for the event and hereby declare that:

- The device is deemed safe to operate in a lecture theatre or sports hall environment
- The device meets all the above Scrutineering checks

Signed

Print

Date