



Coimisiún na Scrúduithe Stáit
State Examinations Commission

LEAVING CERTIFICATE EXAMINATION, 2021

ENGINEERING – TECHNOLOGY PROJECT: DESIGN

Higher Level – 150 marks

PROJECT MUST BE COMPLETED BY FRIDAY 5th MARCH, 2021

PLEASE READ CAREFULLY

General directions to candidates

1. The project you design, make and submit for examination must be unique and be **your own individual work**, carried out in the school under the supervision of the teacher.

Your own individual work is intended to include the intellectual activity of design along with the practical activities of making the model and compiling a folio.

Proof of **your own individual work** must be obvious from both the model and folio presented for examination otherwise marks will be lost.

Note: Where computer aided manufacture (CAM) is used, supporting CAD files/drawings must accompany the design folio to authenticate **your own individual work**.

2. A detailed Marking Scheme is included on this paper. Your teacher will help you to familiarise yourself with the Marking Scheme.
3. Read the Design Brief carefully commencing with the **Introduction**. Plan and present your individual solution as outlined in the instructions given under the headings **Design Process** and **Design Realisation**.
4. Your completed project consisting of a model and design folio, **both clearly identified with your examination number**, must be available to the visiting examiner.

Design Brief

1. Introduction

Urban freight distribution is the system and process by which goods are collected, transported, and distributed within urban environments. It is essential to supporting international and domestic trade, as well as the daily needs of local businesses and consumers, in a sustainable manner. Progressive technological determination of low emissions vehicles for urban usage in this sector has been notable. Central to the research is the European Commission Funded *Furbot Project* which developed the concept architecture of a light duty, fully electric vehicle, to transport two cargo boxes. Following a sustainable and efficient mobility approach, a robotic handling device has been designed and positioned on-board the vehicle. The handling device realizes the loading-unloading operations on the right side of the vehicle and from the ground to the vehicle platform.

Design a model *Urban Freight Vehicle* to the general specifications outlined below. The *Vehicle* should be your own unique design and should:

- (a) Be a four wheeled, single seat vehicle;
- (b) Have a forward propulsion unit;
- (c) Feature an on-board lift mechanism to enable loading/unloading of a single cargo box.

Presentation of the completed project should ensure that:

- (a) All main operating features are **clearly visible without dismantling**;
- (b) The longest dimension *of the vehicle* does not exceed **400 mm**;
- (c) Electric power does not exceed **9 volts**.

**Special Note: (i) A cargo box need not be included in the final solution.
(ii) Modified toys or recycled projects are not acceptable.**

2. Design Process (40 marks)

A design folio must be compiled which will detail your:

- (a) **Analysis of the given brief and investigation of possible solutions;**

Note: When using research sources, including the internet, the sources **must be acknowledged**. Research material directly copied from the internet or from other sources and presented as your own work will not receive any marks.

- (b) **Criteria for selection of your own individual solution:**

- (c) **Production drawings/plans;**

Note: Where computer aided manufacture (CAM) is used, supporting CAD files/drawings must accompany the design folio to authenticate **your own individual work**.

- (d) **Testing and evaluation** of your design solution;

- (e) Special instructions, if required, regarding the testing of the solution by the examiner.

**Note: Marks are awarded as shown in Marking Scheme (Page 4 of 4).
Computer-aided design (CAD) should be used where possible.**

3. Design Realisation (110 marks)

Using appropriate materials and processes, make the model according to your own individual design plans. Computer aided manufacture (CAM) technology should be used, where appropriate, to enhance manufacture.

You are expected to demonstrate a range of appropriate skills to manufacture and assemble all the parts, subject to the following guidelines:

- (a) Standard components may be used to support the assembly and interconnection of various parts;
- (b) Unnecessary recycling will result in lost marks. Recycling will be acceptable **only** in cases where a complex **part** cannot readily be made in the school;
- (c) **Bought-in electronic solutions will result in lost marks;**
- (d) Adhesives, if used, should be applied sparingly.

Note: Marks are awarded as shown in Marking Scheme (Page 4 of 4).

4. Project Presentation

Your completed project consisting of the model and design folio, **both clearly identified with your examination number**, must be available to the visiting examiner.

Marks are awarded for quality of presentation and finished appearance of both the model and folio.

MARKING SCHEME

HIGHER LEVEL	
MARKING CRITERIA - FOLIO	
Analysis of brief	5 marks
Investigation of solutions	10 marks
Criteria for selection of solution	5 marks
Production drawings/plans	10 marks
Testing and evaluation	5 marks
Presentation of folio	5 marks
TOTAL	40 marks

Note: Where computer aided manufacture (CAM) is used, supporting CAD files/drawings must accompany the design folio to authenticate **your own individual work**.

HIGHER LEVEL	
MARKING CRITERIA - MODEL	
Model satisfies brief	5 marks
Constraints observed	5 marks
Mock-up/Inventiveness	10 marks
Function (does it work?)	10 marks
Choice of materials	10 marks
Choice of processes	10 marks
Suitability of assembly techniques	10 marks
Suitability of parts and functions	10 marks
Application of skills	10 marks
Safety considerations	10 marks
Quality of work	10 marks
Presentation of model	10 marks
TOTAL	110 marks