Kingston University London

EG5016B – Exploring Engineering Project Management

BEng/MEng Mechanical Engineering
BEng/MEng Mechanical Engineering (Automotive)
BEng/MEng Electrical and Electronics Engineering

INDUSTRY LIVE BRIEF

Thank you for supporting our undergraduate students with a Live Brief. This form will help us capture the key information for your proposed challenge and ensure a rewarding experience for the students involved.

1. Organisation / Contact Details

- **Organisation name** : Red Bull Powertrains 2026
- **Your name** : Giovanni Colangelo
- **Job Title / Role** : Senior Mechanical Performance Development Engineer
- **Email Address** : Giovanni.colangelo@redbullpowertrains.com
- **LinkedIn Profile (optional)** : www.linkedin.com/in/giovanni-colangelo-a37520121

2. Title of the Challenge

A short, clear title (e.g. "Redesigning a Modular Bike for Urban Use")

Designing an Intake and Exhaust system for a Single-Cylinder engine to emulate V6 race-engine behaviours

3. Summary of the Brief

A short description (250 – 300 words) of the real-world engineering problem you would like the students to work on.

In Formula 1, the performance of the V6 hybrid power unit depends heavily on how the engine breathes. The intake and exhaust systems shape airflow, pressure waves and thermal behaviour, which in turn affect combustion, torque delivery and overall efficiency. To accelerate development, engineers often use single-cylinder research engines. These rigs provide a controlled, cost-effective platform with unlimited testing time under FIA regulations, unlike the full power unit which is tightly restricted.

The challenge for students is to design a low-cost, modular intake and exhaust system for a single-cylinder engine that can replicate the breathing behaviour of a V6 race engine. By swapping modular elements — such as intake runner lengths, plenum volumes, throttle sizes, or exhaust header segments — the system should allow students to reproduce changes in torque curves, transient response, and volumetric efficiency that would be observed in a full race engine.

The focus is not on replicating proprietary designs but on building a flexible educational tool: a modular kit that demonstrates how real-world engine development tackles airflow, performance optimisation and trade-offs between cost, weight, manufacturability and sustainability.

Students will be assessed on their ability to create a robust concept design, supported by CAD, analysis and a test plan, that highlights how system-level decisions in intake and exhaust design influence combustion system development.

4. Background or Motivation

What is the industry context or reason behind this challenge?

In high-performance industries like Formula 1, single-cylinder test rigs are invaluable because they allow engineers to explore and refine combustion systems without regulatory limitations on testing time, in a cost-effective way and limiting the development cost and turnaround time. To make these rigs meaningful, their intake and exhaust systems must closely mimic the dynamic behaviours of the full V6 engine. This project gives students the opportunity to translate those principles into a practical, modular kit. By doing so, they will learn first-hand how design variables — such as runner length, plenum volume, and exhaust tuning — directly impact airflow, pressure waves and ultimately engine performance. It connects motorsport-level innovation with fundamental engineering skills in design, analysis and testing.

5. Constraints/Special Considerations

Any key requirements such as sustainability, manufacturing, cost, regulations, or customer needs?

Performance: System must mimic V6 engine behaviour in terms of pressure wave tuning and in-cylinder indicated pressure (e.g. torque curve shifts, pressure wave tuning).
Cost: Total kit ≤ £20000
Manufacturing: Accessible processes only (CNC, sheet metal, FDM 3D printing).
Confidentiality: No proprietary F1 data or geometry; all assumptions must be generic and transparent, in accordance with FIA 2026 Power Unit regulations
Customer needs: System should be modular, reconfigurable in <15 minutes and clearly demonstrate performance trends.

6. Presentation and Acknowledgement

Do you consent for the student work on this brief to be presented at our Future Skills Day (December 2025) or shared internally within the University (with appropriate credit to you/your organisation)?

☒Yes
☐Yes, but internal use only
☐No

7. Are you planning to attend the Future Skills Day on the 10th of December between 10am – 2pm at the Townhouse, Penrhyn Road Campus, Kingston University London?

☐Yes
☒Maybe
☐No