ESTECO Academy in collaboration with APRILIA Racing and Gamma Technologies launches its 2016 Design Challenge dedicated to Engineering Students around the world.

Test your skills in numerical analysis, simulation and testing to design the perfect race engine. The winning team will enjoy a job experience with the APRILIA Racing team, which during its young history already counts on several World Championship Awards.

Competing teams will enjoy a hands-on experience and learn how to balance the use of cutting edge software technology with their analytical applied mathematics background, in the quest for the optimal design.

1. GENERAL INFORMATION AND DEADLINES

ESTECO, Aprilia Racing and Gamma Technologies are pleased to invite teams of undergraduate and graduate students attending the Faculties of including but not limited to Engineering in universities around the world, to submit a project and compete in the ESTECO Academy & APRILIA Racing Design Challenge.

The competition challenge consists in the design of a 4 stroke single cylinder engine through multidisciplinary optimization, using principles of engineering to find the highest improvement in the engine performance, respecting the constraints and starting from the baseline configuration outlined in the presentation attached. The submitted work should be innovative and should demonstrate the use of the modeFRONTIER optimization platform and Gamma Technologies solution; the jury will favor designs providing significant improvements in energy usage and sustainability.
The most successful entries will be those that leverage advanced or novel engineering applications while adding creativity to the entire design process. The objective of the competition is to draw students to prototyping, design and engine component manufacturing stages; the scope of the design problem is intentionally broad so as to foster creative thought and produce innovative devices.

All intellectual property (IP) generated during the competition will be wholly owned by the inventors. ESTECO, Gamma Technologies and Aprilia Racing will not claim a stake in the students’ IP as a result of their participation in the ESTECO Academy Engine Design Competition.

a. ADMISSION REQUIREMENTS AND PARTICIPANTS

Participants can be individuals or teams up to 5 people currently enrolled in a postgraduate or undergraduate university course. Each member of the team must be able to prove his/her student status by means of a current enrollment certification.

To participate in the competition, individuals/teams must register by filling in this form > academy.esteco.com/competition

b. DEADLINES AND IMPORTANT DATES

UM16 May 17-18 > Official launch | design challenge announced
30th November 2016 > Closing team registration
30th April 2017 > Closing project work submissions
June 2017 > Award Ceremony

c. DELIVERABLE FORMATS

Submissions will be judged on the basis of a technical report (maximum 20 pages) integrated by a PPT presentation (maximum 20 slides) with project strengths and the motivations behind the proposed design solution.

The technical report should clearly identify the assumptions made and the eventual limitations of the simulation model used. Engineering choices not verified by a quantitative analysis should be justified with other means.

Templates for both the technical report and the PPT will soon be available on the same page.

All submissions must be sent to academycompetition@esteco.com
d. JUDGING PANEL AND CRITERIA

The judging panel will include one member for each company promoting the competition and will be either a company representative or an external judge indicated by the company. The jury’s decision is final.

The results will be judged on the basis of three criteria:

- innovation proposed by the team compared with traditional solutions
- predicted (and justified) performances
- methodology adopted

e. PRIZES

1st Prize:
6-month internship at Aprilia Racing*
Visit of the Aprilia RC headquarters and labs
1 year of ESTECO Academy membership for each team member

2nd Prize:
Visit of the Aprilia RC headquarters and labs
1 year of ESTECO Academy membership for each team member

f. AWARD CEREMONY

Held in June 2017, location TBD.

* Subject to the possession of a regular work permit for Italy and to the conditions offered by Aprilia RC. Based on team member resumes, Aprilia RC will select and offer the internship to one member.
2. THE DESIGN CHALLENGE

The design challenge topic is the design of a 4 stroke single cylinder engine through multidisciplinary optimization (using modeFRONTIER) and 1-D simulation of the engine system with GT-SUITE. Where needed, other software tools can complement the analysis (Excel, Matlab, CAD tools, 3D CFD tools), being not mandatory.

Engine Specifications:

Displacement: 250 cc
Cylinder bore $D = 81$ mm
Stroke $S = 48.5$ mm
Rev limit 17,500
Conrod length $L = 105$ mm
Throttle body diameter $D_{\text{Throttle}} < 53$ mm
INLET Valve Diameter $D_{\text{ASP}} <= 35.5$ mm (2x)
EXHAUST Valve Diameter $D_{\text{SCA}} <= 27.5$ mm (2x)
Valve Cams timing fix - NOT variable
Rc $<= 15.8$ (compression rate)
Fuel: STD (refer to GT-SUITE internal configuration)
Natural aspiration (without turbo system)
ISO Boundary conditions (air temperature, pressure, humidity)

The design team may concentrate on the optimization of the 1-D engine model respecting the overall engine specifications, identifying objectives and constraints to the problem in order to reach the best engine performances possible (measured in terms of engine power curve, as simulated within GT – POWER). Specifically, the aspects to be modeled and improved are:

- Airbox volume and air filter surface
- Throttle valve diameter (single), no barrel or slide system
- INLET duct in the head (section and length)
- EXHAUST duct in the head (section and length)
- External exhaust pipe (section and length, no silencer)
- Intake cam duration and lift ($\text{lift} <= 15$ mm)
- Exhaust cam duration and lift ($\text{lift} <= 13$ mm)
- Friction coefficient estimation
3. SOFTWARE TOOLS AVAILABLE

Teams will be provided with the engine modeling software by Gamma Technologies and the ESTECO Academy membership, including the license of modeFRONTIER and access to the online training portal.

Specific training webinars will be organized to help teams set up their models and integrate the two tools.

Once the registration is approved, the team will receive download links to install the software and a VPN access to connect to the license server. The access will be granted for the entire duration of the competition, until the submission of projects deadline.

To know more about the software go to

> ESTECO Academy membership
> Gamma Technologies