# PARTNERS ACADEMIC SUMMER SCHOOL 2026
# Syllabus for Mechanical Engineering

## Subject Area
This syllabus is for PARTNERS applicants seeking to progress to the degrees of:

- H300 BEng Hons Mechanical Engineering
- H301 MEng Hons Mechanical Engineering

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## Aims
To allow students to demonstrate their potential to succeed in specified degree programmes by showing a grasp of entry-level subject-specific knowledge, understanding, cognitive and subject-specific skills.

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## Learning Outcomes
A good knowledge and understanding of …

- Students will have learned about vehicle dynamics and optimising vehicle design through a series of practical experiments and challenges. This will involve covering some core mechanics that some students may know from prior learning but will be of a similar level and theme to what they will cover in stage 1 mechanics.
- They will also learn some basic MATLAB programming to support their analysis.

The ability to apply this knowledge and critical understanding to…

- They will work in groups to learn about vehicle design and how different parameters can alter performance. The students will then design a vehicle using Lego based upon what they have learned, with the end goal of testing it via a soapbox-style racecourse.
- They will also learn how to use MATLAB to support their mechanics analysis. They will estimate things like speed, acceleration, and the tipping point of their vehicle. They will then get the chance to test their predictions. Students will then write about their predicted vs. measured values and discuss in their reports why these discrepancies appear in real-life engineering scenarios.

Competence in…

- Vehicle dynamics, Model building, Design, MATLAB coding, Data collection, and Report writing.

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## Summer School Syllabus

Day 1
Introduction to Mechanical Engineering (9:00-10:00). This session will be a lecture, with all students within the Mechanical Engineering strand in attendance. The content will cover what it's like to be an undergraduate Mechanical Engineering student, and also some basic mechanics and tips for the upcoming practical challenge, which is split across day 1 and day 2. The purpose of this is to ensure you understand the assessed work associated with attending PASS for mechanical engineering, and also to give you an understanding of what it's like as a student.

Soapbox Team Formation + Guided Independent Study + Build Session (10:00-12:00). This session will be based in a computer cluster, where you will be assigned to a build team consisting of other students on the PASS mechanical engineering stream. You will be given a guidebook, which gives tips and advice regarding vehicle design. Your challenge is to research what makes a good vehicle design, and how you can incorporate this into your build. You can fill out your guidebooks as a team. The goal here is to ensure you are prepared for the upcoming build session! You are then free to move to one of the multifunction labs. You have until lunchtime to build a vehicle that can withstand a number of engineering challenges (details in your guidebook!). There will be experts on hand to help out, but it's your responsibility to work as a team to build and design your car. The purpose of this is to show you can apply theoretical engineering knowledge to produce a real-life functional item.

Soapbox Challenge (13:00-16:00). This session will be a lab practical. Predict how your car will behave when it's put to the test using the mechanics you learned in the introduction lecture, then test it out for real! Compare your predicted and observed values, and begin to consider why they are different. This will form the basis of your assessed report. You will also receive a spot-check, where your team will verbally present to an expert judge as to why you picked the design elements of your car. You will receive feedback, which should be included in your report alongside reflections on the feedback.

Office hour (16:00-17:00). Optional - visit to ask our engineering staff any questions you have about studying here. Computer lab access available.

Day 2
Office hour (9:00-10:00) - Optional - visit to ask our engineering staff any questions you have about studying here. Lab/computer lab access available.
Soapbox Challenge + MATLAB Computing (10:00-12:00). This session will be a lab practical but you will have access to the computer labs all day. Use the theory you have learned in this morning's lecture to predict how your vehicle will behave when put to the test on the final two soapbox challenges. They will also learn how to use MATLAB to support their mechanics analysis.

Mechanical Engineering streams & summary (13:00-14:00). This session will take the form of a lecture, to cover what we learned in the taught and practical soapbox sessions, and how you can use this to complete your assessed report. Further information on report submission and guidance for completion will be provided. Additionally, non-automotive careers available to you as a mechanical engineering graduate (e.g. design, manufacturing and biomedical) will be covered.

Guided report writing and Q&A (14:00-16:00). Worried about the assessed report? Don't be! This session will be based in the computer cluster, and will serve a dual purpose. Firstly, to help you fill out your report, this session will provide dedicated time, whilst you are still around your team-mates and the information is fresh in your mind. Secondly, a Q&A panel will be on hand for the first half of the session, in case you missed the office hour on day 1, or have thought of new questions relating to studying engineering here at Newcastle University.

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## Activities for Personal Study
A guided independent study session will occur on day 1 (detailed above), but it is WITHIN the scheduled teaching time. No other learning is required.

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## On-Campus Teaching:
Wednesday 1st (PM) Thursday 2nd & Friday 3rd July

## Online Teaching:
Monday 29th & Tuesday 30th June

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## Formative Assessment Details
A report
More details will be given during the event by your Academic Strand Lead.

## Hand-in Method
Digital

## Assessment deadline
Friday 10th July