Ahmed - I have been assigned as the group leader throughout our discussions. I have researched more into the lab and this is what I came up with Objectives (what I will achieve in this lab)
• Determine motor constants R, Vb, KE, KT and sketch a first torque–speed line.
• Stay within ~1.4 A current limit; avoid overheating.
• Gather the measurements needed to choose an initial gearbox ratio (3:1 vs ~9:1).

- Equipment we will use
  • Bench PSU (CV/CC), digital multimeter (at motor terminals), laser tachometer/encoder, load/torque fixture (or brake), wiring with known lead resistance.
- Procedure I will follow (step-by-step)
- Setup & checks : Wire motor to PSU, set current limit ≈ 1.4 A, confirm tach/reflective tape.
- Lead check : Measure lead resistance/voltage drop so I can use true motor terminal voltage.
- Stall sweep (≤10 s total, broken into short pulses):
  – Briefly hold shaft; step Vs through small values; record (V,I) pairs at the motor terminals.
  – I will fit V = Vb + I·R → R (slope) and Vb (intercept).
- No-load speed (3 min):
  – Run motor at Vs = [e.g., 6 V]; measure ω_free with tach (≥3 repeats).
  – Compute KE ≈ (Vs − Vb)/ω_free.
- Loaded points (8–10 min):
  – Apply incremental load (3–5 levels). For each level record: Vs(at motor), I, ω.
  – Compute KT from T/I (using fixture torque) or form T(ω) via V = KEω + IR + Vb.
- High-torque check (≤3 s):
  – Brief near-stall at I ≈ 1.3–1.4 A to confirm T_stall ≈ KT·I. Cooldown afterwards.
- Quick consistency check (2 min):
  – Compare KE vs KT (SI units should match numerically); note % difference.
  – Sketch torque–speed line: intercepts at T_stall and ω_free.

- Data I will record (compact table)
  • Stall sweep: (V, I) pairs → fitted R = [ ], Vb = [ ].
  • No-load: Vs = [ ], ω_free = [ ] → KE = [ ].
  • Loaded points: (ω, I, Vs, torque reading).
  • High-torque: I ≈ [ ], ω ≈ 0 → T_stall ≈ KT·I = [ ].
- Calculations I will do during/after the lab
  • KE = (Vs − Vb − I·R)/ω (use no-load for sanity check).
  • KT from slope T vs I (or via combined motor equation).
  • Torque–speed line: T(ω) = (KT/R)·[(Vs − Vb) − KE·ω].
  • Wheel torque need (for gearbox choice):
  – F_ramp = m·g·sinθ; F_fric ≈ [assume/measure]; wheel radius r = [ ].
  – T_wheel = (F_ramp + F_fric)·r / [# drive wheels].
  – Motor torque needed with ratio G and efficiency η: T_motor = T_wheel/(η·G) ≤ KT·1.4 A.
  – Compare 3:1 (η≈0.85) vs ~9:1 (η≈0.72) for pass/fail and estimated speed v ≈ (r/G)·ω_free.
- Safety & data quality (what I will enforce)
  • Keep stall pulses very short; allow cooldowns; stop if casing is hot.
  • Measure voltage at motor terminals (not PSU display).
  • Take ≥3 repeats per data point; note mean and range.
- My role as group lead (who does what)
  • I will coordinate timing, set PSU limits, and verify fits on-the-spot.
  • I will read tach/encoder; Hengran will log data; Samuel will manage the load fixture.
- Expected outputs to bring to next session
  • R, Vb, KE, KT with brief notes on uncertainty.
  • First torque–speed plot (hand-sketch is fine).
  • A provisional gearbox ratio recommendation (with one-line justification) to prototype next week.

Ali- This week, I read through the Semester 1 Lab 1: Motor Characterisation and Semester 1 Lab 2: Line Sensors sections in the Technical Handbook to prepare for the upcoming ESP labs. My group has assigned everyone which labs they will attend, and I was assigned to complete the Line Sensors lab.

Lam - This week, I have conducted some research on line array sensor. The optical sensor we will be using is the TCRT5000 infrared optical sensor made by Vishay. It consists of an IR emitter and a phototransistor. It has a range of 0.2mm to 15mm. To drive this sensor, a drive current is fed to the anode. VCC should be connected tto a resistor and o the collector while the emitter and cathode is 0V. An analog signal can be obtained from the collector, the range of this signal is to be determined.

A noise cancelling method can be implemented by switching the IR emitter on and off. Noise can be recorded when the IR emitter is off, the phototransistor will only then receive IR signals from the environment.

Typical line array sensors have 4-6 sensor in line and 14-17mm between each sensor. Since the track width is 17mm in width, I would guess that 17mm would be a suitable distance between each sensor. The number of sensor to be used is to be determined.

Hengran Chu-