Industry projects 2020

**Hitachi Rail Limited**

**Week 1 (Project introduction)**

Lesson 1 AM

* Introduction to the project
  + Train manufacturing bid to meet a specific customer specification.
    - This will include designing a train and presenting it to the final customer with ‘justification of factors including design, materials, and energy sources’.

*Action: We are thinking that the role play / interview type situation is much better delivered by yourselves. Can we split your staff so that a couple come in the morning to introduce the task and the rest come for the afternoon session?*

*Action: Can you send us the customer brief please.*

Lesson 2 PM

* Role play - interview examples to demonstrate benefit of having project work to use as an example in different scenarios.

*Action: Planned and delivered by Hitachi staff.*

* Weekly review: What did you learn in this session?

**Week 2 (Design - Material)**

Lesson 1 AM

* Provide vehicle outer dimensions of railcar (2.5m wide x 25m long x 4m high).
* Task: Students to research material properties and materials that are used on high speed trains.
* Complete materials matrix with a material choice at the end of the session with written material justification.

*Action: Please can you suggest 3 suitable materials we can research. I am thinking steel, aluminium and????*

*Action: Jack and Vicky book laptops*

Lesson 2 PM

* Continue work from AM session. Both group are going to do this if OK with Engineering Hall and they have staff to supervise. Materials testing in the Engineering Hall.

*Action: Hitachi staff in am, pm or some in each?*

*Practical sheet needed for materials testing? Has this been created?*

* Weekly review: What did you learn in this session?

**Week 3 (Manufacturing Layout)**

Lesson 1 AM

* Visit to the factory – Floor plan and vehicle shape to be discussed.

*Action: Jak book minibuses and complete Evolve*

Lesson 2 PM

* A2 Floor Plan – Students are provided with an outer perimeter and shapes representing stations to be located within the factory; the task is to most effectively plot out the factory floor plan.
* Weekly review: What did you learn in this session?

*Action: Jonny providing task*

*Action: Will Hitachi staff be involved in am visit or be available in pm?*

**Week 4 (Design – Body Design)**

Lesson 1 AM

* Main consideration: Kinematic Envelope – this must be satisfied or train may collide with trees etc. (tilting train video). Hitachi presentation
* Research task: Current train designs in the UK and in Japan (Shinkansen). Make a mood board of different designs that you can use on your display.
* Generate 3 concept designs (sketches)

*Action: Presentation to the 2 groups or put together for the start of the session?*

*Action: Jack and Vicky book laptops*

*Action: Hitachi staff in am session?*

Lesson 2 PM

* Choose a final design
* Draw design onto A3 paper, label with material choices to then lead into next week of prototyping
* Possibly look at material costings on laptops
* Weekly review: What did you learn in this session?

*Action: Emma book laptops. Jak book 101*

**Week 5 (Design and build)**

Lesson 1 AM

* Continue with build of prototype.

*Action: Hitachi staff in am session*

*Action: Jack and Vicky book laptops*

Lesson 2 PM

* Finalise Build
* Weekly review: What did you learn in this session?

*Actions: Emma book laptops. Jak book 101*

**Week 6 (Power)**

Lesson 1 AM

* 10 minute presentation on current UK capabilities with OLE (Overhead Line Electrification). Only main routes have OLE.
* Research task into alternative methods of power.
* Produce a risk assessment for OLE – my group are going to do this in the am

*Action: Hitachi staff am*

*Action: What are alternative sources? Electric, diesel, battery ……*

*Action: Can Hitachi send us a copy of their risk assessment and we can adapt to suit our students*

*Action: Jack and Vicky book laptops*

Lesson 2 PM

* Propose method of power for your train design
  + Include risk assessment associated with power generation method.
* Going to have a think about putting a practical in instead of more research.
* Practical task – alternative ‘renewable’ sources of energy???

Consider suitability

Choose the most suitable energy for their train and produce a risk assessment if need.

* Solar panels practical – different area of solar cell exposed and record current and voltage. Scale up to calculate area of solar panels needed to power train – 25000V. Evaluate if solar cells are a viable option and suggest alternatives
* Weekly review: What did you learn in this session?

**Week 7 (Assembly vs Sub-Assembly)**

Lesson 1 AM

* Students will carry out an exercise about production line efficiencies. They are required to build certain design with lego in the quickest time possible.
* Discuss the use of a sub-assembly line to speed up the production process.

*Action am and pm: Nina to produce, Hitachi staff to run*

*Action am and pm: Book the studio and do it all as one big group*

*Action: Can we have some Hitachi staff in am and others pm?*

Lesson 2 PM

* Run the process again with a sub-assembly area to demonstrate the advantages of sub-assembly.
* Weekly review: What did you learn in this session?

Hitachi to run

**Week 8 (Drive Systems)**

Lesson 1 AM

* Shildon visit – Positioning of drive systems and how they affect vehicle dynamics.

*Action: Jak book minibuses and complete Evolve*

*Action am and pm: Can we have some Hitachi staff in am and others in pm?*

Lesson 2 PM

* Battery powered vehicle building exercise (the one they do at Shildon)
* Weekly review: What did you learn in this session?

*Action: Nina? To provide resources (we can supplement if we know what we need)*

Outcome: Students have a better understanding of factors that affect train motion. They use trial and improvement techniques.

Move this task to next week:

* Bogie suppliers exercise; students are tasked with looking at three different bogies suppliers. All of which can supply ‘in spec’ bogies for your train, however they vary in cost, quality and performance. The task is to examine the variances and pitch which option they would like to go with long term.

**Week 9 (Vehicle Braking)**

Lesson 1 AM

* Bogie suppliers exercise; students are tasked with looking at three different bogies suppliers. All of which can supply ‘in spec’ bogies for your train, however they vary in cost, quality and performance. The task is to examine the variances and pitch which option they would like to go with long term.
* Students produce a written report which compares each different factor, cost effectiveness etc. and choose the best choice for their train. They justify that, using quantitative data where possible.

*Actions: Jonny providing information catalogue info*

*Actions: Hitachi staff in am?*

Lesson 2 PM

Our group are going to do this instead of the F = ma stuff

* Using video stimuli, students consider what might affect the stopping time / distance of a train (mass, speed, friction, leave on the line, design)
* Practical: Surface finishing: How do friction coefficients effecting braking distances?
* We have designed a simple stopping distances practical using trolleys and ramps to investigate the effect of passenger numbers on stopping distance by adding masses to the trolley. This can be extended to investigating the effect of ‘leaves on the line’ – on a smoother floor (lab floor compared to carpet) if time allows
* Weekly review: What did you learn in this session?

**Week 10-11 (Presentation prep)**

* Use everything you have learned over the last ten weeks to create your presentation stand for the 3 April.
* It needs to be engaging and draw people in to talk to you so that you can explain your design,
* Create team roles and responsibilities.

**We have discussed ‘team roles and responsibilities’ and these will be allocated for different roles in the presentation prep:**

**Someone to ensure prototype design is complete**

**Someone to create A1 poster for stand**

**Someone to be the main speaker – they will write a narration or cue cards**

**Someone(s) to complete the other bits for the stand – drawn design, reports, practical results, mood board etc**