Kam Chana and Ben Fudge - Trinity Term 2024

University of Oxford-Department of Engineering Science

Coursework Module - Trinity Term 2024

Turbomachinery Computer Aided Design

Student's Name: _____

College: _____

Day	Nominal Activities	Engagement am	Engagement pm	Supervisor Initials & Date	Comments
Monday (9am – 5pm)	**Introduction. Solid & Assembly Modelling.**				
Tuesday (9am – 5pm)	**Linkage redesign. Fluid Mechanics lecture.**				
Wednesday (9am – 1pm)	**Runner design**				
Thursday (9am – 5pm)	**Volute & Surface modelling, turbine demonstration & data analysis.**				
Friday (9am – 5pm)	**Complete Report & Modelling.**				
Comments		**Assessment Mark**			
		Total Mark			
		Supervisor Sign & Date			

Lab Organisers: Kam Chana (kam.chana@eng.ox.ac.uk) Phone 88741

Ben Fudge (benjamin.fudge@maths.ox.ac.uk)

Location: Software Lab A (MS Windows) Thom 6th Floor

Safety Statement:

Read the Francis Turbine RA (risk assessment) on Canvas.

Observe the guidelines for use of computer workstations when using CAD – check your posture and have regular breaks from the screen to avoid eyestrain.

In the lab session you must come appropriately dressed in robust shoes (no open toes) and prepared to tie long hair back. Also, before entering the working areas, remove any items of trailing clothing (e.g. scarves) or jewellery that could get caught in rotating machinery.

Learning Outcomes:

After attending the laboratory classes and performing the required work you should be able to:

- Explain the use of Computer Aided Design and Manufacture. Create solid and surfaced CAD models of component parts and assemblies.
- Create formal drawings of parts and assemblies using CAD.
- Perform a motion analysis of a mechanism assembly.
- Apply Fluid mechanics theory to a turbine design. Understand the mechanism for controlling the turbine.
- Create animations of CAD parts or assemblies.

Locations of other activities:

Task	**Location (Times to be advised)**
Turbine demonstration	Fluids lab - Thom 3rd Floor
Fluid Mechanics lecture	LR2

Requirements for Assessment:

Work individually for the CAD modelling exercises, and runner design calculations.

You can collaborate, for the linkage mechanism redesign process, but create individual models and drawings of the resulting parts and assemblies.
You will be assessed on the redesign of the linkage mechanism, the finished assembly and a brief report of the runner testing results.

Your report and drawings must be saved as pdf documents and submitted to the Canvas assignment. The report should consist of –

- Your runner test results data.
- A fully annotated graph of the efficiency vs volumetric flow for your runner design, with best fit curve. Plots of other graphs (e.g flow vs runner speed) that help to show the performance characteristics.
- A copy of the Matlab script used to create the graph.
- Brief comments on your plots (how do they compare to the target running conditions, and the typical performance of industrial equipment, and why might they be different).
- An image of the finished assembly
- Formal drawings to enable complete manufacture of all the parts that you have modified or created for the mechanism redesign.
    - These drawings are separate to the report and should be set up on A3 sheets and submitted in pdf form to the Canvas assignment.
- Modified parts can refer to the original drawing as a starting point for the modification work (see Part 2 page 10).
- A formal assembly drawing of the mechanism redesign, including a Bill of Materials table and balloons.

The report and drawings should be finished and submitted by 2:30pm on Friday.

Save all your work. We may ask to see your CAD models, motion analysis and animations on screen.

Engagement. Marks can be lost for failing to engage with the course. The guidelines laid down in the Course Handbook apply. You may lose an engagement mark for every half

day that you have an unexcused absence or fail to engage (up to a maximum of 4) unless previously agreed.

Assessment. We will have a brief discussion with you about your report and drawings submitted on Canvas. Individuals will be awarded a mark, as follows:

- Engagement – 4 marks are given for full engagement, and marks can be deducted for poor participation as described above.
- The quality of work will be assessed out of a maximum of 5, based on the design report, drawings and animation produced by each individual.
- Completed animations should be saved to a network directory not Canvas (details to be advised).

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Turbomachinery CAD Coursework Module TT24 - weeks 7 & 8

	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00
Monday	Introduction	Part 1 – Solid Modelling			LUNCH		Parts 1 & 2 – Solid & Assembly Modelling		
Tuesday	Part 2 – Assembly Modelling		Fluid Mechanics Lecture (LR2)	Part 2 – Assembly Modelling			Part 3 Runner design		
Wednesday	Parts 3 & 4 - Runner design & Volute & Surface modelling						Free Time Note that the Computer Room will be unavailable during this time		
Thursday	Part 4 – Volute & Surface modelling						Part 4 – Volute/Surface modelling/Animation		
	Part 5 – Turbine Demonstration						Part 5 - Turbine Demonstration		
Friday	Complete and submit report, drawings, and animation.						**2:30pm Report deadline.** Your submission will be marked in discussion with you.		