Lam Research Challenge 2025

Problem Statements (PS) - Mechanical Engineering

PS1: 100 Marks

Design and develop a parametric and dynamically configurable flange–bolt assembly using SolidWorks or any equivalent CAD software. Begin by downloading a suitable machine model (such as a motor–gearbox system) from an online CAD repository like GrabCAD. Choose one component from the assembly to modify and integrate a custom-designed flange–bolt system.

The assembly must be linked to an Excel spreadsheet, allowing key parameters—such as bolt size, outer and inner diameters, flange thickness, and bolt hole pattern—to be modified. The model should update automatically based on these inputs using design tables, parametric equations, and assembly-level references, enabling scalable and flexible configurations.

As part of the submission, record a one minute video demonstration showing the modeling workflow, the Excel integration, and how the assembly adapts to changes in parameters. The video must include testing of at least five different parameter combinations to validate the dynamic behaviour of the model.

Week Number	Tasks Number	Remarks	Submissions	Date
W1	T1-1	Parametric Flange Design	1.Video 2. PPT 3. Unique document	19-07-2025
W2	T1-2	Configurable Flange-Bolt Assembly		
The task descriptions and evaluation guidelines are provided in the following sections.				

T1-1: Parametric Flange Design

Objective: Design a flange model in SolidWorks using parametric dimensions so that it can be automatically updated when inputs like outer diameter, bolt circle diameter, number of holes, and bolt size are changed.

Key Actions:

- Create a fully defined 3D model of the flange using design tables or equations.
- Include parameters like:
    - Outer and inner diameters
    - Flange thickness
    - Bolt hole diameter and count
    - Pitch circle diameter (PCD)
- Validate the model for dimension-driven updates.

T1-2: Configurable Flange-Bolt Assembly

Develop a dynamic assembly where the flange automatically updates along with appropriately sized bolts and spacing when flange parameters change.

Key Actions:

- Create an assembly that links flange and bolt models external references.
- Use assembly configurations or design table-driven mates to:
    - Automatically position bolts based on hole pattern
    - Scale bolt size based on hole diameter
- Test multiple configurations to ensure flexibility and stability.

Guide lines for the Video and Evaluation Criterial

Stage	Focus Area	Evaluation Criteria (What to Look For)	Video (Time In Sec)	Marks
Introduction	Self & Problem Statement	Concise introduction of the presenter and a clear articulation of the problem being addressed.	5	5
Practical Relevance	Real-Life Correlation	Problem is well-connected to a real-life example or relatable scenario.	10	25
Background Research	Prior Work & References	Includes references to previous work or studies; demonstrates awareness of existing efforts.	10	10
Solution Approach	Problem-Solving Methodology	Presents a unique, innovative, and logical solution approach; well explained.	15	25
Resource Utilization	Use of Tools, Training, and Support	Effectively explains how self training and learning tools were used for your solution.	10	15
6. Publication Readiness	Documentation & Future Scope	Mentions scope for documentation, proof of concept, and publication potential.	5	5
7. Presentation & Delivery	Communication & Technical Quality	Clear speaking, confident body language, good audio quality, fluency in English, and appropriate content density for the time limit.	0	10
8. Conclusion	Learing Outcome from the PS		5	5
		Total	60	100

Guide lines for the PPT

Slide No	Slide Heading	Focus Area	Evaluation Criteria (What to Look For)	Marks
1	Title & Introduction	Problem Statement & Objective	Clear title, presenter introduction, and well-defined problem statement.	10
2	Background & Context	Relevance & Motivation	Explains why the problem is important and worth solving. Real-world connection or need is clearly shown.	10
3	Literature/Market Research	Past Work/Current Landscape	References existing solutions, research, or market gaps. Cited properly with insights.	10
4	Proposed Solution	Innovation & Uniqueness	Clearly presents the core idea/solution with innovative value and originality.	15
5	Methodology/Design	Technical Approach	Shows how the solution works — workflow, algorithm, design flow, or process diagram.	10
6	Implementation	Prototype/Execution Plan	Describes the actual development, tools used, and progress so far (or implementation plan).	10
7	Resources Used	Tools, Technologies, Training	Details the use of training, support, tools (e.g., AI, software), and how they added value.	5
8	Results/Validation	Proof of Concept or Outcomes	Presents results (if available) or expected outcomes. Includes visuals like charts/tables.	10
9	Future Scope/Publication Potential	Scalability & Next Steps	Mentions how the work could be scaled, documented, or published.	5
10	Conclusion & Delivery	Summary, Communication, Visual Appeal	Summarizes key points, good slide design, clarity of speech, confidence, and audience engagement.	15
			Total	100

Unique document Template(A Two page document)

Section 1: Understanding and Design Intent (150–200 words)

- Briefly explain your understanding of the mechanical context of your machine example (motor–gearbox system) and the importance of a parametric flange–bolt assembly.
- Highlight what makes your solution technically sound and logically structured.
- State the purpose of parameterization in real-world mechanical assemblies.

Section 2: Engineering Physiochemistry Relevance (150–200 words)

- Discuss the material selection for the flange and bolts with relevance to chemical resistance, thermal behavior, and mechanical stress.
    - Why stainless steel or carbon steel?
    - What about corrosion resistance or thermal expansion?
    - If composite material chooses then what will be the cost
- Include physiochemical properties like thermal conductivity, specific heat, and oxidation potential of selected materials.
- Optionally relate to Galvanic corrosion and bolt–flange contact surface chemistry under load or in industrial settings.

Section 3: Excel–CAD Integration Logic (With Screenshots)

- Describe the workflow of linking Excel to SolidWorks (or chosen software).
- Include one screenshot of the Excel sheet with parameter values and corresponding CAD update.
- Mention at least one error case encountered during integration and how your team resolved it.

Section 4: Few photos of your selfies with geo tag needs to be placed in one complete page.