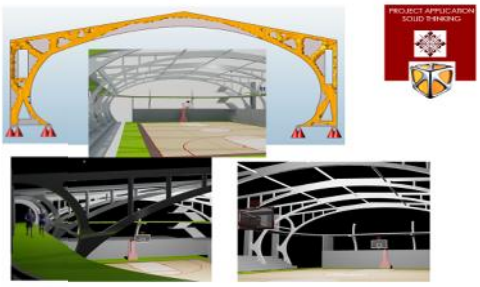
SOLIDTHINKING INSPIRE: Generative Design



1. INTRODUCTION

The design of new product development or architectural components such as a long span frame or trusses can be challenging, since the design does not only have to look good, it also has to meet several safety requirements and standards. In addition, all designs have to be developed within the shortest time possible. To meet these challenges the engineers, architects and designers are always looking for solutions that can reduce their design and testing cycles.

After an evaluation of the design sketches, the engineering development of the part has to focus on aspects such as thicknesses, material, keeping the original shape as close as possible to the original sketch.

In this program the participant will start the design from zero and used simulation and optimization to drive the design. Participant will first created a simple profile and used it to perform a topology optimization of the profile in solidThinking Inspire®. The optimization results inspired the final design, which was refined by the design team, and lastly validated in solidThinking Inspire®. A typical optimization process follows these steps: Creation of the design space and application of loads and boundary conditions. The optimization tool uses the input to propose an optimal structure. The design proposal offers the best possible combination of lightweight and structural efficiency. Subsequently, the part is quickly refined to define the final shape, which is then again analyzed with Inspire to verify its structural performance.

2. OBJECTIVES

These 2 days course will be using Altair's solid Thinking Inspire as a simulation driven design and optimization solution, to solve challenging design problems and can be interfaces to existing CAD tools for shape and size refinement.

i. To impart simulation driven design approach in product design according to industrial requirements.

ii. To provide industrial driven knowledge with analytical thinking and skill in design evaluation and design improvement using innovative CAD/CAE technology.

iii. To enhance creativity and allow designers to develop forms faster.

iv. To understand feasibility as well as technical limits or constraints that come from the customer.

3. OUTCOME

Trainees will be able to demonstrate simulation driven design method and approach in new product development.

I. Trainees will be able to develop and investigate structural concept efficiently according to the given material design layout and design package for producing industrial products with dynamic motion parameters.

II. Trainees will be able to enhance and harnessing design philosophy through optimization skill and knowledge in bridging the gap between architecture @ designer with engineers in industry.

4. COURSE MODULE

Day	Contents / Sub Contents	Activities	Key Methodologies	Duration
Day 1	***New Structure Concept*** ***Inspire Introduction & Model Setup*** • Sketching and Styling for Design Modelling Process.	- Hand-on Session - Q&A Session	- Individual Tutorials - Individual	8 hours

	• Process Flow for Concept Design Generation. a. Exploration on Structurally Efficient Concept ***Hands-on Exercise*** • **Exercise 1** – Design concept generation • **Exercise 2** – Design concept workflow with solid edit tools • Introduction to analysis • Analysis Result overview • **Exercise 3** – Running a baseline analysis **Topology Optimization** • FEA • Optimization Basics • Topology Optimization • Polynurbs modelling • Design interpretation & verification ***Inspire hands-on Training***: • Analysis, Connection & Topology Optimization • 3D Modelling and Editing • **Exercise 4** – Simplification Tools for Redesign Workflow • Optimization • **Exercise 5** – Reanalysis and Concept Design Verification	- Interactive Video Session	Assessment	
Day 2	**Motion analysis & Advance features.** **General Design guidelines for AM** **DFAM for FDM, SLS & DMLS** • Geometry considerations • Material property considerations • General design alerts • Key design considerations • Support design	- Industrial driven lecture - Technology Demonstration	- Individual Tutorials	8 hours

	• CAD design & file conversion • Effects of build orientation • Mid-build inserts **Case Studies & Discussion** **<u>Inspire hands-on Training</u>**: Lattice Optimization, Topography, Gauge Optimization; Polynurbs • Material, Loads and Support Establishment. • Shape Controls for Manufacturing. • Conceptual Design Validation. • Stress, Displacement and Weight Results. Derived Concept for Final Design **Online Assessment @ Altair University** • Online Certification for SolidThinking Inspire			

TENTATIVE PROGRAM

DAY 1	
8.30 a.m. - 1.00 p.m.	**Inspire Introduction** **Geometry Create & Simplify** **Model Analysis**
1.00 p.m. – 2.30 p.m.	**Lunch break**
2.30 p.m. – 5.00 p.m.	**Model Optimization** **Review Result** **Shape Control** **Generative Design: PolyNURBS surfaces**
5.00 p.m. – 8.00 p.m.	**Dinner break**
8.00 p.m. – 10.00 p.m.	**SolidThinking Inspire Advanced Examination (part 1)**
DAY 2	
8.30 a.m. - 1.00 p.m.	**Generative Design: Lattice structures**
1.00 p.m. – 2.30 p.m.	**Lunch break**
2.30 p.m. – 5.00 p.m.	**Motion analysis** **SolidThinking Inspire Advanced Examination (part 2)**

5. PREREQUISITES

- Basic Design knowledge such design and sketching for conceptual ideas
- Familiar with any 3D cad software
- Basic understanding of materials and production process.
- Some engineering knowledge

(Note: Participants have to bring own laptop/PC)

- Link for installation will be given prior to the training confirmation

System Requirements

Operating Systems:

- Windows 10 (64 bit)
- Windows 8.1 (64 bit)
- Windows 7 (64 bit)

Hardware:

- OpenGL graphics card with at least 256 MB of on-board memory
- Note: Integrated Intel graphics hardware is currently not supported

Memory:

- 4 GB of RAM (8 GB recommended)

6. TARGET PARTICIPANT

- Drafting
- Architectural Designer
- Designers
- Industrial Designer
- Modeller
- Draftsman
- Engineers
- R&D Engineer
- CAE Engineer
- Mechanical Engineer
- Manufacturing Engineer
- Design Engineer
- Assistant Engineer & Designer
- Creative Managers
- Product development and manufacturing
- Technology and innovation strategists

The targeted trainees for participate this program will be from various local industry not limited to constructions, which includes transportation, shipbuilding, railway, oil and gas, electronics, medical, aerospace, automotive, defense, agricultural.

7. TRAINER PROFILE

Mohd Suffian bin Ab Razak

M. Eng. (Mechanical), Universiti Malaya
B. Eng. (Mechanical), Kobe University

The facilitator started his career at Perusahaan Otomobil Nasional (PROTON) in 2008 as production engineer. In this capacity, he was responsible towards lean manufacturing system implementation, production preparation for New Product Introduction (NPI) and Body-in-White (BIW) Quality in Body Assembly plant. He was the coordinator for Body Assembly in the successful projects of SAGA FLX.

Pursuing his passion in automotive design and technology, he chose to be a teaching engineer in Mechanical Engineering Technology Department, Universiti Teknikal Malaysia Melaka in 2013. Following a series of trainings in Altair Hyperworks software, he was certified as trainer in Altair – MAI – ORS Technologies Sdn. Bhd. certification program.

To date, he had collaborated with engineers in automotive and SME sectors, conducted various research on design optimization, reverse engineering, component and system analyses, assisted by more than 30 undergraduates under his supervision. He is committed to making industry – university partnership work.