



LIGHTWEIGHT
SOLUTIONS



Realize
YOUR NEXT LEVEL



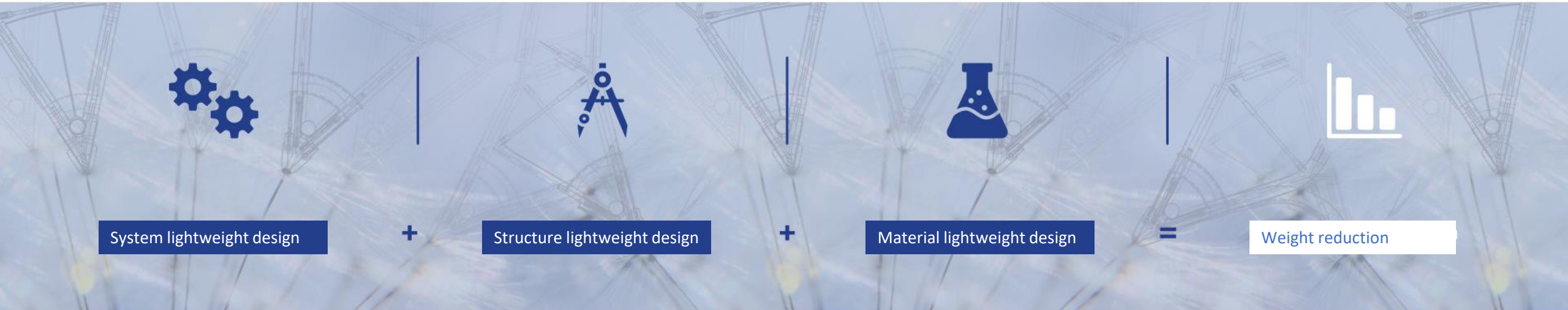
NMIS
National Manufacturing
Institute Scotland

Lightweighting Academy

Training of steering/controlling mass properties and holistic identification of weight saving opportunities on parts, assemblies and overall systems and vehicles

Version 6

Berlin, 5th of Sept. 2022



Our Lightweighting Academy is especially designed for engineering experts, who are dealing with mass properties of parts, assemblies, systems and overall vehicle weights or have to manage, control or forecast mass properties during the design process of industrial products.

Our customers will be trained to recognize and estimate weight savings during the design process on parts and assembly level as well as on overall vehicles.

Title	Mass Properties- Controlling/Steering/Forecast			
No.	Course MA-PROP I	Course MA-PROP II	Course MA-PROP III	Course MA-PROP IV
Topic	Mass Properties - Controlling/ Steering/ Forecast Basics I	Mass Properties - Controlling/ Steering/ Forecast Basics II	Mass Properties - Controlling/ Steering/ Forecast Advanced I	Mass Properties - Controlling/ Steering/ Forecast Advanced II
Description	Introduction & Definitions Identification of Current mass, COG, Empty weight, Breakdowns, weight targets, axle loads, load cases	Verification of masses/COG, payloads, calculation of load cases, axle loads Weight Reports I	Risks & opportunities, tolerances / Uncertainties / Maturity levels / Margins / Weight Reports II	Forecasting - Controlling- Tracking / monitoring of design processes / supplier weight management /Weighing / Weight Reports III
Lecturer	Senior Lightweighting Consultant	Senior Lightweighting Consultant	Senior Lightweighting Consultant	Senior Lightweighting Consultant
Overall Duration	1 month	1 month	1 month	1 month
Hourly Effort	15 hours lecture per month plus preparation	15 hours lecture per month plus preparation	15 hours lecture per month plus preparation	15 hours lecture per month plus preparation
Net Price (plus sales tax)	3.500,00 €	4.000,00 €	4.000,00 €	4.500,00 €

For participant group up to 5 participants per company.

	A			
Title	Mass Properties- Controlling/Steering/Forecast			
No.	Course MA-PROP I	Course MA-PROP II	Course MA-PROP III	Course MA-PROP IV
Topic	Mass Properties - Controlling/ Steering/ Forecast Basics I	Mass Properties - Controlling/ Steering/ Forecast Basics II	Mass Properties - Controlling/ Steering/ Forecast Advanced I	Mass Properties - Controlling/ Steering/ Forecast Advanced II
Description	Introduction & Definitions Identification of Current mass, COG, Empty weight, Breakdowns, weight targets, axle loads, load cases	Verification of masses/COG, payloads, calculation of load cases, axle loads Weight Reports I	Risks & opportunities, tolerances / Uncertainties / Maturity levels / Margins / Weight Reports II	Forecasting - Controlling- Tracking / monitoring of design processes / supplier weight management /Weighing / Weight Reports III
Lecturer	Senior Lightweighting Consultant	Senior Lightweighting Consultant	Senior Lightweighting Consultant	Senior Lightweighting Consultant
Overall Duration	1 month	1 month	1 month	1 month
Hourly Effort	15 hours lecture per month plus preparation	15 hours lecture per month plus preparation	15 hours lecture per month plus preparation	15 hours lecture per month plus preparation
Net Price (plus sales tax)	800,00 €	950,00 €	950,00 €	950,00 €

For single participants

	B					
Title	Lightweight Design & Identification of Risks and Opportunities					
No.	Course STR-LE I	Course STR-LE II	Course STR-LE III	Course M-LE	Course SYS-LE	Course MM-LE
Topic	Structural Lightweight Engineering Basics R&O	Structural Lightweight Engineering Advanced I R&O	Structural Lightweight Engineering Advanced II R&O	Material Lightweight Engineering Fundamentals R&O	System Lightweight Engineering Fundamentals R&O	Manufacturing Methods for Lightweight Engineering R&O
Description	Fundamentals - Strength, stiffness Pressure, Tension Bending, Torsion Load Paths, Load Steps, FEM results Weight saving opportunites	Introduction - differential, integral and hybrid concepts Sheet metal design Sandwich systems Applications & Weight saving opportunites	Fundamentals Frameworks Bionic Methods and concepts Shear Fields Space Frames Applications & Weight saving opportunites	Steel-alloys Al-alloys Plastic material Composites Weight saving opportunites	System influences / Multiphysical Problems / Functional Integration Holistic Weight saving opportunites	Fundamentals Manufacturing methods for supporting lightweight design welding, riveting, casting, injection moulding, super forming, pressing 3D printing
Overall Duration	1 month	1 month	1 month	1 month	1 month	1 month
Hourly Effort	15 hours lecture per month plus preparation	15 hours lecture per month plus preparation	15 hours lecture per month plus preparation	12 hours lecture per month plus preparation	15 hours lecture per month plus preparation	15 hours lecture per month plus preparation
Net Price (plus sales tax)	1.500,00 €	2.000,00 €	2.000,00 €	2.500,00 €	3.500,00 €	3.500,00 €

For participant group up to 5 participants per company.

B						
Title	Lightweight Design & Identification of Risks and Opportunities					
No.	Course STR-LE I	Course STR-LE II	Course STR-LE III	Course M-LE	Course SYS-LE	Course MM-LE
Topic	Structural Lightweight Engineering Basics R&O	Structural Lightweight Engineering Advanced I R&O	Structural Lightweight Engineering Advanced II R&O	Material Lightweight Engineering Fundamentals R&O	System Lightweight Engineering Fundamentals R&O	Manufacturing Methods for Lightweight Engineering R&O
Description	Fundamentals - Strength, stiffness Pressure, Tension Bending, Torsion Load Paths, Load Steps, FEM results Weight saving opportunities	Introduction - differential, integral and hybrid concepts Sheet metal design Sandwich systems Applications & Weight saving opportunities	Fundamentals Frameworks Bionic Methods and concepts Shear Fields Space Frames Applications & Weight saving opportunities	Steel-alloys Al-alloys Plastic material material compounds & Composites Weight saving opportunities	System influences / Multiphysical Problems / Functional Integration Holistic Weight saving opportunities	Fundamentals Manufacturing methods for supporting lightweight design welding, riveting, casting, injection moulding, super forming, pressing 3D printing
Overall Duration	1 month	1 month	1 month	1 month	1 month	1 month
Hourly Effort	15 hours lecture per month plus preparation	15 hours lecture per month plus preparation	15 hours lecture per month plus preparation	12 hours lecture per month plus preparation	15 hours lecture per month plus preparation	15 hours lecture per month plus preparation
Net Price (plus sales tax)	500,00 €	600,00 €	600,00 €	700,00 €	800,00 €	800,00 €

For single participants.

C				
Title	Lightweight Design / Industry Applications and Samples Rail vehicles			
No.	Course LE-RAIL I	Course LE-RAIL II	Course LE-RAIL III	Course LE-RAIL IV
Topic	Lightweight Engineering Railway vehicles Interior / Exterior	Lightweight Engineering Railway vehicles Carbody Main structure	Lightweight Engineering Railway vehicles Bogies Suspension	Lightweight Engineering Railway vehicles Electrics Powertrain
Description	Fundamentals Rail Vehicles Interior/Exterior lightweight design concepts &	Fundamentals Rail Vehicles carbody lightweight design concepts & samples	Fundamentals Rail Vehicles Bogies and suspension lightweight design concepts & samples	Fundamentals Rail Vehicles Bogies and suspension lightweight design concepts &
Overall Duration	1 month	1 month	1 month	1 month
Hourly Effort	15 hours lecture per month plus preparation	15 hours lecture per month plus preparation	15 hours lecture per month plus preparation	15 hours lecture per month plus preparation
Net Price (without tax)	To be defined			
Time Line Planning	To be defined			

**TGM
REFERENCES**

TOP references show cross-industry competence:



ALSTOM



SIEMENS



STADLER





BMW

- BMW – Weight optimization realized in the development phase including cost reduction across all vehicle components
→ Mass reduction > 70 kg with simultaneous cost reduction

PORSCHE

- Weight workshops and weight process optimization
→ Successful process development

LAMBORGHINI

- Sports car concept early stage, weight management,
- Structural and system weight optimization across all vehicle components and trades
→ Mass reduction > 20 kg

DAIMLER

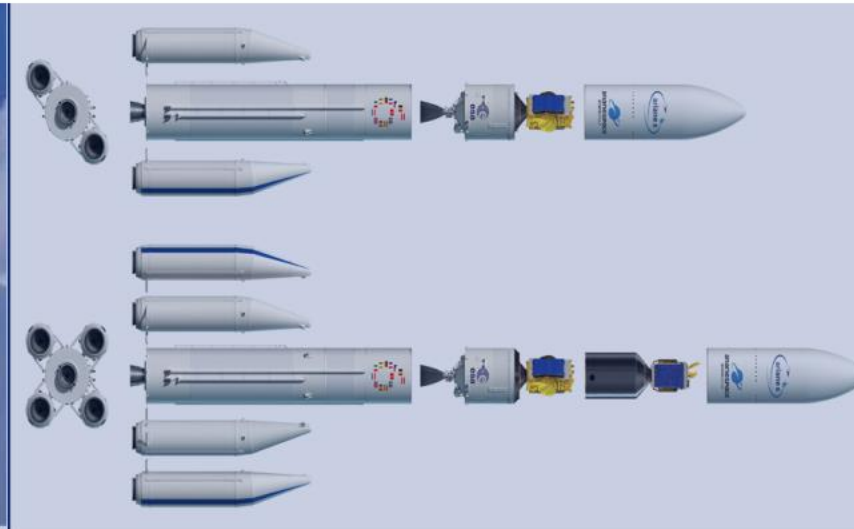
- Vehicle weight management A/B-class
→ Mass reduction achieved 80 kg

VW

- Various vehicles of the MEB-Platform
- Research project GOLF Next Generation
→ Successful target mass approach +/- 20kg exactly from the concept phase

E-BASE

- ZIM-Research project Lightweight-Chassis
- Thrust field support system for electric vehicles
→ Patented Lightweight system



AIRBUS

- Aircraft Future Projects – Weight management Aircraft A30X – Wing, fuselage, interior (Germany, England, France)
 - Aircraft A380 Cabin weight optimization (Germany, England, France, Spain, Italy)
- Smart Act – Software tool used for weight management

GE AIRCRAFT

- Weight analysis and optimization of an aircraft engine

BOEING

- Weight management & consulting

MT AEROSPACE

- Lightweight consultancy & Process optimization
 - Development of a “Mass properties & Lightweight Control & Weight management system” for Space Systems and in early and late stages of development e.g.: different upper level systems
- Successful process development and introduction



SIEMENS

- Weight management & Lightweight consultancy
 - Siemens High speed train ICE4
 - Tramway AVENIO / Bidding support HF6
 - S200 MUNI (USA)
- Successful achievement of mass target in the large project and > 1800 kg Mass reduction

DEUTSCHE BAHN

- Weight Management & Consultancy
- Lightweight freight waggon DB-Systemtechnik

ALSTOM/BOMBARDIER

- Lightweight consultancy & Weight management
 - ZEFIRO Highspeed
 - LRV Flexity Outlook
 - DO2010 / TWINDEX
- Weight Data Tool – Software in use for weight management
- Lightest streetcar in the world

STADLER

- Weight management & Axle load optimization
 - Double-decker train car Rocky Mountaineer (Canada)
 - Subway J/JK
- Mass reduction > 6500 kg

SKODA

- Holistic Lightweighting consultancy
 - ForCity Smart
- Mass reduction > 2000 kg

HÖRMANN

- Lightweighting consultancy
- Weight Data Tool – Software in use for weight management