




Enjoy Sunshine, Enjoy Modelling

When the spring is coming, modelling is coming

The Modelling Team



G-I-2

The Implementation

When the spring is coming, modelling is coming

The Modelling Team

Faculty of Industrial Design Engineering

Delft University of Technology

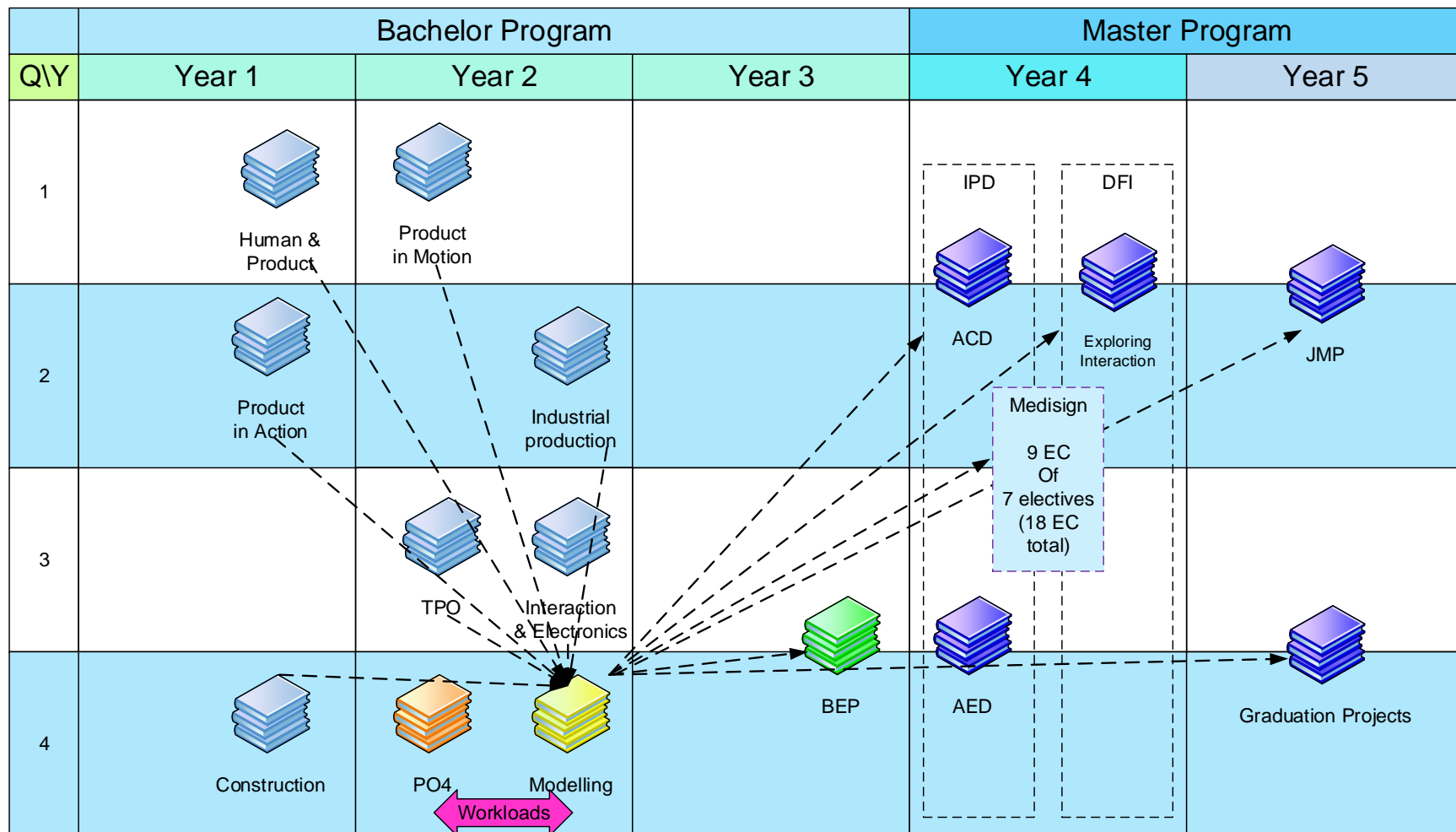


Contents

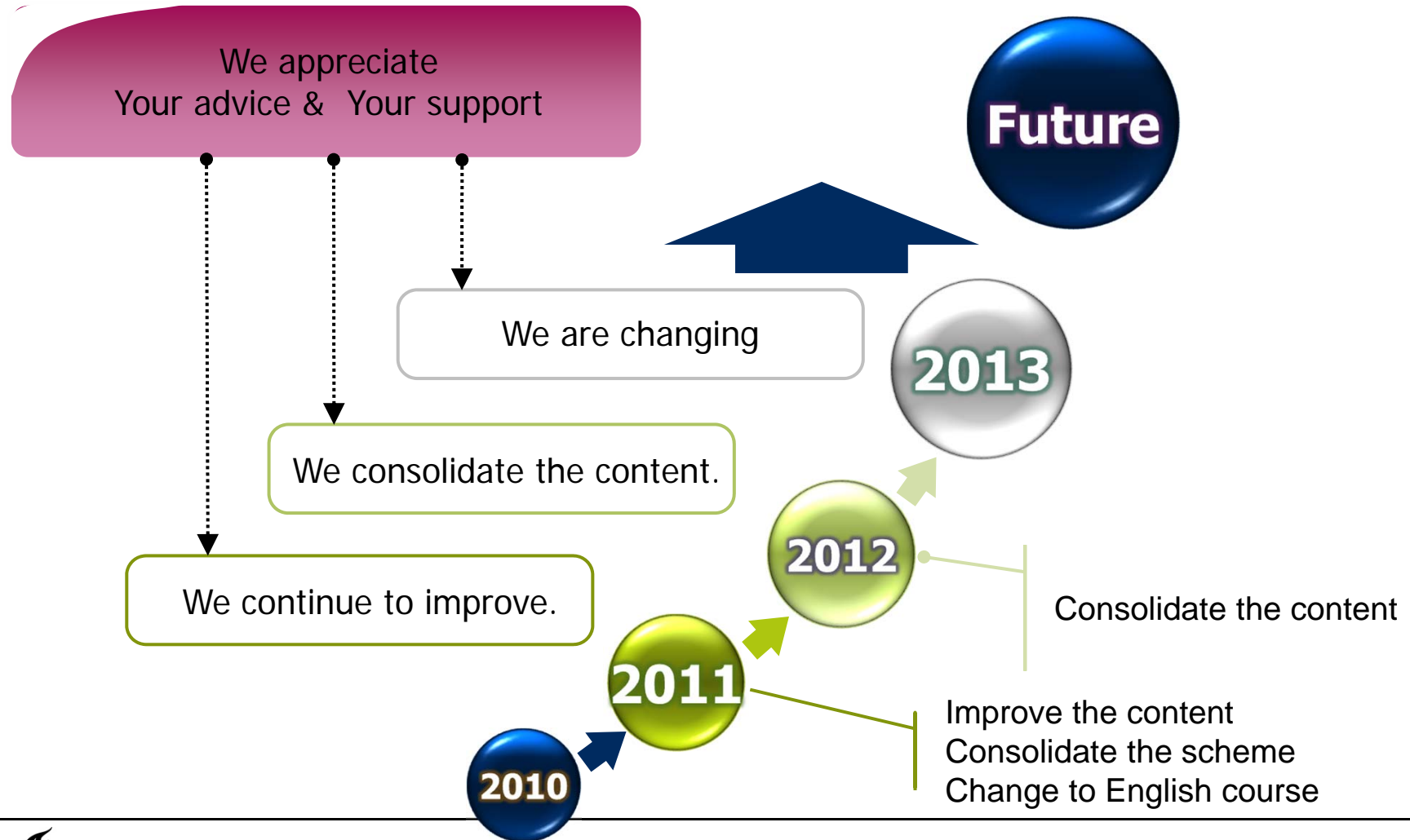
IO2081 Modelling

- Modelling @ IDE
- Past, Present and Future
- IO2081 Modelling - 2013
- The Blackboard
- Things to do

Modelling @ IDE



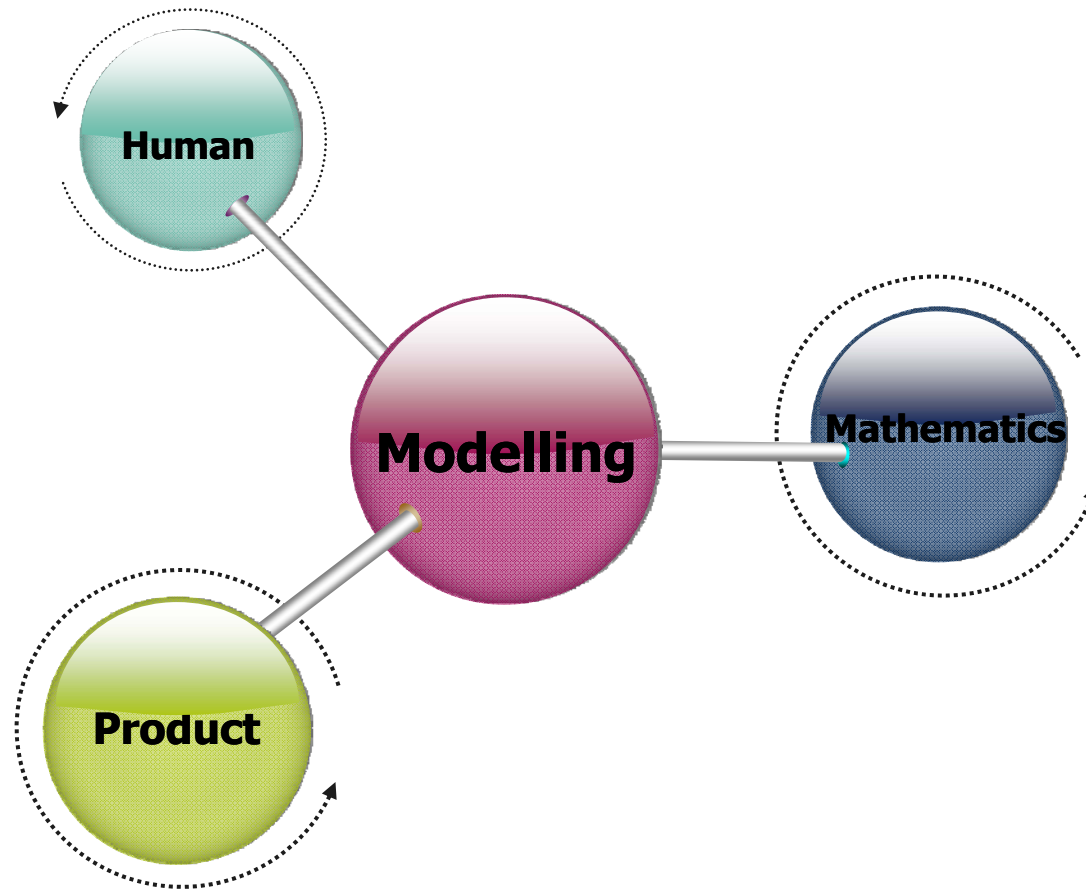
Past, present & future of IO2081 Modelling



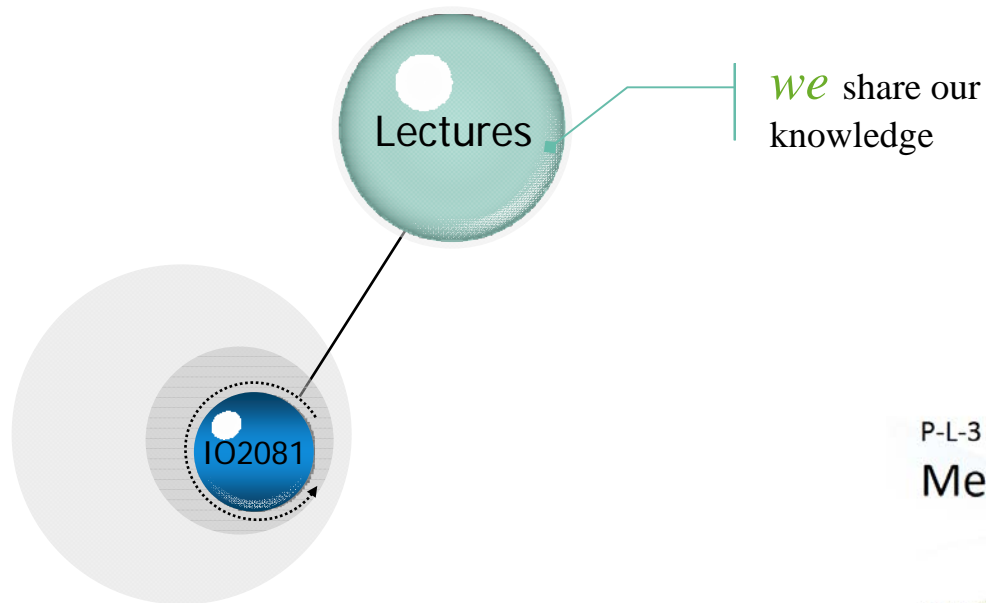


IO2081 Modelling 2013

The content



Education methods - Towards your competences



Education methods - Towards your competences

Lectures

we share our knowledge

IO2081

Workshops

you learn for yourself, let the knowledge sink in

IO2081 Modeling Workshop P-W-M-1: The slow-closing toilet seat

Attention: Fiction case study, for education only

Design brief: A soft close feature slows the toilet lid down while closing, that the lid does not slam onto the seat.

Question: Build a model to describe the movement of the lid based on the following choices:

We choose:

1. The material of the lid is ABS, the density is 1020 kg/m^3 .
2. The damping coefficient of the angular damper is $c = 1$.
3. The force direction is horizontal, the amplitude is F and the force only works from time 0 to $\theta = 0.1$.
4. The shape of the seat is a rectangular box, the length L is 50 cm , the width W is 20 cm , the thickness T is 1 cm .
5. Neglect the air friction.

System:

Lid

Earth

Damper

Force

Sketch:

Consider the lid as a point mass $\sum M = 0$

Cause	Mass of the lid	Damper	Gravity	Force $F(t)$
Effect	Inertia	Slows down the speed of the lid	The lid goes down	The lid starts to rotate

Consider all forces along the rotation axis:

$$-\frac{L}{2} \cdot \frac{d^2 \theta(t)}{dt^2} - c \frac{d\theta(t)}{dt} + mg \frac{L}{2} \sin(\theta) - F(t)L = 0$$

Green line

Consider the lid as a box $\sum M = 0$

Cause	Mass of the lid	Damper	Gravity	Force $F(t)$
Effect	Inertia	Slows down the speed of the lid	The lid goes down	The lid starts to rotate

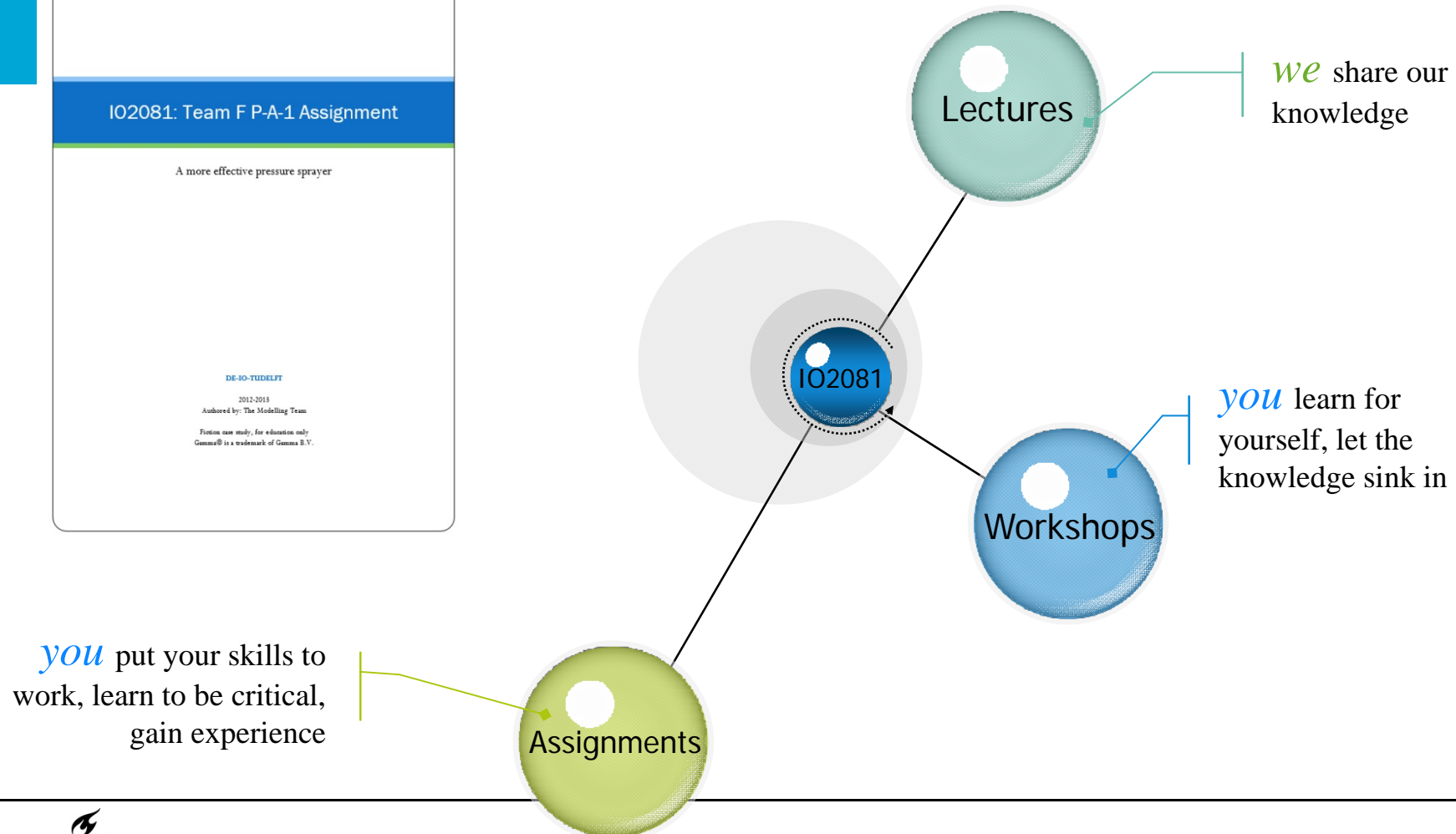
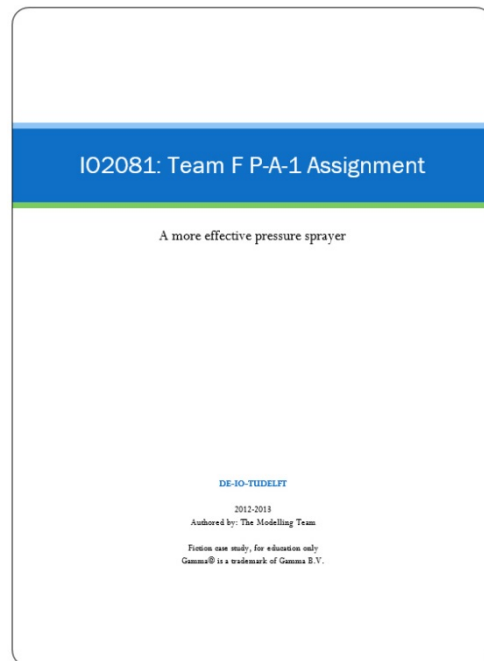
Consider all forces along the rotation axis:

$$-\left(\frac{mL^2}{3} + \frac{mL^2}{12}\right) \frac{d^2 \theta(t)}{dt^2} - c \frac{d\theta(t)}{dt} + mg \frac{L}{2} \sin(\theta) - F(t)L = 0$$

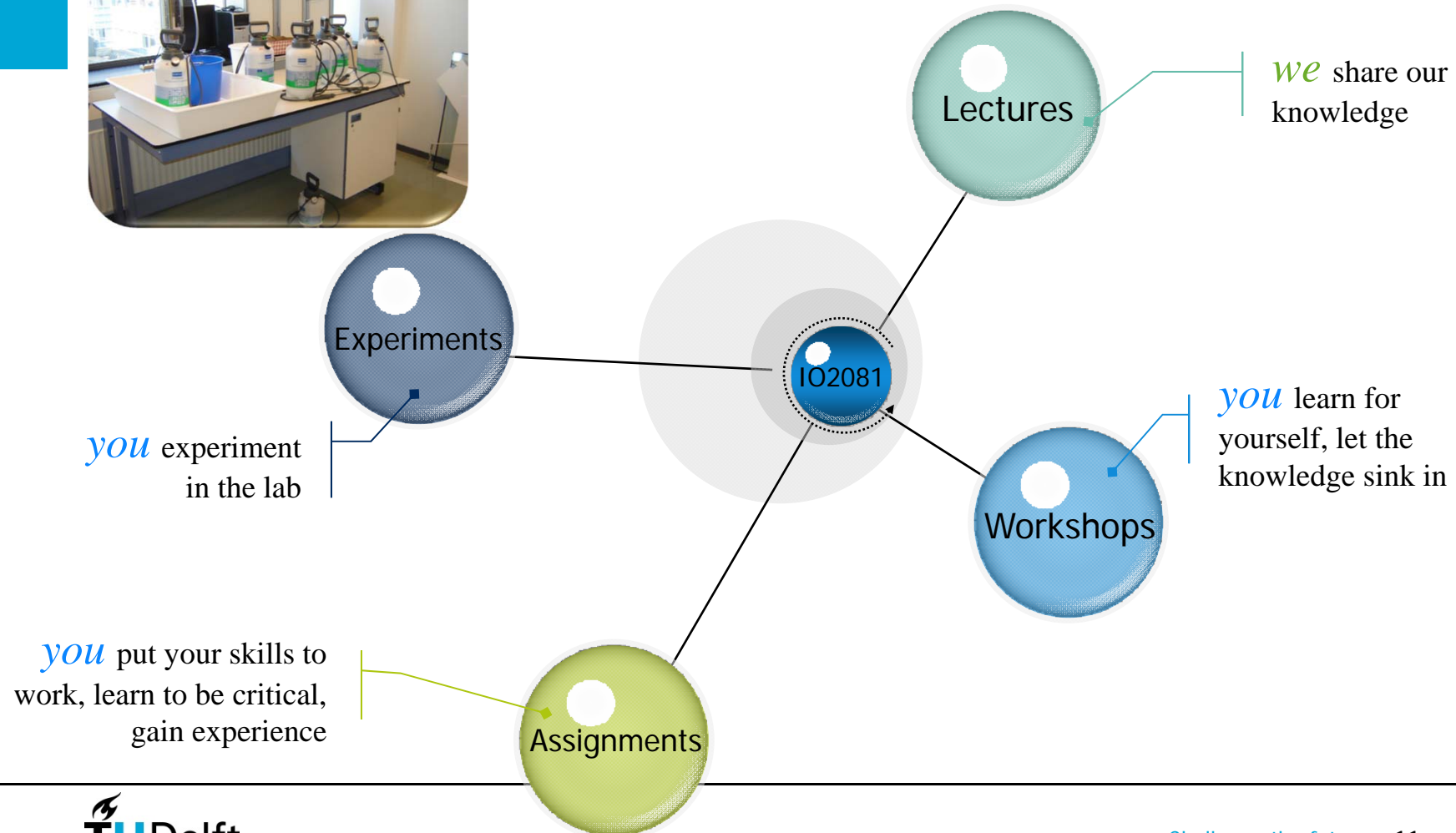
Solution: See Maple file P-W-M-1

Page 16

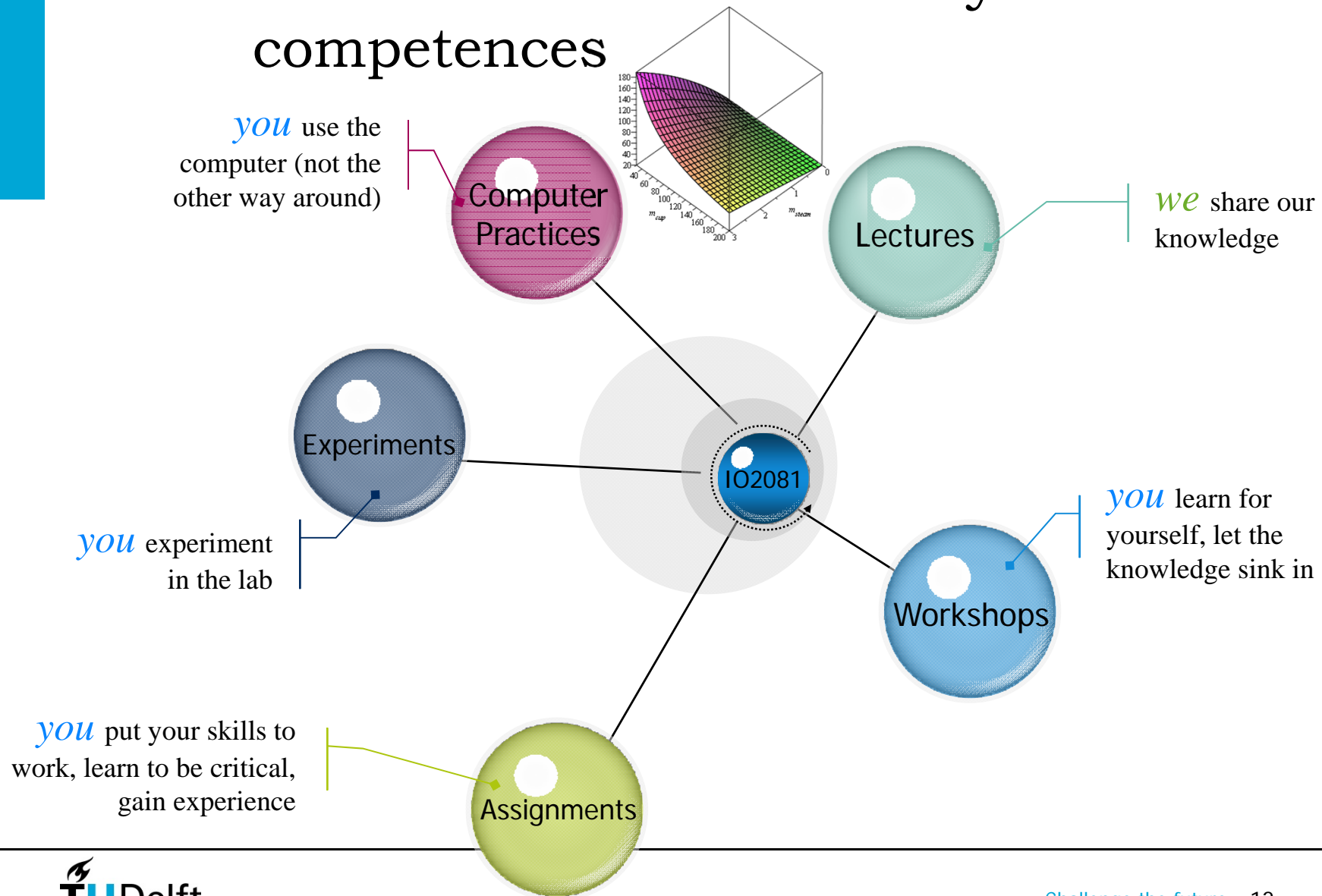
Education methods - Towards your competences



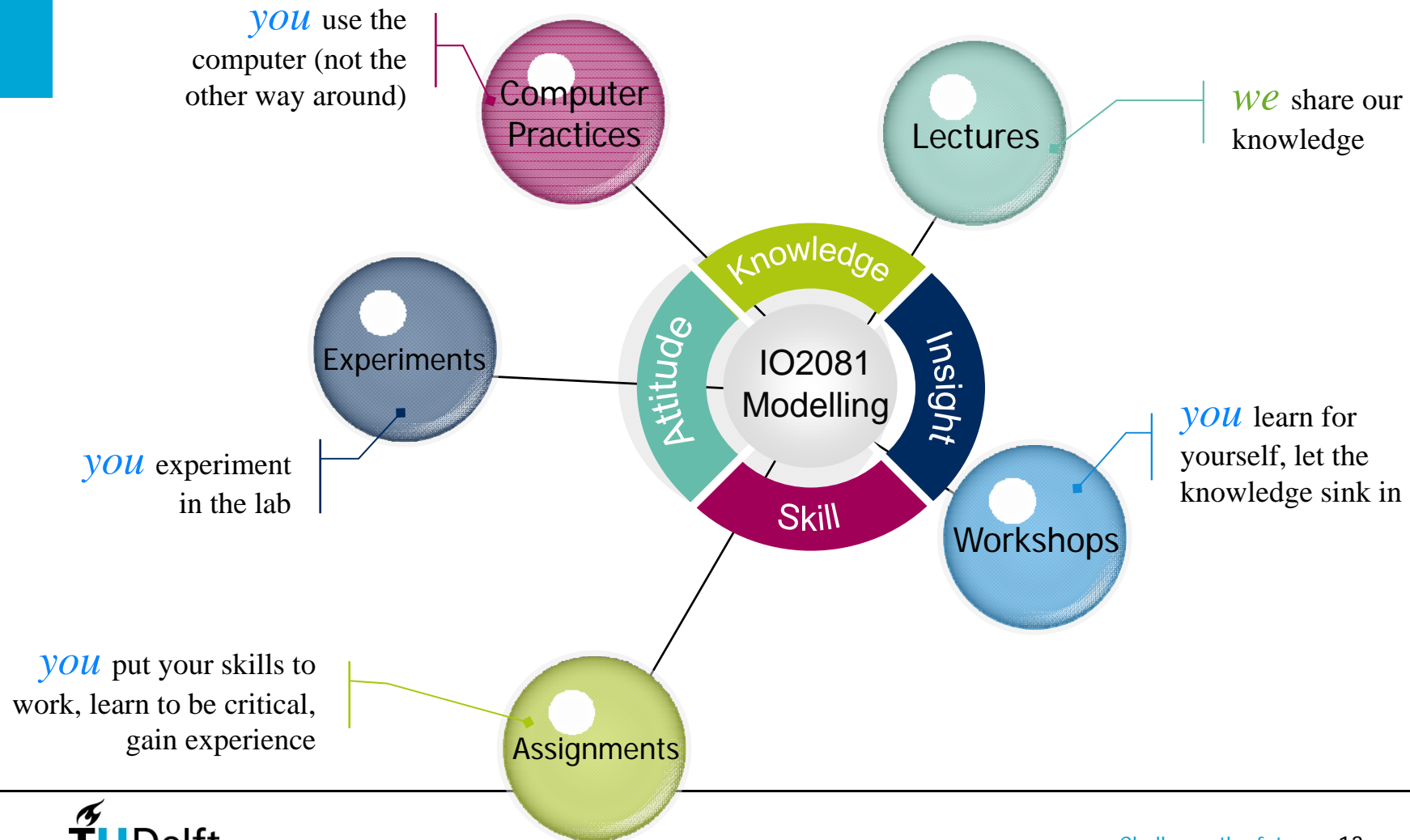
Education methods - Towards your competences



Education methods - Towards your competences



Education methods - Towards your competences



The puzzle

Education methods

Facilities

Knowledge



Time limitations

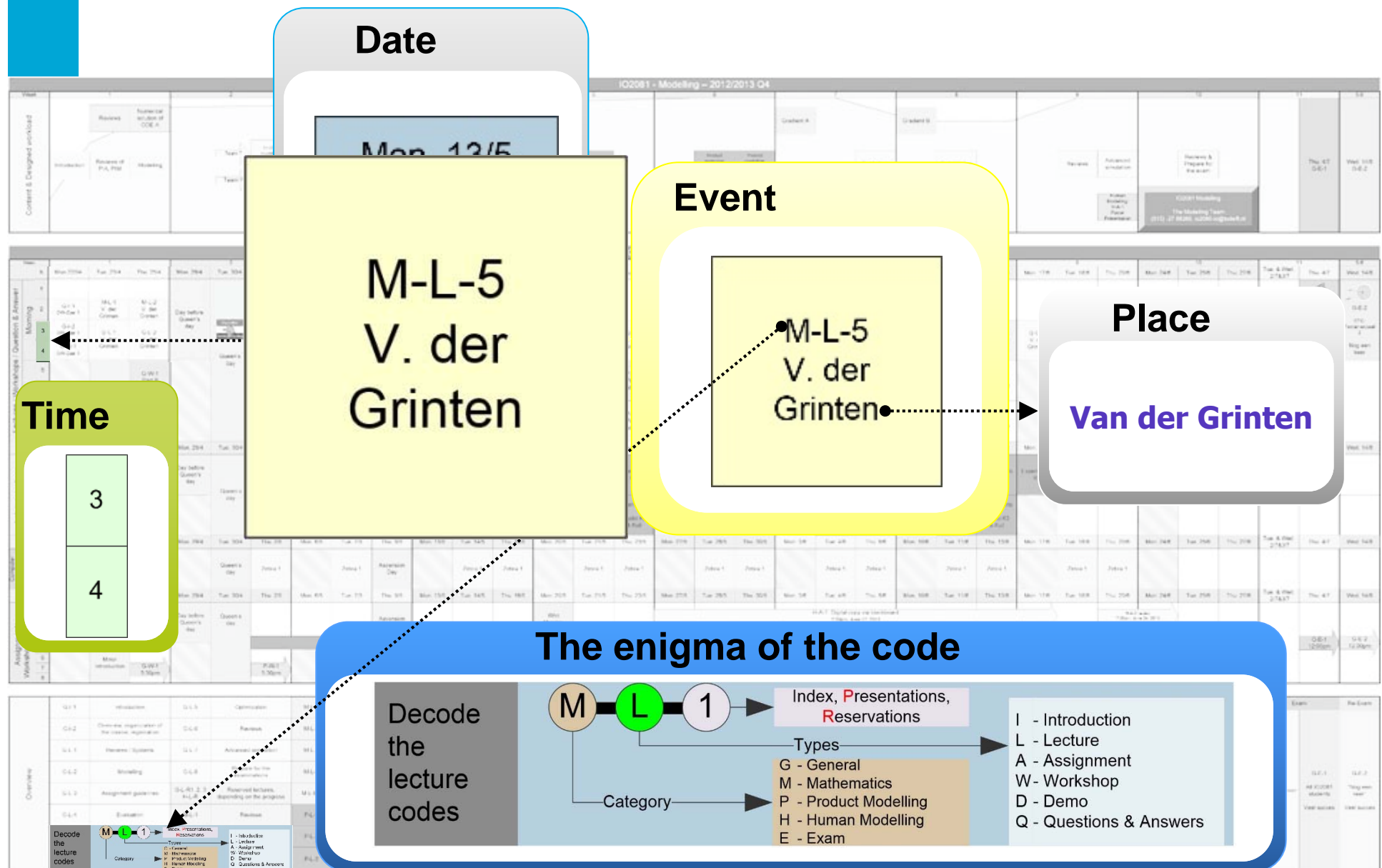
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IQ2081 - Modelling – 2012/2013 Q4													
Week	1	2	3	4	5	6	7	8	9	10	11	EB	
Content & Designed workload	<div>Introduction</div> <div>Reviews of PIA, RIM</div> <div>Modeling</div> <div>Numerical solution of ODE A</div> <div>Reviews</div>	<div>Team 1</div> <div>Team 2</div> <div>Product modelling Thermofluidics</div> <div>Product modelling Fluid mechanics</div>	<div>Numerical solutions of ODE B</div> <div>Analytical solutions of ODE</div>	<div>Partial differences/ Sensitivity</div> <div>Product modelling Fluid mechanics</div> <div>Product modelling Thermodynamics</div>	<div>Product modelling Mechanics</div>	<div>Product modelling Presentation of Pa-1</div> <div>Human Modelling Anthropometric model</div> <div>Rugby Modelling Domesticity</div>	<div>Product modelling Presentation of Pa-2</div> <div>Human Modelling Case studies Biomechanics</div>	<div>Gradient A</div> <div>Evaluation</div>	<div>Gradient B</div> <div>Optimization</div>	<div>Reviews</div> <div>Advanced simulation</div>	<div>Reviews & Prepare for the exam</div> <div>IQ2081 Modelling</div> <div>The Modelling Team</div> <div>(015) 27 88200 / i2081cs@qut.edu.au</div>	<div>Thu 4/7 G-E-1</div>	<div>Wed 14/8 G-E-2</div>

[illegible]

Overview	G-1-1	Introduction	G-1-5	Optimization	M-1-2	Numerical solution of ODE in Maple	H-1-1	Anthropometric model	IC2081 Workshop sequences <div>1-10 topics in first 11 workshops will be given to 200 of the new groups</div>										All IC2081 students	Join Complete Program	Team I	Studio 2	Topic 1: Use Maple to solve	IC2081-
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Content, Date, Time and place of an event



Problem based learning

IO2081 - Modelling – 2012/2013 Q4																									
Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Content & Designed workload	Introduction Review of P1A, P1B Modeling	Review of P1A, P1B Modeling	Numerical solution of ODE A Analytical solution of ODE B	Numerical solution of ODE B Analytical solution of ODE A	Partial differential Equations	Partial differential Equations	Partial differential Equations	Partial differential Equations	Partial differential Equations	Partial differential Equations	Partial differential Equations	Partial differential Equations	Partial differential Equations	Partial differential Equations	Partial differential Equations	Partial differential Equations	Partial differential Equations	Partial differential Equations	Partial differential Equations	Partial differential Equations	Partial differential Equations	Partial differential Equations	Partial differential Equations	Partial differential Equations	Partial differential Equations
Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Lectures / Workshops / Questions & Answers	Q1.1 Mon 22:04	Q1.2 Tue 23:04	Q1.3 Wed 24:04	Q1.4 Thu 25:04	Q1.5 Fri 26:04	Q1.6 Sat 27:04	Q1.7 Sun 28:04	Q1.8 Mon 29:04	Q1.9 Tue 30:04	Q1.10 Wed 31:04	Q1.11 Thu 01:05	Q1.12 Fri 02:05	Q1.13 Sat 03:05	Q1.14 Sun 04:05	Q1.15 Mon 05:05	Q1.16 Tue 06:05	Q1.17 Wed 07:05	Q1.18 Thu 08:05	Q1.19 Fri 09:05	Q1.20 Sat 10:05	Q1.21 Sun 11:05	Q1.22 Mon 12:05	Q1.23 Tue 13:05	Q1.24 Wed 14:05	Q1.25 Thu 15:05
Assignments / Workshops / Exams	Q1.1 Mon 22:04	Q1.2 Tue 23:04	Q1.3 Wed 24:04	Q1.4 Thu 25:04	Q1.5 Fri 26:04	Q1.6 Sat 27:04	Q1.7 Sun 28:04	Q1.8 Mon 29:04	Q1.9 Tue 30:04	Q1.10 Wed 31:04	Q1.11 Thu 01:05	Q1.12 Fri 02:05	Q1.13 Sat 03:05	Q1.14 Sun 04:05	Q1.15 Mon 05:05	Q1.16 Tue 06:05	Q1.17 Wed 07:05	Q1.18 Thu 08:05	Q1.19 Fri 09:05	Q1.20 Sat 10:05	Q1.21 Sun 11:05	Q1.22 Mon 12:05	Q1.23 Tue 13:05	Q1.24 Wed 14:05	Q1.25 Thu 15:05
Exams	Q1.1 Mon 22:04	Q1.2 Tue 23:04	Q1.3 Wed 24:04	Q1.4 Thu 25:04	Q1.5 Fri 26:04	Q1.6 Sat 27:04	Q1.7 Sun 28:04	Q1.8 Mon 29:04	Q1.9 Tue 30:04	Q1.10 Wed 31:04	Q1.11 Thu 01:05	Q1.12 Fri 02:05	Q1.13 Sat 03:05	Q1.14 Sun 04:05	Q1.15 Mon 05:05	Q1.16 Tue 06:05	Q1.17 Wed 07:05	Q1.18 Thu 08:05	Q1.19 Fri 09:05	Q1.20 Sat 10:05	Q1.21 Sun 11:05	Q1.22 Mon 12:05	Q1.23 Tue 13:05	Q1.24 Wed 14:05	Q1.25 Thu 15:05
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Review

Case studies in product modelling

Case studies in human body modelling

Advanced Modelling

Prepare for the exam

The learning materials – designed for you

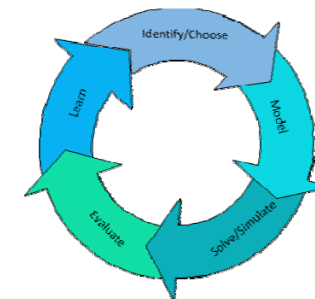
PPT slides

The study guide

P-L-3 Mechanics

The Modelling Team
Department of Design Engineering
Faculty of Industrial Design Engineering
Delft University of Technology

IO2081



Modelling is the way of thinking

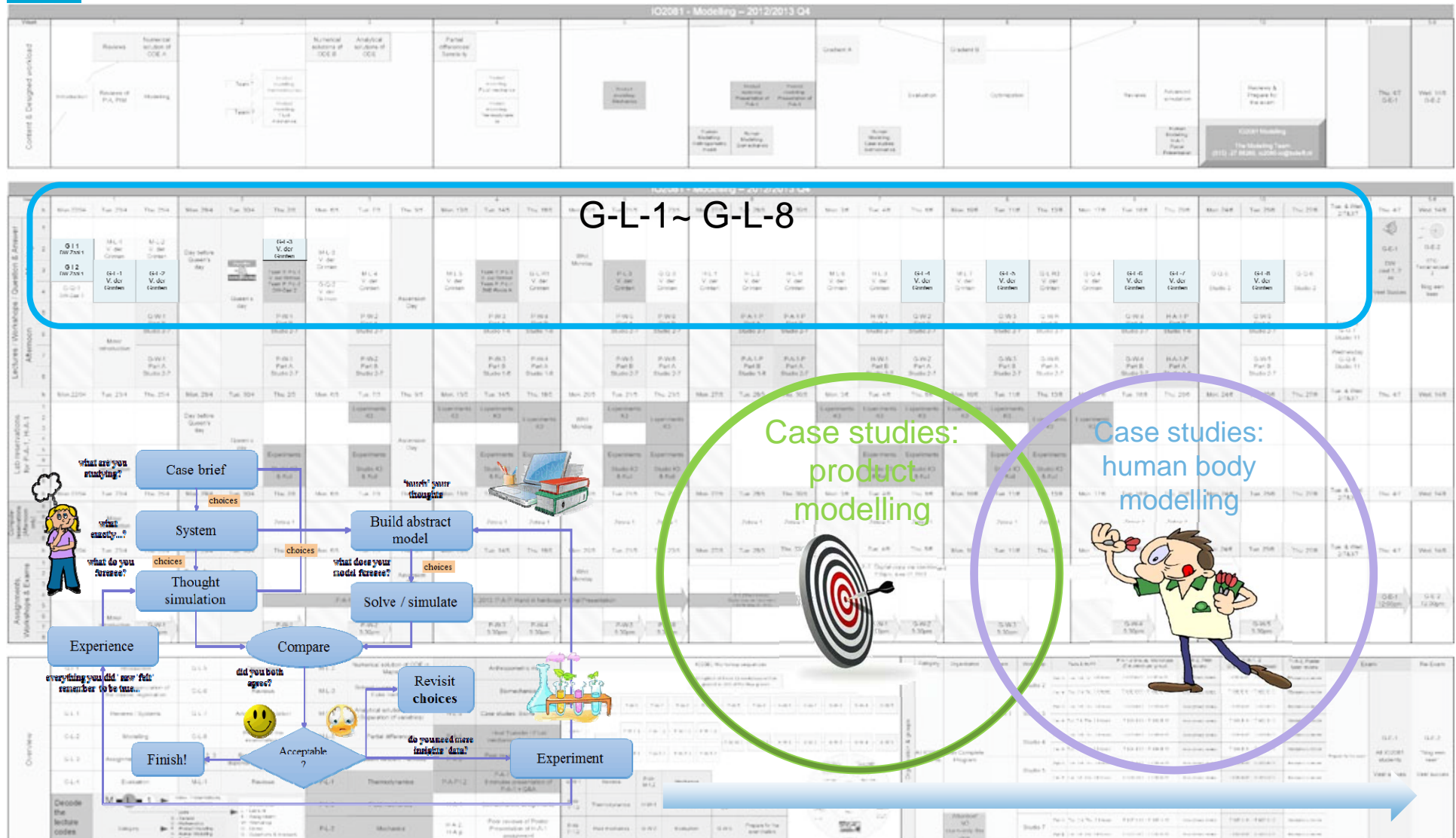
The Study Guide

IO2082 Modelling, 2012-2013

The Modelling Team
Faculty of Industrial Design Engineering
Delft University of Technology

General lectures:

The Modelling Framework - Modelling is the way of thinking



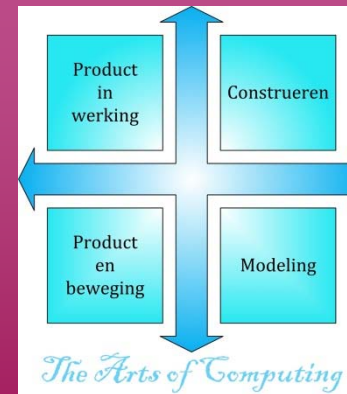
MapleDoc for Maple®

Maple will be a useful tool

we will help you
step by step
for a smooth learning
experience



The MapleDoc



MapleDoc

Y. Song (Wolf) B.Eng, M.Sc., Ph.D.
Erik W. Thomassen M.Sc.

Faculty of Industrial Design Engineering
Delft University of Technology

Case studies in Product modelling Tangible physics

Laptop usage

Please **DO NOT** use laptops in general,
product and human lectures

Case study: Thermodynamics

Case study: Fluid mechanics

P-L-1~P-L-3

Case study: Mechanics

Case studies in
product
modelling



The Modelling TV

Case studies in human body modelling - Discovery yourself

IO2081 - Modelling - 2012/2013 Q4

H-L-1~H-L-3

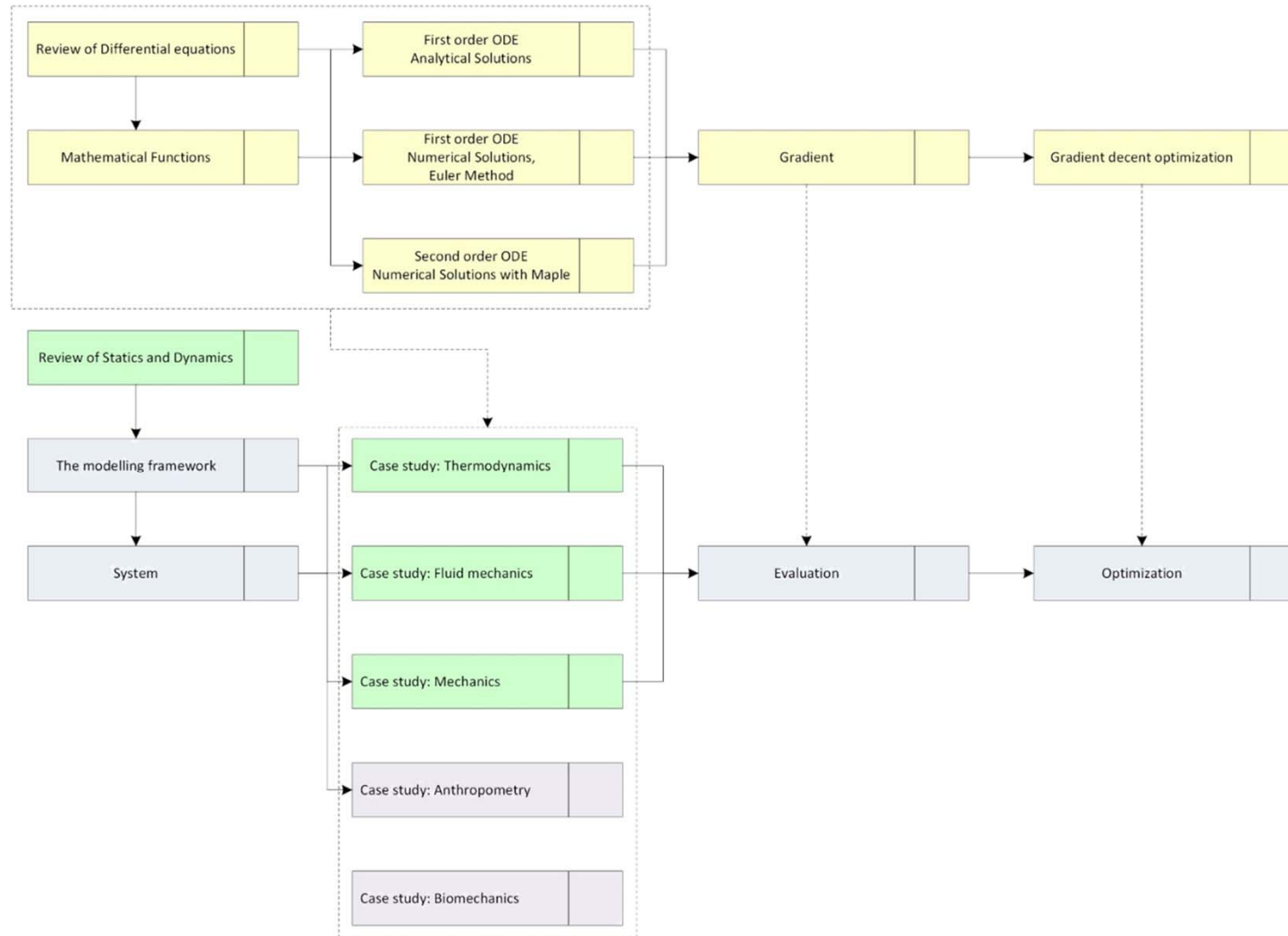
Case study: Anthropometry 37

Case study: Biomechanics 38

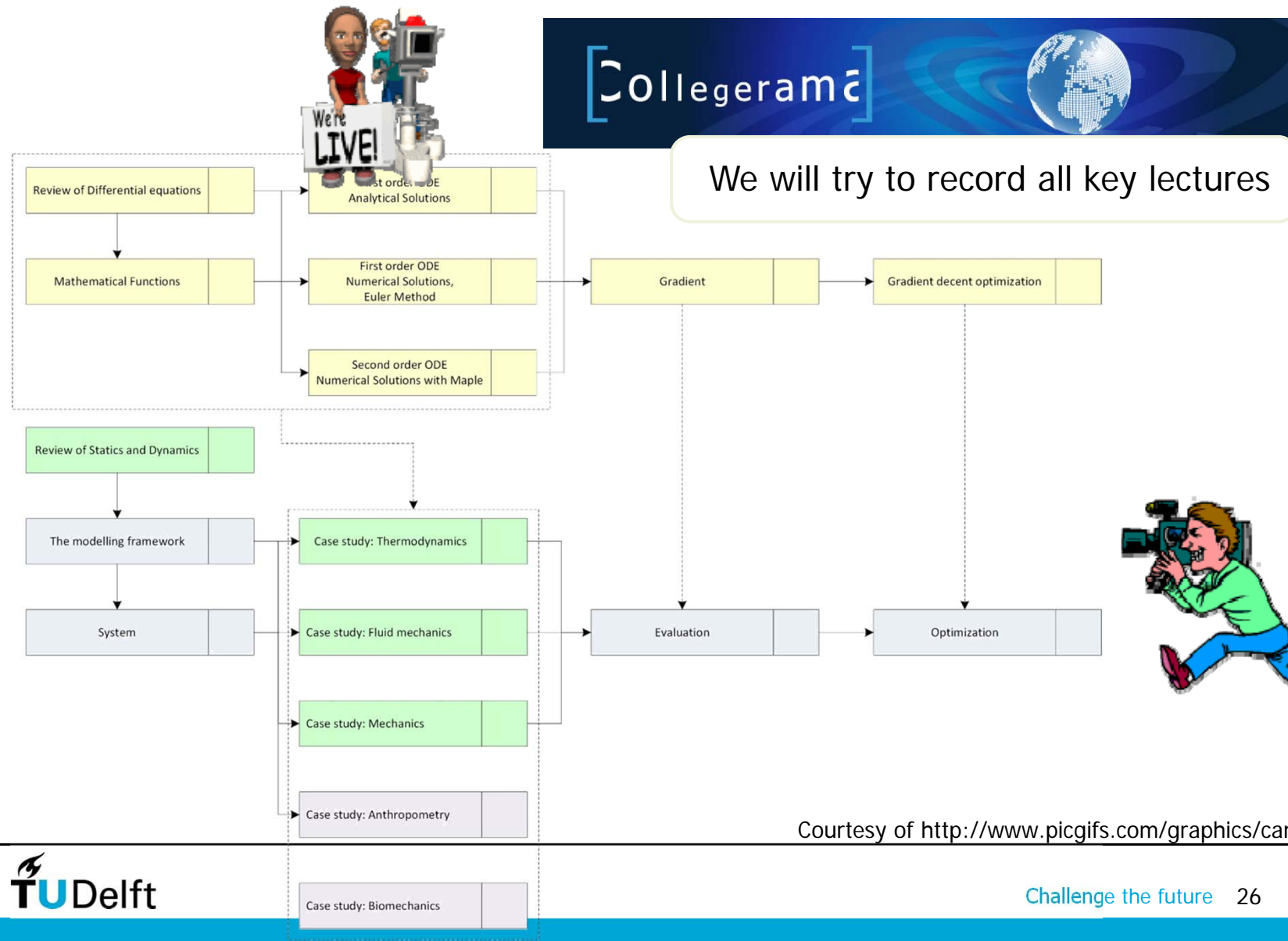
The Modelling TV

The image displays a detailed course schedule for IO2081 - Modelling - 2012/2013 Q4. The schedule is organized into columns representing weeks and rows representing different topics. A purple circle highlights a specific section of the schedule, labeled 'H-L-1~H-L-3', which includes 'Case study: Anthropometry 37' and 'Case study: Biomechanics 38'. A blue circle highlights another section, labeled 'The Modelling TV', which features a 3D model of a human leg and foot. A cartoon character is also present in the bottom right corner of the highlighted area.

The complete learning line



Thank you: Collegerama



Courtesy of <http://www.picgifs.com/graphics/cameraman/>

Smaller groups, more attention (2 persons per group)

Instead of

The image is a composite graphic. On the left, a cartoon illustration of two children swinging happily on a swing set is overlaid on a detailed course schedule for 'iQ2051 - Modelling - 2012/2013 Q4'. The schedule is a complex grid showing lecture times, topics, and exam dates. On the right, a large, dense crowd of diverse cartoon people is shown. Below these elements, four large, colorful arrows point from left to right, labeled 'Assignments', 'Presentations', 'Workshops', and 'Not in the Exam'. The background is a complex grid of course details, including lecture times, topics, and exam dates.

Choose one subject for assignments (P-A-1,2)

Lecture sequences are different for different teams



Then review another Team: P-A-2

Team T
Start from Thermodynamics

Team F
Start from Fluid mechanics

Team T: P-A-1

How long will the juice be cooled?



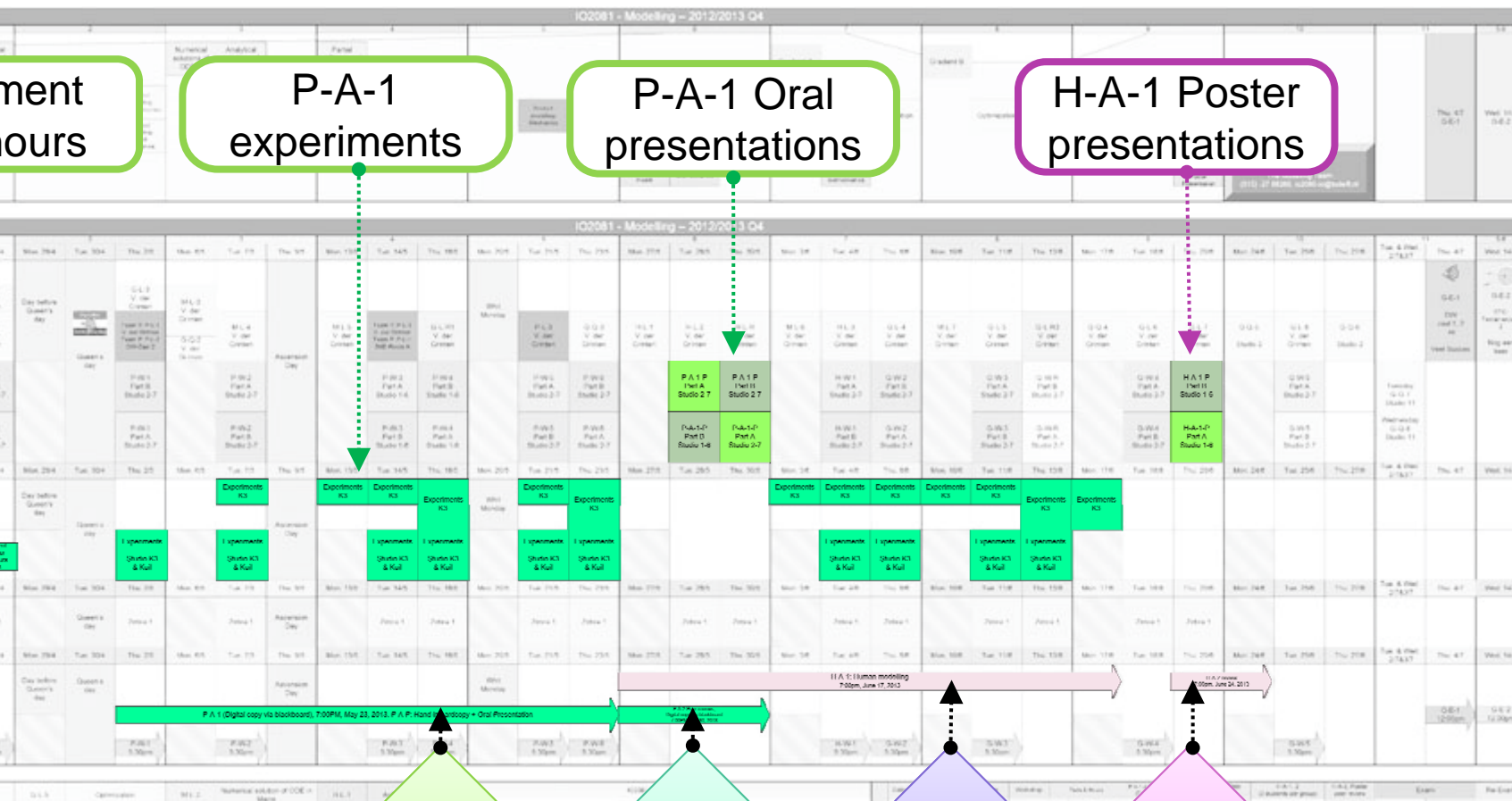
Team F: P-A-1

How long will the jet work?



Courtesy of <http://www.gardena.com>, <http://www.curver.com>,

In total there are four assignments



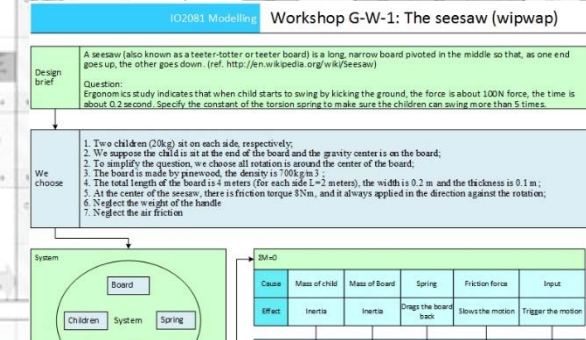
We will help you to solve a practical design question

Two staff will help you in a studio

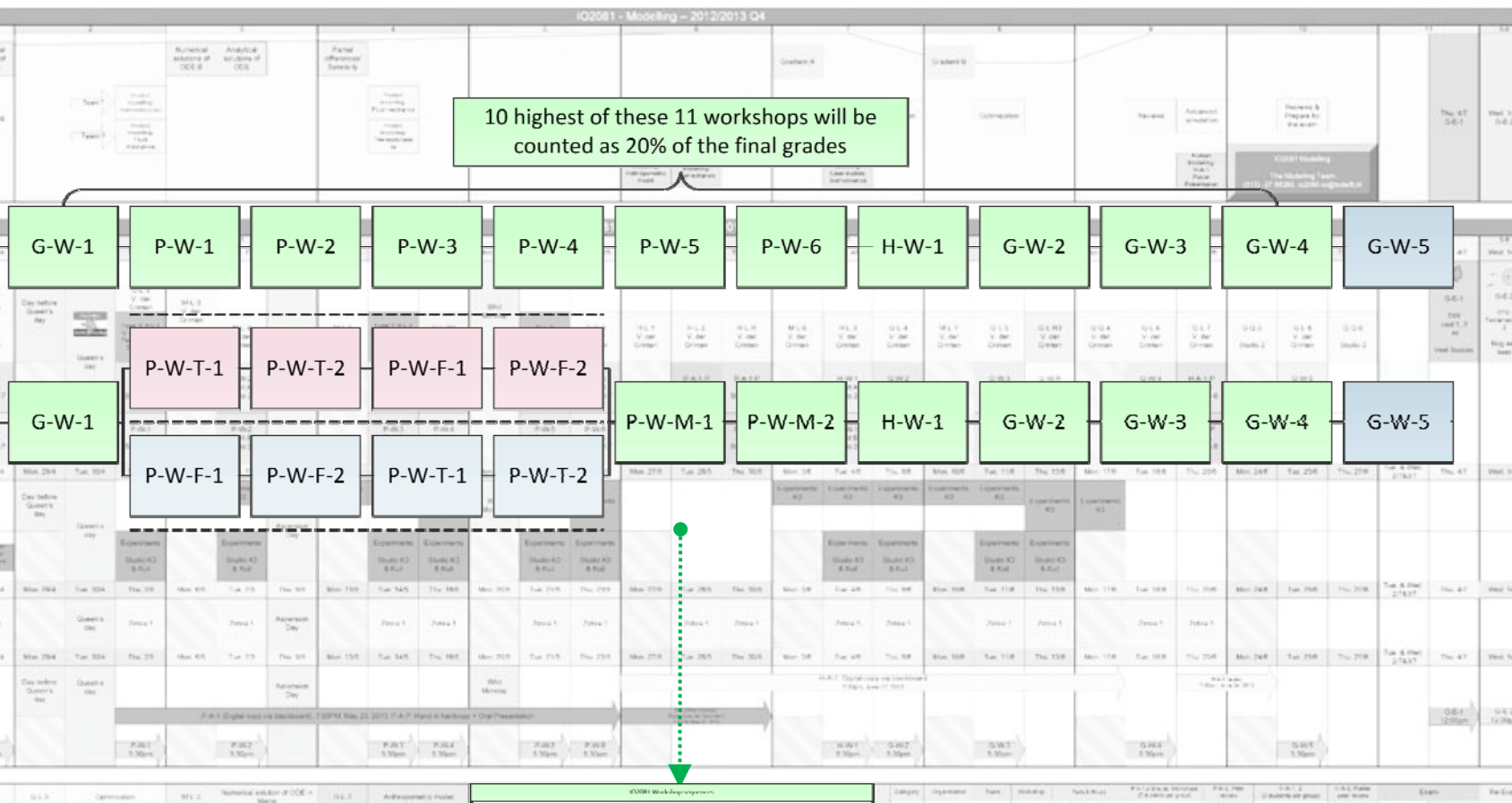
Part A: Tuesday 5~6 hour, Thursday 7~8 Hour

Part B: Tuesday 7~8 hour, Thursday 5~6 Hour

Workshop G-W-1~4, P-W-1~6, H-W-1, G-W-1



The sequences of the workshop



The workloads

Lecture

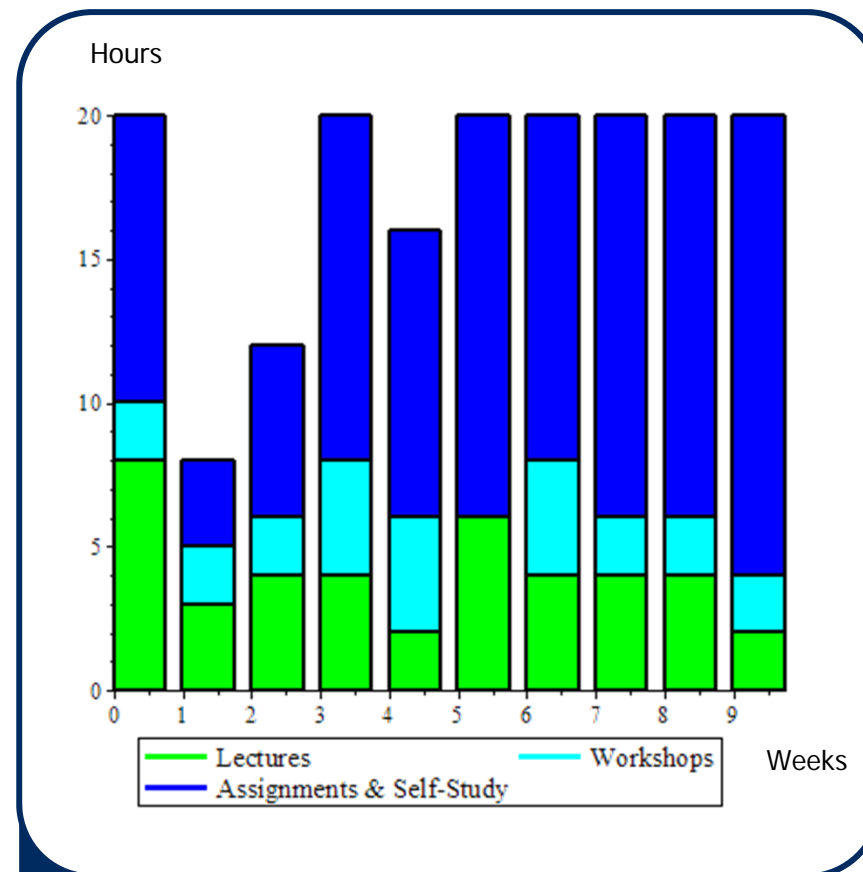
41 hours, 23.2%

Workshop

24 hours, 13.6%

Assignments & Self-study

111 hours, 63.1%



This graph

Maple 16

Organization: Team, Studio, Part and Index

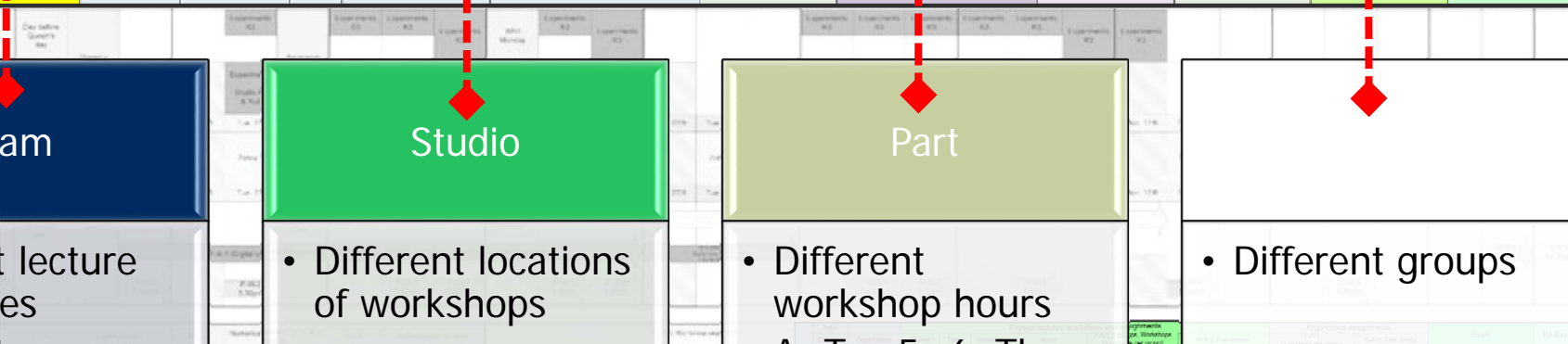
IO2081 - Modeling - 2012/2013 Q4											
Organization	Team	Workshop	Paris & Hours		P-A-1,2 Groups, Workshops (2 students per group)	P-A-2, Peer review	H-A-1, 2 (2 students per group)	H-A-2, Poster peer review	Exam		Re-Exam
Complete program	Team T	Studio 2	Part A	Tue. 5-6, Thu, 7-8 hours	T-S02-A-01 ~ T-S02-A-15	Anonymous review	T-S02-A-01 ~ T-S02-A-15	Anonymous review	Prepare for the exam	G-E-1 All IO2081 students Veel succes	G-E-2 "Nog een keer" Veel succes
			Part B	Tue. 7-8, Thu, 5-6 hours	T-S02-B-01 ~ T-S02-B-15	Anonymous review	T-S02-B-01 ~ T-S02-B-15	Anonymous review			
		Studio 3	Part A	Tue. 5-6, Thu, 7-8 hours	T-S03-A-01 ~ T-S03-A-15	Anonymous review	T-S03-A-01 ~ T-S03-A-15	Anonymous review			
			Part B	Tue. 7-8, Thu, 5-6 hours	T-S03-B-01 ~ T-S03-B-15	Anonymous review	T-S03-B-01 ~ T-S03-B-15	Anonymous review			
		Studio 4	Part A	Tue. 5-6, Thu, 7-8 hours	T-S04-A-01 ~ T-S04-A-15	Anonymous review	T-S04-A-01 ~ T-S04-A-15	Anonymous review			
			Part B	Tue. 7-8, Thu, 5-6 hours	T-S04-B-01 ~ T-S04-B-15	Anonymous review	T-S04-B-01 ~ T-S04-B-15	Anonymous review			
	Team F	Studio 5	Part A	Tue. 5-6, Thu, 7-8 hours	F-S05-A-01 ~ F-S05-A-15	Anonymous review	F-S05-A-01 ~ F-S05-A-15	Anonymous review			
			Part B	Tue. 7-8, Thu, 5-6 hours	F-S05-B-01 ~ F-S05-B-15	Anonymous review	F-S05-B-01 ~ F-S05-B-15	Anonymous review			
		Studio 6	Part A	Tue. 5-6, Thu, 7-8 hours	F-S06-A-01 ~ F-S06-A-15	Anonymous review	F-S06-A-01 ~ F-S06-A-15	Anonymous review			
			Part B	Tue. 7-8, Thu, 5-6 hours	F-S06-B-01 ~ F-S06-B-15	Anonymous review	F-S06-B-01 ~ F-S06-B-15	Anonymous review			
		Studio 7	Part A	Tue. 5-6, Thu, 7-8 hours	F-S07-A-01 ~ F-S07-A-15	Anonymous review	F-S07-A-01 ~ F-S07-A-15	Anonymous review			
			Part B	Tue. 7-8, Thu, 5-6 hours	F-S07-B-01 ~ F-S07-B-15	Anonymous review	F-S07-B-01 ~ F-S07-B-15	Anonymous review			

Attention!
NO
only this
year

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Organization: Team, Studio, Part and Index

Organization	Team	Workshop	Parts & Hours		P-A-1,2 Groups, Workshops (2 students per group)	P-A-2, Peer review	H-A-1, 2 (2 students per group)	H-A-2, Poster peer review	Exam		Re-Exam	
Complete program	Team T	Studio 2	Part A	Tue. 5-6, Thu, 7-8 hours	T-S02-A-01 ~ T-S02-A-15	Anonymous review	T-S02-A-01 ~ T-S02-A-15	Anonymous review	Prepare for the exam	G-E-1 All IO2081 students Veel succes	G-E-2 "Nog een keer" Veel succes	
			Part B	Tue. 7-8, Thu, 5-6 hours	T-S02-B-01 ~ T-S02-B-15	Anonymous review	T-S02-B-01 ~ T-S02-B-15	Anonymous review				
		Studio 3	Part A	Tue. 5-6, Thu, 7-8 hours	T-S03-A-01 ~ T-S03-A-15	Anonymous review	T-S03-A-01 ~ T-S03-A-15	Anonymous review				
			Part B	Tue. 7-8, Thu, 5-6 hours	T-S03-B-01 ~ T-S03-B-15	Anonymous review	T-S03-B-01 ~ T-S03-B-15	Anonymous review				
		Studio 4	Part A	Tue. 5-6, Thu, 7-8 hours	T-S04-A-01 ~ T-S04-A-15	Anonymous review	T-S04-A-01 ~ T-S04-A-15	Anonymous review				
			Part B	Tue. 7-8, Thu, 5-6 hours	T-S04-B-01 ~ T-S04-B-15	Anonymous review	T-S04-B-01 ~ T-S04-B-15	Anonymous review				
		Team F	Studio 5	Part A	Tue. 5-6, Thu, 7-8 hours	F-S05-A-01 ~ F-S05-A-15	Anonymous review	F-S05-A-01 ~ F-S05-A-15				Anonymous review
				Part B	Tue. 7-8, Thu, 5-6 hours	F-S05-B-01 ~ F-S05-B-15	Anonymous review	F-S05-B-01 ~ F-S05-B-15				Anonymous review
	Attention! NO only this year		Studio 6	Part A	Tue. 5-6, Thu, 7-8 hours	F-S06-A-01 ~ F-S06-A-15	Anonymous review	F-S06-A-01 ~ F-S06-A-15				Anonymous review
				Part B	Tue. 7-8, Thu, 5-6 hours	F-S06-B-01 ~ F-S06-B-15	Anonymous review	F-S06-B-01 ~ F-S06-B-15				Anonymous review
Studio 7			Part A	Tue. 5-6, Thu, 7-8 hours	F-S07-A-01 ~ F-S07-A-15	Anonymous review	F-S07-A-01 ~ F-S07-A-15	Anonymous review				
			Part B	Tue. 7-8, Thu, 5-6 hours	F-S07-B-01 ~ F-S07-B-15	Anonymous review	F-S07-B-01 ~ F-S07-B-15	Anonymous review				



Organization: An example – Group: T-S03-A-01

Organization	Team	Workshop	Parts & Hours		P-A-1,2 Groups, Workshops (2 students per group)	P-A-2, Peer review	H-A-1, 2 (2 students per group)	H-A-2, Poster peer review	Exam		Re-Exam
Complete program	Team T	Studio 2	Part A	Tue. 5-6, Thu. 7-8 hours	T-S02-A-01 ~ T-S02-A-15	Anonymous review	T-S02-A-01 ~ T-S02-A-15	Anonymous review	Prepare for the exam	G-E-1 All IO2081 students Veel succes	G-E-2 "Nog een keer" Veel succes
			Part B	Tue. 7-8, Thu. 5-6 hours	T-S02-B-01 ~ T-S02-B-15	Anonymous review	T-S02-B-01 ~ T-S02-B-15	Anonymous review			
		Studio 3	Part A	Tue. 5-6, Thu. 7-8 hours	T-S03-A-01 ~ T-S03-A-15	Anonymous review	T-S03-A-01 ~ T-S03-A-15	Anonymous review			
			Part B	Tue. 7-8, Thu. 5-6 hours	T-S03-B-01 ~ T-S03-B-15	Anonymous review	T-S03-B-01 ~ T-S03-B-15	Anonymous review			
		Studio 4	Part A	Tue. 5-6, Thu. 7-8 hours	T-S04-A-01 ~ T-S04-A-15	Anonymous review	T-S04-A-01 ~ T-S04-A-15	Anonymous review			
			Part B	Tue. 7-8, Thu. 5-6 hours	T-S04-B-01 ~ T-S04-B-15	Anonymous review	T-S04-B-01 ~ T-S04-B-15	Anonymous review			
	Team F	Studio 5	Part A	Tue. 5-6, Thu. 7-8 hours	F-S05-A-01 ~ F-S05-A-15	Anonymous review	F-S05-A-01 ~ F-S05-A-15	Anonymous review			
			Part B	Tue. 7-8, Thu. 5-6 hours	F-S05-B-01 ~ F-S05-B-15	Anonymous review	F-S05-B-01 ~ F-S05-B-15	Anonymous review			
		Studio 6	Part A	Tue. 5-6, Thu. 7-8 hours	F-S06-A-01 ~ F-S06-A-15	Anonymous review	F-S06-A-01 ~ F-S06-A-15	Anonymous review			
			Part B	Tue. 7-8, Thu. 5-6 hours	F-S06-B-01 ~ F-S06-B-15	Anonymous review	F-S06-B-01 ~ F-S06-B-15	Anonymous review			
Studio 7		Part A	Tue. 5-6, Thu. 7-8 hours	F-S07-A-01 ~ F-S07-A-15	Anonymous review	F-S07-A-01 ~ F-S07-A-15	Anonymous review				
		Part B	Tue. 7-8, Thu. 5-6 hours	F-S07-B-01 ~ F-S07-B-15	Anonymous review	F-S07-B-01 ~ F-S07-B-15	Anonymous review				
Attention! NO only this year											

3

• Team T: Assignment: The cup

• Workshop at studio 3 for Tuesday and Thursday

• Team T: Assignment: The cup

• Workshop at studio 3 for Tuesday and Thursday

• Team T: Assignment: The cup

• Workshop at studio 3 for Tuesday and Thursday

• Team T: Assignment: The cup

• Workshop at studio 3 for Tuesday and Thursday

• Team T: Assignment: The cup

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Exam dates & format

IO2081 – Modelling – 2011-2012

Examination, 9:00am-12:00pm, July 5, 2012

Question sheet 1 of 3 Physics questions

Info 1 Please read the following instructions

1. There are 3 pages of questions, 4 pages of physics answer sheets and 2 pages of ergonomics answer sheets in the exam
2. In total there are 8 questions, 4 physics questions named PQ1 to PQ4 and 4 ergonomics questions named EQ1 to EQ4
3. Please put the answers in the right box in the answer sheet

Info 2 The formulas

Derivative: $\left(\frac{1}{\sqrt{x}}\right)' = \frac{1}{2\sqrt{x}}$	Derivative: $\left(\ln(x)\right)' = \frac{1}{x}$	Indefinite integrals: $\int \frac{c}{ax+b} = \frac{c}{a} \ln(ax+b) + C$	Mass moment of inertia of a point mass: $I = mR^2$
Spring: $F = -kx(t)$	Damper: $F = -c \frac{dx(t)}{dt}$	Spring (angular): $M = -k\theta(t)$	Damper (angular): $M = -c \frac{d\theta(t)}{dt}$
Natural frequency: $\omega_0 = \sqrt{\frac{k}{m}}$	Damping ratio: $\zeta = \frac{c}{2\sqrt{mk}}$	Linked load: $Q = mL$	Heat capacity: $\frac{dQ(t)}{dt} = mc \frac{dT(t)}{dt}$
Conduction: $\frac{dQ(t)}{dt} = \frac{kA(T_1(t) - T_2(t))}{L}$	Convection: $\frac{dQ(t)}{dt} = hA(T_1(t) - T_2(t))$	Density: $\rho = \frac{m}{V}$	Pressure: $p = \frac{F}{A}$
Combined gas law: $\frac{p_1 V_1}{T_1} = \frac{p_2 V_2}{T_2}$ (Charles law)	Coriolis law: $v = \sqrt{2gh}$	Bernoulli equation: $\frac{p_1}{\rho} + gh_1 + \frac{v_1^2}{2} = \frac{p_2}{\rho} + gh_2 + \frac{v_2^2}{2} = \text{Constant}$	

PQ1 16% The Seesaw: Modelling and Evaluation

A seesaw is a long, narrow board pivoted in the middle so that, as one end goes up, the other goes down.

Question A: Two children (mass m , each) sit on each side of the seesaw, and one of them starts to swing by kicking the ground with force F for a short moment t_0 . Build a mathematical model to describe the movement of the seesaw.

- We choose:**
1. the seesaw rotates about the center of the board, and both children sit at the end of the board; the total length of the board is L , and the mass of the board is m_b , which is larger than the mass of a child;
 2. a torsion spring (spring constant k) and an angular damper (damping coefficient c) are installed at the center of the seesaw;
 3. to neglect the mass of the handle and to neglect the air friction;
 4. to use point mass to approximate the mass moment of inertia of both children and both sides of the board.

With the original design parameters, after the kick, the response of the system is presented in the figure on the left. The client wants you to adjust the design parameter(s) in order to reduce the frequency of the vibration, i.e., increase time span t^* shown in the figure.

Question B: Which parameter(s) do you suggest to change? Why?

PQ2 20% The Splash Challenger: Modelling, Simulation and Evaluation

With a big water tank, the splash challenger is able to spray water through several orifices to amuse children in the playground.

Questions: Considering a two-orifice splash challenger as shown in the sketch:

- A. Predict the remaining height of water 60 seconds after the start of the play;
- B. Manufacturing errors lead to systematic variation of the diameters of orifices. This will affect the flow rate. Evaluate the sensitivity of the height of the water at 60" second with respect to the varying diameter of orifice 1.

We know:

1. the shape of the tank is cylindrical and its diameter (D) is 1 meter;
2. the height difference (H_1) between the two orifices is 30 cm;
3. the initial height of water (H_0) in the tank is 1 m regarding orifice 1;
4. the shapes of both orifices are circular, the diameter of orifice 1 (D_1) is 3 cm and the diameter of orifice 2 (D_2) is 2 cm; the discharge coefficient is 0.6 for both orifices.

We choose:

1. to use the Euler method to solve the questions (2 steps).

Next Page

Page 1

Sample exam will be publish on BB @ Week 7

G-E-2

2nd exam

Aug.14, Wed.

DTC Tentamenzaal 2

9:00~12:00pm

Nog een keer

DW Zaal 1 + Zaal 2

9:00~12:00pm

Good luck

We ask your help to use IO2081 index (1~3 digits)
Registered students already got it by e-mail

IO2081 Index, Example: 123

Assignments

IO2081

P-A-1

Team T assignment

Group Number:

Team	Studio	Part	Group Number
T	XX	X	XX

Student	Name	Study number	IO2081 Index
1			xxx
2			xxx

Exam

Please DONOT use pencil

Your study number

Your name, please print in block letters

Signature

A single wheel bike: Modelling

System components

Class

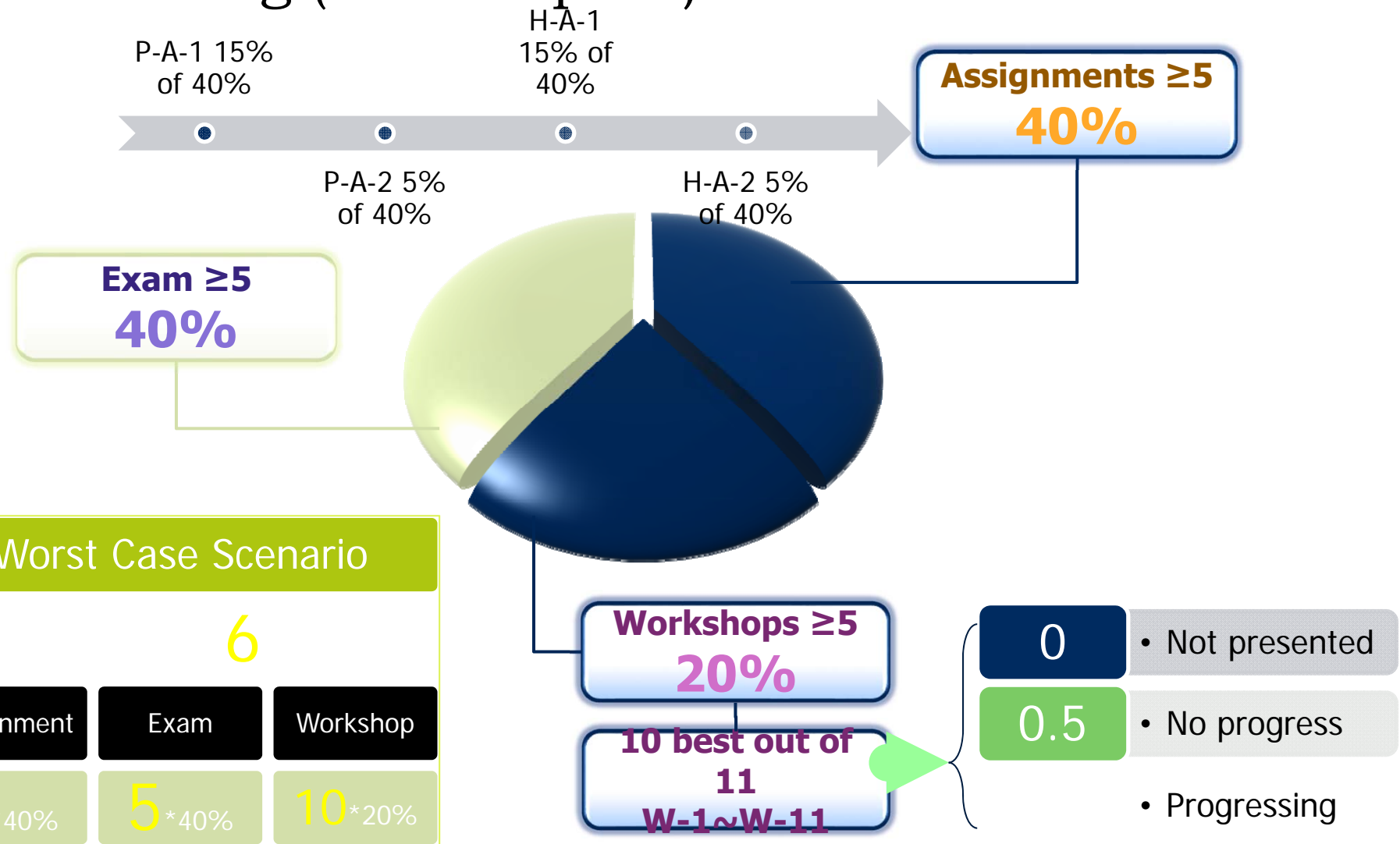
Effect

Model

Others

- Communications
- Checking grades
- ...

Grading (≥ 6 is a pass)



Enrollment & Questions

Group enrollment

The enrolment tool will be available on Blackboard from
11:45AM till 19:00 PM today.

Questions? G-Q-1 is the next session

In IO2081, before you call 112

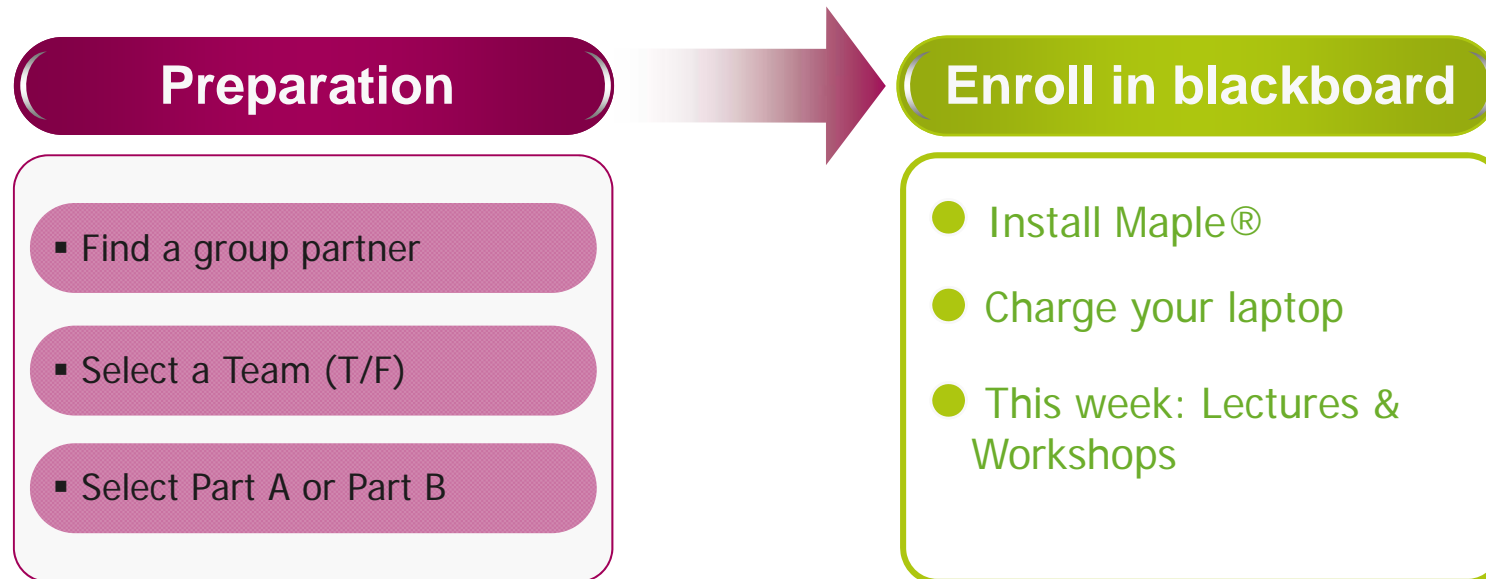
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Y. Song (Wolf)

015 -27 88286, y.song@tudelft.nl

English and very poor Dutch service only

To do



Thank you

The Modelling Team

Boyi Wong
Christos Spitas
Daniel Den Bosch
David Peck
Edgar Rios Soltro
Emiel van Elderen
Ernest van Bremen
Fred den Elzen
Herman Broekhuizen
Iemkje Ruiter
Jasper Henny
Jeffrey Tchai
Jo Geraedts

Judith de Groot
Leen Bogerd
Leon Kuiper
Marc Tassoul
Marina Wellink
Paulien Veldhoven
Peter Loeffen
Renée van der Wijden
Rianne Laan
Richard Goossen
Roel Somers
Sander Minnoye
Yu Song (Wolf)
Zoltan Rusak