Programme

Training School COST Action FP1402

"Probabilistic Modelling and Reliability Assessment in Timber Engineering"

Norwegian University of Science and Technology
Sunday 11th – Friday 16th September 2016

Local Organizer

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SCOPE

In the last few years the interest in designing timber structures has steadily increased. The reason for this being an increased focus in society on sustainability and environmental aspects but also due to the positive effects on the inner climate in accommodation buildings and the increased architectural possibilities. Furthermore, timber is technically and economically competitive compared with steel and concrete as a building material for a broad range of normal building structures.

However, timber is at the same time a very challenging material when it comes to the estimation and proper representation of the load bearing capacity and stiffness related behavior of timber components, systems and connections that are exposed to load effects and environmental effects in real structures. In particular these challenges are related to the development of mechanical models and the consistent representation of uncertainties that are associated with the modelling. Especially the latter aspects require essential knowledge and training that in many European Universities is not part of the standard structural engineering curriculum.

The main objective of this Training School is to create a better understanding and executive skills in the probabilistic modelling and reliability assessment of timber structures. This includes the following specific learning objectives:

- Basic Probability Theory: Reviewing practical aspects of basic probability theory and engineering uncertainty modelling.
- Data Analysis: Creating basic understanding and executable skills in statistics and data analysis.
- Reliability of Structures: Introducing basic concepts on Structural Reliability Methods with special emphasis on Monte Carlo Simulation and First Order Reliability Method.
- Code Calibration: Practical aspects of risk and reliability based code calibration.
- Assessment of existing structures: Practical aspects of risk and reliability based on the reassessment of the reliability of existing timber structures.
- Reliability in the context of Risk and Safety: Aspects concerning observed failure rates, risk acceptance, human error and conservatism.

All learning objectives will be aligned to practical examples from timber engineering. Case studies will be executed under guidance during the course.

The Training School is part of COST Action FP1402. It will significantly contribute to the attainment of the Actions overall objectives.

List of Trainers:

Matthias Schubert, Matrisk GmbH, Switzerland

Staffan Svensson, Borås HS, Sweden

Michele Baravalle, NTNU, Norway

Stefan Winter, TU München, Germany

Gerhard Fink, Aalto University, Finland

Jochen Köhler, NTNU, Norway

TARGET GROUP

The target group for this Training School are researchers at all stages of their career. Since the subject covered is not part of the standard structural engineering curriculum it is envisaged to extend the invitation explicitly to more experienced researchers and teachers. This approach is in line with the successful “Training for Trainers” initiative on structural engineering and the Eurocodes, initiated by the European Commission. The envisaged number of attendees is 25 – 40 (subject to budget allocated to FP1402 for 2016). In case a selection of participants is necessary, COST rules on gender and country participation will be considered.

PROGRAMME

Sunday 11th – Friday 16th September 2016

When	*What*	*Who*	*Where*
Sunday, September 11			Accommodation for Sep 11-12 – under own arrangements
16:00 – 16:45	**Introduction Lecture** Course overview, practicalities, common basics	**Jochen Köhler**	**NTNU Trondheim, Gloshaugen**
17:00 – 18:30	**A short history on the use of reliability methods in engineering** Problem setting, deterministic vs. probabilistic Brief Historical review Early and late developments of methods, the role of computer performance Application examples. Reliability based design. Risk based design. Historical Code formats and their developments towards being semi-probabilistic	**Gerhard Fink**	
18:30 – 19:15	**Recent developments and challenges of the Eurocodes**	**Stefan Winter**	
20:00	Joint Dinner at Restaurant Una Pizzeria og Bar. Beddingen 14, 7014 Trondheim		**Solsiden Trondheim**

When	*What*	*Who*	*Where*
Monday, September 12			
08:00	**Meeting Point at Galtwort, infront of the main building at NTNU Gloshaugen.** **Traveling to Kvenvær by bus. The bus trip will take about 3 hours.** Joint Bus journey to Skaroya. Stopover at Hitra Tunnel (Excursion) Lunch box Boat transfer to Skaroya Check inn		**TRAVEL**
15:00 – 17:00	**Evaluation of Structural Performance – Optimization** Set up the design problem as an optimization problem. Define failure as the event causing consequences. Discuss the relevant factors, i.e. consequence and probability of failure.	**Jochen Köhler**	**Skarøya**
17:00 – 19:30	**Application Example** Set up an example for 5 different types of timber structures. Groupwork. MatLab. Presentation of the results.	**Jochen Köhler,** **All**	
20:00	Dinner at the Main House.		

When	*What*	*Who*	*Where*
Tuesday, September 13			**Skarøya**
07:30	Breakfast at the Main House.		
08:00 – 10:00	**Structural Reliability – Introduction** Basic Concepts. Cornell reliability index. Hasshofer/Lind., FORM.	**Jochen Köhler**	
10:15 – 11:45	**Application Example** - Reliability of Timber Structures, FORM. FORM: Set up of 5 examples. Groupwork. MatLab	**Jochen Köhler, All**	
12:00	Lunch at the Main House.		
13:00 – 14:30	**System Reliability – Introduction** Parallel/Serial, Cut-Sets, Simple Bounds	**Jochen Köhler**	
14:45 – 15:15	**Reliability of Timber Structures – Monte Carlo** Random number generation, Crude sampling, Latin Hypercube, Importance Sampling	**Matthias Schubert**	
15:30 – 19:00	**Application Example** - Reliability of Timber Structures, Monte Carlo.	**Matthias Schubert, All**	
19:30	Dinner at the Main House.		

When	*What*	*Who*	*Where*
Wednesday, September 14			**Skarøya**
07:30	Breakfast at the Main House.		
08:00 - 10:00	**Timber Material Characteristics – Introduction** Solid wood, Timber, Timber Products, Grading, spatial variability, volume effect, DOL, MIS.	**Staffan Svensson, Gerhard Fink**	
10:00 – 12:00	**From data analysis to probabilistic modelling** Method of moments, MLE, Bayesian Statistics / Updating, Regression Analysis.	**Matthias Schubert**	
12:00	Lunch at the Main House.		
13:00 – 15:30	**Application Examples –** Data Analysis, probabilistic representation of timber material properties-	**Matthias Schubert, All**	
15:45 – 17:15	**Design assisted by testing**	**Staffan Svensson**	
17:30 – 19:00	**Application Examples –** Design assisted by testing.	**Staffan Svensson, All**	
19:30	Dinner at the Main House.		

When	*What*	*Who*	*Where*
Thursday, September 15			**Skarøya**
07:30	Breakfast at the Main House.		
08:00 – 09:30	**Assessment of Timber Structures** Additional information and measurements, reliability updating, proof loading, damage prediction.	**Gerhard Fink**	
09:45 – 12:00	**Application Example** – Assessment of Timber Structures.	**Gerhard Fink, All**	
12:00	Lunch at the Main House.		
13:00 – 14:30	**Code Calibration – principles and practical challenges** Code safety formats, Calibration strategies, generic representation of design situations, calibration.	**Michele Baravalle**	
14:45 – 16:15	**Application Example** – Code Calibration.	**Michele Baravalle, All**	
16:30 – 18:00	**Reliability in the context of Risk and Safety + Discussion** observed failure rates, risk acceptance, human error, conservatism.	**Matthias Schubert, All**	
20:00	Dinner at the Main House.		

When	*What*	*Who*	*Where*
Friday, September 16			**Skarøya**
08:00	Breakfast at the Main House. Please have your luggage ready.		
09:00 – 11:00	**Wrap up and learning assessment.**	**Jochen Köhler, All**	
11:00 – 14:00	**Travelling back to Trondheim by bus.** **Lunch box** **Upon arrival to Trondheim, under own arrangement.**		**TRAVEL**

TRAVEL INFORMATION (Trondheim Airport – Trondheim City Center)

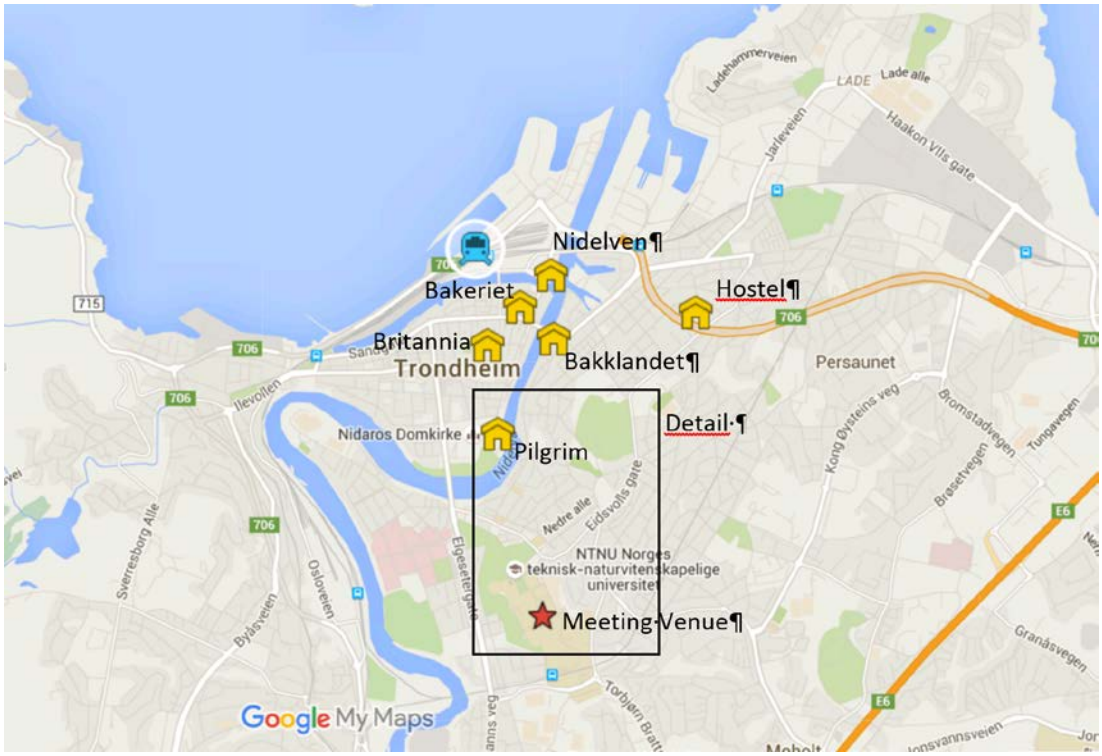
Trondheim International Airport Værnes (https://avinor.no/flyplass/trondheim/)
From the Airport, you can take either “Værnesekspressen” or “Flybussen” to the city center.
Price is for one way: NOK 130.
Please note that the travelling to / from Trondheim before / after the Training School is under own arrangements. From September 12 – September 16 , joint transfer to / from Trondheim will be arranged by us.

VENUE INFORMATION:

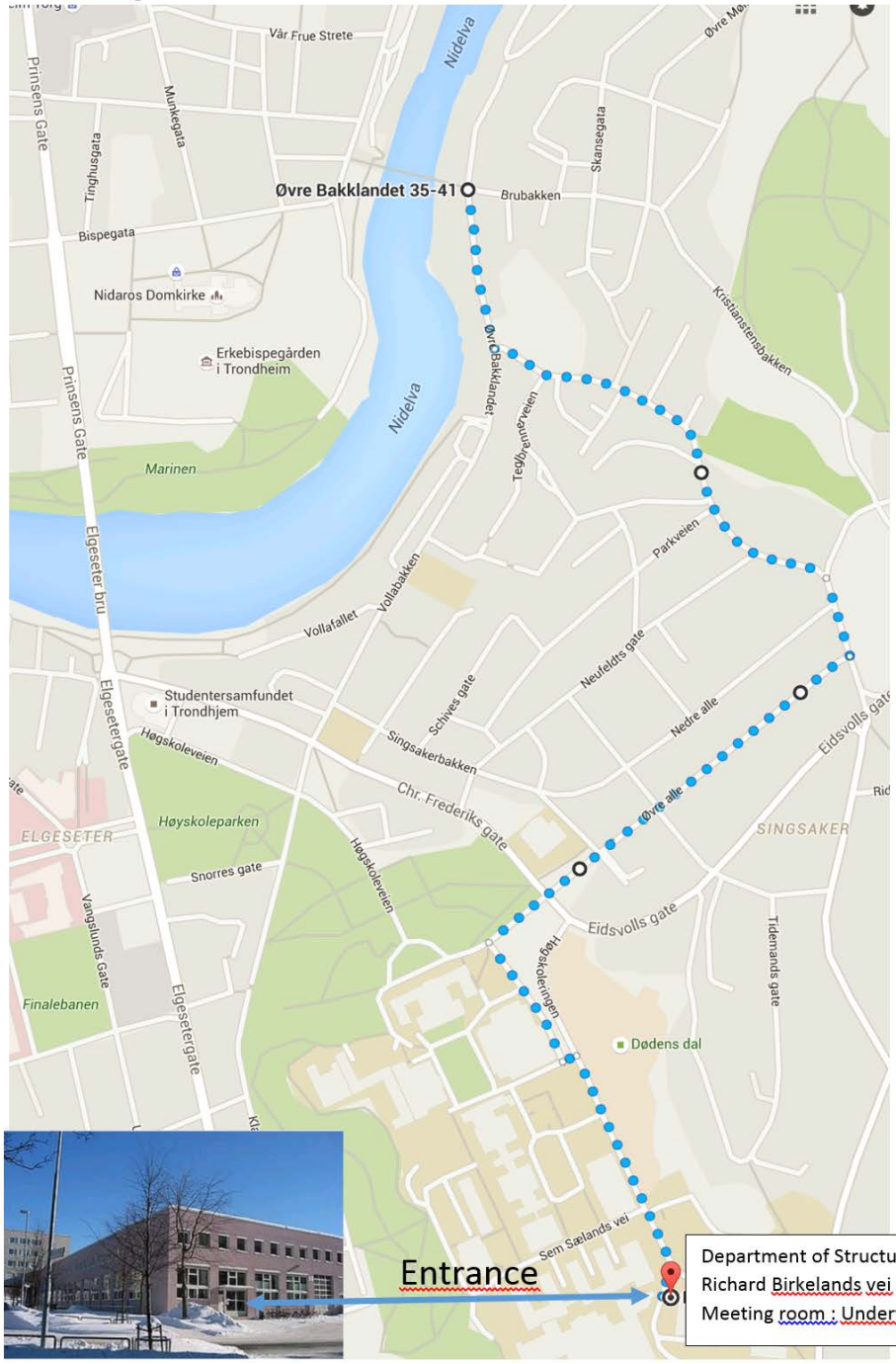
- Venue in Trondheim

On September 11th, Sunday, we will all meet at Norwegian University of Science and Technology (NTNU), at the Department of Structural Engineering which is located at Richard Birkelands vei 1A, Campus Gloshaugen.
Meeting room: Undervisningslab.

How to get to the Department of Structural Engineering from the city center:



Detail meeting venue:



- Venue in Skaroya

The Training School will take place on an island on the Atlantic Coast in Mid-Norway about 2.5 hours car drive away from Trondheim. The venue consists of an old schoolhouse and several buildings that are used for accommodation: http://hitraleirskole.no/.

The surrounding does provide an excellent atmosphere for concentrated working and learning. At the same time there will be possibility to enjoy the coastal nature in the free time. Bedrooms will be shared (from two to nine beds), shared toilets / showers and Wifi will be the main building and the boat house. Please note that the speed of internet is not suitable for streaming or downloading large amounts of data but sufficient for reading emails and chatting.

The setting, i.e. accommodation and catering will be simple. It is recommended to bring the following items:
* warm woollen clothes, socks
* waterproof outerwear, including shoes
* towels and toiletries

HOTEL INFORMATION
- Accommodation Trondheim (under own arrangements)

The hotel accommodation in Trondheim from September 11 -12 is under own arrangements.
We recommend the below hotels in the city center.

Britannia Hotel Trondheim

Scandic Bakklandet

Scandic Nidelven

Clarion Collection Hotel Bakeriet

Other recommended budget accommodations:

- Nidaros Pilgrim Center website
- Trondheim Hostel website

- Accommodation in Skaroya (Under COST FP1402 arrangements)

Your accommodation from September 12-16 in Skaroya will be at Hitraleirskole. http://hitraleirskole.no/.

Skaroya does not offer hotel standard, but will have great hospitality, exciting food and impressive nature experiences. Bedrooms will be shared (from two to nine beds), shared toilets / showers and Wifi will be the main building and the boat house. Please note that the speed of internet is not suitable for streaming or downloading large amounts of data but sufficient for reading emails and chatting.

The setting, i.e. accommodation and catering will be simple. It is recommended to bring the following items:
* warm woollen clothes, socks
* waterproof outerwear, including shoes
* towels and toiletries

There will be three main buildings at Skaroya.

The Main House : This is where we serve the meals and where we have our classroom (ca 50 persons maximum). In addition there is a basement lounge with soccer game, sofas and relaxing area which can be used as group facilities (20 people).

- Bedroom 1: 2 beds
- Bedroom 2: 1 bed
- Bedroom 3: 4 bunk beds and 2 double beds (6-8 persons)
- Bedroom 4: 4 bunk beds and 2 double beds (6-8 persons)

The Sleeping Quarters: One small living room and kitchen - suitable for about 4-6 persons. Plenty of shared showers and drying room for clothes. The house can be divided into two zones if you need to have ladies and gentlemen's on separate sleeping, shower and toilet facilities.
No wifi in this house yet.

- Bedroom 5: One double bed and 2 bunk beds (3-4 persons)
- Bedroom 6: 2 bunk beds
- Bedroom 7: 6 bunk beds
- Bedroom 8: 9 bunk beds
- Bedroom 9: 7 bunk beds
- Bedroom 10: 4 bunk beds
- Bedroom 11:4 bunk beds
- Bedroom 12:6 bunk beds
- Bedroom 13:6 bunk beds

The Boat House : On top of the boathouse we have built a loft with a beautiful view of the bay. Kitchen, bathroom, sofas, dinning table and fireplace.

- Bedroom 14 - one double bed and one extra bed (2-3 persons)
- Bedroom 15- one double bed and one extra bed (2-3 persons)
- Bedroom 16- one double bed and one extra bed (2-3 persons)
- Bedroom 17 - loft room - 2-3 persons
- Bedroom 18 - loft room - 2-3 persons

Meals:

Meal will be provided from excellent chef on local commodities. Coffee and tea breaks with cookies or fruits are included. It will be a set menu based on the daily catch and availability of ingredients. All allergies or other needs will be taken care of if we get notice well in advance.

- Sept 12 - Dinner
- Sept 13 - Breakfast, lunch, Dinner
- Sept 14 - Breakfast, lunch, Dinner
- Sept 15 - Breakfast, lunch, Dinner
- Sept 16 - Breakfast

Package payment in Hitra (Sep 12-16, 2017)

- The total package rate in Hitra will be between NOK4530 – 4635, depending on how many participants we will be. The price includes:
    - Transportation by bus and boat from Trondheim to Skaroya and back again.
    - Life jackets
    - Made beds (bring your own towels and toiletries)
    - Meals, starting with dinner 12th Sept and including breakfast 16th Sept.
    - Coffee and tea breaks with cookies, fruit etc
    - Guide and boat driver for trips by sea or land
    - Free use of traditional wooden rowing boats (about eight boats)
    - Free use of nine kayaks, two canoes and one sailing boat.
    - One big classroom and three smaller group areas
    - Handling fee

Regarding the payment for your stay in Hitra, a prepayment of NOK2000 will be requested to do on the below website : https://skaroya.hoopla.no/sales/costfp1402/
Deadline for pre-payment: July 1st, 2016
The rest of the payment (NOK2530 - NOK2635) shall be paid individually by credit card on the spot.

Cancellation terms:

- Before 3 months - 50% refund
- Before 1 month - 20% refund
- Later than one month no refund.

Disclaimer:
The budgetary contracts for the next grant period (01/05/16 – 30/04/17) of our COST Action have been signed by all parties involved. However we are required to inform you that in the very unlikely case that there is a shutdown of COST and its budgets (which has never happened before), the cancellation fees for the stay in Hitra can neither be born by the Grant holder, nor by the local organizer but will have to be born by the whole group.