

MSc thesis or Study project proposal

## Time-variant reliability analysis and updating of ship structures in serviceability limit state

### Motivation and Objectives

Serviceability limit state (SLS) provides a first level safety check of a ship structure and it is related to normal operational conditions. Rules and regulations ensure that the SLS is satisfied by establishing simplified design criteria which are commonly based on characteristic (or nominal) values of material and geometric properties, e.g., yield strength, thickness loss due to corrosion. However, the performance of a ship in operation may differ from its intended design plan. Moreover, new data may become available during its service lifetime that can be used to update our initial model predictions. For example, collecting thickness measurements data from inspection surveys can be used to update corrosion model predictions. The aim of this thesis is to assess and compare the failure probability for a design and existing ship in terms of first initial yielding point, considering the ship as a beam. For this purpose, time-variant reliability analysis using Monte Carlo simulation is applied. Bayesian inference methods are also used to update basic parameters of the structural reliability problem by exploiting available data from the service life of the ship under investigation.

### Methodology

- Literature review on time-variant reliability analysis and updating of deteriorating (ship) structures
- Formulation of the problem
- Code implementation
- Post-processing of results and conclusions

### Requirements

- Completed structural reliability, risk analysis or similar classes
- Good programming skills (Matlab or Python)
- No specific knowledge on ship structures is required; only static mechanics

**Starting date:** Flexible, as soon as possible

### Supervised by

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### References

1. Straub, D., Schneider, R., Bismut, E., & Kim, H. J. (2020). Reliability analysis of deteriorating structural systems. *Structural safety*, 82, 101877.