# TMA4220 - Numerical Solution of Partial Differential Equations Using Finite Element Methods

## Programming Project

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Finite Element Methods on Free Vibrations

## The Free Vibration Equation

$$\rho \frac{\partial^2 u}{\partial t^2} = \nabla \sigma(u) \tag{1}$$

- Semi-discretization on (1) yields

$$M\ddot{\boldsymbol{u}} = -A\boldsymbol{u} \tag{2}$$

$$A = [A_{ij}] = \iiint_{\Omega} \bar{\epsilon}(\varphi_i)^T \, C \bar{\epsilon}(\varphi_j) \, \mathrm{d}V$$

$$M = [M_{ij}] = \iiint_{\Omega} \rho \varphi_i^T \varphi_j \mathrm{d}V$$

- Assuming $\boldsymbol{u} = \boldsymbol{u} e^{i\omega t}$ on (2) yields the generalized eigenvalue problem

$$\omega^2 M\boldsymbol{u} = A\boldsymbol{u} \tag{3}$$

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- Fourth item.
- Fifth item. Extra text in the fifth item.

# Blocks

## Block Title

You can also highlight sections of your presentation in a block, with it's own title

## Theorem

*There are separate environments for theorems, examples, definitions and proofs.*

## Example

Here is an example of an example block.

# Summary

- The first main message of your talk in one or two lines.
- The second main message of your talk in one or two lines.
- Perhaps a third message, but not more than that.

- Outlook
  - Something you haven't solved.
  - Something else you haven't solved.

# For Further Reading I


A. Author.
*Handbook of Everything*.
Some Press, 1990.

S. Someone.
On this and that.
*Journal of This and That*, 2(1):50–100, 2000.