# 02623 The Finite Element Method for Partial Differential Equations

**January 2026**

**TENTATIVE COURSE PLAN**

**Place:** Lectures and exercises: See course website.

**Teachers:** **Assoc. Prof. Allan Peter Engsig-Karup** (APEK) E-mail: apek@dtu.dk
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**Teach. Assist. Max Ebstrup Bitsch** (MABI) E-mail: maxbit@dtu.dk

**Materials:**
- This course plan
- Lecture notes: A. P. Engsig-Karup, Price: Free,
'The Spectral/hp-Finite Element Method for Partial Differential Equations'

**Course description**

The Finite Element Method (FEM) is of major importance for model-based simulation for cost-efficient engineering analysis on computers. In this course we give a concise treatment of the various aspects of the Finite Element Method (FEM) including: local and global interpolation functions based on triangular elements, boundary value problems for partial differential equations, the assembly of global algebraic system of equations, Gaussian elimination for banded systems, iterative solution methods, time-dependent problems. Systematic development, through exercises, of computer software implementing the FEM. The final assignment of the course will be in one of the special topics, for example an application of the finite element method for the solution of a particular problem from engineering sciences.

**Lectures and deadlines**

| Date | Time | Topic | Teachers |
|---|---|---|---|
| 5/1 | 9:00 | Introduction | APEK |
| | | Sections 1.1 -1.7 in the Notes | APEK |
| 6/1 | 9:00 | Sparse computations and solving linear systems | APEK |
| 9/1 | 17:00 | FIRST ASSIGNMENT DUE (Exercises 1.1, 1.2, 1.5, 1.6, 1.7) | |
| 12/1 | 9:00 | Recap, first assignment | APEK |
| | 9:15 | Sections 2.1 - 2.10 in the Notes | MABI |
| | 11:00 | A short introduction to Mesh generation | APEK |
| 15/1 | 8:00-11:00 | Introduction to COMSOL (3 hours, B308/101) | Thure Ralf |
| | 11:30-12:00 | Introduction and overview of projects | APEK |
| 16/1 | 17:00 | SECOND ASSIGNMENT DUE (Exercises 2.1-2.8) | |
| 19/1 | 9:00 | Recap, second assignment | APEK |
| | 9:15 | Third assignment kickoff. | APEK |
| 22/1 | 13:00 | POSTER DUE (Hand in PDF for print in A0) | |
| 23/1 | 9:00 | POSTER PARTY | |
| | 9:00-9:30 | Discussion of course evaluation | ALL |
| | 9:30-12:00 | Poster Party Presentation Session | ALL |