# Introduction to Computer Mathematics

<table>
<thead>
<tr>
<th>Semester*</th>
<th>Code</th>
<th>Program**</th>
<th>No of hours per week: lectures + exercises</th>
<th>Total</th>
<th>ECTS credits</th>
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<tr>
<td>4.6</td>
<td>14575</td>
<td>ME, AE</td>
<td>2+2</td>
<td>30+30</td>
<td>5</td>
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**Lecturer:** Prof.dr.sc. Mario Essert, doc.dr.sc. Andrej Jokić (TU/e Eindhoven/NL, v.suradnik), dr.sc. Tihomir Žilić

**Course objective:**
We combine topics from mathematics and algorithm theory with presentation of supporting state-of-the-art mathematical software tools and programming languages, with the aim to give students basic theoretical knowledge and familiarize them with tools for engineering and scientific computing. The covered topics range from the fields of computational complexity, numerical mathematics and mathematical programming. The application examples include modelling and simulations of dynamical systems, robust and optimal design in mechanical and electrical engineering, robust and optimal control.

**Prerequisite:** Basic knowledge of numerical mathematics, linear algebra and optimization is desirable

**Learning outcomes:**
Course objectives are
- to make a link, in theory and practice, between engineering, mathematics and computation
- to present the basic notions and results from computational complexity theory
- to give students understanding, tools and some experience of how to formulate wide class of engineering problems in terms computable computer programs
- to familiarize the students with the available state-of-the-art computer software tools (Scilab/MATLAB/Octave, SAGE/WR Mathematica) and their capabilities

**Course contents**

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<th>Topics</th>
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<tr>
<td>1. Introduction and course overview: from engineering problem to mathematical problem formulation and computer solution</td>
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<tr>
<td>2. Algorithms and complexity</td>
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<td>3. Selected topics from numerical mathematics</td>
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<td>4. Hard problems and their relaxations</td>
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<td>5. Selected topics from optimization</td>
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<td>6. Robust optimization and applications</td>
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<td>7. Software tools and toolboxes</td>
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**Recommended literature:**

**Type of exercises:**
- x auditory; 
- x laboratory; 
- practicum; 
- design; 
- Other

**Examination :**
- x final exam; 
- x continuous testing; 
- Other

**Language**
- Croatian, English

**Tutorials in English for incoming students**
- YES

* Bachelor program: Semester 1-7, Master program: Semester 8-10
** ME – Mechanical Engineering, NA – Naval Architecture, AE – Aeronautical Engineering