M. Eng.
Applied Computational Mechanics
Simulation Based Engineering Sciences
Career-integrated study program
I. IAW – Introduction to Institute for Executive Education
II. Details about ACM
III. Studying in a career-integrated study program
Program partners
Overview

Technische Hochschule Ingolstadt (leading university)
- 42 study programs, ~ 5.500 students
- Core competences in the area of technology and economy
- 3 faculties (Business School, Mechanical Engineering, Electrical Engineering)

Hochschule für angewandte Wissenschaften Landshut
- 30 study programs, ~ 5.400 students
- 6 faculties (Business Economics, Electrical Engineering, Computer Sciences, Mechanical Engineering, Social Work, Interdisciplinary Studies)

CADFEM GmbH (esocaet)
- One of Europe’s biggest providers of simulation technology
- 185 employees (in the CAE business, ~ 250 worldwide)
- CADFEM esocaet imparts simulation know-how at first hand
Established in 2008

Combines all activities in the field of executive education at THI

- Career-integrated study programs
- Career-integrated further education

Comprehensive educational research

- Offene Hochschule Oberbayern (OHO)
- „Schaufenster Elektromobiltät“ (Showcase Electric Mobility)
- „Netzwerk Qualifizierung Elektromobiltät“ (Network Qualification Electric Mobility)

13 Master programs
10 Bachelor programs
>600 students
28 employees
2,9 Mio.€ external funding

Information presentation – M. Eng. Applied Computational Mechanics
Our claim

education-to-employment (E2E)

- **Schedule** meets the needs of professional workers.

- **Efficient** studying experience due to small student groups.

- **Highly qualified professors and lecturers** support participants to expand their expertise.

- Application oriented **competence transfer** allows participants to improve their occupational and social skills.
Our claim
Your future expertise

With ACM, you lay the foundation for your further personal and professional development. You will acquire knowledge and skills in order to be successful and to act in a socially responsible manner.
Our claim

Quality management

- The Institute for Executive Education is a officially **system-accredited unit within THI**
- The accreditation is based on a **comprehensive quality management system**, which ensures **sustainable quality assurance** and **advancement**.

The accreditation of our educational offers allows comparability to other National and European Higher Education Area programs.

The **system accreditation** certifies a **high quality standard in research and teaching** and it ensures

- **the studiability for professionals**.
- **highly transparent processes**.
- **committed support and assistance**.
Content

I. IAW – Introduction to Institute for Executive Education

II. Details about ACM

III. Studying in a career-integrated study program
# M. Eng. Applied Computational Mechanics

## Key data

<table>
<thead>
<tr>
<th><strong>M. Eng. Applied Computational Mechanics</strong></th>
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<tbody>
<tr>
<td><strong>Academic degree:</strong></td>
<td>Master of Engineering, M. Eng. (Cooperate degree THI and HAW)</td>
</tr>
<tr>
<td><strong>Expected start:</strong></td>
<td>Winter Term 2019/20 (September/October)</td>
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<tr>
<td><strong>Standard period of study:</strong></td>
<td>5 Semesters</td>
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<tr>
<td><strong>Duration of study:</strong></td>
<td>Usually 4 semesters</td>
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<tr>
<td><strong>ECTS credit points:</strong></td>
<td>90 CP</td>
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<tr>
<td><strong>Language:</strong></td>
<td>English</td>
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<tr>
<td><strong>Director of studies:</strong></td>
<td>Prof. Dr. Jiri Horak (THI) / Prof. Dr. Bernhard Gubanka (HAW Landshut)</td>
</tr>
<tr>
<td><strong>Admission requirements:</strong></td>
<td>University degree, 1 year of work experience, proficiency in English B2 and German A1</td>
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<tr>
<td><strong>Application deadline:</strong></td>
<td>15.07.2019 (for winter semester)</td>
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<tr>
<td><strong>Tuition fees:</strong></td>
<td>Total amount € 20.000,- payable by installment (4x € 5.000,-) + administration fee/semester: € 42,-</td>
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</tbody>
</table>
Students…

- enhance their **theoretical expertise** and **practical skills** in the area of **FEM** and related topics.

- master **new simulation challenges** on their job from the very beginning of the course.

- hone their **social competences** by learning in an international environment.
Target group

M. Eng. Applied Computational Mechanics

Graduates…

- with a first academic degree in the field of **engineering, natural sciences** or other related subjects.

- with qualified **work experience (at least 1 year)** in the field of engineering or natural sciences, which has to be acquired **after** the first academic degree.

- with sufficient **English skills** (B 2 according to the Common European Framework of Reference for Languages) and **German skills** (A 1).
<table>
<thead>
<tr>
<th>Semester</th>
<th>Modules</th>
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</thead>
<tbody>
<tr>
<td>1. Semester*</td>
<td>Applied Methods in Simulation-Based Engineering</td>
</tr>
<tr>
<td></td>
<td>Specific Methodological Competencies</td>
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<td></td>
<td>Self-Competence and Social Competence at the Workplace</td>
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<tr>
<td>2. Semester</td>
<td>Mathematics and Computational Methods</td>
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<td></td>
<td>Solid Mechanics</td>
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<td></td>
<td>Finite Element Method</td>
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<td>3. Semester</td>
<td>Materials and Material Models</td>
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<td></td>
<td>Computational Dynamics</td>
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<td></td>
<td>Project</td>
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<tr>
<td>4. Semester</td>
<td>Elective Module 1</td>
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<td>Elective Module 2</td>
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<td></td>
<td>Geometrically Nonlinear and Contact Analysis</td>
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<tr>
<td>5. Semester</td>
<td>Master thesis</td>
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</table>

* The modules of the first semester stated in the Appendix of the SPO (study and examination regulations) can be credited under consideration of the basic principle of Art. 63 BayHSchG.
# Module content (I)

## Overview

<table>
<thead>
<tr>
<th>Module</th>
<th>Content</th>
<th>Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mathematics and Computational Methods</strong></td>
<td>• Numerical solution of linear and nonlinear systems of equations</td>
<td>Written Exam</td>
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<tr>
<td></td>
<td>• Numerical discretization, ordinary and partial differential equations</td>
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<td></td>
<td>• Tensors; Fourier analysis; curve, surface and volume integration</td>
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<tr>
<td><strong>Solid Mechanics</strong></td>
<td>• Stress state, deformation and strain state</td>
<td>Written Exam</td>
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<td></td>
<td>• Plane, torsion and plate problems</td>
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<td></td>
<td>• Energy principles</td>
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<tr>
<td><strong>Finite Element Method</strong></td>
<td>• The principle of virtual work, basic elements</td>
<td>Written Exam</td>
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<td></td>
<td>• Bars and beams, plates and shells</td>
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<td></td>
<td>• FEM in the product development process</td>
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<tr>
<td><strong>Materials and Material Models</strong></td>
<td>• Classification of materials, introduction to material models</td>
<td>Written Exam</td>
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<td></td>
<td>• Viscoelasticity; plasticity; computational aspects</td>
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<td>• Composites</td>
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<tr>
<td><strong>Computational Dynamics</strong></td>
<td>• Resonance and damping, machine dynamics</td>
<td>Written Exam</td>
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<td></td>
<td>• Experimental dynamic analysis; response analysis based on the given load</td>
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<td>• Numerical simulation; modal analysis; reduction methods</td>
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<tr>
<td><strong>Project</strong></td>
<td>• Solving an actual complex problem in a team</td>
<td>Project Thesis</td>
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<td>• Topics in the area of applied research, product or manufacturing development</td>
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<td></td>
<td>• Using analytical, numerical and/or experimental methods</td>
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</table>
## Module content (II)

### Overview

<table>
<thead>
<tr>
<th>Module</th>
<th>Content</th>
<th>Exam</th>
</tr>
</thead>
</table>
| Elective Module: Fatigue and Fracture | • Cyclic behavior of materials; fatigue tests and fatigue data evaluation  
• Lifetime estimation, introduction to guidelines  
• Linear elastic fracture mechanics, elastic-plastic fracture mechanics; cracks | Written Exam              |
| Elective Module: Scientific Programming | • Numerical computing environments and programming languages in engineering sciences  
• Algorithm development based on mathematical methods  
• Symbolic versus numerical computation | Student Research Paper    |
| Elective Module: Optimization and Robust Design | • Penalty methods, response surface methods, adaptive strategies  
• Evolutionary strategies, genetic algorithms, Pareto optimization strategies  
• Robust design optimization, applications | Oral Exam                  |
| Elective Module: Modeling Techniques | • Advanced modeling techniques, choosing an appropriate approach  
• Mesh-morphing techniques, reduced order modeling  
• Treatment of constraints, exploiting symmetry | Oral Exam                  |
| Elective Module: Acoustics       | • Wave equation, analytical solutions; numerical methods  
• Sound radiation; reflection, diffraction, scattering of acoustic waves; plane waves  
• Fluid-structure interaction, coupled systems, coupling of computational methods | Oral Exam                  |
| Elective Module: Multibody Systems | • Spatial kinematics, spatial kinetics  
• Newton-Euler and Lagrange’s equations, non-smooth dynamics  
• Numerical simulation methods and applications | Written Exam              |
## Module content (III)

### Overview

<table>
<thead>
<tr>
<th>Module</th>
<th>Content</th>
<th>Exam</th>
</tr>
</thead>
</table>
| Elective Module: Product Development and Management Processes | • Manufacturing processes; collaborative and simultaneous engineering  
• Product data management; virtual engineering  
• Industrial engineering; production systems; manufacturing strategies | Seminar Paper         |
| Elective Module: Experimental Validation    | • Experimental techniques: measurement of physical quantities  
• Numerical and experimental limitations; boundary and initial conditions  
• Practical exercises combining numerical and experimental methods | Practical Exam        |
| Elective Module: Mechatronics               | • Fundamentals of field theory, boundary conditions, field coupling  
• Components of mechatronic systems  
• Description and simulation of actuators; control | Written Exam          |
| Elective Module: Fluid Dynamics and Heat Transfer | • Conservation laws describing motion of fluids; turbulence modeling  
• Numerical methods and their implementation  
• Best practice: evaluation of simulation quality, identification of error sources | Written Exam          |
| Elective Module: Simulation: State-of-the-Art in Industry and Science | • Attendance of a scientific meeting with presentations on advanced simulation techniques  
• Discussion of the presented topics  
• Writing a scientific paper on a given topic, presentation | Student Research Paper |
| Compulsory Elective Module: Computational Fluid Dynamics in Practice | • Boundary layer, flow separation  
• Vortex flow  
• Characteristics of turbulent flows, instabilities; scales, energy cascade, Kolmogorov hypothesis | Project Thesis        |
### Module content (IV)

#### Overview

<table>
<thead>
<tr>
<th>Module</th>
<th>Content</th>
<th>Exam</th>
</tr>
</thead>
</table>
| Geometrically Nonlinear and Contact Analysis | • Geometrically nonlinear phenomena in structural mechanics  
• Contact phenomena, contact detection, contact forces  
• Stability and convergence issues; application of commercial software | Written examination |
| Master Thesis | • Including Colloquium |
**Admission requirements**

**Admission ACM**

**Qualified work experience**
- in the field of engineering or natural sciences (at least 1 year)

**First academic degree**
- in engineering or natural sciences with at least **210 ECTS points**

**First academic degree in engineering or natural sciences with at least**
- **180 ECTS points**

missing ECTS-points can be accredited on the basis of previous work experience or internships (case-by-case review)
Application deadline:

- **For summer term:** Nov 15 – Jan 15
- **For winter term:** May 2 – July 15

The online application tool allows:

- application for all IAW study programs
- uploading of required documents
- information about the current application status
CADFEM esocaet candidate program
– building blocks for your individual preparation

- Application **check list**
- Offers for **English** as language of study:
  - Placement test
  - Intensive courses
  - English certificate B2 exams
- **Mathematics refresher course**
  - Online learning course
- **Simulation module** for beginners
  - Complete modules for creditation
- Introduction to simulation **software tools**

Sign up at:
[www.esocaet.com/studies/thi-hl/bewerberprogramm](http://www.esocaet.com/studies/thi-hl/bewerberprogramm)
Content

I. IAW – Introduction to Institute for Executive Education
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The **study concept** meets the needs of enterprises and employees: lessons and self-study alternate during the course of the semester.

A **module** normally contains 5 in-person days. They take place on Thursday/Friday to Saturday.

The **self-study phases** provide flexibility in terms of time and location.

**Documents** for the lectures are offered to the participants via the interactive learning platform *Moodle*.
Studying in a career-integrated study program

Attendance during the semester

**Attendance:**
- Five days per module
- 15 days per semester
- Lectures usually take place on weekends (Friday, Saturday, partly on Thursday) at the THI & the HAW. You will have lectures from 8.00 – 12.30 o’clock and from 13.30 – 18.00 o’clock

**Semester break:**
- Usually no lectures during Bavarian school holidays
Quality management

Regular evaluations and quality management circles take place at IAW to guarantee the quality within the study programs.

- **Freshman survey** at the beginning of a study program
- **Evaluations** of every single module during the study program retrieving satisfaction with teaching content, didactics, methods and practice-orientation
- Annual **student surveys** to evaluate student satisfaction with equipment, support and organization of their program
- Annual **quality circles** for student feedback
- **Alumni surveys** test satisfaction after graduation
- Every second year, IAW holds **quality circles** for professors and lecturers to enable exchange of information regarding the study program
- **Company workshops and interviews** ensure state-of-the-art content
Funding opportunities for career-integrated studies:

- **Scholarships**
  
  There are some scholarships, which you might be eligible for.
  
  Comprehensive scholarship data banks: [www.mystipendium.de](http://www.mystipendium.de) and [www.stipendienlotse.de](http://www.stipendienlotse.de)

- **Tax reduction**
  
  Studying can reduce your individual tax load. For detailed information, please contact your tax accountant.

- **Support of the employer**
  
  Many companies support employees taking a career-integrated study program by providing some time off from work or by offering individual financial support.
  
  Approach your employer in time.
**Your contact**

**Directors of studies**

**Technische Hochschule Ingolstadt**
Institut für Akademische Weiterbildung (IAW)
Esplanade 10
85049 Ingolstadt

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Institut für Akademische Weiterbildung (IAW)
Esplanade 10
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**Prof. Dr. Jiří Horák**
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E-mail: jiri.horak@thi.de

**Hochschule für angewandte Wissenschaften Landshut**
Institut für Weiterbildung
Am Lurzenhof 1
84036 Landshut

**Hochschule für angewandte Wissenschaften Landshut**
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84036 Landshut

**Prof. Dr. Bernhard Gubanka**
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Your contact
Organisation, matriculation

Technische Hochschule Ingolstadt
Institut für Akademische Weiterbildung (IAW)
Esplanade 10
85049 Ingolstadt

Programme Manager:

Kerstin Steidle
Institut für Akademische Weiterbildung

Phone: +49 / (0)841 / 9348-1511
E-mail: kerstin.steidle@thi.de

Responsibilities:

• Organizational issues THI
• Matriculation at THI
Your contact
Organization

CADFEM GmbH
esocaet
Marktplatz 2
85567 Grafing b. München

http://www.esocaet.com/

Nicolas Beck
CADFEM esocaet

Phone: +49 / (0)8092 / 7005-834
E-mail: NBeck@cadfem.de

Responsibilities:
• general organizational issues
• Support during the application process

Hochschule für angewandte Wissenschaften
Landshut
Institut für Weiterbildung
Am Lurzenhof 1
84036 Landshut

Brigitte Oberweger
HAW Landshut, Institut für Weiterbildung

Phone: +49 / (0)8 71 506-461
E-mail: Brigitte.Oberweger@haw-landshut.de

Responsibilities:
• Organizational issues HAW Landshut