Master Program: Construction Management and Engineering (CME)

JAN 2023

Dr. Qi Han
What is CME?

→ the art of integration
From identifying problems on the urban level, investigating and providing solutions to contract management, process management, design collaboration and project realization

2 Construction Management and Engineering (CME)
Why study CME?

➔ extend your knowledge with academic management methods to better understand and control smart cities and buildings.
4TU Organization

Univ. Eindhoven (TU/e): Built Environment
Univ. Delft (TUD): Civil Engineering
Univ. Twente (UT): Civil Engineering
Univ. Wageningen (WUR): No CME program

https://www.4tu.nl/cme/
Scientific knowledge areas

Department of the Built Environment

Department of Industrial Engineering and Innovation Sciences

Application topics

City Information Management (CIM)

Building Information Management (BIM)

Engineering

Management
City Information Management

- considering urban informatics (including geospatial data, sensor data and 3D city data).
- focus on utilizing urban data for the development of models representing and simulating real-urban realm phenomena.
- help various stakeholders to make informed decisions using urban analytics in the context of smart cities.

Graduation example:
TU/e Campus Digital Twin – A virtual living lab for a healthy campus
Building Information Management

- handling and managing building information throughout the building life cycle
- focus on improving the Architecture, Engineering, Construction, operation, and demolition process
- using both static data (including building models and point clouds) and dynamic data (including sensor data and IoT)
- creation of digital twins of buildings and their occupants, and real-time data processing employing AI technology in the context of smart buildings

Graduation example: ‘Model checking using open standards and data platforms’
The spirit of CME at TU/e
Research-Driven and Project-Oriented → Challenge-Based Learning
MSc Program CME

- Core courses 30 EC
- Specialization electives 35 EC
- Free electives 15 EC
- Certificate programs
- Graduation project is 40 EC

Master program schedule

**Foreign students**

<table>
<thead>
<tr>
<th>Year</th>
<th>Quartile 1</th>
<th>Quartile 2</th>
<th>Quartile 3</th>
<th>Quartile 4</th>
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<tbody>
<tr>
<td>Year 1</td>
<td>Courses</td>
<td>Courses</td>
<td>Courses</td>
<td>Courses</td>
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<tr>
<td>Year 2</td>
<td>Research proposal</td>
<td>Research proposal</td>
<td>Graduation project</td>
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**Dutch students**

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<thead>
<tr>
<th>Year</th>
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### Overview

**Master’s Program**

#### 10 Construction Management and Engineering (CME)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Ects</th>
<th>Year</th>
<th>Engineering</th>
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- **30 ects**
- **35 ects out of 70 ects**

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<tr>
<th>Course Code</th>
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<td>3</td>
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Overview Master’s Program

- Free electives 15 EC
  - Free to get courses from other Built Environment/Industrial Engineering/Innovation management, etc.
  - Built Environment Certificate courses

- Certificate Programs
  - Construction Technology
  - Building Design and Technology
  - Circular Design in the Built Environment
  - Technology Entrepreneurship and Management
Career prospects

- Engineering Consultancy
- Management Consultancy
- Governmental institutes
- Developers
- Start-ups
- Contractors
- Researchers
Why CME @TUE

- High quality of education
- English programs
- Smart Cities and Buildings theme
- Ranks 1st among 4TU-CME programs
Life of a CME student

- Eindhoven, the Brainport region: High tech
- of CoUrsE! study association of CME
- Events:
  - Dutch Design Week (DDW), Glow Eindhoven, Carnival, and so on
of CoUrsE! CME Study Association
(www.ofcourcecme.nl)

- Events: Workshops, Lectures, Excursions, non-educational activities
- Company vacancies
- Master Thesis database
CME Information package:
How to organize your 2-year CME Master
(including your Personal Study Plan)

Course descriptions
Study planning guide
Contact data
Admission requirements

- TU/e, TU Delft or Universiteit Twente Bachelor or Bachelor from another Dutch university?
  - Check the doorstroommatrix
- Hbo diploma
  - You must first complete a pre-master program. Check the doorstroommatrix
- International diploma
  - Check our admission wizard
  - Send an email to our International Office, io@tue.nl
- tue.nl/admission
  - doorstroommatrix and admission wizard
Premaster

- All premasters start in September and take 1 semester to complete
- 100% (30 ECTS) of the premaster within your first year
- Finish the premaster completely before starting the master

- Enrollment in the Master’s program is possible in February and September

- Curriculum per track: https://studiegids.tue.nl/opleidingen/pre-master-programmas/architecture-building-and-planning/curriculum/
http://www.tue.nl/cme

Questions?
Example core course
Collaborative Design

Gain insight in the problem domain of Collaborative Design with special attention to Systems Engineering (SE) and Building Information Models (BIM).

A consortium of companies (Architects, Engineers, Urban Designers) made by the students works in collaboration to complete a design and engineering assignment.
Example core course
Process modeling and information management

Analyse problems, optimize processes, manage information flows in urban development projects

Three interlinked assignments of a hypothetical new development in a specific city

• Select three suitable locations for development using GIS
• Apply decision making and linear programming theory to select one of these locations
• Describe the design/construction process of one of the buildings at the chosen location using IDM (Information Delivery Manual)
Example core course
Case study process modeling

An exercise in the analytical skills to apply industrial engineering tools (in the field of urban development) to get a better understanding of the business process

Analyze the current practice with the real case introduced by the company and provide recommendations for future
Example specialization elective
Fundamentals of BIM

Applying building information technologies in practice, developing novel ways to address current and future challenges in ICT-supported collaboration in building and construction and doing fundamental research in the field.

Gain insight into state-of-the-art BIM developments, open standards and new technologies.
Example specialization elective

Parametric Design

In this course, computational design methods and technologies are investigated that enable designers and engineers to generate, analyze and optimize built structures on various levels of detail and at different planning and design stages.
Graduation example: A Roadmap Towards Stakeholder Engagement
Improving stakeholder engagement in complex projects
by providing an interactive stakeholder engagement process guideline
Graduation example:
BIM-based Building Circularity Assessment from the Early Design Stages
Graduation example: Improving knowledge about circularity in the definition phase
Master Thesis 1 Decision-making for housing refurbishment based on environmental performance and owner preference

Method: consumer research via choice experiment on the market.
Goal: harmonize engineering decision with market potential (adoption rate)

Method: LCA (operational and embodied energy and carbon), cost-benefit, comfort, health and safety Key Performance Indicators.
Goal: perform assessments to harmonize client goals with the Environment, Economic and Comfort aspects.

Method: free accessible information share about multi-objectives.
Goal: find refurbishment package to achieve clients goal definition.

Method: document as-is building performance using BIM.
Goal: identify problems and define goals

Method: consumer preference inclusion

Preparation Phase

As-is building performance
BIM model
Use Case definition

Refurbishment package criteria to parameters evaluation system

Knowledge phase

Verification phase

Installation method & comfort energy saving & carbon investment

LCA, cost-benefit, comfort KPI
Master Thesis 1 Decision-making for housing refurbishment based on environmental performance and owner preference.

YouTube: ROTUNDORO. A web-based decision support tool for building refurbishment.
Master Thesis 2: Enhancement of the process of reusing building products

Method

Research design

Diagram showing the process of reusing building products, including dismantling, product inventory, online database, and matching with BIM models.
Master thesis 2 Final products

- Process analysis
- Valorization of the market
- Connection JSON data with web apps

Database

(Stock of all inventoried reusable products)

Inventarisation application

Dashboard product management

Matching application

Matching application

{JSON code}