Master Program: Construction Management and Engineering (CME)

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What is CME?



\rightarrow 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





Why study CME?

 \rightarrow extend your knowledge with <u>academic management</u> methods to better understand and control <u>smart cities and buildings</u>.





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/



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

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

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Building Information Management

- handling and managing building information throughout the building life cycle
- focus on improving the Architecture, Engineering, Construction, operation, and demolishment 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 \rightarrow Challenge-Based Learning



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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

	Quartile 1	Quartile 2	Quartile 3	Quartile 4
Year 1	Courses	Courses	Courses	Courses
Year 2	Research proposal	Research proposal	Graduation project	Graduation project
	TU/e Courses	TU/e Courses		

Dutch students

	Quartile 1	Quartile 2	Quartile 3	Quartile 4
Year 1	Courses	Courses	Courses	Courses
Year 2	Research proposal	Research proposal	Graduation project	Graduation project
	Int. Courses	Int. Courses		

Overview Master's Program

	CME		Scientific area			
				Engineering	Managemen	
		# Ects	Q			
	30 ects					
1CM900	Project management	2,5	2		Х	
1ZM65	System Dynamics	5	3		Х	
7ZM8M0	Collaborative Design	5	3	Х	Х	
7ZM3M0	Case Study Process modelling	2,5	1	Х	Х	
7ZM5M0	Process Modeling and Information Management	5	4	Х	Х	
7ZZ9M0	Design Science Methodology and Systems Engineering	5	1	Х	Х	
7ZZ6M0	Legal and Governance	5	1		Х	
	35 ects out of 70 ects					
7ZW7 M0	Urban Research Methods	5	3	Х	Х	
1ZM20	Technology Entrepreneurship	5	2		Х	
1ZM120	Entrepreneurial Marketing	5	2		Х	
7ZW4M0	Built Environment and Smart Mobility	5	4	Х		
77M1M0	Research and Development project	10	1-2,	x	x	
		10	3-4	~	X	
7ZW1M0	Big data for urban & transportation analysis / project	10	3-4	Х		
7M900	Fundamentals of BIM	5	2	Х		
7ZW3M0	Urban Planning II	5	1	Х	Х	
7RC100	Inner-city modular high-rise	5	1		Х	
7KP8M0	Smart Building Methodology and Technology	5	3	Х		
7XC1M0	Circularity in the Built Environment	5	1	Х		
7ZM7M0	Parametric design	5	3	х		

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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



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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



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of CoUrsE! CME Study Association

(www.ofcourcecme.nl)

- Events: Workshops, Lectures, Excursions, non-educational activities
- Company vacancies
- Master Thesis database





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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, <u>io@tue.nl</u>
- <u>tue.nl/admission</u>
 - 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/architecturebuilding-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

The Case

International Education and Culture Cluster		
Location:	The Hague	
Residents:	4 cultural foundations	
Integrated contract:	UAV-GC 2005	
Contract value:	Design & Build: € 142 mic	
	Maintenance: € 44 mio	
Sustainability goals:	BREEAM-NL Excellent	
	GPR score of 8,5	







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



Phase Demolish None

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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



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ulation 1: measurement circular design strategies

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he same processes of calculation 1 are used for calculation 2. Based or

the answers to the project parameters, a score is calculated for the

effects of the circular design strategies on the management aspects

cost, time, and quality of a construction project. Calculation 2 divides the total score for each circular design strategy into a score for cost,

time, and quality.8

Calculation 2:

easurement

tircular design

trategies

he answers to the project parameters are linked to processes. Based on the answers to the project

parameters, a score is calculated per circular design strategy. Calculation 1 determines for each circular design strategy to what extent it is advantageous to apply the strategy in the construction project.

Master Thesis 1 Decision-making for housing refurbishment based on environmental performance and owner preference



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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



Master thesis 2 Final products

- **Process analysis** •
- Valorization of the market •
- Connection JSON data with web apps ٠



Inventarisation application

ProjectID

1234

Deuren

Locatie

Bron NL SfB Code

32

Materiaal Hout

Dashboard product management