Mechanical Engineering
High-Tech Engineering

MSc Programme

To meet the steadily increasing requirements in all high precision engineering application areas, traditional mechanical engineering is pushed to extremes in precision, miniaturisation and multi domain integration both for the products of tomorrow and the equipment to make those products. This requires a science-based engineering approach based on thorough understanding of not only mechanics and dynamics but also aspects such as thermodynamics, mechatronics, optics and system miniaturisation and integration.

Degree	Master of Science in Mechanical Engineering
Starts	September
Credits	120 ECTS, 24 months
Language	English
Application deadline	April 1st: international students July 1st: Dutch degree
Scholarships	scholarships.tudelft.nl

Course Programme

The purpose of the MSc Track in High-Tech Engineering (HTE) is to educate engineers in the technological knowledge and skills they need to design a new generation of both the products and the required equipment that will enable even greater achievements.

Starting from the fundamentals of physics and mechanics, students gain the insights and understanding they will need to push beyond the current limits. The programme includes analysis, design and implementation of solutions, using analytical models, computational methods and experimental work to reach new performance and understanding. With this focus on the 'ultimate in mechanical engineering' the program confronts students with the daunting conceptual and design challenges of developing (and utilising) tools for precision mechanical engineering. Although the emphasis is on high tech equipment and instrumentation, the same knowledge and methodology applies to energy systems, medical equipment, automotive and aerospace design and many other fields of mechanical engineering, enabling these future engineers to address the needs of our modern society.

Focus Area

Next to the HTE obligatory courses students choose a research focus in which they want to deepen their knowledge:
- Mechatronic System Design (MSD) aims at designing integrated, high accuracy systems of mechanisms, sensors, actuators and control

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First Year*		Second Year
Mechanical Engineering courses (total of 20 ECTS) • Physics and Measurement (6 ECTS) • Control System Design (3 ECTS) • Heat Transfer (3 ECTS) • Nonlinear Mechanics (4 ECTS) • A societal course (4 ECTS)		Traineeship (optional) (15 ECTS)
Compulsory courses I (total of 3 ECTS) • Student Colloquia and events PME (1 ECTS) • Intro lab PME (2 ECTS)		Literature survey (10 ECTS)
Compulsory courses II (choose 5 out of 7) (total of 19-27 ECTS) • Engineering Dynamics (4 ECTS) • Optics (4 ECTS) • Mechatronic System Design (4 ECTS) • Fundamentals of Mechanical Analysis (4 ECTS) • Precision Mechanism Design (4 ECTS) • Micro- & Nanosystems Design & Fabrication, incl. MEMS lab (4 ECTS) • Eng. Optimization: Concept & Applications (3 ECTS)		
• Elective courses (minimum of 14 ECTS)**		Master thesis project (35 ECTS)

* Minor changes possible **See website and study guide for more information.

to perform complex tasks while interacting in a multi-physical environment, with a focus on distributed actuation, sensing and control.

- Opto-Mechatronics (OM) deals with high-tech systems where optical units dominate the speed and precision of operation, such as lithography for semiconductor production and for 3D metal printing, but also extreme accuracy measurement systems. By nature, this is a multidisciplinary field integrating optics and mechatronic system design, resulting in smart and adaptive optical systems.

- Engineering Dynamics (ED) studies the time-dependent linear and non-linear motion of mechanical structures to engineer dynamical systems using both mathematical and experimental methods. Material properties, thermo-dynamic interactions and physical actuation forces are studied for enhanced performance of high-speed devices.

- Micro and Nano Engineering (MNE) bridges the gap between the ultimate small and the macro world. The primary focus is on the production and assembly of precise and small parts and products of micrometer and nanometre scale.

- Engineering Mechanics (EM) deals with physics of mechanics and its experimental, mathematical and numerical tools, design procedures and innovative designs. Basic themes covered are Solid Mechanics, Dynamics, Computational Mechanics, Structural design and Optimization.

Graduation examples
The subjects of the graduation projects of some of the past students are listed below.
• Topology optimization of dynamic structures
• New finite element formulations for computational contact mechanics
• Design of an improved 6DOF positioning stage with nanometre stability for AFM measurements
• Development of distributed on demand supply for air conveyor systems
• Deformable gripper design using distributed actuators
• AFM hollow cantilevers integrated with actuating systems
• A non-linear identification tool for extracting mechanical properties of graphene sheets
• High-resolution on-demand growth of nano-diamond and carbon nanotubes using femto-pipette

Career prospects
The track prepares students to fulfil key positions in leading high-tech companies, such as NXP, ASML, Siemens, or BMW, or pursue a successful academic career in leading universities.

Students Association Taylor
The very active student association Taylor, establishes a strong, active link between students and the department staff. Lectures, receptions, visits to industry, and the annual international "Taylor Trip" are organized.

25% international students

3/2 Student/staff ratio

International "Taylor trip", prev. to e.g. Japan, USA, Canada, China

6+ Company visits per year

12+ Company lunch lectures / drinks per year

Career perspective:

80% Job in High-Tech Engineering/research

99% Job within 3 months