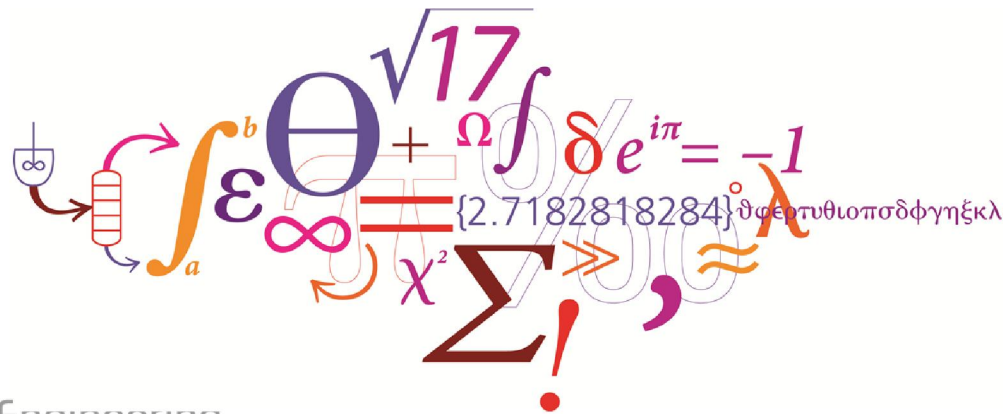


Welcome and Chemical Engineering Activities in Denmark

Jakob Kjøbsted Huusom



DTU Chemical Engineering
 Department of Chemical and Biochemical Engineering

Content

- The Technical University of Denmark & Dep. of Chemical and Biochemical Engineering
- Chemical Engineering Education at DTU

DTU – a short history



Establishment

Lyngby Campus

Autonomy & mergers

1829

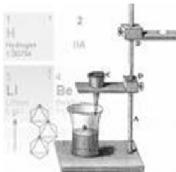
Den Polytekniske Lærestalt



HC Ørsted



Chemistry



Mech. Eng.



1962

Relocation initiated



Øster Voldgade



Sølvgade



1974

Inauguration of new campus



Merger with DIA

1994



DTU Act & autonomy

Merger with:



Danish National Space Center



Danish Institute for Food and Veterinary Research



Danish Institute for Fisheries Research



Danish Transport Research Institute

2001

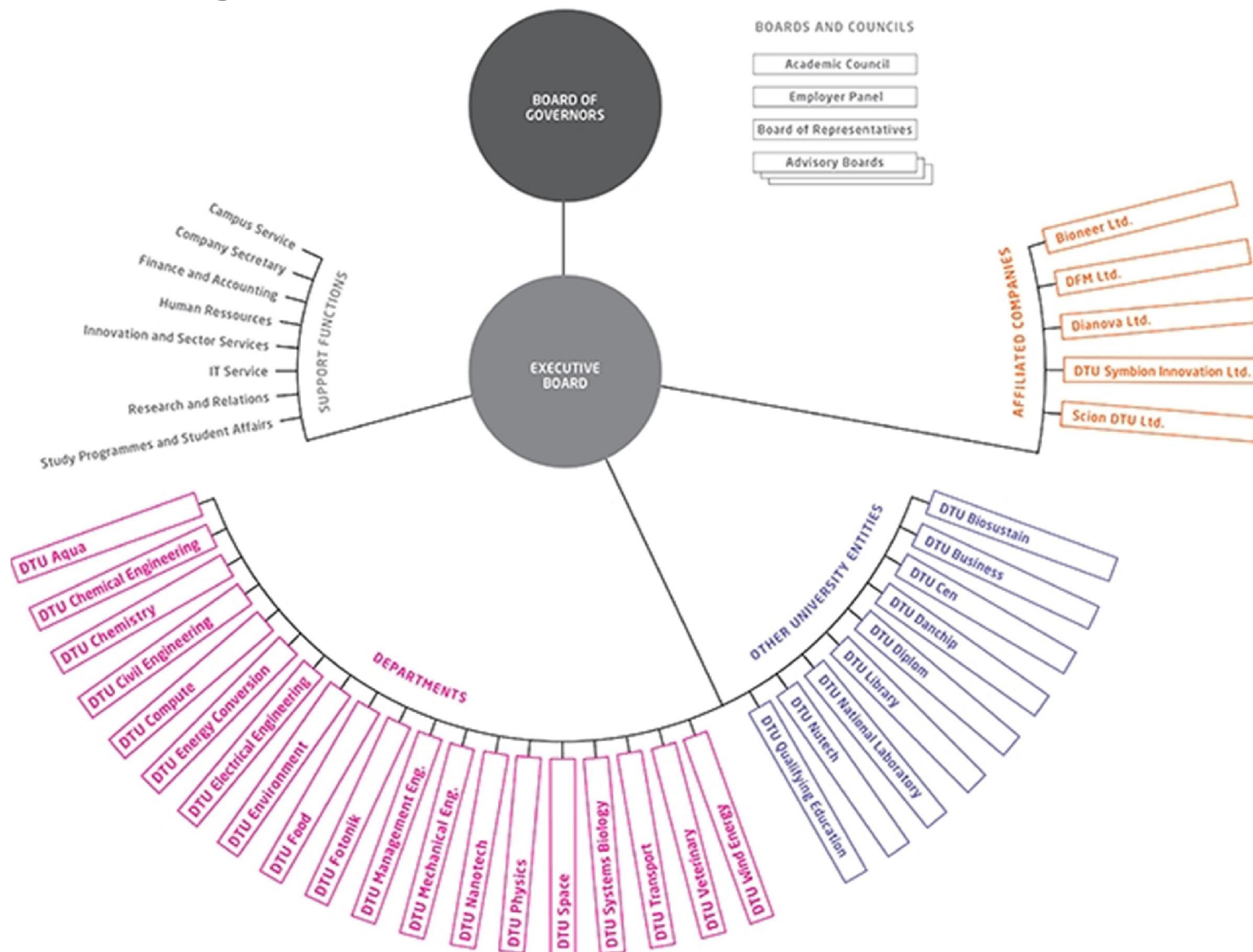
2007

2013

INGENIØR
HØJSKOLEN
KØBENHAVN
- University College



DTU – Organisation



DTU-Chemical Engineering

- Education (BEng, BSc, MSc, PhD, industrial courses), Research and Innovation covering:

Product design, Process design and Production in:

- Chemical
- Biochemical
- Food
- Pharma
- Energy
 - Oil and Gas
 - Power
 - Energy intensive industry

DTU-Chemical Engineering

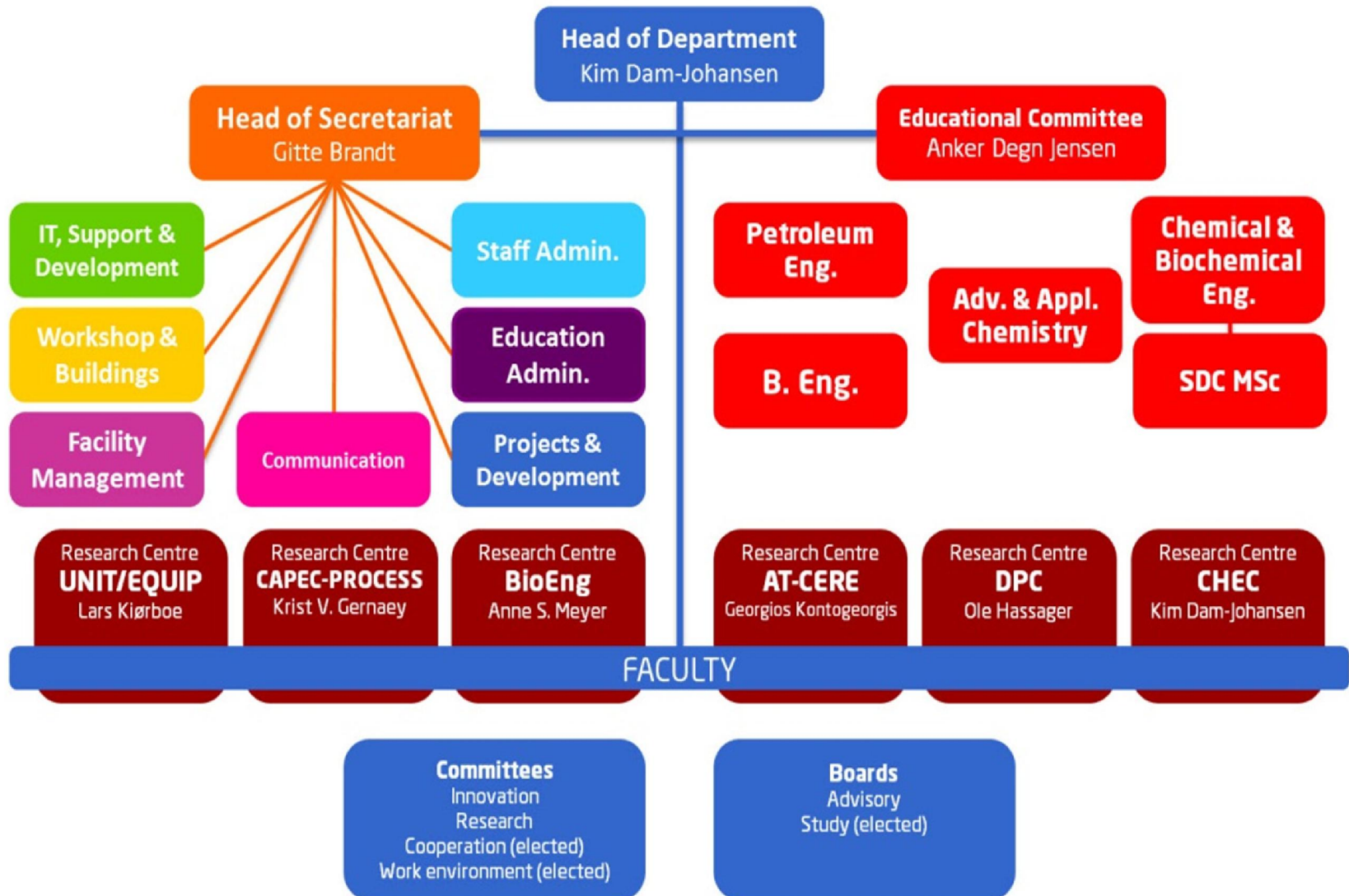
Vision

- Is acknowledged as a world leading Chemical Engineering department: nr. 41 worldwide (2015 QS World University Rankings)
- Is an attractive partner for university departments and research-based industry
- Helps to retain, develop and attract knowledge-based national working places including companies with affiliates abroad
- Supports development of sustainable solutions in the fields of chemistry, biotechnology, food, pharma and energy through research and research based consultancy
- Is attractive as a place to work for ambitious and technology-passionate staff members

DTU-Chemical Engineering – Lyngby Campus



DTU-Chemical Engineering – Organisation



DTU-Chemical Engineering in numbers (2015)

➤ ~250 employees

- 34 faculty members
- 100 PhD students
- 73 post docs/researchers
- 60 technical/administrative

➤ Publications

- 180 papers with referee in ISI indexed journals (WoS)
- 31 PhD thesis (8 industrial)
- 10 patents and patent ideas

Companies in DTU-Chemical Engineering's Consortia

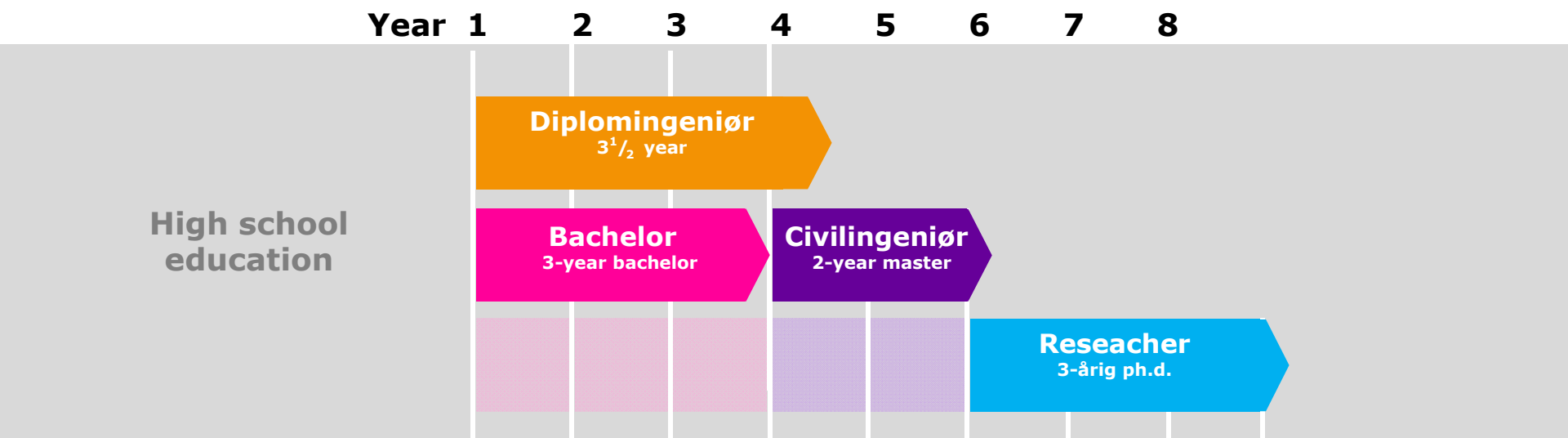


Education at DTU



- **One of Europe's leading technical universities**
- **More than 850 international students**
- **98 % of all international students value their stay at DTU**

Education at DTU



**Bachelor of engineering
(Diplomingeniør)**

17

Educational programs

Bachelor of science

18

Educational programs

**Master of science
(civilingeniør)**

28 + 30

Educational programs

**International
Educational programs**

Bachelor of engineering programs

- Architectural Engineering
- Arctic Technology
- Building and Civil Engineering
- Chemical and Bio Engineering
- Chemical Engineering
and International Business
- Electrical Engineering
- Electrical Energy Technology
- Food Analysis
- Global Business Engineering
- Healthcare Technology
- IT and Economics
- IT Electronics
- Manufacturing and Management
- Mechanical Engineering
- Process and Innovation
- Software Technology
- Traffic and Transportation

Bachelor of engineering programs

Structured programs tailor made to prepare students for industry.

Each semester is thematic and for ChemEng it is:

1. semester: Chemical and biochemical production
2. semester: Chemical and biochemical systems
3. semester: Chemical and biotechnological process engineering
4. semester: Biotechnology and process design
5. semester: **Industrial internship**
6. semester: Process and product design
7. semester: **Final project**

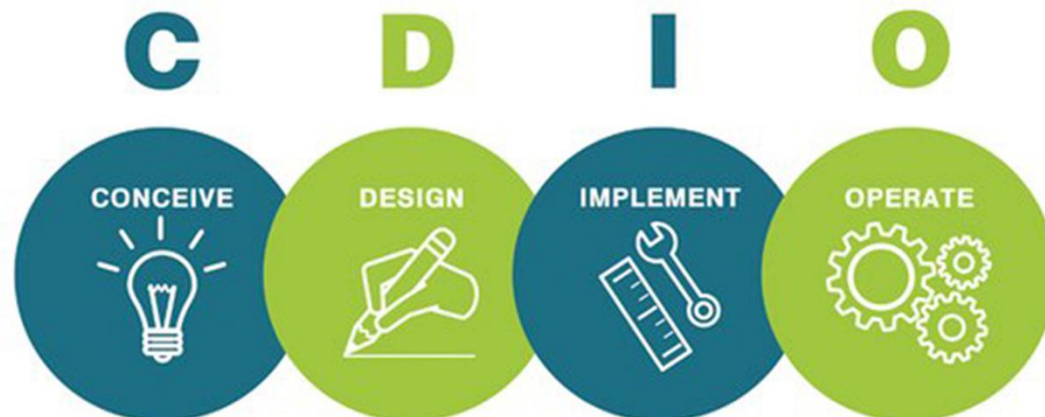
Bachelor of engineering programs

A business-oriented program

Industry and application-oriented, interdisciplinary and innovate — those are the keywords for DTU's BEng programs.

CDIO

In order to meet the requirements of industry, DTU has chosen to enroll all its BEng students in a CDIO program. CDIO takes the real life of the professional engineer as its starting point, with the C-D-I-O acronym standing for the problem-solving phases which an engineer typically encounters: Conceive – Design – Implement – Operate.



Bachelor of science programs

- **Architectural Engineering**
- **Biotechnology**
- **Chemistry and Technology**
- **Civil Engineering**
- **Design and Innovation**
- **Earth and Space Physics
and Engineering**
- **Electrical Engineering**
- **Environmental Engineering**
- **General Engineering**
- **Human Life Science Engineering**
- **Mathematics and Technology**
- **Mechanical Engineering**
- **Medicine and Technology**
- **Network Technology and IT**
- **Physics and Nanotechnology**
- **Quantitative Biology
and Disease Modelling**
- **Software Technology**
- **Strategic Analysis
and Systems Design**

Bachelor of Science

Bachelor of Science in Engineering = 180 points = 3 years

Natural sciences
45 ECTS points

Projects and general courses
45 ECTS points

Technological specialisation
courses
45 ECTS points

Electives courses
45 ECTS points

B.Sc. in Chemistry & Technology

Natural sciences 45 ECTS points out of 57,5		Projects and general courses 45 ECTS points out of 50
Mathematics 1 General chemistry Mathematics 2 Physical chemistry	Physics 1 Statistics Inorg.chem. Life science	Programming Introduction to chem. & chem. eng. Theory of science in engineering Introductory Project in Chemistry Bachelor project
Technological specialisation courses 45 ECTS points out of 60		Electives courses 45 ECTS points
Organic chem. 1 Organic chem. 2 Physical chemistry Chem. process eng. Reaction engineering Mathematical models for chem. syst.	Chem. synth. Lab practice Inorg. chem. Coord. Chem. Proces control	May be chosen freely among the many courses at DTU

Master of science programs

- **Advanced and Applied Chemistry**
- **Aquatic Science and Technology**
- **Architectural Engineering**
- **Bioinformatics and Systems Biology**
- **Biotechnology**
- **Chemical and Biochemical Engineering**
- **Civil Engineering**
- **Computer Science and Engineering**
- **Design & Innovation**
- **Digital Media Engineering**
- **Earth and Space Physics and Engineering**
- **Electrical Engineering**
- **Engineering Acoustics**
- **Engineering Design and Applied Mechanics**
- **Engineering Management**
- **Environmental Engineering**
- **Food Technology**
- **Materials and Manufacturing Engineering**
- **Mathematical Modelling and Computation**
- **Medicine and Technology**
- **Petroleum Engineering**
- **Pharmaceutical Design and Engineering**
- **Photonics**
- **Physics and Nanotechnology**
- **Sustainable Energy**
- **Telecommunication**
- **Transportation and Logistics**
- **Wind Energy**

Master of Science

Master of Science in Engineering = 120 points = 2 years

General competence courses
30 ECTS points

Master thesis project
30 ECTS points

Technological specialisation
courses
30 ECTS points

Electives courses
30 ECTS points

Focus Areas of MSc Program

Chemical and Biochemical Product Engineering

Advanced product development based on physics, chemistry, biochemistry and microbiology.

Interplay of product properties and production techniques is in focus.

Chemical and Biochemical Process Technology

Process systems design and development based on natural sciences, biotech. and chem. eng. fundamentals

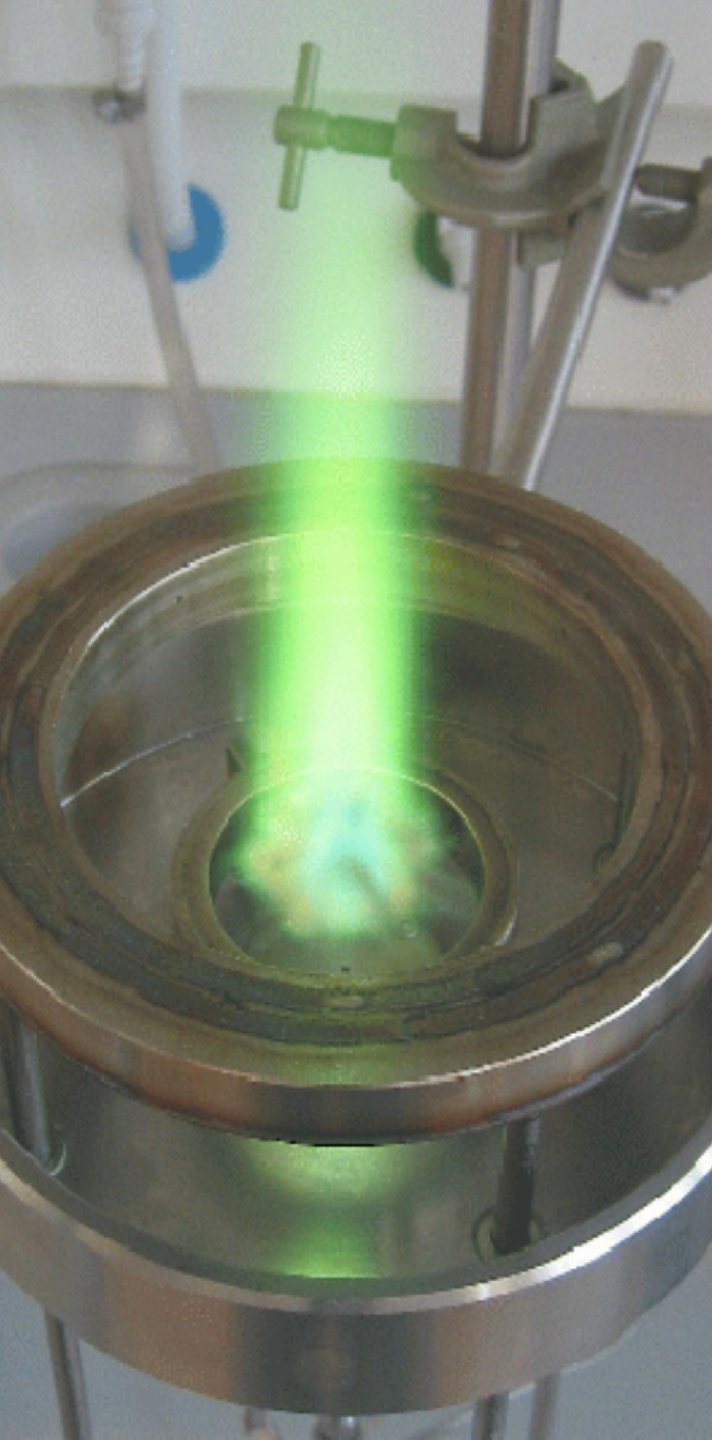
Synthesis of chemical and biochemical aspects of processing.

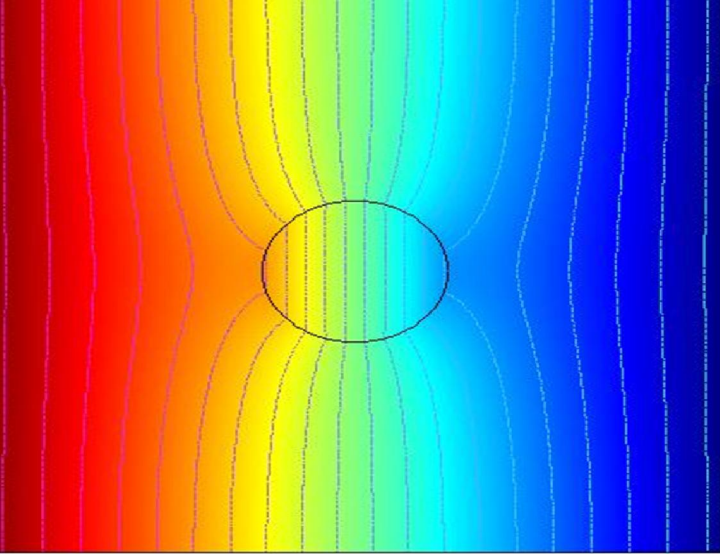
Energy and Environmental Technology

Technological methods to control energy use and environmental load of production facilities.

Processes rooted in chemical or biochemical engineering. Cross-disciplinary focus area.

From nano- to Mega-scale





General Competences



MSc Core

Synthesis

General Engineering

The MSc core

Model-based analysis is an important element in Chemical and Biochemical Engineering.

At least one of two possible courses

Synthesis and General Engineering

Design in Chemical and Biochemical Engineering synthesizes different engineering and science disciplines, and must consider external needs.

At least one of two possible courses

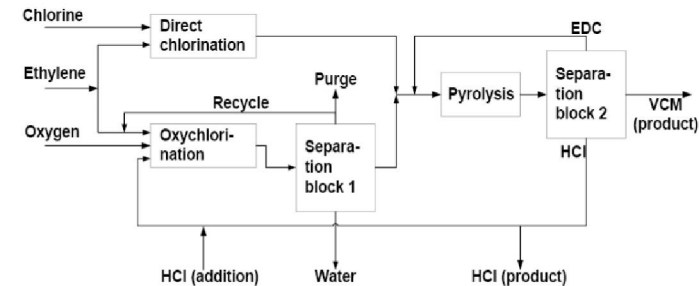
General Engineering in a Societal Context

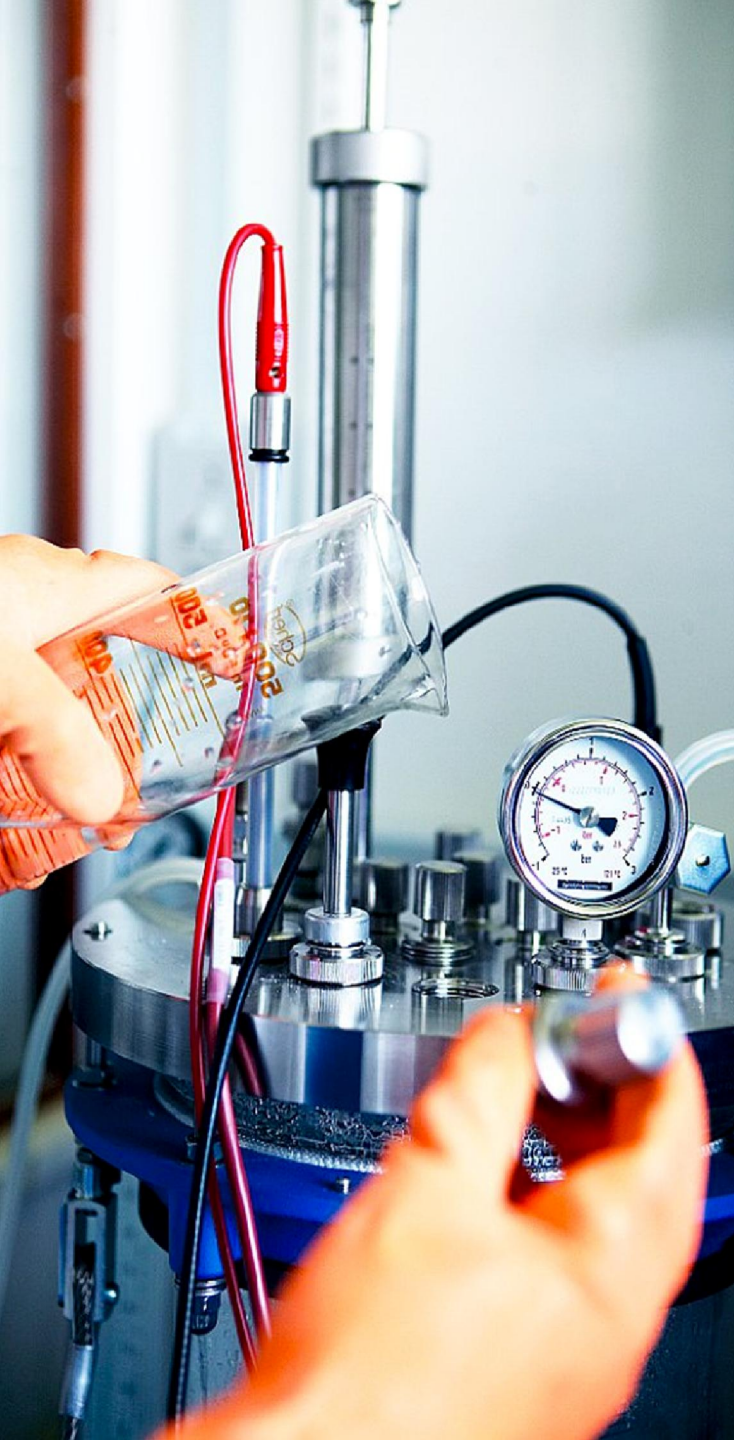
Combination of chemical and biochemical insight, process equipment knowledge, management, and economics to satisfy requirements of safe, clean, economical and socially responsible production.

At least one of three possible courses

3 aspects of competency

Core, Cross-disciplinary, and Cooperative abilities





Technological Specialization

Bio-Process Technology
Chemical Product Design
Applied Thermodynamics
Reaction Engineering
Enzyme Technology
Catalytic Processes
Transport Phenomena
Process Control
Applied Math and Modelling
Energy use in Processes
Processes in Energy Technology
Environmental Technology
Bio-Product Development
Chemical Process Technology
Energy and Sustainability
Industrial Ecology

Elements of the world

Sino-Danish Center for Education and Research



中国科学院大学

University of Chinese Academy of Sciences

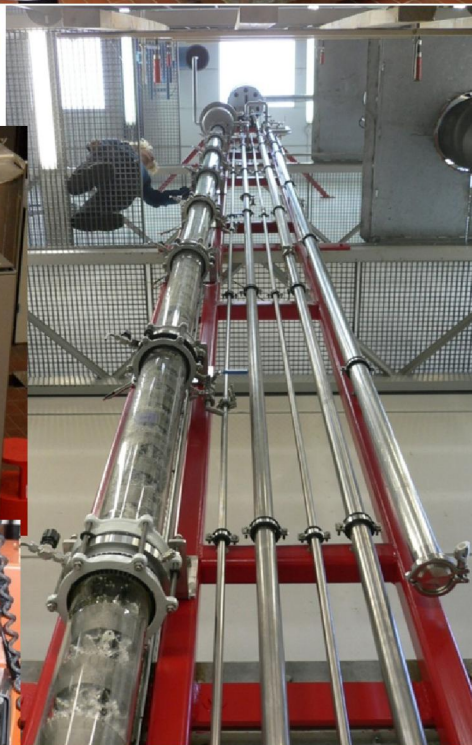


International standards European Federation of Chemical Engineering



Chemical and Biochemical Engineering

<p>First cycle (BSc) 180 ECTS</p> <p>Core</p> <p>Fundamentals of math and sciences 45 ECTS Chemical Engineering fundamentals 35 ECTS Chemical Engineering applications 15 ECTS Non-technical subjects 10 ECTS Bachelor's thesis project 15 ECTS</p>	<p>DTU BSc-Chemistry & Technology 180 ECTS</p> <p>Core</p> <p>Fundamentals of math and sciences 45 Technological core courses 45 Projects and general courses 25 Bachelor's thesis project 20</p>
<p>Second cycle (MSc) 120 ECTS</p> <p>Core</p> <p>Science and mathematics min 15 ECTS Chemical engineering topics min 40 ECTS</p> <p>MSc Chemical Eng. thesis min 20 ECTS</p>	<p>DTU MSc-Chem. & Biochem. Eng. 120 ECTS</p> <p>Core</p> <p>Mathematics and model analysis min 10 Chem. Eng. general competence min 10 Chem. Eng. tech. specialisation min 30 MSc Chemical Eng. thesis min 30</p>



KT Pilot plant

- About 25 different setups covering distillation, absorption, drying, filtration, flow, pump, membranes, stirring, extraction, centrifugation, crystallization, organic synthesis, heat transfer, high temperature processes, solids handling, fixed bed, process control
- A range of mobile units
- Appr. 300 students passing every year
- 10 different courses, from BSc/BBng to PhD.
- 4 faculty + 2 technicians.
- Workshop essential. We build our plants ourselves
- Units build for teaching as well as or research

Summer courses in experimental process technology

For 9 years we are running 2 summer courses:

1. A 4 weeks course specially designed for American university students
7 experiments/reports + oral presentation
3 excursions to chemical industrial sites
About 5-8 universities attend every year. In 2014 we had 80 students
2. A 3 weeks course for other foreign students
4 experiments/reports
3 excursions to chemical industrial sites
Max. 20 students. In 2014 16 students fra SDC