Aalto University

Where Science and Art meet Technology and Business

SELECT Fall Seminar Sept 27, 2016
Aalto University in brief

• Foundation-based university of technology, business, arts and architecture.

• **Founded in 2010**, when the Helsinki School of Economics, Helsinki University of Technology and University of Art and Design Helsinki were merged to form a single institution.
The way forward
Core elements of our 2016-2020 strategy

Values

**Passion** for exploration
**Courage** to influence and excel
**Freedom** to be creative and critical
**Responsibility** to accept, care and inspire
**Integrity**, openness and equality
The way forward
Core elements of our 2016-2020 strategy

Strategic objectives

Research excellence for academic and societal impact
Renewing society by art, creativity and design
Educating game changers
Key performance indicators

For 2016-2020 strategy

Excellence
- Quality of publications (proportion of top-10% publications)
- Participation in artistic, innovative and entrepreneurial activities
- Value of business created

Research
- Quality of productions (proportion of top-10% peer reviewed forum appearances)
- I. Participation in artistic, innovative and entrepreneurial activities
- II. Share of multidisciplinary studies in degrees taken
- III. Share of multidisciplinary projects

Art and creative practices
- Quality of productions (proportion of top-10% peer reviewed forum appearances)

Education
- Quality of education (graduate feedback)
- Employment (% of recent graduates)

Multidisciplinarity
- II. Share of multidisciplinary studies in degrees taken
- III. Share of multidisciplinary projects

Entrepreneurship
- Value of business created
- Significant corporate, public and non-governmental partnerships

Societal impact
- Employment (% of recent graduates)

Strategy enablers
- 1. Employee satisfaction survey results
- 2. Quality and cost efficiency of services
- 3. Diversity of funding base

Campus
- 1. User and partner survey results
- 2. Spaces shared with academic units in different fields and external partners
- 3. Energy efficiency and CO2 emissions
Schools
School emphasis

School of Engineering
- Arctic technology
- Mechanics and material technology
- Multidisciplinary energy technologies
- Sustainably built environment
- Systems design and production

School of Chemical Technology
- Process technology
- Industrial biotechnology
- Biomaterials science
- Metals and minerals recovery processes
- Active and functional materials

School of Electrical Engineering
- Information and communication technology ICT
- Micro- and nanotechnology
- Energy and environment
- Health and wellbeing

School of Business
- Microeconomics
- Behavioral finance and financial markets
- Management systems and decision-making
- Strategic management in the global context
- Customer behavior
- New business creation: entrepreneurship, new business models and the service economy

School of Science
- Computational and mathematical sciences
- Condensed-matter and materials physics
- Energy sciences
- Computer sciences
- Neuroscience and technology
- Creating and transforming technology-based business

School of Arts, Design and Architecture
- Environmental design
- Meanings and expressions, storytelling
- Artistic research practice
- Culture of sharing: new ways of planning, producing and distribution
- Digital society
School of Engineering

Science to engineering

Watch the video
School of Engineering

- Themes related to climate change, the sufficiency and cleanliness of energy and the sustainable use of natural resources are central research and education.

Graduates in 2014

- 29 Doctoral degrees
- 3 Licentiate degrees
- 350 Master’s degrees
- 366 Bachelor’s degrees

748
School of Engineering

Departments:
- Energy Technology
- Engineering Design and Production
- Real Estate, Planning and Geoinformatics
- Civil and Structural Engineering
- Applied Mechanics
- Civil and Environmental Engineering

Other units:
- ADDLab - Aalto Digital Design Laboratory

Major infrastructure:
- Aalto Ice Tank – multipurpose basin
School of Chemical Technology
Catalyst of change
Watch the video
School of Chemical Technology

- **Strength**: combining know-how in natural sciences with expertise in bioscience and engineering.

- Masters and Doctors of Technology perform a wide range of work in the metal and electronics industries, wood processing industry and the chemical, pharmaceutical, biotechnology and food industries.

**Graduates in 2014**

- 35 Doctoral degrees
- 141 Bachelor’s degrees
- 147 Master’s degrees

323
School of Chemical Technology

Departments:
Biotechnology and Chemical Technology
Chemistry
Materials Science and Engineering
Forest Products Technology

Major infrastructure:
Bioeconomy infrastructure
Research
Four competence areas and the multidisciplinary themes linking them

Four core areas of expertise
Three grand challenges
Teaching
About 20,000 students

Graduates from Aalto University earn Bachelor’s, Master’s and Doctoral degrees in science, business and arts.

Our mission is to educate responsible, independent experts who have an understanding of the big picture.
Societal impact
Multidisciplinary factories

The Factories combine the expertise of the Schools in the fields of product development, media, services and health care and well-being.
Multidisciplinary factories

In the Factories, students, researchers, companies and organisations collaborate on joint projects.

Approaches and methods encourage hands-on, innovative work.

The Design Factory is Aalto University's most popular destination for visitors. It has served as an example for several similar international factories, such as at Tongji University in Shanghai, Swinburne University of Technology in Australia and CERN, the European Organisation for Nuclear Research.
Promoting entrepreneurship

**Aalto Center for Entrepreneurship**
Promotes business success by establishing connections between researchers and companies as well as providing assistance in the exchange of technology and entrepreneurship.

- 200 innovation proposals or business ideas/year
- 10-15 research-based start-ups/year
- 15–20 patent applications/year

**Small Business Center**
Offers SMEs comprehensive solutions for business development and creating new enterprises throughout the lifecycle of a company.

**Aalto Ventures Program**
Provides instruction and research in entrepreneurship.

- Minor subject in the Master’s degree programme and academic research that promotes instruction and practical start-up enterprise
- Operates in co-operation with Stanford University
Promoting entrepreneurship

Organisation which coaches aspiring startup companies and entrepreneurs.

- 30-40 businesses involved each year
- 30 students doing internships in Silicon Valley and other business clusters
- SLUSH – leading startup event in Europe

Europe's largest student-run entrepreneur community.

- 9,000 community members
- 100 active
- 8,000 participants in events each year
Co-operation and partnerships
Sustainable Biomass Processing
Sustainable *Biomass* Processing

- Production of fuels and chemicals from biomass
- Introduces the most relevant chemical and biochemical processes in these applications
Sustainable *Biomass* Processing

<table>
<thead>
<tr>
<th>Course code</th>
<th>Name of the course</th>
<th>ECTS</th>
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<tbody>
<tr>
<td>CHEM-E1100</td>
<td>Plant Biomass</td>
<td>5</td>
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<tr>
<td>KTH</td>
<td>Environomical Pathways for Sustainable Energy Conversion (MJ 2493)</td>
<td>7</td>
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<td><em>Choose from these courses in order to get 30 ECTS altogether completed:</em></td>
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<tr>
<td>CHEM-E7100</td>
<td>Engineering Thermodynamics, Separation Processes, part 1</td>
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<td>CHEM-E7110</td>
<td>Engineering Thermodynamics, Separation Processes, part 2</td>
<td>5</td>
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<td>EEN-E2005</td>
<td>Bioenergy I</td>
<td>5</td>
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<td>EEN-E2006</td>
<td>Bioenergy II</td>
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<td>EEN-E2007</td>
<td>Energy, Environment and Emission Control</td>
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<td>EEN-E3006</td>
<td>Energy Markets</td>
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<tr>
<td>EEN-E9010</td>
<td>Energy Project</td>
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*Note: Students who choose this module for their second year must have basic knowledge of chemistry or chemical engineering*
Test rig for *biomass* and sludge drying

Test rig: 1) fan, 2) air heating element, 3) rotameters for air form the compressed air net 4) control units of fan and heating element, 5) air duct, 6) scale (not seen in a picture) 7) drying chamber, 8) bypass line.
Master’s Thesis
Master’s thesis at Aalto

- 30 ECTS credits (about 5-6 months)
- Typically done in collaboration with one or more industrial companies
  - Project work
  - Literature part and Experimental part
- The Thesis Advisor(s) of the Master’s thesis can also be from industry
- Topic, timetable etc. must be discussed with the supervising professor
- Future employment opportunities

https://into.aalto.fi/display/enmundusselectchem/Studies+-+Sustainable+Biomass+Processing
Thesis topics

- Normally ‘tailor made’ for each student considering three issues:
  - Student’s academic background
  - Student’s own interests
  - Ongoing projects in industry and/or professor’s research group
Master’s thesis topics of *SELECT* students

Synthesis of porous polyacrylonitrile-based copolymers for applications in catalysis and CO2 capture

Development of Cellulose Based Adsorbents for the Removal of Nickel from Aqueous Solutions
**Master’s thesis topics of SELECT students in 2016**

Thermochemical Valorization of Waste: Pyrolytic Conversion of Horse Manure

Investigation of effects of natural gas quality and chemical kinetic model on combustion characteristics
Examples of *industrial* partners

- Forest industry (Stora Enso, UPM...)
  - Biowax, biodiesel and biogas production from forest residues and industrial ‘waste’ streams
  - Nanofibrillar cellulose (energy efficiency and other aspects)...
- Energy industry (Fortum, UPM...)
- Chemical industry (Neste Oil, St 1...)
  - Biofuel production from plant biomass, microbes and waste (thermal, chemical, biochemical and microbial conversions)
- Machinery suppliers (ABB, Andritz, Foster Wheeler, Metso, Wärtsilä...)
- Engineering houses (Pöyry...)
Student projects

- CHEM Arts
- Design Factory
Student union AYY
RESONATE AWARD 2015

http://resnick.caltech.edu/awards-winners2015.php

Mika Järvinen

Resonate Award recipient for pioneering a CO2 sequestration process that converts a low-value steel-manufacturing by-product into a valuable resource for industry.

Mika Järvinen is an Associate Professor in the Department of Energy Technology at Aalto University and an Academy of Finland Research Fellow. His team’s Resonate Award winning process sequesters CO2 by mineral carbonation using steel slag (a by-product of steelmaking) as raw material. Järvinen’s Doctoral student Arshe Said worked as the main researcher on this project. Using waste slag and CO2 flue gas as resources, the team’s process yields high valued precipitated calcium carbonate (PCC), which is useful to many industries. Järvinen is a graduate of the Department of Energy Technology at Lappeenranta University of Technology. Prior to his postdoctoral studies in the Aalto University, he worked at the Ahlstrom Machinery Corporation as a research engineer. In addition to carbon capture and storage by mineral carbonization, Järvinen’s group researches biomass combustion, circulating fluidized bed gasification of waste, and advanced modeling of industrial processes, mainly for energy and metallurgical applications.
Further information

• Professor Olli Dahl

• Coordinators at Aalto
  • Anja Hänninen, anja.hanninen at aalto.fi
  • Börje Helenius, borje.helenius at aalto.fi

• https://into.aalto.fi/display/enmasterchem/Other+guides
Towards a better world

Welcome to study at Aalto University!
Further information:
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