Introduction of Mechanical Engineering Department

Department of Mechanical Engineering
National Taiwan University of Science and Technology
Location of National Taiwan University of Science and Technology (NTUST)
NTUST was founded in 1974 as the first technology-oriented national university in Taiwan.

The ME department was established in 1975.

NTUST is one of the top 11 universities in Taiwan, which receive the grant of “Aim for the Top University Plan” sponsored by the Ministry of Education.
Objectives of Education

- Fundamental knowledge and design capability in various fields of mechanical engineering and technologies.
- Advanced research programs in core competency areas.
- Lifelong learning capabilities.
Ranking of Taiwan Tech

2012 QS World Uni. Ranking: 396 (Top 6 in Taiwan)

2012 Times World Uni. Ranking: 353 (Top 6 in Taiwan)

2013 QS World ME Dept. Ranking: 100-150 (Top 3 in Taiwan)
ME Department Statistics

- 531 undergraduates (50%)
- 522 graduates (50%)
  - 420 Master students
  - 102 PhD students
- 46 full-time faculty members
- 50+ Labs
- 200+ Courses offered/year (accredited by IEET in 2008, Taiwan) (equivalent to ABET)
- More than 20 English Courses offered/year
- 5 research divisions
Faculty Profiles

- 46 faculty members
  - All with Ph.D. degree
    - 32 USA graduates
    - 2 Japan
    - 8 Europe
    - 4 Taiwan
  - 22 full professors (50%)
  - 10 associate professors (21%)
  - 14 assistant professors (29%)
International Students

Currently 39 International graduate students enrolled in:

18 for MS degree
21 for PhD degree

• Mainly from Indonesian and Vietnam.
• More from Ethiopia and Kenya in the coming semesters.
Research Divisions

- Design and Solid Mechanics
- Manufacturing Engineering
- Thermal and Fluid Mechanics
- Control Engineering
- Materials Science & Engineering
Design and Solid Mechanics Division

- Vibration
- Solid mechanics
- Dynamics
- Optimal design
- Mechanism design
- Acoustics
- Fracture mechanics
- CAD
- Intelligent machines
- Intelligent robots
- Tolerance design
- Micro-scale system design
Manufacturing Division

- CAD/CAM, 5-axis machining
- MEMS fabrication
- Metal forming
- Reverse engineering
- Rapid prototyping
- Process automation
- Tribology
- Precision manufacturing
- Metrology
- Opto-Mechatronics
- Network system integration
Thermal and Fluid Mechanics Division

- Fluid Dynamics, Aerodynamics
- Combustion
- Heat Transfer, Electronics Cooling
- Internal Combustion Engine
- Turbomachinery
- MEMS, Microfluidics
- Microscale Thermophysics
- Foundry Engineering
- Methods: ComputationalFD, ExperimentalFD, AnalyticalFD, Laser Diagnostics Techniques

\[ Re = 1200, \quad \alpha = 30^\circ, \quad t^* = \frac{tu}{C} = 3.130 \]
Control Division

- Mechatronics
- System dynamics
- Robotics
- Vehicle navigation
- Fluid power control
- ITS and vehicle control
- Computer control systems
- Intelligent control
- Nonlinear systems and control
- Robust/adaptive control
- Real-time control
- Embedded systems
- Digital signal processing
Material Division

- Foundry technology
- Diamond composite
- Welding metallurgy
- Laser material Processing
- Electron microscopy
- Phase transformation
- High temperature corrosion
- Surface treatment
- Mechanical metallurgy
- Semiconductor materials
- Non-destructive methods
**Courses**

- **Solid Mechanics and Design:** Vibration, Robotics, Fracture Mechanics, CAD, Solid Mechanics, Mechanical Design, Kinetics, Gear Designs...
- **Thermal & Fluidic:** Fluid Mechanics, Aero-dynamics, ICE, Fluidic Machines, Acoustics, Energy, Numerical Analysis, Micro-fluidic Analysis...
- **Control:** System Dynamics and Control, Mechatronics, Hydraulic and Pneumatic Control, Robust Control, Precision Motion Control, Vehicle Dynamics, Computer Vision...
- **Teaching Groups**
- **Manufacturing:** Thermal-Plastic Mechanics, Forming, Opto-Mechatronics, CAD/CAM, Fatigue, Precision Manufacturing and Measurement, Engineering database, MEMS...
- **Materials:** Corrosion, Defect Analysis, Casting, Functional Ceramics, Laser Machining, Welding, Electronic Microscopy, Electro-Ceramic, Non-destructive Inspection, Fuel Cell and Green Energy...
Major Laboratories for Research (I)

**Design and Solid Mechanics:**
- AI Lab.
- Mechanism and Mechanical Design Lab.
- CAD/CAM Lab.
- Vehicle Navigation And Control Lab.
- Vibration Lab.
- Noise Research Lab.
- Intelligent Robots Lab.

**Manufacturing:**
- Precision Measurements Lab.
- Opto-mechatronics Lab.
- Rapid Prototyping Lab.
- Precision Manufacturing Lab.
- Laser Material Processing Lab.
- Metal Forming Lab.
- CNC Machine Shop
- Traditional Machine Shop
- Metrology Lab.
Major Laboratories for Research (II)

**Control:**
- Automatic Control Lab.
- Electromechanical Control Lab.
- Real-Time Control Lab.
- Electronics Lab.

**Thermo-Fluid:**
- Advanced Thermo-Fluid Lab.
- Computational Fluid Dynamics Lab.
- Fluid Mechanics Lab.
- Thermal Engineering Lab.
- MEMS Lab.
- Turbo Machinery Lab.

**Materials:**
- Functional Ceramic Lab.
- Electron Microscopy Lab.
- Powder Metallurgy Lab.
- Metallography Lab.
- Heat Treatment Lab.
- Materials Testing Lab.
- Foundry Shop
- Welding Shop
Mechanical System Design Course

- Project oriented
- Robot contest
- Different theme each year!
## Intelligent Robot Center

<table>
<thead>
<tr>
<th>Intelligent Robots</th>
<th>Humanoid Robots</th>
<th>Face Robots</th>
<th>Other Robots</th>
<th>Robot Theater</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DOC - 1</strong></td>
<td></td>
<td>Janet</td>
<td>Catcher</td>
<td>Notation Reading and Singing Show</td>
</tr>
<tr>
<td><strong>DOC - 2</strong></td>
<td></td>
<td>Thomas</td>
<td>Panda Robot</td>
<td>Puppets Show Manipulated by Androids</td>
</tr>
<tr>
<td><strong>DOC - 2.5</strong></td>
<td></td>
<td>Pica</td>
<td>Security Robot</td>
<td>The Phantom of the Opera</td>
</tr>
<tr>
<td><strong>DOC - 3</strong></td>
<td></td>
<td>Ringo</td>
<td>Delivery Robot</td>
<td>Real Time Portrait Show</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Musical Dancing Show</td>
</tr>
</tbody>
</table>

**Intelligent Robots**: Janet, Thomas, Pica, Ringo

**Humanoid Robots**: Janet, Thomas

**Face Robots**: Janet, Thomas, Eva, Esen

**Other Robots**: Catcher, Panda Robot, Security Robot, Delivery Robot

**Director**: Prof. Chyi-Yu Lin
Opto-Mechatronics Technology Center

Opto-Mechatronics component design & manufacturing

- Low db Plastic Optical Fiber
- Disk Array heat transfer analysis
- Double-wave length laser light
- Micro-drill Laser inspection system

Director: Prof. Fang-Jung Shiou
Biomechanics Research Team

Director: Prof. Ching-Kong Chao
Piezoelectrics and Ultrasonics Research Team

Piezoelectric material design and characterization

Design of piezoelectric components and system integration

Precision positioning control

Inspection and processing of brittle materials

Director:
Prof. Chen-Chia Chou
Atmospheric-pressure Plasma Research Team

Micro-sensors

Atmospheric-pressure system

Director: Prof. Ye-Ee Wu
Thank You