New Education System Begins in April 2016

Outline of Education Reform at Tokyo Tech

June, 2015
Why Education Reform Now?

We will cultivate students with the drive to excel and the vision to contribute to society through science and technology.
Cultivate talented people in science and technology with the skills and expertise to lead
Talented people with the expertise and leadership skills to create a better future

**Expertise**
- Acquisition of fundamental knowledge in a wide range of fields, including mathematics, physics, chemistry, and life sciences
- Basic and specialized knowledge at the world's highest level in the fields of science and technology
- Will to contribute to society in science and technology fields

**Leadership**
- Broad vision based on accomplishments both inside and outside their areas of expertise
- Ability to communicate and collaborate with people from different fields and cultures
- Drive to take on global issues
- Will and ability to take part in creating a better future
Overseas Study at the World’s Top Universities

Encourage study abroad for all students

- Academic tuning for easier credit transfer
- Open curricula and syllabi to the public
- Tuning of curricula
- Tuning of credit conversion

World’s Top Universities

| Course          | Credits | Translation
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Physics I</td>
<td>8.01</td>
<td></td>
</tr>
<tr>
<td>Dynamics of Machinery</td>
<td>2.670</td>
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</tbody>
</table>

Tokyo Tech

物理学 I

| Course          | Credits | Translation
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>物理学 I</td>
<td>101</td>
<td></td>
</tr>
<tr>
<td>--機械の動力学</td>
<td>14-201</td>
<td></td>
</tr>
</tbody>
</table>

Invite faculty from the world’s top universities

Aiming to become one of the world’s top ten research universities
1. Education System

- Joining of the Undergraduate and Graduate Schools
- Seamless Transition between Degree Programs
- More Options for Specialized Fields
- Deepening of Expertise and Development of Interdisciplinary Knowledge

2. Quality Assured Education

- Revitalized Curricula
- Quarter System
- Achievement-Based Assessment

3. New Education Environment

- Redefining University Education
- Active Learning
- Tools for Self-Initiated Learning

4. Education Support Systems

- Enhanced Student Support System
- Enhanced Faculty Support System
Undergraduate and graduate schools will be joined – a first in Japan
## Combining Undergraduate and Graduate Departments

### Current System

<table>
<thead>
<tr>
<th>Undergraduate</th>
<th>Graduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Schools, 23 Departments</td>
<td>6 Schools, 45 Departments</td>
</tr>
</tbody>
</table>

#### School of Science
- Mathematics / Physics, Chemistry / Information Science / Earth and Planetary Sciences

#### School of Engineering

#### School of Bioscience and Biotechnology
- Biochemistry / Biotechnology

### New System

<table>
<thead>
<tr>
<th>6 Schools, 19 Departments</th>
</tr>
</thead>
</table>

#### Schools
- Science
- Engineering
- Materials and Chemical Technology
- Computing
- Life Science and Technology
- Environment and Society

#### Departments
- Mathematics
- Physics
- Chemistry
- Earth and Planetary Sciences
- Mechanical Engineering
- Systems and Control Engineering
- Electrical and Electronic Engineering
- Information and Communications Engineering
- Materials Science and Engineering
- Chemical Science and Engineering
- Mathematical and Computing Science
- Computer Science
- Life Science and Technology
- Architecture and Building Engineering
- Civil and Environmental Engineering
- Transdisciplinary Science and Engineering
- Social and Human Sciences
- Innovation Science
- Technology and Innovation Management (professional master's degree program)
## Schools, Departments, and Majors

<table>
<thead>
<tr>
<th>School</th>
<th>Department</th>
<th>Undergraduate Major</th>
<th>Graduate Major</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Science</strong></td>
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<td></td>
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<tr>
<td></td>
<td>Mathematics</td>
<td>Mathematics Major</td>
<td>Mathematics</td>
</tr>
<tr>
<td></td>
<td>Physics</td>
<td>Physics Major</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chemistry</td>
<td>Chemistry Major</td>
<td></td>
</tr>
<tr>
<td><strong>Engineering</strong></td>
<td>Mathematics</td>
<td>Mathematics Major</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physics</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Chemistry</td>
<td>Chemistry Major</td>
<td></td>
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<tr>
<td><strong>Materials and Chemical Technology</strong></td>
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<td>Mathematics Major</td>
<td></td>
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<tr>
<td></td>
<td>Physics</td>
<td>Physics Major</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chemistry</td>
<td>Chemistry Major</td>
<td></td>
</tr>
<tr>
<td><strong>Computing</strong></td>
<td>Mathematical and Computing Science</td>
<td>Mathematical and Computing Science Major</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Computer Science</td>
<td>Computer Science Major</td>
<td></td>
</tr>
<tr>
<td><strong>Life Science and Technology</strong></td>
<td>Life Science and Technology</td>
<td>Life Science and Technology Major</td>
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<tr>
<td></td>
<td>Architecture and Building Engineering</td>
<td>Architecture and Building Engineering Major</td>
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<tr>
<td></td>
<td>Civil and Environmental Engineering</td>
<td>Civil and Environmental Engineering Major</td>
<td></td>
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<tr>
<td></td>
<td>Transdisciplinary Science and Engineering</td>
<td>Transdisciplinary Science and Engineering Major</td>
<td></td>
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<tr>
<td><strong>Environment and Society</strong></td>
<td>Social and Human Sciences</td>
<td>Social and Human Sciences Major</td>
<td></td>
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<tr>
<td></td>
<td>Innovation Science</td>
<td>Innovation Science Major</td>
<td></td>
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<tr>
<td></td>
<td>Technology and Innovation Management</td>
<td>Technology and Innovation Management Major</td>
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<tr>
<td></td>
<td>Institute for Liberal Arts</td>
<td>Liberal arts courses taken throughout each program</td>
<td></td>
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</tbody>
</table>

1st years join one of seven academic groups.
Seamless transition between degree programs

The new education system will allow for easier transitions from bachelor’s to master’s and master’s to doctoral programs.

Result:

Students will be able to better visualize their academic goals and choose from various courses and challenges to achieve those goals.
Leadership education

With the new education system, students will gain vital leadership skills through broad training in their majors, research, and liberal arts courses.

Seamless Transition between Degree Programs

Impact of new curriculum

Earlier involvement in graduate-level research

Under certain conditions, undergraduates will be able to take master’s-level courses and join research projects. Qualifying master’s students will be able to do the same for doctoral-level courses and research. This will provide a more seamless transition between degree programs.

Leadership education

With the new education system, students will gain vital leadership skills through broad training in their majors, research, and liberal arts courses.
More Options for Specialized Fields

Students will have more options for specialized fields of study

Example: A student interested in studying materials

3 Departments
- Department of Metallurgical Engineering
- Department of Organic and Polymeric Materials
- Department of Inorganic Materials

2nd-year undergraduates must join a department to advance, even if they are unsure of the field in which they wish to specialize.

Education system which divides fields
- Few faculty in each department
- Limited range of fields offered
- Limited flexibility to meet students’ education needs

1 Department
- Department of Materials Science and Engineering

Under the new education system, the student will first receive general training in courses before deciding on a field of specialization. Students will also have the option to change their field halfway through their degree. With faculty from a wider range of fields, students will have greater options for study.

Education system which combines fields
- More faculty from a wider range of fields provides the flexibility to support students’ individual education goals.
- More opportunities for cross-disciplinary study
Seamless transitions between degree programs will allow for both deeper pursuit of expertise and development of interdisciplinary knowledge.

- Acquire broad, fundamental knowledge
- Choose field of expertise matching goals
- Develop interdisciplinary knowledge
- Deepen expertise
Education Reform

1. Education System

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- Seamless Transition between Degree Programs
- More Options for Specialized Fields
- Deepening of Expertise and Development of Interdisciplinary Knowledge

2. Quality Assured Education

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- Quarter System
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3. New Education Environment

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4. Education Support Systems

- Enhanced Student Support System
- Enhanced Faculty Support System
Revitalized Curricula

New, high-quality curricula

- Each department will offer newly-designed, high-quality curricula.
- To maintain high quality, the newest curricula will always be used throughout the Institute.

Curricula that make it easy for students to select courses

- Course progression and relationship between courses will be better defined.
- Academic competencies that will be acquired through each course will be more clearly stated.
- Broader learning opportunities will be available through minors under an interdisciplinary option

Curricula tuned to those of the world’s top universities

- For improved compatibility with other top universities’ curricula, a course numbering system will be implemented and syllabi will be globally accessible in English.
- Achievement-based assessments will be used to show the extent of knowledge a student has acquired.
Revitalized Curricula

- **Life science courses will be compulsory**
  First-year undergraduates will take courses that are fundamental to studying science and technology. Life sciences will be added to the compulsory courses in addition to math, physics, chemistry, English, and liberal arts. The courses will thoroughly cover the basics and provide broad, foundational knowledge.

- **New 100-level courses will be offered**
  In one example, new undergraduates will take a Frontiers of Science and Technology course, where they will attend lectures by leading Tokyo Tech researchers, Nobel Prize-level scientists, and industry experts.

- **Classes conducted in English**
  All major courses will be conducted in English in the master's and doctoral degree programs. Some basic courses in the bachelor's degree program will be taught by international faculty in English. All students will be strongly recommended to study abroad or gain other international experience.
Quarter system

Under the quarter system, one academic year will be divided into four quarters.

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Duration</th>
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<tbody>
<tr>
<td>1Q</td>
<td>April–early June</td>
</tr>
<tr>
<td>2Q</td>
<td>Mid June–early August</td>
</tr>
<tr>
<td>Summer Vacation</td>
<td>Mid August–mid September</td>
</tr>
<tr>
<td>3Q</td>
<td>Late September–late November</td>
</tr>
<tr>
<td>4Q</td>
<td>Early December–early February</td>
</tr>
</tbody>
</table>

Exact periods for each quarter are under review.

Upon implementing:

- Intensive learning in shorter periods will enhance learning effectiveness.
- Flexible academic plans will make it easier to study abroad or do internships.
- Offering courses more frequently will better accommodate students.
- Enrollment in Tokyo Tech will be more accessible for international students.
Achievement-based assessment

Academic progress will be measured using achievement-based assessments and learning portfolios, emphasizing the extent of knowledge acquired rather than simply the number of years of study.

Result:

- Students will view their progress in terms of knowledge acquired rather than credits earned.
- Academic advisors will provide guidance based on students’ learning portfolios, allowing them to better grasp their strengths and weaknesses and take charge of their own educational paths.
Achievement-Based Assessment

Standard model

Students are assessed on whether or not they can progress to the next stage.

- **A**: Achievement-based assessment to join a department and advance to 2nd year after completing 100-level courses.
- **B**: Achievement-based assessment to begin independent research project (equivalent to the current graduation research).
- **C**: Achievement-based assessment for graduation.

<table>
<thead>
<tr>
<th>Year</th>
<th>Bachelor's Degree Program (4 years)</th>
<th>Master's Degree Program (2 years)</th>
<th>Doctoral Degree Program (3 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st year</td>
<td>2nd year</td>
<td>3rd year</td>
<td>4th year</td>
</tr>
<tr>
<td></td>
<td>2 years for master's degree program</td>
<td></td>
<td>3 years for doctoral degree program</td>
</tr>
</tbody>
</table>
Achievement-Based Assessment

Early graduation model

Aspiring students will be able to progress to the next stage earlier.

A. Achievement-based assessment to join a department and advance to 2nd year after completing 100-level courses

B. Achievement-based assessment to begin independent research project (equivalent to the current graduation research)

C. Achievement-based assessment for graduation

1. 1st year
   - 3.5 years for bachelor’s degree program (including 6 month independent research project)

2. 2nd year
3. 3rd year
4. 4th year
   - 1.5 years for master’s degree program

5. 2nd year
   - 2 years for doctoral degree program
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Inspiring ambition with the new Lecture Theatre

New undergraduates will attend lectures by leading Tokyo Tech researchers, Nobel Prize-level scientists, and industry experts.

Students will be exposed to the wonders of research and motivated to pursue careers in science and technology.

Strike while the iron is hot.
Through group work, discussions, and presentations, students will take more active roles in their education.

Students will cultivate initiative, communication skills, and leadership skills.

From passive participation to active learning
Online learning

Massive open online courses (MOOC) will provide greater flexibility and allow for study both on and off campus.

Content will be taught in English and Japanese.

Students will engage in flipped learning, course preparation, and review.

Tokyo Tech will gain greater recognition as one of the world’s top universities.

Preparation and review will deepen students’ understanding of course content.
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Enhanced support system for students

- Academic advisors will support students in their goals, education plans, and employment searches.

- Learning portfolios will help provide seamless transitions between degree programs.

- To support their ambitions, students can consult their academic advisors at any time. All students will have at least one scheduled meeting with their academic advisors per academic year.

Enhanced support system for faculty

- Faculty will be provided training in new teaching methods and in teaching in English.

- Organizations providing education training will be strengthened to further enhance faculty’s teaching abilities.
Science and technology offer paths to a new world.

Study hard, enjoy your life at Tokyo Tech, and grow to become leaders of the future.

Tokyo Tech will wholeheartedly support you in achieving your goals.