Post-graduate Study on Nano-Satellite Technologies (PNST) Fellowship
Kyushu Institute of Technology (Kyutech)

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PNST in partnership with the Government of Japan in cooperation with the Kyushu Institute of Technology (Kyutech) provides nationals of developing countries or non-space-faring nations extensive research opportunities in nano-satellite systems through the use of the nano-satellite development and testing facilities available at Kyutech.
PNST program is full-scholarship program operated under Space Engineering International Course (SEIC), by Kyutech

Introduction

Overview comments by Associate Prof. T. Fuse (Kyutech)
Where We Are

Japan

Sapporo

Kyushu

Fukuoka

Mt. Fuji

Tokyo

Osaka
Kyushu Institute of Technology (Kyutech)

• A national university founded in 1909
  – 4,200 Undergraduate students
  – 1,300 Graduate students
  – 360 Faculty members
  – Engineering, Computer science, Life-sciences
• Located in the Kitakyushu region
  – Population of more than 1 million
Hands-on and Practical Education

Lab-Based Final Year of All Undergraduate Program

Final-year undergraduate students become laboratory members for research work and thesis.
Research Centers & Units

Center of Excellence for Advanced Research

Laboratory of Lean Satellite Enterprises and In-Orbit Experiments

Integrated Research Center for Energy and Environment

Next Generation Power Electronics Research Center

Research Center for Neuromorphic AI Hardware
Center for Nanosatellite Testing

To be capable of doing all the tests for a satellite up to 50cm, 50kg

Conducted more than 400 tests for external users since 2010

Space Development and Utilization Award (JAXA president award), 2022
Space Projects at Kyutech

Kyutech has numerous world-class space facilities and space projects, including:

1. Electrostatic discharge testing in space plasma environment
2. Space-use material degradation testing under UV and atomic oxygen flux
3. Nano-satellite environment testing (vibration, shock, thermal vacuum, thermal cycling, outgassing, EMC & antenna compatibility, etc.)
4. Hypervelocity impact testing using two-stage light gas guns (up to 6.2 km/s)
5. BIRDS nano-satellite series
6. HORYU nano-satellite series
7. SPATIUM nano-satellite series
8. Aoba-Velox nano-satellite series
9. KITSUNE 6U satellite
Kyutech Satellite Heritage

HORYU-1 (1U) 2006-2010 Not launched
HORYU-II 2010-2012 Launch 2012/5/18
Shinen-2 2013-2014 Launch 2014/12/03
HORYU-IV 2013-2016 Launch 2016/02/17
AOBA VELOX-III 2014-2016 ISS Release 2017/01/19

BIRDS-I constellation 2015-2017 ISS release 2017/07/07
BIRDS-II constellation 2016-2018 ISS release 2018/08/10
SPATIUM-I 2016-2018 ISS release 2018/10/06
Ten-Koh 2016-2018 Launched 2018/10/29
AOBA VELOX-IV 2016-2018 Launched 2019/01/18

BIRDS-III constellation 2017-2019 ISS release 2019/06/17
BIRDS-IV constellation 2018-2020 ISS release 2021/03/14
KITSUNE 2019-2021 ISS release 2022/08/12
FUTABA 2018-2021 ISS release 2022/08/12
MITSUBA Launch failure 2022/10/12
BIRDS-5J, -5Z, -5U Launch 2022/11/7

27 satellites launched since 2012
World No.1 academic satellite operator*

*Bryce Space and Technology
Operator and Mission Type Trends

Number of Academic Smallsats 2013 – 2022, by Institution

Academic Institutions with More than Five Smallsats Launched

- Kyushu Institute of Technology
- Technical University of Berlin
- Southwestern Polytechnic University
- Massachusetts Institute of Technology (MIT)
- University of Colorado at Boulder
- Boston University
- San Jose State University (SJSU)
- Nanyang Technical University
- Tsinghua University (Beijing)
- California Polytechnic State University (Cal Poly)
- Nanjing University of Aeronautics and Astronautics
- Georgia Institute of Technology (Georgia Tech)
- Montana State University
- Cornell University
- University of Toronto

200+ academic operators launched smallsats 2013 – 2022
Space Engineering International Course (SEIC)

- Started in April 2013 at Graduate School of Engineering, Kyutech to support PNST
  1. Research toward a Master or Doctoral degree
  2. On-the-job training such as space environment testing workshop
  3. Project Based Learning (PBL) through space projects
  4. Space-related lectures in English
     - Not only engineering, but also space policy and others

There is a scholarship opportunity. “PNST”
## Where SEIC students come from (as of April 2022)

<table>
<thead>
<tr>
<th>Number of Students (67 in total)</th>
<th>Nationality (26 countries)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>Japan</td>
</tr>
<tr>
<td>4</td>
<td>France, Philippines, Zimbabwe</td>
</tr>
<tr>
<td>3</td>
<td>Paraguay, Thailand, Uganda</td>
</tr>
<tr>
<td>2</td>
<td>Bhutan, Spain</td>
</tr>
<tr>
<td>1</td>
<td>Brazil, Cambodia, China, El Salvador, Ethiopia, Honduras, India, Indonesia, Laos, Malaysia, Mexico, Myanmar, Nepal, Rwanda, Sri Lanka, Trinidad and Tobago, Vietnam</td>
</tr>
</tbody>
</table>
More than 120 foreign students from 41 countries enrolled in 9 years

PNST/SEIC won Space Development Utilization Award (Minister of Foreign Affairs) in 2017
International Awards and Recognition

Bringing diversity to engineering education

GEDC Airbus Diversity Award (2017)

The BIRDS Project
BIRDS Program
Satellite program for non-space faring countries

Mission Statement
By successfully building and operating the first national satellite, make the foremost step toward indigenous space program at each nation.

JAPAN, GHANA, MONGOLIA, NIGERIA, BANGLADESH, THAILAND

BIRDS-II (2016-2018)
JAPAN, BHUTAN, MALAYSIA, PHILIPPINE

BIRDS-III (2017-2019)
JAPAN, SRI LANKA, NEPAL

BIRDS-IV (2018-2020)
JAPAN, PARAGUAY, PHILIPPINE

BIRDS-V (2020-2022)
JAPAN, ZIMBABWE, UGANDA
Program features

- 1U CubeSat constellation of
  - BIRDS-I: 5 satellites by Bangladesh*, Ghana*, Japan, Mongolia*, and Nigeria
  - BIRDS-II: 3 satellites by Bhutan*, Malaysia and Philippine
  - BIRDS-III: 3 satellites by Japan, Sri Lanka* and Nepal*
  - BIRDS-IV: 3 satellites by Japan, Paraguay* and Philippine
  - BRIDS-V: 3 satellites by Japan, Zimbabwe* and Uganda*
- Made by students at Kyutech
- 2 years from concept design to disposal
- Released from ISS
- Network operation by multiple ground stations

* First satellite for the country

Group photos of BIRDS-I, –II, –III, -IV and -V teams
To promote international cooperation and proliferation of CubeSat technology, all the technical information will be put in the public domain very soon.
**BIRDS-X Mission**

- **The goal**
  - Bring diversity to the space sector and democratize the usage of space

- **Missions**
  - Using a 2U CubeSat, BIRDS-X, we provide an opportunity to do hands-on work on satellite communication using an APRS payload onboard
  - Two competitions
    - APRS mission payload competition
    - APRS ground terminal competition
  - Demonstrate a new low-cost UHF transceiver in orbit
BIRDS-X project

BIRDS-X satellite is developing to be launched in next year!
Next project at Kyutech

Data collection & storage

Earth observation
(5m GSD)

S&F mission done by BIRDS countries

KITSUNE (6U)
Launched March 24, 2022

http://www.shikoku-np.co.jp/national/55cliffe_topic/photo.aspx?id=20120516000644&no=1
https://agrijournal.jp/renewableenergy/11918/
https://www.toshinikueisha-mito.com/

Mobile data
Connectivity
Sensor
Data forward
Image data
Network

Sensor data analysis
Information extraction

Information distribution

User

KITSUNE (6U)
Launched March 24, 2022

Sensor data analysis
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What students can acquire in SEIC through PNST (Post-graduate Study on Nano-Satellite Technologies)

• Hands-on training

• Diversity environment

• Space engineering professionalism and research

• Project management and system engineering skills through space projects

• Be professional of space engineering
Come to Japan for a great learning and cultural experience ... … it will change your life

SEIC students celebrating spring under cherry blossoms
The Access to Space for All x SDGs Interview Series #2 on PNST is released in the UNOOSA website.

Access to Space for All initiative for Sustainability: Interview Series Article #2 July 2022

How Education Through PNST Contributes to the SDGs

Interviewee: Prof. Mengu Cho, Director of the Space Engineering International Course, Kyutshu Institute of Technology (Kyutech)

Kyutech

Kyushu Institute of Technology

Abhas Maskey, 2020 graduate of the PNST fellowship, Founder of Antarikchya Pratisthan Nepal

Date: Interview conducted with Kyutech on 28 June 2022 and with Abhas Maskey on 13 July 2022

Background:
The United Nations/Japan Long-term Fellowship Programme: Post-graduate study on Nano-Satellite Technologies (PNST) is offered by the United Nations Office for Outer Space Affairs (UNOOSA) and the Government of Japan, through the support of the Ministry of Education, Culture, Sports, Science and Technology (MEXT), in cooperation with the Kyushu Institute of Technology (Kyutech). The Fellowship programme provides financial support...

https://www.unoosa.org/documents/pdf/Access2Space4All/AccSpace4AllxSDGsInterview/AccSpace4All_x_SDGs_Interview_PNST.pdf
The End

This pdf is available to you at UNOOSA website