

Day #1 01.14 21:00~23:00 (JST)

# KiboCUBE Academy

Lecture 1-0

## Introduction to KiboCUBE Academy 2021

Japan Aerospace Exploration Agency  
JEM Utilization Center





1. Introduction to KiboCUBE Program
2. Introduction to KiboCUBE Academy
  1. Objective
  2. Curriculum
  3. Lecturer Introduction
3. Conclusion

# 1. Introduction to KiboCUBE Program

## KiboCUBE Program



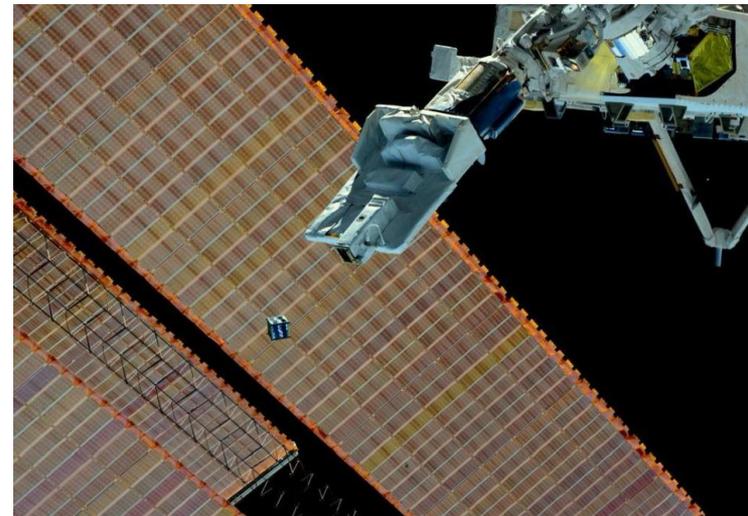
### KiboCUBE:

The cooperation program between the United Nations Office for Outer Space Affairs (UNOOSA) and the Japan Aerospace Exploration Agency (JAXA) on CubeSat deployment from the International Space Station (ISS) Japanese Experiment Module (Kibo).

KiboCUBE aims to provide educational and research institutions from space-faring countries of United Nations membership with opportunities to deploy, from the ISS Kibo, nano-satellites (CubeSats) which they develop and manufacture.



ISS Japanese Experiment Module Kibo. © JAXA



Deployment of a CubeSat from the ISS. © NASA/JAXA

# 1. Introduction to KiboCUBE Program

## Japanese Experiment Module “Kibo”



*“Kibo” is ...*

*The only module to deploy CubeSats from the ISS. Kibo's unique capability is comprised of an airlock system and a robotic arm. Since the first orbital deployment of CubeSats from Kibo in 2012, nano-satellites and CubeSats from various countries around the world have been deployed from Kibo.*



First CubeSats deployment from the ISS. © JAXA

*“KiboCUBE” can...*

*lower the threshold for space activities and contribute to building national capacity in spacecraft engineering, design and construction.*



Deployment of the first KiboCUBE CubeSat 1KUNS-PF (Kenya) from the ISS. © JAXA

# 1. Introduction to KiboCUBE Program



## Past Winners



	Winner		Objective	Status of Satellite
1 <sup>st</sup> round Selected in 2016	KENYA: University of Nairobi "1KUNS-PF"		To monitor agriculture and coastal areas	- Deployed from ISS on 11 May 2018 - Re-entered atmosphere in June 2020
2 <sup>nd</sup> round Selected in 2017	GUATEMALA: Universidad de Valle De Guatemala "Quetzal-1"		To acquire remote sensing data for natural resource management	- Deployed from ISS on 29 April 2020 - On-orbit, collecting data
3 <sup>rd</sup> round Selected in 2018	MAURITIUS: Mauritius Research Council "MIR-SAT 1"	<sup>1)</sup> 	To collect <sup>2)</sup> thermal infrared images and to test onboard communication	- Currently under development
3 <sup>rd</sup> round Selected in 2018	INDONESIA: Surya University "SS-1"		To demonstrate remote communication	- Currently under development
4 <sup>th</sup> round Selected in 2019	MOLDOVA: Technical University of Moldova "TUMnanoSAT"		To demonstrate technology and test various components	- Currently under development
5 <sup>th</sup> round Selected in 2020	SISTEMA DE LA INTEGRACIÓN CENTROAMERICANA: "MORAZAN-SAT"		To monitor weather variables in remote areas providing early warning during extreme weather events	- Currently under development

© UNOOSA

1) The Institution name changed from "Mauritius Research Council" to "Mauritius Research and Innovation Council".

2) The mission changed from "To collect thermal infrared images" to "To collect images".

# 2. Introduction to KiboCUBE Academy

## 2.1. Objective(1/2)



The objectives of the KiboCUBE Academy is to provide fundamental knowledges for the applicants to achieve their goals through KiboCUBE.

Themes below will be explained in detail;

- Introduction to space systems, the advantage of developing and utilizing space technology
- Introduction to engineering aspects of CubeSat system, their capabilities and application examples
- Approaches on how to manage the development process of CubeSats
- Expertise on how to build a reliable satellite system
- Detailed information on satellite testing, verification, operation and related regulations.
- Insight on how to leverage CubeSat projects as a sustainable capacity building program.

KiboCUBE Academy also provides direct Q&A opportunities with the lectures!



1U CubeSat Model



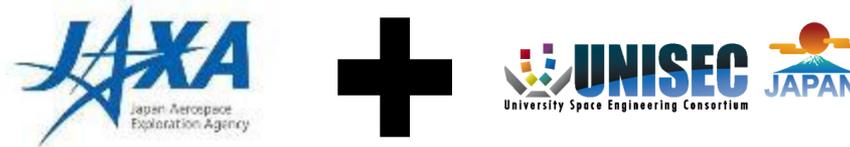
Hands-on Training of Satellite Engineering



CubeSat Operation

# 2. Introduction to KiboCUBE Academy

## 2.1. Objective (2/2)



- UNISEC will support JAXA in the KiboCUBE Academy to provide a more **strengthened** capacity building program for members who are thinking about applying to KiboCUBE or are interested in CubeSats.
- UNISEC is a non-profitable organization to support practical space development activities in universities and colleges, such as small satellite and hybrid rockets.
- Through UNISEC network, KiboCUBE Academy will be supported by professionals from Japanese universities that are highly skilled in advancing satellite missions and highly knowledgeable in the full life cycle of a satellite, including development, testing and operation, data utilization of data.

# 2. Introduction to KiboCUBE Academy



## 2.2. Curriculum



- The KiboCUBE Academy curriculum consists of **7 lectures** and **1 Q&A session**.

**2021**

**January 14**



Lecturer: JAXA

Lecture 1-0 Introduction to KiboCUBE Academy 2021

Lecturer: *Toshinori Kuwahara, Associate Professor, Tohoku University*

Lecture 1-1 CubeSats Change the World

Lecture 1-2 Introduction to CubeSat Technologies

**January 21**



Lecturer: *Shinichi Nakasuka, Professor, University of Tokyo*

Lecture 2-1 Overview of Satellite Development Process

Lecture 2-2 How to make your satellite survive in space?

**January 28**



Lecturer: *Mengu Cho, Professor, Kyushu Institute of Technology*

Lecture 3-1 Introduction to Satellite Testing

Lecture 3-2 CubeSats for Capacity Building

**February 4**



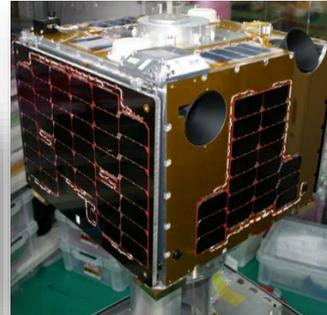
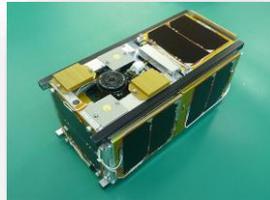
Lecturer: *Toshinori Kuwahara*

Lecture 4-1 Satellite Operation and Related Regulations

Q&A Session (All Lecturers)

# 2. Introduction to KiboCUBE Academy

## 2.3. Lecturer Introduction



## Toshinori Kuwahara, Dr. -Ing.

### Position:

2015 - Associate Professor

Department of Aerospace Engineering, Tohoku University

2017 - Technical Advisor, Nakashimada Engineering Works, Ltd.

2017 - Technical Advisor, ALE Co., Ltd.

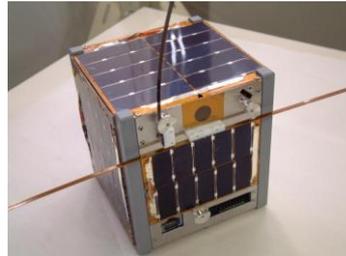
2020 - Chairperson, University Space Engineering Consortium Japan (UNISEC)

### Research Topics:

Space Development, Utilization, and Exploration by Small Spacecraft Technologies

# 2. Introduction to KiboCUBE Academy

## 2.3. Lecturer Introduction



## Shinichi Nakasuka, Ph.D.

### Position:

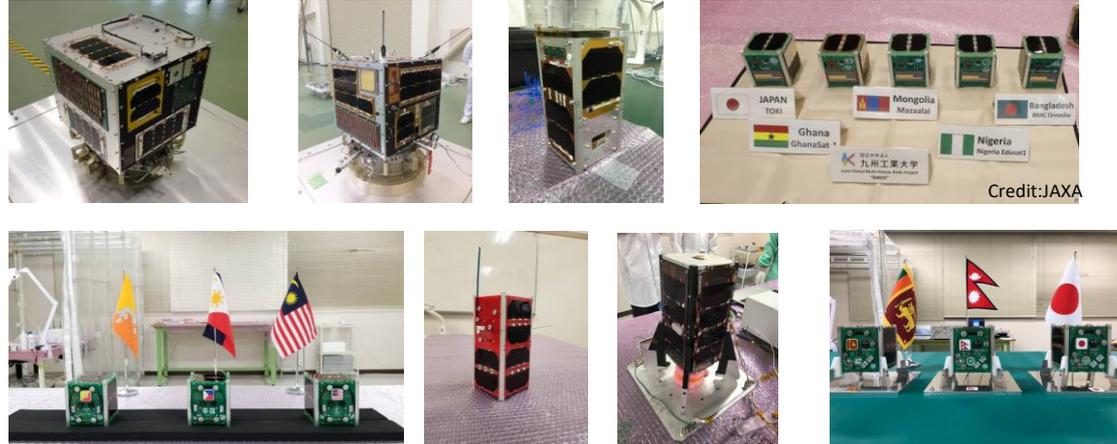
- 1990 - Lecturer, Department of Aeronautics and Astronautics, University of Tokyo
- 1993 - Associate Professor, University of Tokyo
- 2004 - Professor, University of Tokyo
- 2012 - Member of Space Policy Committee, Cabinet Office
- 2013 - Chairperson, UNISEC-GLOBAL

### Research Topics:

Micro/nano/pico-satellites, Novel Space Systems, Guidance, Navigation and Control  
Autonomy and Intelligence for Space Systems

# 2. Introduction to KiboCUBE Academy

## 2.3. Lecturer Introduction



### Mengu Cho, Ph.D.

#### Position:

2004 - Professor, Department of Space Systems Engineering\*  
Director, Laboratory of Lean Satellite Enterprises and In-Orbit Experiments \*\*  
Kyushu Institute of Technology, Japan

2014 - Visiting Professor, Nanyang Technological University, Singapore

2013 - Coordinator, Nations/Japan Long-term Fellowship Programme, Post-graduate study on Nano-Satellite Technologies (PNST)

(\*since 2018)  
(\*\*since 2020)

#### Research Topics:

Spacecraft Environment Interaction, Lean Satellite

# 3. Conclusion



- KiboCUBE program provides educational and research institutions from developing countries of United Nations membership with critical support to build national capacity in spacecraft engineering, design and construction, through CubeSat deployment opportunities from the ISS Kibo.
- The objective of KiboCUBE Academy is to provide fundamental knowledges for applicants to achieve their goals through KiboCUBE, including various aspects such as management and engineering expertise.
- JAXA and UNOOSA hope that the knowledge and information shared through KiboCUBE Academy will lead to successful space mission for the participants and that more applications will be received for the 6<sup>th</sup> round of KiboCUBE.



**Thank you very much.**