

# ICPE 2024



## Information Book

The 50th Anniversary of ICPE & Nanotechnology  
23-26 October 2024, Sendai, Japan

### Map of the Venue

Centersquare, School of Engineering  
Tohoku University



**B,C:** Building No.

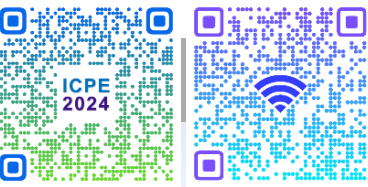
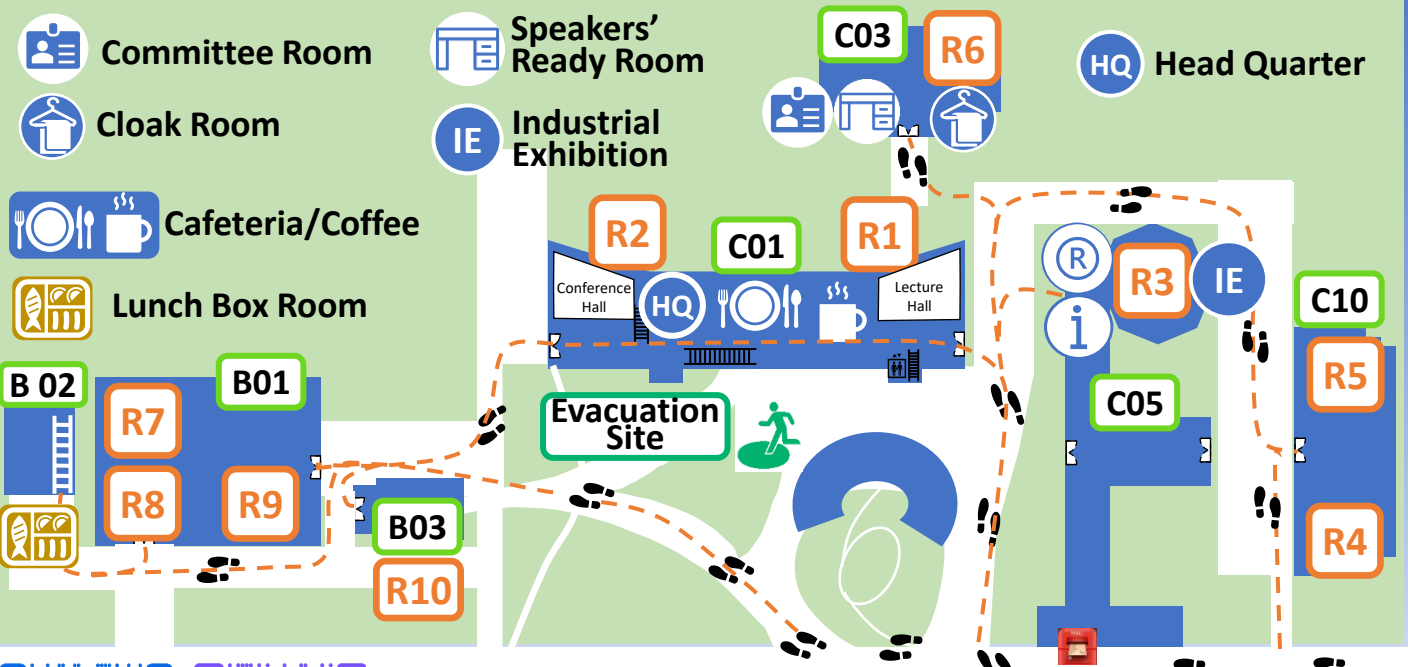
**R:** Room No.



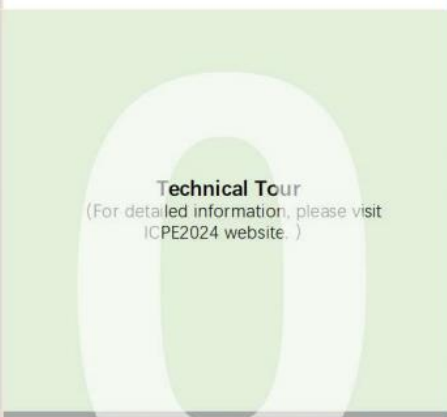
Registration Desk



Information Desk



From Aobayama  
Subway Station

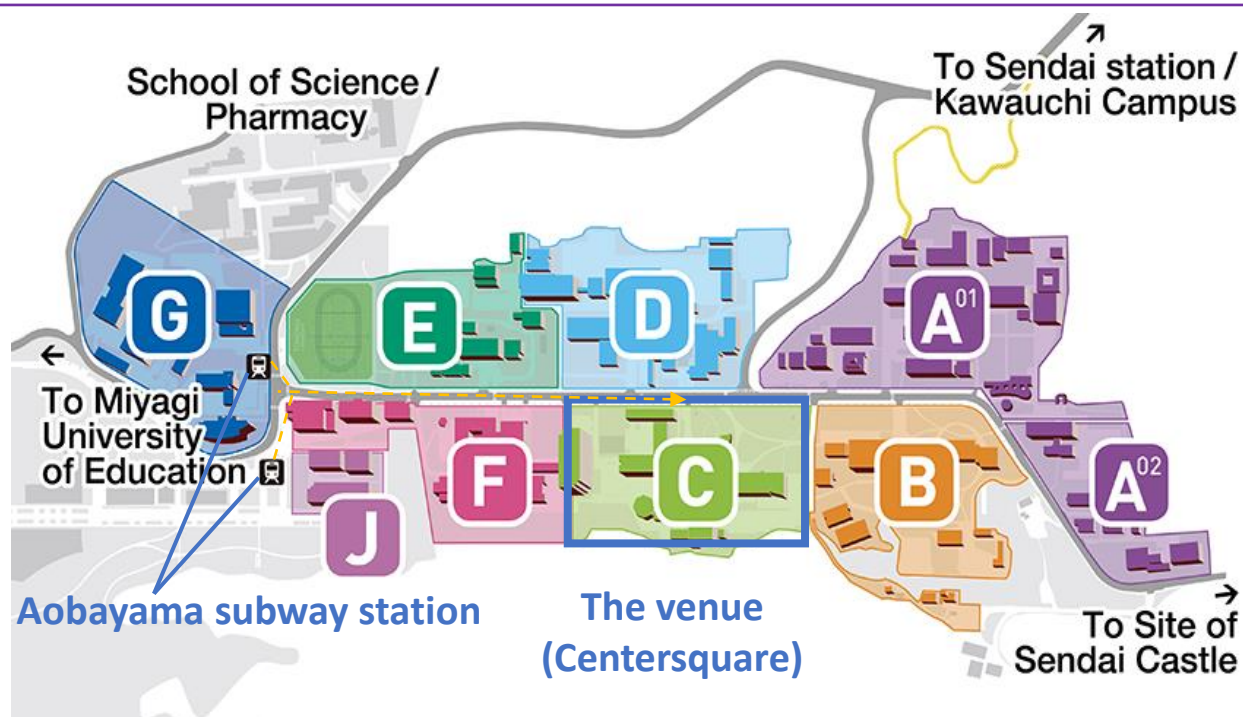
Thursday, Oct.24, 2024						Wednesday, Oct.23, 2024	
Time	Room 1	Room 2	Room 3	Room 4	Room 5	Time	
08:30-09:20	Registration 08:30-17:00 (Building C05, School of Engineering)					09:00   18:00        16:30   18:30   18:30   20:00	 <p><b>Technical Tour</b> (For detailed information, please visit ICPE2024 website.)</p>
09:20-09:40	OC	Room 2 will be used as the Satellite Room of OC & PS1 when Room 1 is over capacity.					
09:40-10:25	PS1						
10:25-10:55	Coffee Break (Building C01 1F)						
10:55-12:25	KS1	KS2	KS3	KS4	KS5		
12:30-13:50	Lunch (Building C01 1F Cafeteria & B02 2F Lunch Box)						
13:50-14:15	FS1	FS2	FS3	FS4	FS5		
14:15-14:40	Coffee Break (Building C01 1F)						
14:40-15:05	FS6	FS7	FS8	FS9	FS10		
15:05-15:35	Coffee Break (Building C01 1F)						
15:35-16:00	FS6	FS7	FS8	FS9	FS10		
16:00-16:25						Registration 16:30-20:00 (Hotel Metropolitan Sendai)	
16:25-16:50							
16:50-17:15							

OC: Opening Ceremony  
KS: Keynote Session  
OS: Organized Session

PS: Plenary Session  
FS: Feature Session  
GS: General Session

Friday, Oct.25, 2024										
Time	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6	Room 7	Room 8	Room 9	Room 10
08:30-09:10	Registration 08:30-17:00 (Building C05, School of Engineering)									
09:10-09:55	PS2	Room 2 will be used as the Satellite Room of PS2 & 3 when Room 1 is over capacity.								
09:55-10:40	PS3									
10:40-11:10	Coffee Break (Building C01 1F)									
11:10-11:30	OS20 (I)	OS21 (I)	GS06 (I)	GS15 (I)	OS15 (I)	OS12 (I)	OS06 (I)	OS02	OS05 (I)	OS19 (I)
11:30-11:50	Lunch (Building C01 1F Cafeteria & B02 2F Lunch Box)									
12:10-12:30	OS20 (II)	OS21 (II)	GS06 (II) OS10 (I)	GS15 (II)	OS15 (II)	OS12 (II)	OS06 (II)	GS07 (I)	OS05 (II)	OS19 (II)
12:30-13:50	Coffee Break (Building C01 1F)									
13:50-14:10	OS20 (III)	OS21 (III)	OS10 (II)	OS18	OS15 (III)	OS04	OS06 (III)	GS07 (II) OS09 (I)	GS17	OS19 (III)
14:10-14:30	Coffee Break (Building C01 1F)									
14:30-14:50	Coffee Break (Building C01 1F)									
14:50-15:10	Coffee Break (Building C01 1F)									
15:10-15:40	Coffee Break (Building C01 1F)									
15:40-16:00	Coffee Break (Building C01 1F)									
16:00-16:20	Coffee Break (Building C01 1F)									
16:20-16:40	Coffee Break (Building C01 1F)									
16:40-17:00	Coffee Break (Building C01 1F)									
17:00-17:20	Coffee Break (Building C01 1F)									
18:00-20:45	Banquet (Hotel Metropolitan Sendai)									

Saturday, Oct.26, 2024										
Time	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6	Room 7	Room 8	Room 9	Room 10
08:30-08:50	Registration 08:30-17:00 (Building C05, School of Engineering)									
08:50-09:10	GS11 (I)	OS01 (I)	OS03 (I)	OS05 (I)	OS15 (IV)	OS13 (I)	OS08 (I)	OS09 (II)	GS10 (I)	OS11 (I)
09:10-09:30	Coffee Break (Building C01 1F)									
09:30-09:50	GS11 (II)	OS01 (II)	OS03 (II)	OS05 (II)	OS15 (V)	OS13 (II)	OS08 (II)	OS09 (III)	GS10 (II)	OS11 (II)
09:50-10:10	Coffee Break (Building C01 1F)									
10:10-10:30	Coffee Break (Building C01 1F)									
10:30-11:00	Coffee Break (Building C01 1F)									
11:00-11:20	Coffee Break (Building C01 1F)									
11:20-11:40	Coffee Break (Building C01 1F)									
11:40-12:00	Coffee Break (Building C01 1F)									
12:00-12:20	Coffee Break (Building C01 1F)									
12:20-12:40	Coffee Break (Building C01 1F)									
12:40-13:50	Lunch (Building C01 1F Cafeteria & B02 2F Lunch Box)									
13:50-14:10	GS11 (III)	GS02 GS08	OS03 (III) OS23 (I)	OS05 (III)	OS15 (VI) OS14	OS17 (I)	OS08 (III)	OS09 (IV)	OS07 (I)	OS11 (III) GS13
14:10-14:30	Coffee Break (Building C01 1F)									
14:30-14:50	Coffee Break (Building C01 1F)									
14:50-15:10	Coffee Break (Building C01 1F)									
15:10-15:30	Coffee Break (Building C01 1F)									
15:30-16:30	Poster Session & Coffee Break (Building C01 1F)									
16:30-16:50	GS12	GS14	OS23 (II)	OS05 (IV)	GS03 GS05	OS17 (II)	OS08 (IV)	OS09 (V)	OS07 (II) OS22	OS16
16:50-17:10	Coffee Break (Building C01 1F)									
17:10-17:30	Coffee Break (Building C01 1F)									
17:30-17:50	Coffee Break (Building C01 1F)									
17:50-18:10	Coffee Break (Building C01 1F)									
18:10-19:30	Farewell Party (School of Engineering, Tohoku University)									



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# ICPE2024 in Numbers

**50** *Years from the first ICPE*

**657+** *Participants (half from outside of Japan)*

**26** *Countries/Regions*

**434** *Papers/Presentations*

**23** *Organized Sessions*

**16** *General Sessions*

**13** *Premium Sponsors*

**12** *Industrial Exhibitions*

# History of ICPE

ICPE1974	Tokyo	ICPE1976	Tokyo	ICPE1977	Kyoto
ICPE1980	Tokyo	ICPE1984	Tokyo	ICPE1987	Osaka
ICPE1994	Chiba	ICPE1997	Hokkaido	ICPE1999	Osaka
ICPE2001	Yokohama	ICPE2006	Tokyo	ICPE2008	Portland
ICPE2010	Singapore	ICPE2012	Hyogo	ICPE2014	Kanazawa
ICPE2016	Hamamatsu	ICPE2018	Kamakura	ICPE2020	Online
ICPE2022	Nara	ICPE2024	Sendai		

## Professor Norio Taniguchi

May 27, 1912-November 15, 1999

Coined the term "nano-technology" in 1974

European Society for Precision Engineering and Nanotechnology Lifetime Achievement Award

### Scientific career

Professor, Tokyo University of Science

[https://en.wikipedia.org/wiki/Norio\\_Taniguchi](https://en.wikipedia.org/wiki/Norio_Taniguchi)

## The 50th anniversary of birth of "Nano-technology"

Prof. Norio Taniguchi presented this paper of nanotechnology concept, for the first time in history, at the first ICPE conference of 1974 (ICPE1974, Tokyo) as: "nanotechnology mainly consists of the processing of separation, consolidation, and deformation of materials by one atom or one molecule"

[https://www.jspe.or.jp/wp\\_e/about\\_us\\_e/history/](https://www.jspe.or.jp/wp_e/about_us_e/history/)

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DNC and Automated Manufacturing System

Problems in Designing Integrated Manufacturing Systems for Batch Production  
C. de Beer (Netherlands)

Controlling of Automated Manufacturing Systems by Using an Expanded DNC-System  
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CAM Systems in Unmanned Factories  
K. Tegino (Japan)

**Nano-technology in Materials Processing (Ultra-fine Finishing)**

**On the Basic Concept of "Nano-technology"  
N. Taniguchi (Japan)**

The Limit of Accuracy of Machine Tools  
J.B. Bryan, E.G. Looewen (U.S.A.)

Elasto-Plastic Precision Machining as an Ultra-fine Finishing Method  
M. Y. Aketa (Japan)

Sensory Limits on the Measurement of Surfaces Using Stylus Techniques  
Whitehouse (U.K.)

Grinding Physics

Development of a Model of Grinding  
B. Doyle, L.E. Samuels (Australia)

Statistical Mechanism of Chip Formation in Grinding Process  
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Chip Generation Process in Grinding  
K. Okamura, T. Nakajima (Japan)

Environmental and Human Concerns in Manufacturing, with Special Consideration  
Computer-Automated Factory  
M.E. Merchant (U.S.A.)

Mechanical and Physical Behaviors of Material in Materials Processing  
Fracture Aspects of Metal Processing  
H. Miyamoto, S. Fukuda (Japan)

Processing to Achieve High Productivity and Controlled Mechanical Properties  
Machining  
J.P. Kahles, M. Field (U.S.A.)

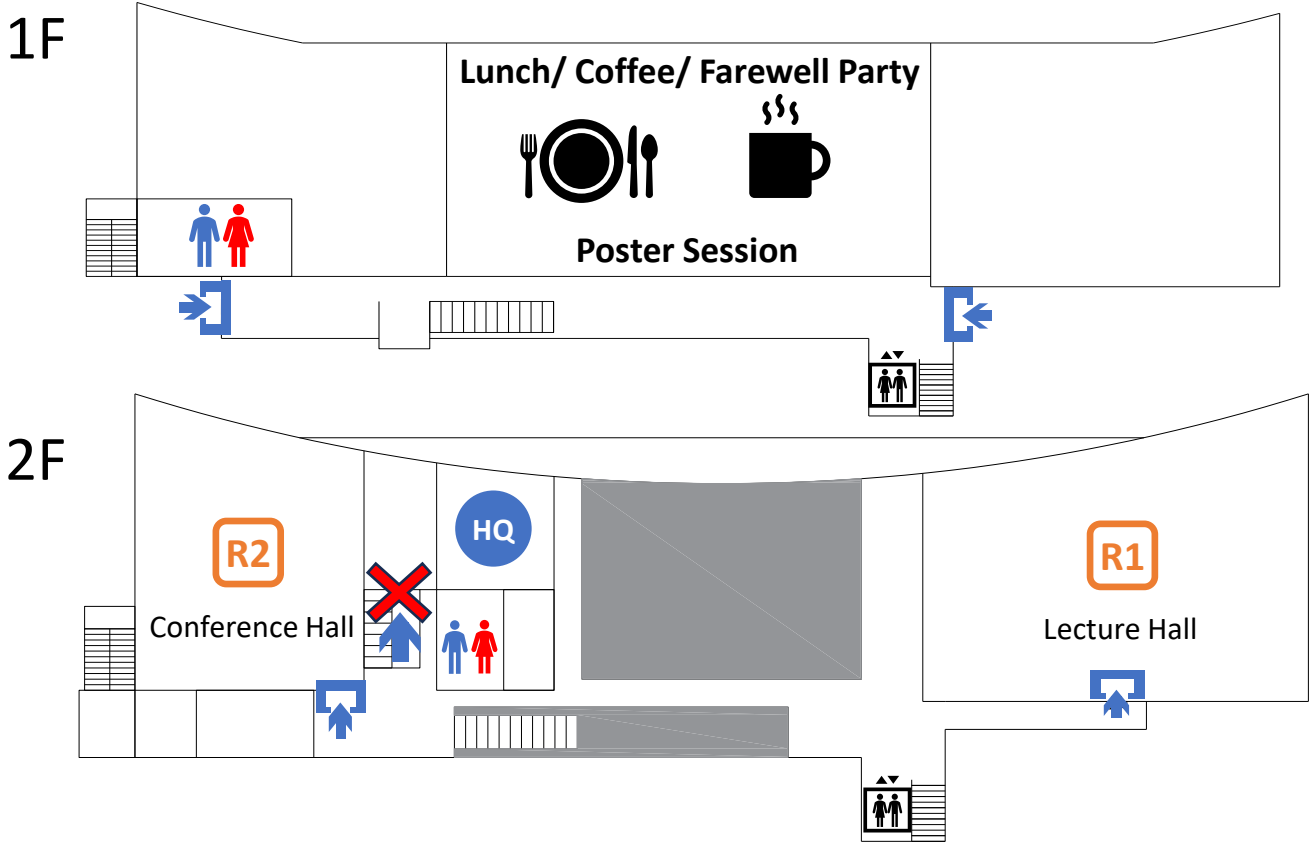
The Formation of the Surface Layer in the Conventional Machining Process and  
Reduction of Them  
K. Kishi, H. Eda (Japan)

Proceedings of  
The International Conference on  
Production Engineering  
**TOKYO 1974**  
(PART II)

SPONSORED  
BY  
THE JAPAN SOCIETY OF PRECISION ENGINEERING  
(J.S.P.E.)  
AND  
INTERNATIONAL INSTITUTION FOR PRODUCTION ENGINEERING RESEARCH  
(C.I.R.P.)

On the Basic Concept of "Nano-technology"  
N. Taniguchi (Japan)

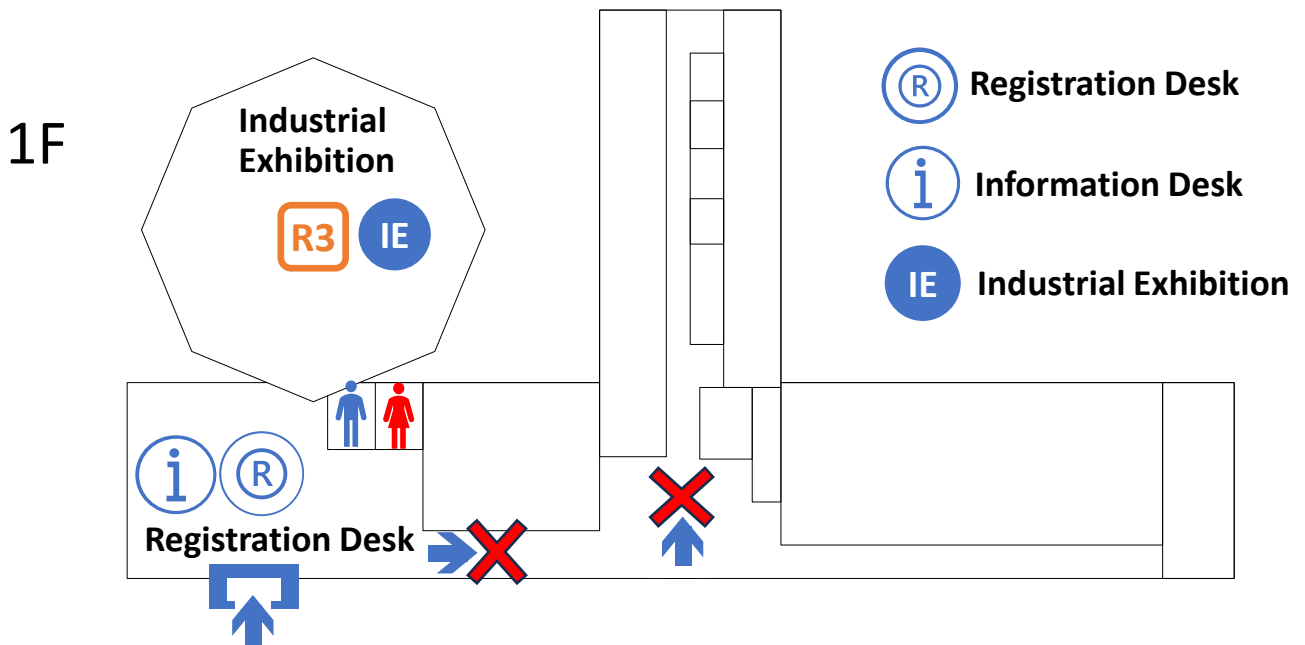
# Building C 01 School of Engineering Center Hall



**HQ** ICPE2024 Head Quarter (International Office)

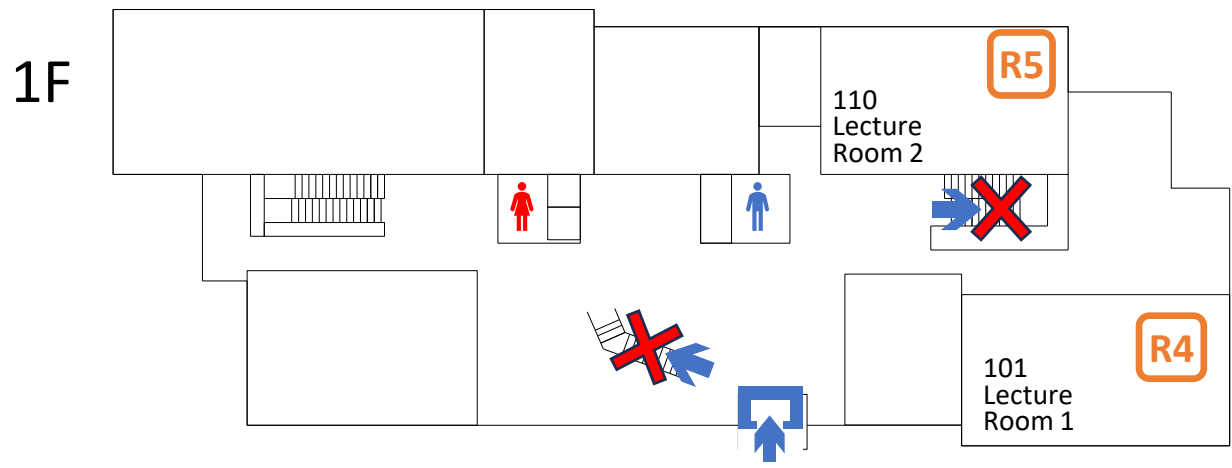
Room 2 will be used as the Satellite Room of Opening Ceremony and Plenary Sessions when Room 1 is over capacity.

# Building C 05 School of Engineering Administration Office

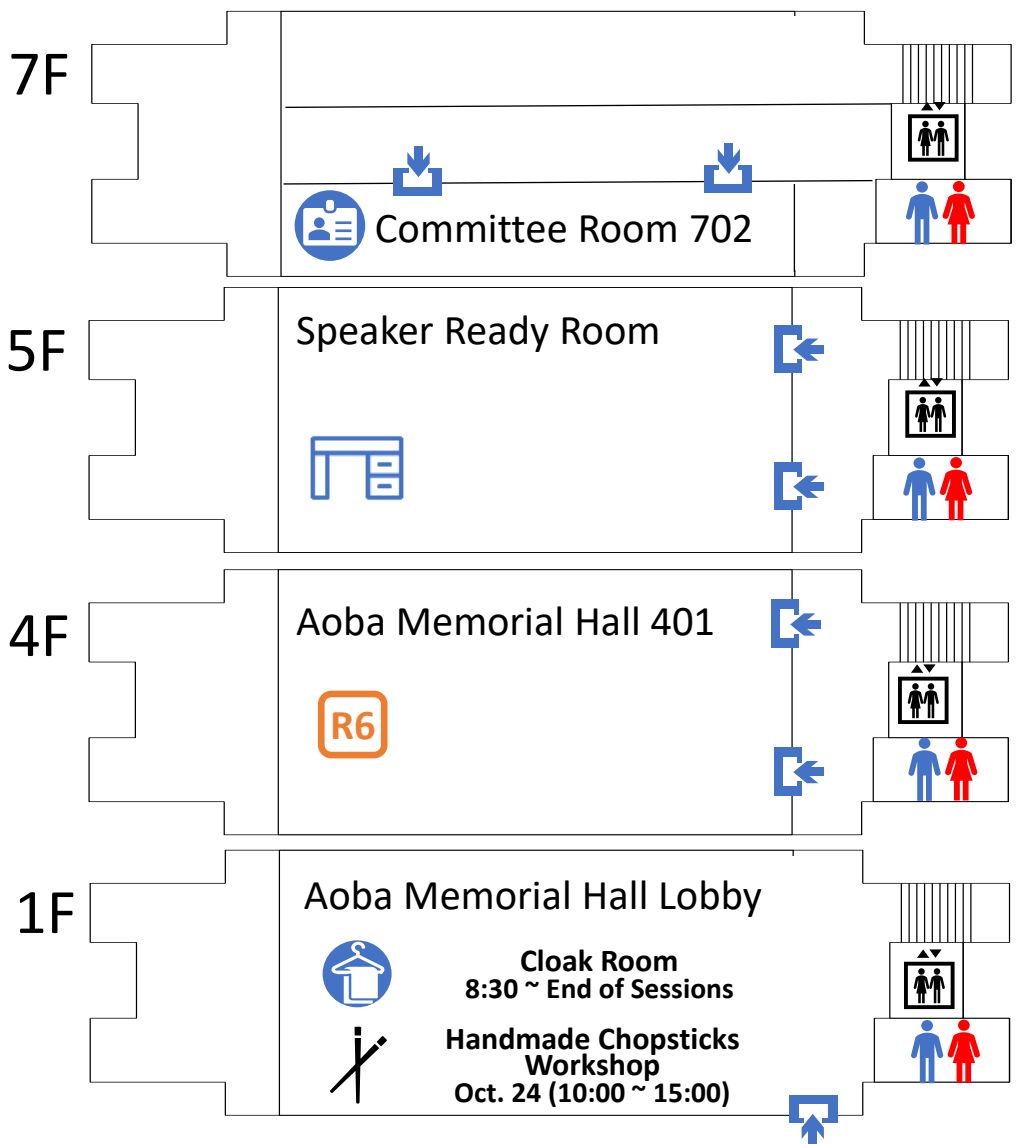


- (R)** Registration Desk
- (i)** Information Desk
- (IE)** Industrial Exhibition

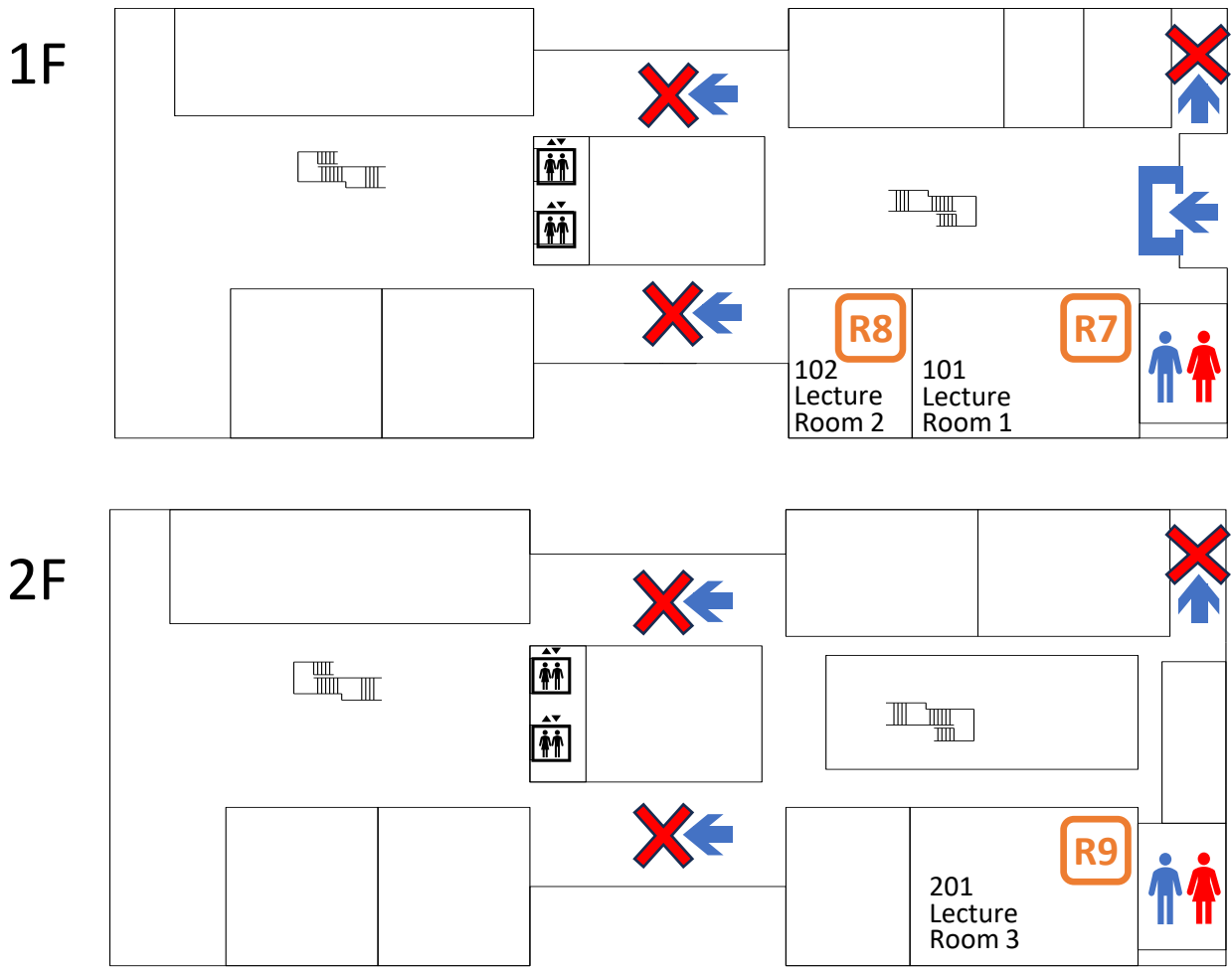
# Building C 10 Engineering Laboratory Complex Building



# Building C 03 Aoba Memorial Hall

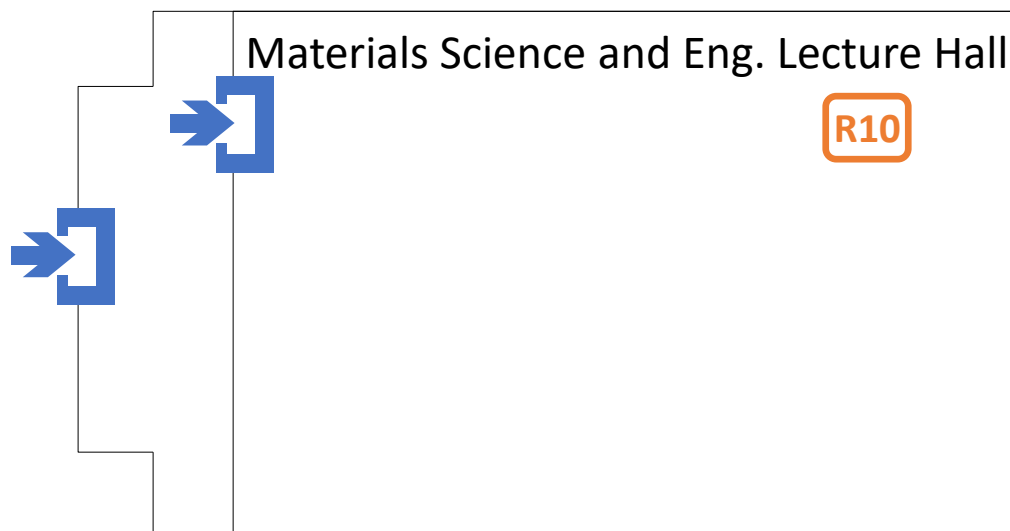


# Building B 01 Materials Science and Eng. Education and Research Building





## Building B 03 Materials Science and Eng. Lecture Hall



## Building B 02 Rutsubo Hall



2F: Rutsubo Hall 1-A 1-B 2-A 2-B

Bento (Lunch Box) Room (11:30 ~ 14:30)

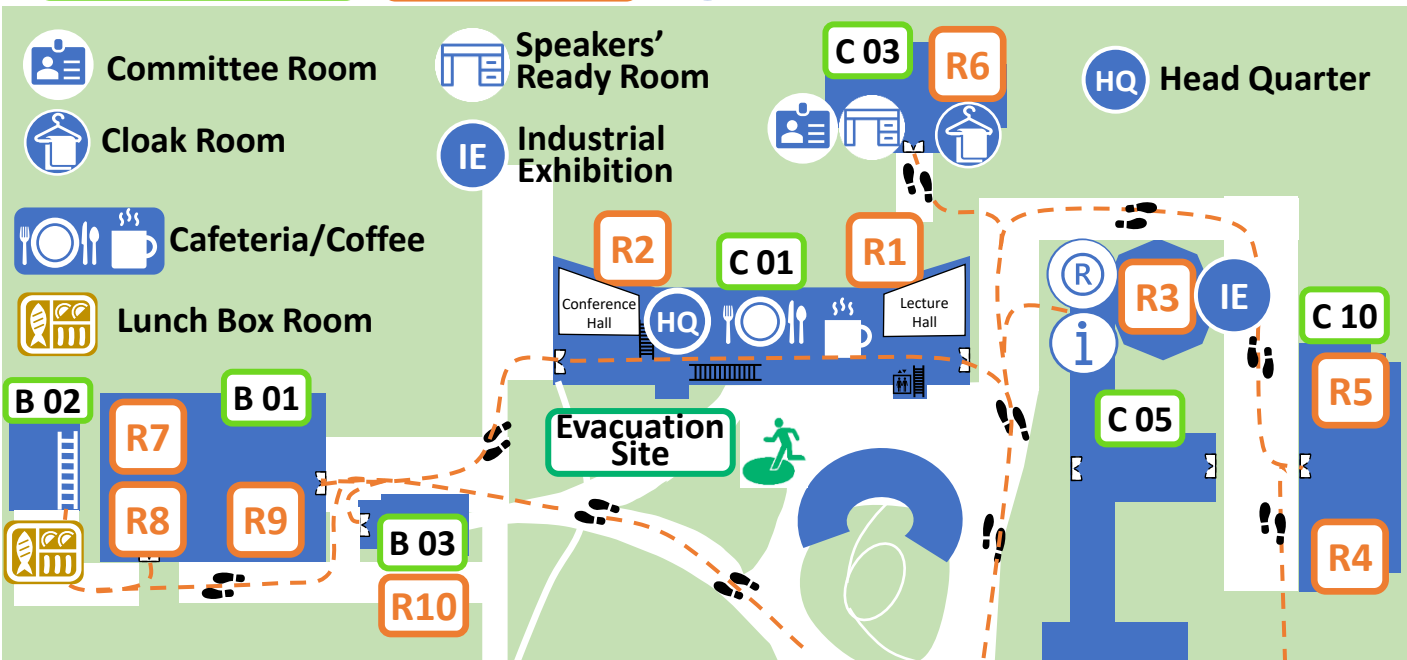
# Cafeteria / Lunch Box (Bento) Information

2024/10/24(Thu)	Lunch Voucher @Aoba dining (Cafeteria) 《2,000 JPY》 *The selection cannot be changed	<ul style="list-style-type: none"> <li>■ Date: 2024/10/24(Thu) by 2 p.m.</li> <li>■ How to use: Hand this voucher to the cashier.</li> <li>* Any excess must be paid in cash.</li> <li>* This voucher is non-refundable.</li> </ul>
ICPE2024	202410-561200 Tohoku Univ.COOP	
2024/10/25(Fri)	Lunch Voucher @Aoba dining (Cafeteria) 《2,000 JPY》 *The selection cannot be changed	<ul style="list-style-type: none"> <li>■ Date: 2024/10/25(Fri) by 2 p.m.</li> <li>■ How to use: Hand this voucher to the cashier.</li> <li>* Any excess must be paid in cash.</li> <li>* This voucher is non-refundable.</li> </ul>
ICPE2024	202410-561200 Tohoku Univ.COOP	
2024/10/26(Sat)	Lunch Voucher @Aoba dining (Cafeteria) 《2,000 JPY》 *The selection cannot be changed	<ul style="list-style-type: none"> <li>■ Date: 2024/10/26(Sat) by 2 p.m.</li> <li>■ How to use: Hand this voucher to the cashier.</li> <li>* Any excess must be paid in cash.</li> <li>* This voucher is non-refundable.</li> </ul>
ICPE2024	202410-561200 Tohoku Univ.COOP	



1. During the reception, attendees will receive a Lunch Ticket corresponding to the information registered by them in advance.
2. Attendees who have chosen the lunch box option can use their Lunch Ticket to collect a lunch box(bento) at building B02 2F but cannot use the voucher on the right side of the Lunch Ticket at the Cafeteria.
3. Attendees who have selected the Cafeteria option can use the voucher on the right side of the Lunch Ticket at building C01 1F to purchase a lunch worth up to 2000 JPY, but they will not be able to collect a lunch box.

**B,C: Building No.**    **R: Room No.**    Registration Desk    Information Desk



## Social Events

### • Welcome Reception

**Date:** Wednesday, 23 October  
**Time:** 18:30 - 20:00  
**Venue:** 4F Sendai Hall, Hotel Metropolitan Sendai  
**Address:** 1-1-1 Chuo, Aoba Ward, Sendai 980-8487  
**Tel:** 022-302-3373  
**Dress code:** Business casual

Catch up with colleagues and friends at this first networking opportunity at ICPE2024. A buffet-style meal will be provided.



Map to Hotel  
Metropolitan  
Sendai

### • Banquet

**Date:** Friday, 25 October  
**Time:** 18:00 – 20:45  
**Venue:** 4F Sendai Hall, Hotel Metropolitan Sendai  
**Dress code:** Semi-formal

Enjoy an elegant dinner, seated and served, along with special entertainment.



### • Farewell Party

**Date:** Saturday, 26 October  
**Time:** 18:10 – 19:30  
**Venue:** Building C01 1F  
**Dress code:** Semi-formal, Business casual

Savor the final night of ICPE2024 with old and new friends/ colleagues. A buffet-style meal will be provided.



Map to the Venue

## Technical/ Excursion Tours

- The Technical/ Excursion Tours are free of charge.
- The Technical/ Excursion Tours are fully support from the Japan Tourism Agency.

### Course information

#### Course ①: NanoTerasu campus/ Tohoku University and Akiu Sightseeing

Dates: October 22 (Day 1 Optional) - 23 (Day 2), 2024

Participants: 50 persons

Schedule:

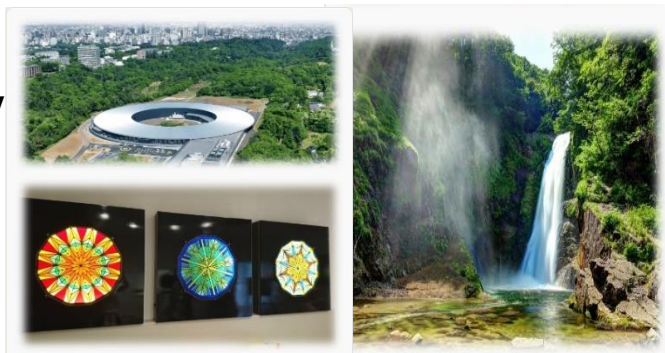
Day 1 (Optional): Accommodation at Metropolitan Sendai East, Comfort Hotel Sendai West, or ANA Holiday Inn Sendai (Accommodation subject to change)

Day 2:

- 09:00: Sendai Station
- 09:30-11:30: NanoTerasu campus/Tohoku University
- 12:00-13:00: Lunch (Gyutan)
- 13:40-14:50: Sendai Kaleidoscopes Art Museum
- 15:10-16:00: Akiu Great Falls
- 17:00: Section meeting at Sendai Station

Transportation: Bus

Meals: Lunch included



#### Course ②: NanoTerasu campus/ Tohoku University and Earthquake Ruins

Dates: October 22 (Day 1 Optional) - 23 (Day 2), 2024

Participants: 50 persons

Schedule:

Day 1 (Optional): Accommodation at Metropolitan Sendai East, Comfort Hotel Sendai West, or ANA Holiday Inn Sendai (Accommodation subject to change)

Day 2:

- 09:00: Sendai Station
- 09:40-11:00: Maple Pavilion
- 11:30-12:20: Sendai 3/11 Memorial Community Center
- 12:30-13:30: Lunch (Rokuchonome Farm)
- 13:50-14:50: Ruins of the Great East Japan Earthquake Sendai Arahama Elementary School
- 15:20-17:00: NanoTerasu campus/Tohoku University
- 17:20: Section meeting at Sendai Station

Transportation: Bus

Meals: Lunch included



## Course information

### Course ③: JAXA and Zao Sightseeing

**Dates:** October 22 (Day 1 Optional) - 23 (Day 2), 2024

**Participants:** 50 persons

**Schedule:**

Day 1 (Optional): Accommodation at Metropolitan Sendai East, Daiwa Roynet Hotel Sendai-nishiguchi PREMIER, or ANA Holiday Inn Sendai (Accommodation subject to change)

Day 2:

- 09:00: Sendai Station
- 10:00-11:15: **Kakuda Space Center**
- 11:45-12:45: Lunch (Denen)
- 14:00-15:00: **Okama Crater**
- 15:30-16:10: **Zao Kokeshi Museum**
- 17:00: Section meeting at Sendai Station

**Transportation:** Bus

**Meals:** Lunch included



### Course ④: Sake Brewery and Matsushima Sightseeing

**Dates:** October 22 (Day 1 Optional) - 23 (Day 2), 2024

**Participants:** 50 persons

**Schedule:**

Day 1 (Optional): Accommodation at Metropolitan Sendai East, Hotel Monte Hermana Sendai, or ANA Holiday Inn Sendai (Accommodation subject to change)

Day 2:

- 09:00: Sendai Station
- 10:20-11:10: **Sake Brewery Tour: Ichinokura**
- 11:40-12:40: Lunch (Matsushima Rikyu)
- 13:00: **Matsushima Coast**
- 13:50-16:00: **Matsushima Coast, Godaido Temple, Zuiganji Temple, Entsuin Temple**
- 17:00: Section meeting at Sendai Station

**Transportation:** Bus, Boat, On foot

**Meals:** Lunch included



## Plenary Chairs



**Prof. Fengzhou Fang**

Tianjin University  
University College Dublin  
Past President of CIRP



**Prof. Andreas Archenti**

KTH Royal Institute of Technology  
President of euspen

## Plenary Speakers



**Prof. Andreas Fischer**

University of Bremen  
PS1 Optical precision metrology for  
the production of microstructures



**Prof. Daewook Kim**

University of Arizona  
PS2 Extreme optical engineering for  
giant telescopes



**Prof. Anthony Beaucamp**

Keio University  
PS3 AI in Precision Engineering:  
Recent Trends and Challenges

## Keynote Speakers



**Prof. Bernhard  
Karpuschewski**

University of Bremen  
KS1-1 Application of coarse-  
grained grinding wheels for  
precision grinding of glassy carbon



**Prof. Hitomi Yamaguchi**

University of Florida  
KS1-2 Polishing of Hardened Steel  
Components using Magnetic  
Abrasive Finishing



**Prof. Erhan Budak**

Sabanci University  
KS1-3 Experimentally backed  
simulation of textured CBN  
grinding wheels for enhanced  
performance



**Prof. Lihui Wang**

KTH Royal Institute of Technology  
KS2-1 Latest Advancement on  
Human-Robot Collaboration in  
Manufacturing

## Keynote Speakers



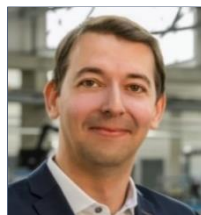
**Prof. Xichun Luo**  
University of Strathclyde  
KS2-2 Digital twin-driven ultra  
precision manufacturing system



**Prof. Samanta Piano**  
University of Nottingham  
KS2-3 Enhancing in-process  
monitoring of additive manufacturing  
through virtual fringe-projection  
simulations



**Prof. Robert Gao**  
Case Western Reserve University  
KS3-1 Deformation prediction in  
English wheeling through physics-  
informed machine learning



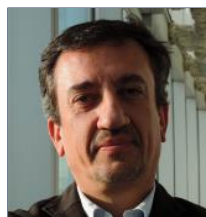
**Dr. Daniel Meyer**  
IWT Bremen  
KS3-2 Precision in Microtexturing: A  
Machine Learning Approach to  
Optimize Surface Parameters and  
Milling Techniques for Enhanced  
Topography



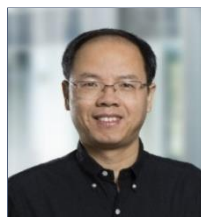
**Prof. Jean-Marc Linares**  
Aix-Marseille University  
KS3-3 How can nature help us find  
mechanical solutions: Sustainable,  
resilient and frugal



**Prof. José A. Yagüe-Fabra**  
University of Zaragoza  
KS4-1 Influence of relative intensity in  
metal-polymer assembly evaluation  
by X-ray computed tomography



**Prof. Giovanni Moroni**  
Politecnico di Milano  
KS4-2 Comparative analysis of  
surface determination techniques  
in coordinate metrology with X-ray  
computed tomography



**Dr. Gaoliang Dai**  
Physikalisch-Technische  
Bundesanstalt  
KS4-3 Top-down and bottom-up  
traceability approaches for applied  
nanodimensional metrology



**Prof. Enrico Savio**  
University of Padua  
KS5-1 Integrated metrology in  
manufacturing: connecting digital  
twins and applications in metal  
forming



**Prof. Benny C.F. Cheung**  
The Hong Kong Polytechnic  
University  
KS5-2 Advances in Autostereoscopic  
Freeform Surface Metrology



**Dr. Jaspreet S. Dhupia**  
The University of Auckland  
KS5-3 Modelling and control of the  
occlusal force for simulating  
voluntary chewing by a robot

## Feature Speakers



### [Dr. Thomas Liebrich](#)

RhySearch  
FS1-1 Laser machining of optical elements



### [Dr. Reina Yoshizaki](#)

The University of Tokyo  
FS1-2 Formation mechanism of Optical Waveguide in  $\alpha$ -Quartz by Ultrashort Pulse Laser



### [Dr. Chieko Kuji](#)

Tohoku University  
FS1-3 Notch effect in blanking of local heating with ultrashort pulsed laser for Fe-based amorphous alloys and its influence on soft magnetic properties



### [Dr. Jufan Zhang](#)

University College Dublin  
FS2-1 Atomic and Close-to-atomic Scale Manufacturing of Large-scale Solid-state Nanopore Array



### [Prof. Zhiyu Zhang](#)

Changchun Institute of Optics, Fine Mechanics and Physics  
FS2-2 Fabrication of membrane optics by diamond turning combined with spin molding



### [Prof. Hao Wang](#)

National University of Singapore  
FS2-3 Development of Augmented Ultraprecision Machining Technology



### [Prof. Burak Sencer](#)

Oregon State University  
FS3-1 Accurate prediction of 5-axis machining cycle times with machine learning



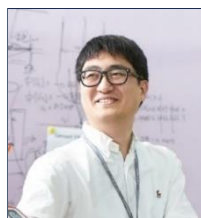
### [Prof. Peng Wang](#)

Case Western Reserve University  
FS3-2 Efficient and Generalizable Machine Learning for Inline Defect Detection in Battery Laser Welding



### [Prof. Xi \(Vincent\) Wang](#)

KTH Royal Institute of Technology  
FS3-3 Design of an RFID-based part identification approach: a case study in an automotive manufacturing plant



### [Dr. Jonghan Jin](#)

Korea National University of Science and Technology  
FS4-1 Multi-wavelength interferometer for measuring absolute distances using numerous frequency modes of the electro-optic comb



### [Prof. Xin Xiong](#)

Chongqing University of Technology  
FS4-2 Research on conjugate differential interferometric self-calibration method for large-scale planar variable-line-spacing gratings



### [Dr. Giacomo Maculotti](#)

Politecnico di Torino  
FS4-3 Towards Nanoindentation Metrological Digital Twin: traceable automated procedure for out-of-control measurements identification



## Feature Speakers



### **Dr. Supat leamsupapong**

King Mongkut's University of  
Technology North Bangkok  
**FS5-1** Role of surface finish on  
corrosion properties of dissimilar  
welding of stainless steels



### **Dr. Peerapong Kasuriya**

King Mongkut's University of  
Technology Thonburi  
**FS5-2** Investigation of surface  
characteristics of mirror-finished  
surfaces using polycrystalline  
sintered diamond ball end mill



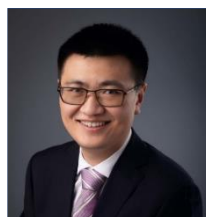
### **Dr. Chunjin Wang**

The Hong Kong Polytechnic  
University  
**FS5-3** Fluid jet polishing of  
functional structured surfaces



### **Dr. Atsushi Ezura**

Sanjo City University  
**FS6-1** Laser-induced Wet Surface  
Treatment using Aluminum Nitrate  
Aqueous Solution for Improvement of  
Wear Resistance of Titanium Alloy



### **Dr. Yunlong Tang**

Monash University  
**FS6-2** Additive Manufacturing of  
Multi-Scale Porous Gyroid Infill  
Structures with Tailored Hardness



### **Mr. Julien Diperi**

Aix-Marseille University  
**FS6-3** How does additive  
manufacturing combine with bio-  
inspiration for design innovation?



### **Dr. Fatma Nur Depboylu**

University of Southern Denmark  
**FS6-4** A new porous biomedical  
implant production process  
development for Laser Powder  
Bed Fusion (L-PBF) Technology



### **Prof. Chao-Ching Ho**

National Taipei University of  
Technology  
**FS7-1** Enhancing Dataset Variability  
in Semiconductor Manufacturing  
through Domain Adaptation and  
Advanced Simulation Techniques



### **Dr. Rachele Bertolini**

University of Padova  
**FS7-2** Enhanced Formability and  
Martensite Transformation in AISI  
316 Stainless Steel at Sub-Zero  
Temperatures



### **Prof. Sangkee Min**

University of Wisconsin-Madison  
**FS7-3** Investigating the effects of  
crystallography on subsurface  
damage during ultra-precision  
machining of sapphire



### **Dr. Zekai Murat Kilic**

The University of Manchester  
**FS7-4** Analytical cutting force  
prediction of axial ultrasonic  
vibrations-assisted milling of  
difficult-to-cut materials



### **Prof. Koji Iwamura**

Osaka Metropolitan University  
**FS8-1** Verification of Effectiveness of  
Demand Forecast for Plant Factories

## Feature Speakers



### [Dr. Ralf D. Geckeler](#)

Physikalisch-Technische  
Bundesanstalt  
FS8-2 State of the art and novel  
approaches in angle metrology at  
the Physikalisch-Technische Bun-  
desanstalt



### [Prof. Feng Gao](#)

University of Huddersfield  
FS8-3 Error analysis for near optical  
coaxial phase measuring  
deflectometry with refraction error  
model



### [Prof. Ryo Sato](#)

Tohoku University  
FS8-4 Second harmonic confocal  
probe with a mode-locked  
femtosecond laser



### [Dr. Ankit Kumar](#)

IIT Bombay  
FS9-1 Enhancing Wear Resistance of  
IN 625 Alloy Through Parameter  
Optimization in Wire Arc Additive  
Manufacturing



### [Dr. Osamu Sato](#)

National Institute of Advanced  
Industrial Science and Technology  
FS9-2 Optimization of multiple-  
orientation dimensional  
measurement on X-ray CT



### [Prof. Charyar Mehdi-Souzani](#)

Université Paris-Saclay USPN  
FS9-3 Aggregation-value-based  
active sampling method for multi-  
sensor freeform surfaces  
measurement and reconstruction



### [Dr. Yindi Cai](#)

Dalian University of Technology  
FS9-4 Volumetric error modeling  
and compensation for nine-axis  
and five-linkage turn-milling  
compound machine tool



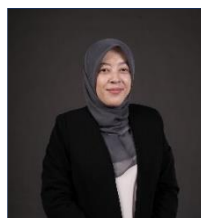
### [Dr. Xiaohua Liu](#)

The Chinese University of Hong Kong  
FS10-1 Sol Gel Glass Micro and  
Metasurface Fabrication



### [Prof. Masanori Kunieda](#)

National Institution for Academic  
Degrees and Quality  
Enhancement of Higher Education  
FS10-2 Measurement of discharge  
reaction force acting on wire  
electrode in wire electrical  
discharge machining



### [Dr. Wijayanti Dwi Astuti](#)

Universitas Gadjah Mada  
FS10-3 Theoretical Inquiry of Type II  
SHG Phase Matching Angle of LBO  
Crystal for Small Angle Detection



### [Dr. Kefei Wen](#)

The University of British Columbia  
FS10-4 Kinematically Redundant  
(6+3)-DOF Hybrid Parallel Robots  
with Very Large Rotational  
Workspace

## Instruction for Oral Presentation

The 20th International Conference on Precision Engineering (ICPE2024) in Sendai

### [Presentation/ Discussion time]

Plenary paper: 40 min / 5 min.

Keynote paper: 25 min / 5 min.

Feature paper: 20 min / 5 min.

Ordinary paper: 15 min / 5 min.

During the 20 minutes (15+5) of an ordinary paper, there will be three time reminders of bell ring. The first bell will ring at 12 minutes, the second at 14 minutes, and the third at 19 minutes. After the third bell, please finish the answer within 1 minute and proceed to the next presentation.

### [Slide format]

Please make your presentation slides using Microsoft PowerPoint. No official slide template is provided in ICPE2024.

### [PC and file upload]

It is recommended that presenters bring their own laptops for presentation to prevent the spread of computer viruses. Please check the connection and your presentation-slides during a break with the help of conference staffs. You can also use the public laptop PC with Windows OS equipped in each session room. In that case, please upload your PowerPoint presentation file to the PC by your USB memory before your session begins.

## Instruction for Poster Presentation

The 20th International Conference on Precision Engineering (ICPE2024) in Sendai

### [Date & Time & Place]

Display time: Oct. 26th, 15:30-16:30 JST, at Building C01 1F&2F

Setup time: Oct. 26th, 9:00 - 15:30 JST

Removal time: Oct. 26th, 16:30-17:00 JST

### [Poster preparation]

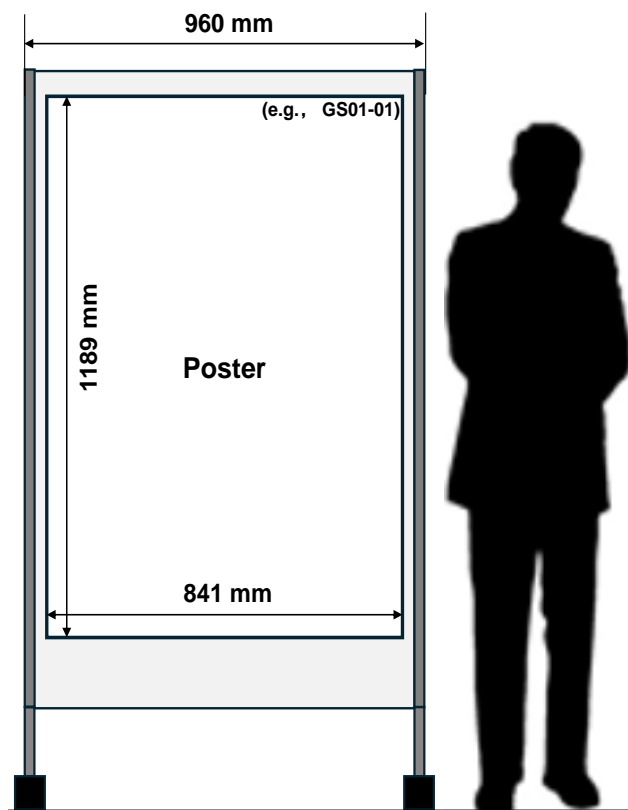
An A0 size poster is recommended to fit the size of the exhibition panel. No official template for the design of the poster as well as the font format and size. However, please write your Reference No. (80 pt bold for A0 size poster) in the top right corner of the poster. Please print and bring posters with yourselves.

### [Posting of posters]

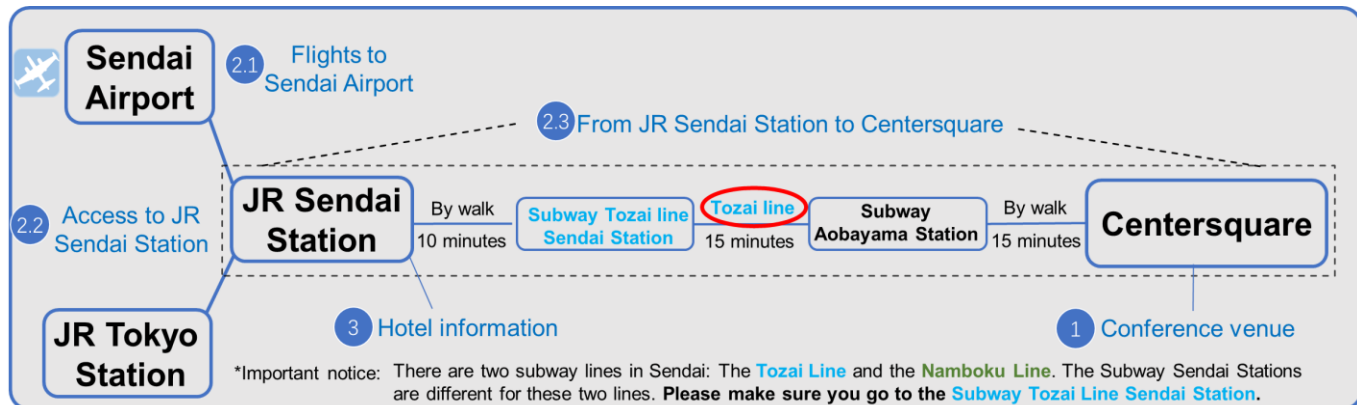
Authors are expected to stand by their posters during the session to answer questions and engage with attendees. Please do not leave your poster place during the session time.

### [Awarding]

A Best Poster Award of ICPE2024 will be selected based on the poster quality among those who submitted a full paper.

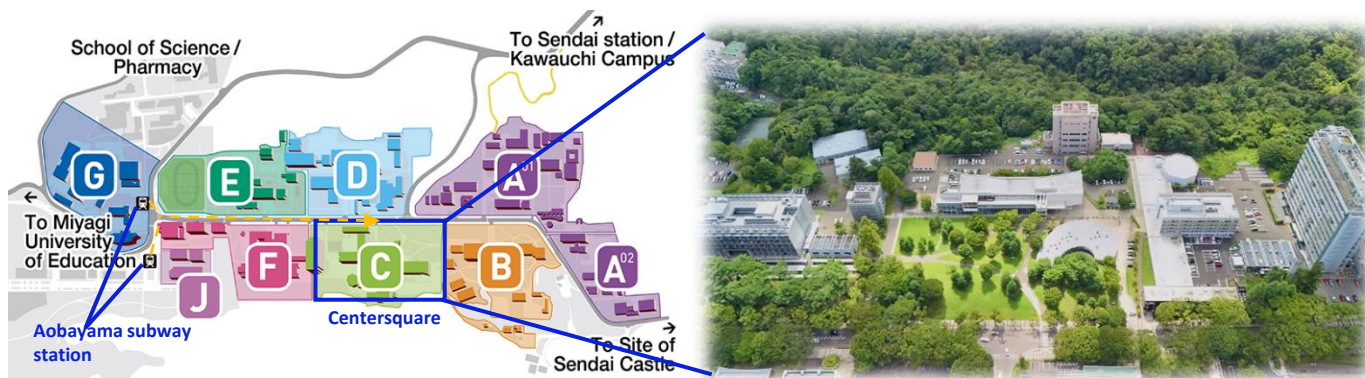


# Conference Venue



## 1 Conference Venue

### Centersquare, School of Engineering, Tohoku University



### Tohoku University Aobayama Campus Map

School of Engineering, Tohoku University is located in Aobayama Campus, a few kilometers west of the center of Sendai city with direct subway-connection to the city center. Aobayama Campus aims for an "Environmental-Harmony-Campus" and considers the preservation of natural environments in Aobayama.

>> [Tohoku University](https://www.tohoku.ac.jp/)

>> [School of Engineering, Tohoku University](https://www.tohoku.ac.jp/eng/department-of-engineering/)

# Access to Sendai

## 2.1 Flights to Sendai Airport

### International Flights to Sendai



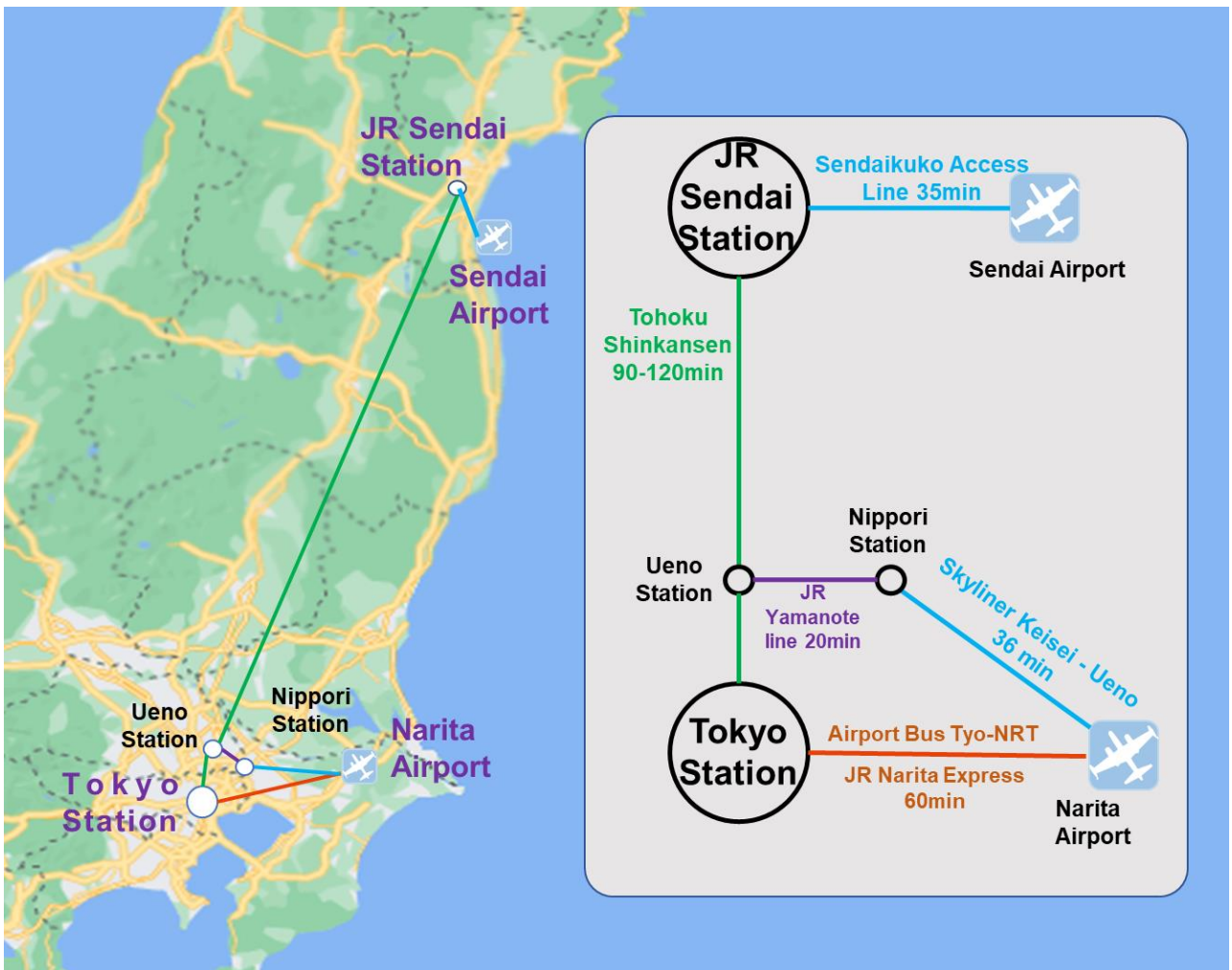
International Airline Information Table	
<b>Shanghai (Shanghai Pudong Airport) PVG → Sendai (Sendai International Airport) SDJ</b>	
Air China	2 weekly flights (Every Tuesday and Saturday)
<b>Dalian (Dalian Zhoushuizi International Airport) DLC → Sendai (Sendai International Airport) SDJ</b>	
Air China	2 weekly flights (Every Monday and Friday)
<b>Seoul (Incheon Airport) ICN → Sendai (Sendai International Airport) SDJ</b>	
Asiana Airlines	1 daily flight
<b>Taipei (Taipei Taoyuan Airport) TPE → Sendai (Sendai International Airport) SDJ</b>	
EVA Air	1 daily flight
Tigerair Taiwan	3 weekly flights
Starlux Airlines	1 daily flight

### Domestic Flights to Sendai



Domestic Airline Information Table	
<b>Sapporo (New Chitose Airport) CTS → Sendai (Sendai International Airport) SDJ</b>	
JAL	5 daily flights
Peach Aviation	2 daily flights
ANA	9 daily flights
<b>Nagoya (Chubu Centrair International Airport) NGO → Sendai (Sendai International Airport) SDJ</b>	
Peach Aviation	1 daily flight
ANA	5 daily flights
<b>Osaka (Kansai International Airport) KIX → Sendai (Sendai International Airport) SDJ</b>	
Peach Aviation	3 daily flights
<b>Fukuoka (Fukuoka airport) FUK → Sendai (Sendai International Airport) SDJ</b>	
JAL	2 daily flights
ANA	5 daily flights

## 2.2 Access to JR Sendai Station



- From Sendai Airport to JR Sendai Station
  - You can take "Sendaikuko Access Line" to JR Sendai Station
  - Approximate time : 35 minutes
  - Fare : 660 Yen
  - >> [Sendai Airport](#)
- From Tokyo Airports (Narita/ Haneda) to JR Sendai Station
  - Plan 1: Take "[JR Narita Express](#)" to JR Tokyo Station, then take "Tohoku Shinkansen" to JR Sendai Station.
  - Plan 2: Take "[Airport Bus Tyo-NRT](#)" to JR Tokyo Station, then take "Tohoku Shinkansen" to JR Sendai Station.
  - Plan 3: Take "[Skyliner Keisei-Ueno](#)" to Nippori Station, then take "JR Yamanote Line" to Ueno Station, finally take "Tohoku Shinkansen" to JR Sendai Station.
- For more information, please refer to
  - >> [East Japan Railway Company](#)
  - >> [Narita Airport](#)
  - >> [Tokyo Haneda Airport](#)

## 2.3 How to purchase Shinkansen tickets?

### 1. Buy tickets at JR Stations:

There are many Shinkansen Trains connecting Tokyo and Sendai, and there is no worry about not being able to catch a train at Tokyo Station. You can buy a Shinkansen ticket from Tokyo to Sendai on the same day before boarding the Shinkansen at JR Tokyo Station from a JR ticket office or a JR ticket machine at Tokyo JR Station or any JR Station in Tokyo or the airports.

It is suggested to buy a ticket in a ticket office from an office staff member if you are not familiar with the train systems in Japan. You can also use a ticket machine that typically has an English menu. Please notice that not all machines are the same, as some only offer Shinkansen tickets, and others only offer seat reservations.

There are two types of Tohoku Shinkansen trains (Faster or Slower) you can take from Tokyo to Sendai:

Faster trains: "Hayabusa", "Hayate" or "Komachi" with only reserved seats, which takes approximately 1.5 hours from Tokyo to Sendai.

Slower trains: "Yamabiko" with both reserved and non-reserved seats, which takes approximately 2 hours or 2.5 hours from Tokyo to Sendai.

There is basically no limitation in the number for the non-reserved seats of the "Yamabiko" trains. You can board any of the Yamabiko trains for the non-reserved seats, although you need to purchase the ticket before boarding.

For more details, please check the following website: [Shinkansen tickets: How to buy and use.](#)

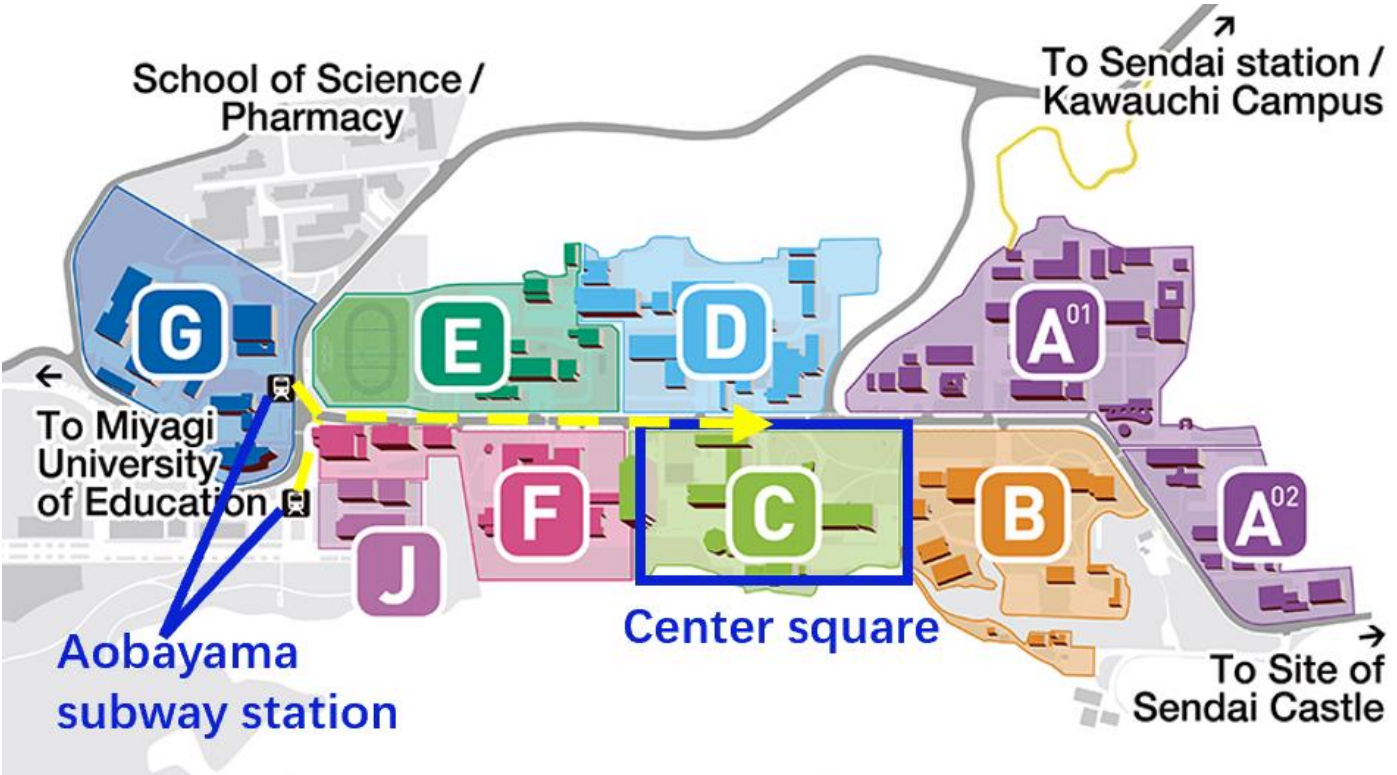
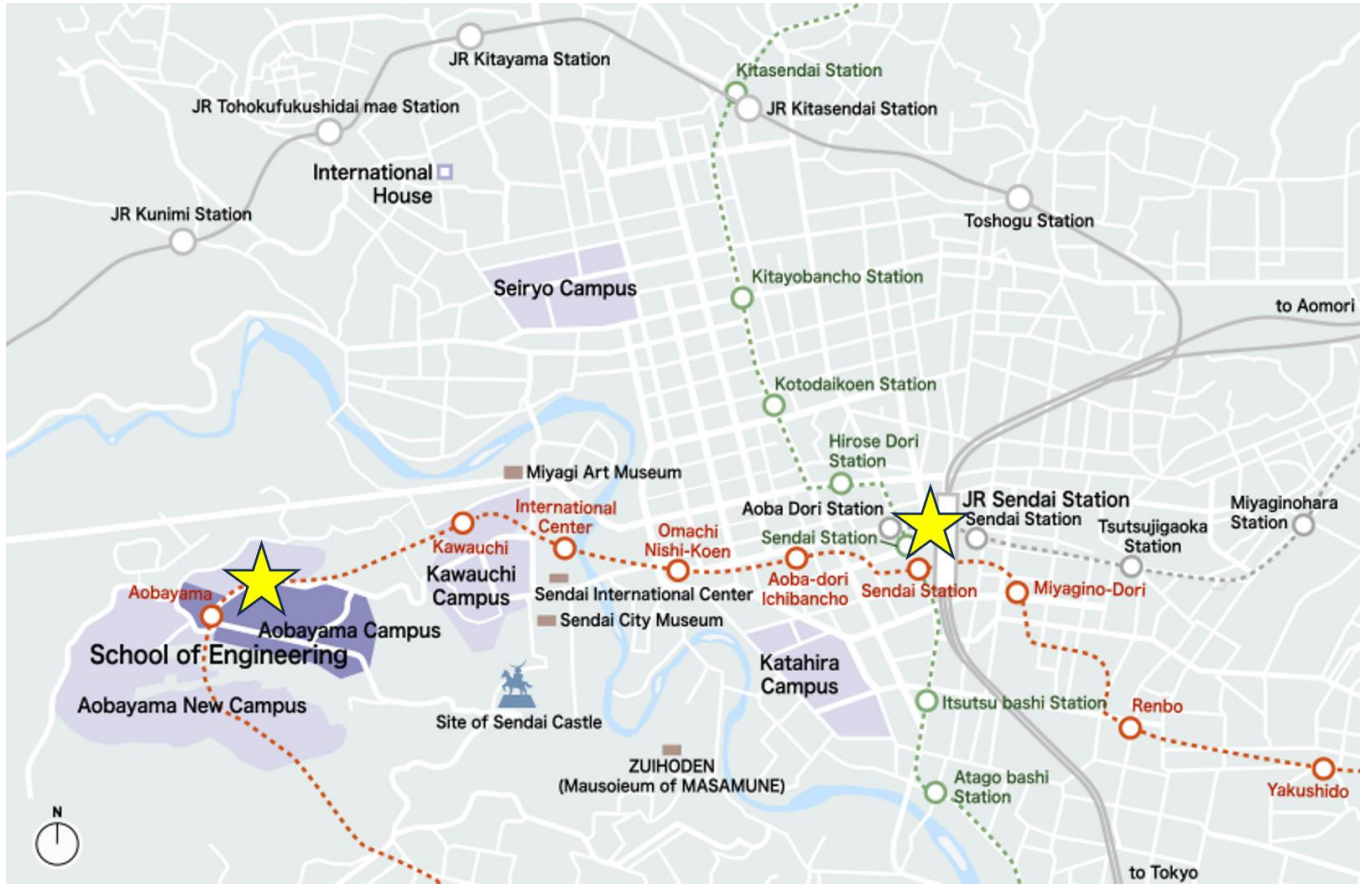


### 2. Buy tickets online:

The following is the website that allows you to purchase Shinkansen tickets before or on the day of boarding:

[JR-East Train Reservation](#)

## 2.4 Access to the Conference Venue (Access Map) (From JR Sendai Station to Centersquare: approximately 40 minutes)





## 2.4 Access to the Conference Venue (Subway information) (From JR Sendai Station to Centersquare: approximately 40 minutes)

• As an environment-friendly and a convenient means of transportation, public subway will be utilized in ICPE2024 for transportation. **A rechargeable IC card (icsca) will be provided at the Conference Registration for three round-trips of subway between Subway Sendai Station and Subway Aobayama Station (the Conference Venue).**

• Please take the **Subway Tozai Line** from **Subway Sendai Station** to **Subway Aobayama Station**. Please note that the JR/ Shinkansen platforms at JR Sendai Station and the subway platforms are **on different floors**. Please follow the following instruction to walk from the JR/ Shinkansen platform to the subway station to take the subway.

• Below are the specific directions for the route.



• Please note that before entering the ticket gates, you need to purchase a subway ticket or use a transportation IC card to pass the gates. The subway ticket vending machines are located to the right of the ticket gates.

• Please make sure you go to the **Subway Tozai Line Platform**.



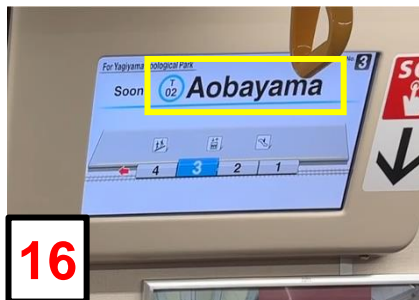
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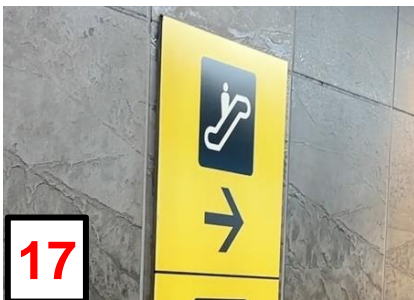
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23



24

• Take the subway in the direction of **Yagiyama Zoological Park** and get off at **Aobayama Station**. Then, follow the signs to exit from **South Exit 1** and proceed towards Centersquare according to the directional arrows.

• Walk from JR Sendai Station to Subway Sendai Station (Tozai Line) within the JR Sendai Station Complex

- Approximate time : 10 minutes

• Take Sendai subway Tozai Line bound to "Yagiyama Zoological Park" and get off at "Aobayama station"

- Approximate time : 15 minutes

- Fare : 250 Yen

• Walk from "Aobayama station" to Centersquare (the conference venue)

- Approximate time : 15 minutes

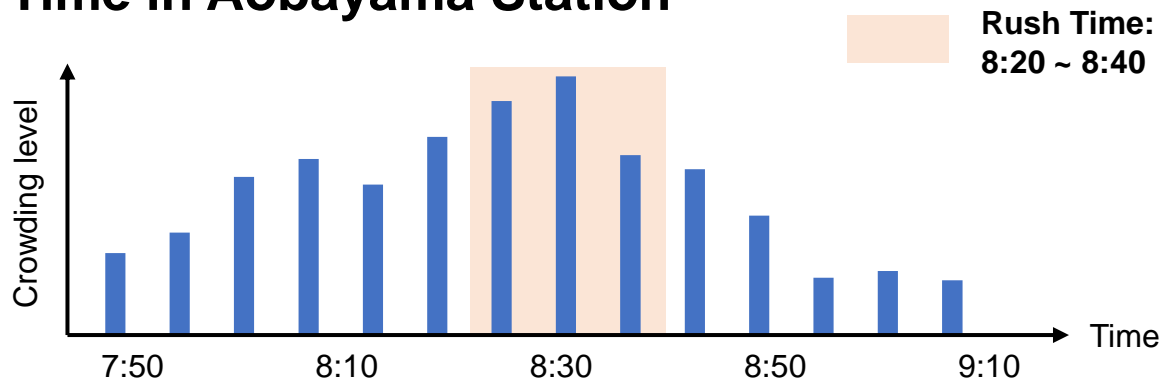
**Caution: No car parking spaces will be provided in the Conference Venue.**

# Timetable of Subway Tozai line

Sendai → Aobayama					
Weekday			Weekend		
5	49		5	49	
6	02 14 24 33 42 50 59		6	02 15 26 35 43 51 59	
7	06 14 21 27 33 38 43 48 53 59		7	07 15 23 31 39 47 55	
8	04 58 10 15 21 26 32 37 42 47 53		8	03 11 19 27 35 43 51 59	
9	04 09 15 23 31 39 47 55		9	07 15 23 31 39 47 55	
10	03 11 19 27 35 44 54		10	03 11 19 27 35 44 54	
11	04 14 24 34 44 54		11	04 14 24 34 44 54	
12	04 14 24 34 44 54		12	04 14 24 34 44 54	

Aobayama → Sendai					
Weekday			Weekend		
15	00 08 16 24 32 40 48 56		15	05 15 25 35 45 55	
16	04 12 20 28 36 43 49 55		16	05 15 25 35 45 55	
17	01 07 13 19 25 31 37 43 49 55		17	05 15 25 35 45 55	
18	01 07 13 19 25 31 37 43 49 55		18	05 15 25 35 45 55	
19	01 07 13 19 25 31 37 43 49 55		19	05 15 25 35 45 55	
20	01 07 13 19 27 35 43 51 59		20	05 15 25 35 45 55	
21	07 15 23 31 39 47 55		21	05 15 25 35 45 55	
22	03 11 19 27 35 43 55		22	05 15 25 35 45 55	

## Rush Time in Aobayama Station



# Weather & General information

## Weather

In Sendai, during late October, the weather tends to be cool and crisp, as autumn is in full swing. Based on historical weather data, the average temperature ranges between 10°C to 19°C in Sendai central region, with some days dipping slightly cooler, especially in the mornings and evenings. The temperature can be much lower in mountains, such as the Zao Mountain in the ICPE2024 Technical Tour Course ③.

## Clothing recommendation

- Layering is key: A long-sleeve shirt with a jacket would be good for daytime. Adding lightweight coat and/or light sweater would be good for mornings and evenings. Winter clothing would be necessary for mountains, such as the Zao mountain.
- Averagely **70%** of raining probability during the conference term (23-26, October), so it is strongly suggested to bring a small, packable **umbrella** or a waterproof jacket.

You can check the latest weather forecast on the Japan Meteorological Agency website: <http://www.jma.go.jp/jma/indexe.html>

## Security

Japan is known for its low crime rate, but it is always wise to be careful of one's personal belongings, especially in crowded areas.

## Drinking Water - Tap Water

Tap water is drinkable anywhere in Japan unless mentioned otherwise. Also, you can buy mineral water at convenience stores, supermarkets, and drink kiosks, etc.

## Currency Exchange

The official currency in Japan is the YEN(¥) and only the Yen is accepted when paying in cash. Currency exchange is available at designated foreign exchange banks.

## Credit Cards, Debit Cards, Travelers' Cheques and ATMs

Major credit cards such as VISA, MasterCard, JCB, Diners Club, and American Express are widely accepted in Japan. Most ATMs, particularly those in post offices and 7-Eleven convenience stores, accept major international credit cards. Please note: Some ATMs may not accept foreign cards, and foreign travelers are advised to exchange their currency in Japan before visiting rural or remote areas.

## Electricity

The local power supply is uniformly 100 volts. The frequency is 50Hz in Sendai (Eastern Japan). The type of power outlet/ connector is "Type A" which is a two parallel-pronged type.



## Consumption Tax

Consumption tax is 10%.

## Taxis

Taxi fares start at approximately JPY 1100 with additional costs depending on distance covered and time elapsed. Payment is made when you reach your destination and the exact fare is shown clearly on the meter, for transparency and assurance. Tipping is not necessary at any time when taking a taxi.

**Tipping** Tipping is not necessary in Japan.

## Smoking

Smoking is available only in the designated areas. Public transportation such as trains, buses and taxis are generally non-smoking. Most hotels have separated rooms, smoking or non-smoking.

## Liability

The Organizing Committees and/or Conference Organizers will not be held liable for personal accidents or losses or damage to private property of registered delegates to the Conference. Delegates should make their own arrangements as regards personal insurances.

## Emergency Calls

To Where	Phone Number
Police	110
Ambulance or Fire	119

# Evacuation information

In the event of a major earthquake during the conference, it is important to protect yourself and avoid injury. Please take the following actions to ensure your safety.

## Actions to Protect Yourself

### If you are in a lecture room:

- Protect your head with a bag or other items.
- Move to a safe place nearby, such as under a desk or in a hallway, to ensure your safety.
- If you are near a window, move away from it to avoid injury from shattered glass.
- Do not rush outside, as there is a risk of glass from the doors or exterior walls falling.

### If you are in a large classroom or conference room:

- Protect your head with clothing or belongings to avoid injury from falling light fixtures or ceiling materials.
- Move to areas near pillars, walls, or stair landings.

### If you are in an elevator:

- Press the button for the nearest floor or all floors, and exit on the floor where the elevator stops, using the stairs to evacuate.
- If you become trapped, use the intercom in the elevator to call for help.

### When you hear the Earthquake Early Warning (an alarm will be announced on campus if the estimated seismic intensity is 4 or higher):

- Assess the situation around you and move away from areas with a risk of falling or toppling objects.
- Protect your head with a bag, or other items, and remain still to ensure your safety.

## Evacuating to Outdoor Evacuation Area

Once the earthquake subsides, promptly evacuate the building and move to the designated outdoor evacuation area to ensure your safety.

### Points to note during evacuation:

- Debris, such as scattered objects and wall fragments, may be present in hallways and on stairs, so act calmly and do not run.
- Gather at the Evacuation Area (refer to the map).



# Hotel Information

Sendai is one of the most popular destinations of tourists in Japan. October is a high season in Sendai for tourists and events. **It is strongly suggested to book your hotel at your earliest convenience.** Basically, any of the hotels in the city center of Sendai (around the JR Sendai Station) would be convenient for a subway access to the Conference Venue. Any of the hotels in Sendai, from reasonable business hotels to luxury city hotels, is clean and safe. A list of hotels is provided in the following for your reference.

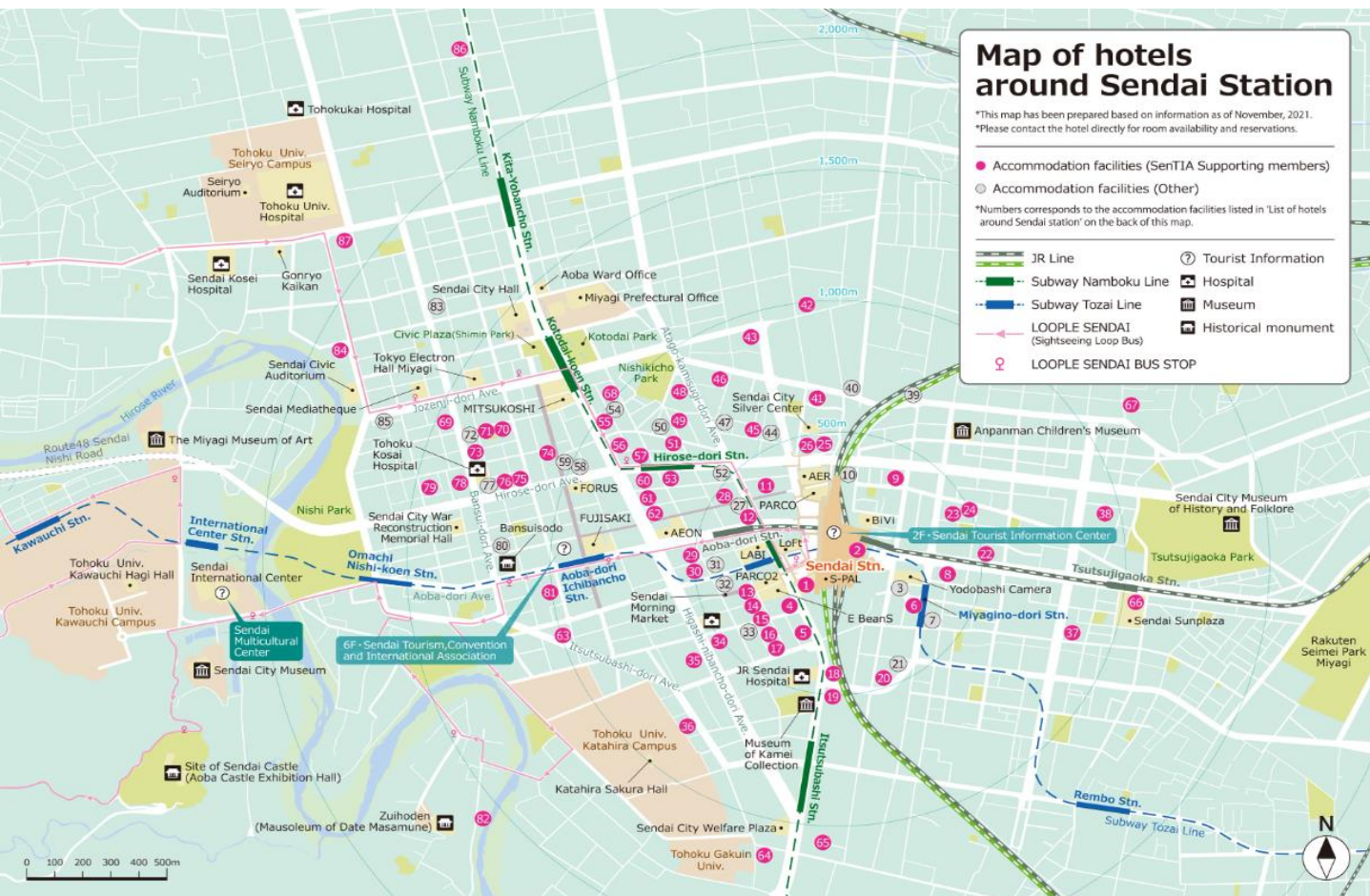
## Recommended Hotels

- **Hotel Metropolitan Sendai** (40 min. to the conference venue of Centersquare by subway and walk)
- **Hotel Metropolitan Sendai** is the main hotel for ICPE2024 Social Program (Reception on October 23 and Banquet on October 25)

< 0 min. walk from JR Sendai Station >  
(Within the JR Sendai Station Complex)

Hotel Metropolitan Sendai : <https://sendai.hotel-metropolitan.com/>  
Hotel Metropolitan Sendai East : <https://east-sendai.hotel-metropolitan.com/>

- **Hotel around JR Sendai Station:**



- **Hotel booking site:** [Expedia](https://www.expedia.com), [Booking.com](https://www.booking.com), [trivago](https://www.trivago.com)
- **Printed version of map and list of hotels :** [Printed version of map and list of hotels](#)

# Hotel Information

## List of Hotels:

### ● Within 500 meters radius from Sendai Stn.

No	Name	TEL	Rooms
1	HOTEL METROPOLITAN SENDAI	81-22-268-2525	295
2	HOTEL METROPOLITAN SENDAI EAST	81-22-302-3373	282
4	Hotel Monterey Sendai	81-22-265-7110	206
5	WASHINGTON HOTEL SENDAI	81-22-745-2222	223
6	HOTEL VISTA SENDAI	81-22-385-6222	238
8	SENDAI GARDEN PALACE	81-22-299-6211	66
9	Comfort Hotel Sendai East	81-22-792-8711	202
11	HOTEL Green Pacific	81-22-221-8888	92
12	Richmond Hotel Premier Sendai Ekimae	81-22-716-2855	183
13	HOTEL Green Well	81-22-216-6155	47
14	HOTEL UNISITE SENDAI	81-22-716-0123	144
15	HOTEL CENTRAL SENDAI	81-22-711-4111	97
16	SENDAI BUSINESS HOTEL STATION FRONT	81-22-262-3211	250
17	HOTEL Green Mark	81-22-224-1050	140
18	Toyoko Inn Sendai-eki Nishi-guchi Chuo	81-22-726-1045	286
19	APA Villa Hotel Sendai-Eki Itsutsubashi	0570-023-111	610
20	ANA Holiday Inn SENDAI	81-22-256-5111	165
22	Hotel Grand Bach Sendai	81-22-296-0660	151
23	Toyoko Inn Sendai Higashi-guchi No.1	81-22-256-1045	208
24	Toyoko Inn Sendai Higashi-guchi No.2	81-22-298-1045	120
25	HOTEL JAL CITY SENDAI	81-22-711-2580	238
26	Hotel Monte Hermana SENDAI	81-22-721-7501	275
28	HOTEL Premium Green PLUS	81-22-212-1255	117
29	HOTEL KEIHAN SENDAI	81-22-263-0321	201
30	ALMONT HOTEL SENDAI	81-22-212-6551	141
34	Sendai Kokusai Hotel	81-22-268-1111	234

### ● Within 1,000 meters radius from Sendai Stn.

No	Name	TEL	Rooms
35	The Westin Sendai	81-22-722-1234	292
36	Aisaki Ryokan (Inn)	81-22-264-0700	15
37			
38	Oka no Hotel	81-22-256-7311	35
41	Richmond Hotel Sendai	81-22-722-0055	344
42	HOTEL SHIRAHAGI	81-22-265-3411	28
43	SENDAI ROYAL MAYFLOWER	81-22-262-5411	182
45	Toyoko Inn Sendai Nishi-guchi Hirose-dori	81-22-721-1045	210
46	Daiichi Inn Park	81-22-213-0089	85
48	HOTEL HOKKE CLUB SENDAI		
	Scheduled to close on January 3, 2024		
49	HOTEL Green Selec	81-22-217-3117	77
51	R&B Hotel Sendai Hirose-dori Ekimae	81-22-726-1919	202
53	dormy inn EXPRESS Sendai Hirose-dori	81-22-715-7077	120
55			
56	Mitsui Garden Hotel Sendai	81-22-214-1131	224
57	KOYO GRAND HOTEL	81-22-267-5111	149
60	Super Hotel Sendai / Hirose-dori	81-22-224-9000	173
61	HOTEL Premium Green Hills	81-22-722-1501	118
62	HOTEL CROWN HILLS SENDAI AOBADORI	81-22-262-1355	154
63	Hotel Bel Air Sendai	81-22-217-8511	125

### ● Within 1,500 meters radius from Sendai Stn.

No	Name	TEL	Rooms
64	MORISHIGE RYOKAN	81-22-222-5373	15
65	Hostel KIKO	81-22-281-9788	40
66	SENDAI SUNPLAZA	81-22-257-3333	74
67	HOTEL Green Palace	81-22-256-2691	88
68	Business Hotel TAIYO	81-22-221-1955	78
69	HOTEL Green Park	81-22-265-6171	72
70	HOTEL Premium Green SOVEREIGN	81-22-227-2322	92
71	Capsule Hotel Leaves	81-22-261-8020	120
73	SAUNA & CAPSULE CURE KOKUBUNCHO	81-22-713-8526	186
74	Smile Hotel Sendai Kokubuncho	81-22-261-7711	202
75	Hotel Grand Terrace Sendai Kokubun-cho	81-22-262-7755	294
76	HOTEL Green With	81-22-261-3737	78
78	MORI NO HOTEL SENDAI	81-22-713-5888	77
79	HOTEL Green Arbor	81-22-213-8990	64
81	HOTEL PEARL CITY SENDAI	81-22-262-8711	166

### ● Within 2,000 meters radius from Sendai Stn.

No	Name	TEL	Rooms
82	Ryokan Otamaya	81-22-222-7892	20
84	HOTEL Green Line	81-22-217-8311	83

### ● Within 2,500 meters radius from Sendai Stn.

No	Name	TEL	Rooms
86	HOTEL Green City	81-22-219-2691	80
87	BANSUITEI IKOISO	81-22-222-7885	14

### [ Accommodation facilities (Other) ]

No	Name
3	Daiwa Roynet Hotel SENDAI
7	Tenza Hotel Sendai Station
10	APA Hotel TKP Sendai-Eki Kita
21	R&B Hotel Sendai Higashiguchi
27	TOPOS
31	Comfort Hotel Sendai West
32	LIBRARY HOTEL SENDAI-EKIMAE
33	HOTEL FOLIAGE SENDAI

No	Name
39	Hotel Palace Sendai
40	HOTEL PARK SENDAI II
44	dormy inn Sendai Ekimae
47	Ryokan Tukasa
50	HOTEL LIVEMAX Sendai Hirose-dori
52	dormy inn Sendai ANNEX
54	Sendai Capsule Hotel Honcho
58	Daiwa Roynet Hotel SENDAI-ICHIBANCHO
59	Henn na Hotel Sendai Kokubuncho

No	Name
72	HOTEL LIVEMAX Kokubuncho
77	9h nine hours Sendai
80	HOTEL LIVEMAX Sendai Aobadori
83	APA Hotel Sendai Kotodai Koen
85	Alpha Hotel in Jozenji

\* Please contact the hotel directly for room availability and reservations. \* This map has been prepared based on information as of November, 2021.

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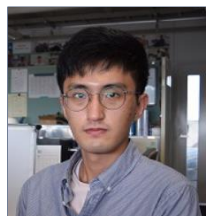
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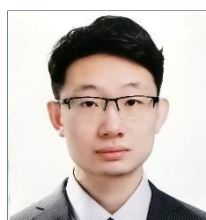
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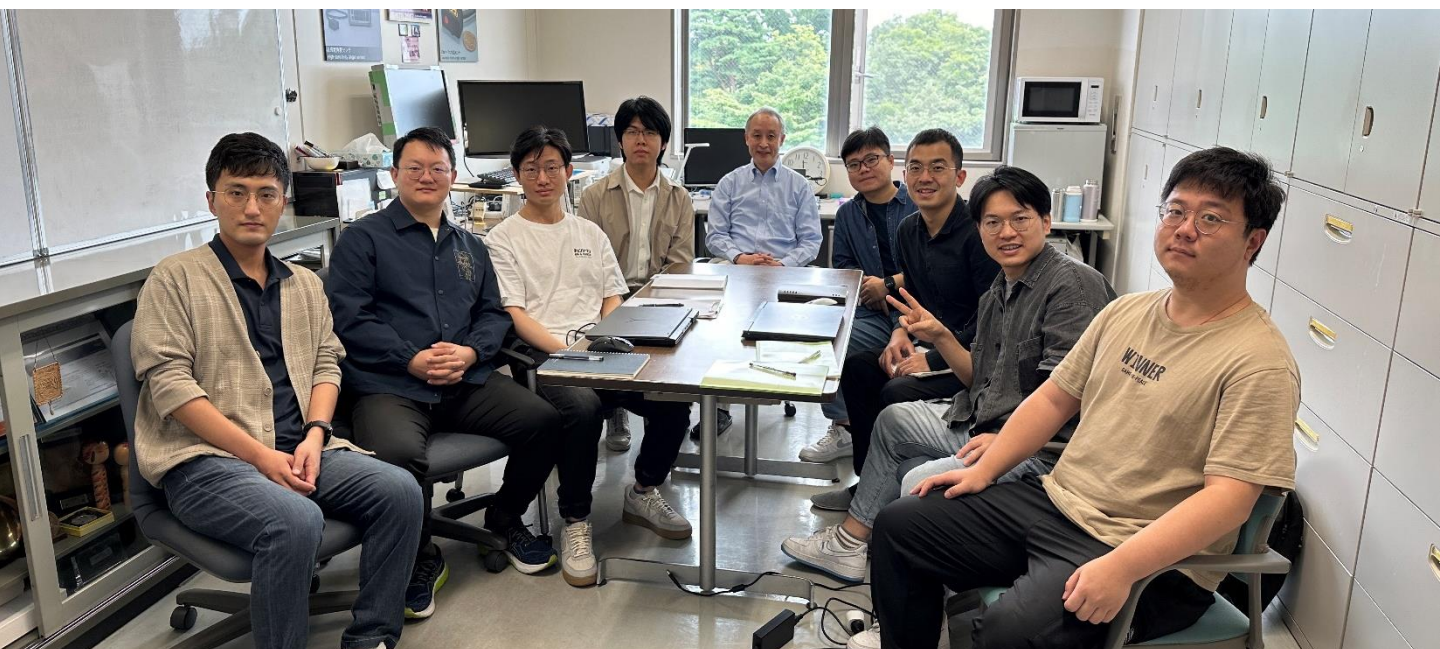
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# Message from the Conference Chair

Dear ICPE2024 Participants,

On behalf of the Conference Committee, I would like to warmly welcome you to ICPE2024 being held at School of Engineering, Tohoku University, Sendai, Japan, from 23 to 26 of October, 2024.

The ICPE conference is organized by The Japan Society for Precision Engineering (JSPE). It has been successfully held 19 times since the 1st ICPE at Tokyo in 1994 where Prof. Norio Taniguchi coined the term of "Nanotechnology". I would like to thank Prof. Masanori Kunieda and JSPE for providing us the opportunity to host this year's ICPE in Sendai, a city called "Mori no Miyako" which means "City of Trees" for the gorgeous nature within the city. The invaluable advices from Profs. Atsushi Matsubara and Daisuke Kono, the Co-Chair and Secretary of ICPE2022 are highly appreciated.

More than 657 participants from 26 countries and regions will be attending ICPE2024. Half of the participants are from outside of Japan. 434 papers will be presented in 23 Organized Sessions and 16 General Sessions. I would like to thank all the invited Plenary/Keynote/Future Speakers and all the authors of the papers in the technical sessions for coming across the world to share their state-of-the-art research work covering a wide range of Precision Engineering, all the session organizers for organizing the sessions and all the reviewers for reviewing the papers.

ICPE2024 is co-organized by the School of Engineering, Tohoku University. ICPE2024 would not be possible without the support from the School of Engineering. Special thanks to Prof. Hiroo Yugami (Previous Dean), and Prof. Akinori Ito (Dean), Prof. Izumi Muto (Chair of The Department of Metallurgy, Materials Science and Materials Processing), Prof. Hirokazu Moriya (Vice Director of International Office) and many others for their kind understanding and generous supports. Prof. Yugami, now the Vice-President of Tohoku University, also helped to arrange the Technical Tours.

The financial supports from the premium ICPE2024 Sponsors listed in the Information Book are highly appreciated. I would also like to thank the Industrial Exhibitors and the advertising companies for their contributions to ICPE2024. The ICPE2024 Technical Tours are financially supported by The Japan Tourism Agency, Ministry of Land, Infrastructure, Transport. The assistance from Mr. Tabata Kentaro, Mr. Akihiko Shimanuki, Mrs. Miki Hasekawa and JTB are also appreciated.

Finally, I would like to thank all the members of the Conference Committee for their great efforts. Special thanks go to Conference Co-Chairs, Prof. Yuki Shimizu who organized the Technical Tours, Prof. Masayoshi Mizutani and Prof. Toshiyuki Takatsuji who organized the Industrial Exhibition, Sub Committee Chairs; Prof. Yasuhiro Mizutani, Prof. Masaki Michihata Prof. Ito So, Dr. Satoru Maruyama and Dr. Makoto Abe who took excellent leadership in each of the committees, Prof. Xin Xiong who did an excellent work for the arrangement of the participants from China, the largest group from outside of Japan. The most appreciation goes to the ICPE2024 Secretary Team, which is composed of my 8 talented Ph.D students and my assistant professor Ryo Sato. They have been working very hard with me for the preparation of ICPE2024 over the last one year and half.

ICPE2024 is a truly hand-made conference. It would be far from perfect and I would like to beg your forgiveness for the problems and issues occurring before and during the conference. Any suggestions and comments would be highly welcome. Hopefully ICPE2024 would be as successful as the previous ICPE conferences with the support from all the ICPE2024 participants.

Welcome to ICPE2024, The 50th Anniversary of ICPE & Nanotechnology!

Welcome to Tohoku University, Sendai, Japan!

Best regards,



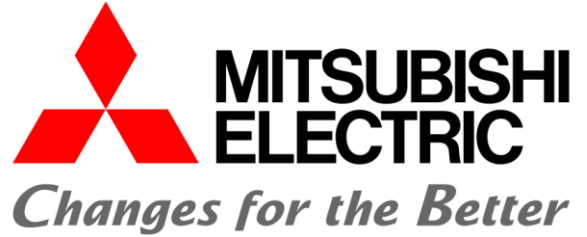
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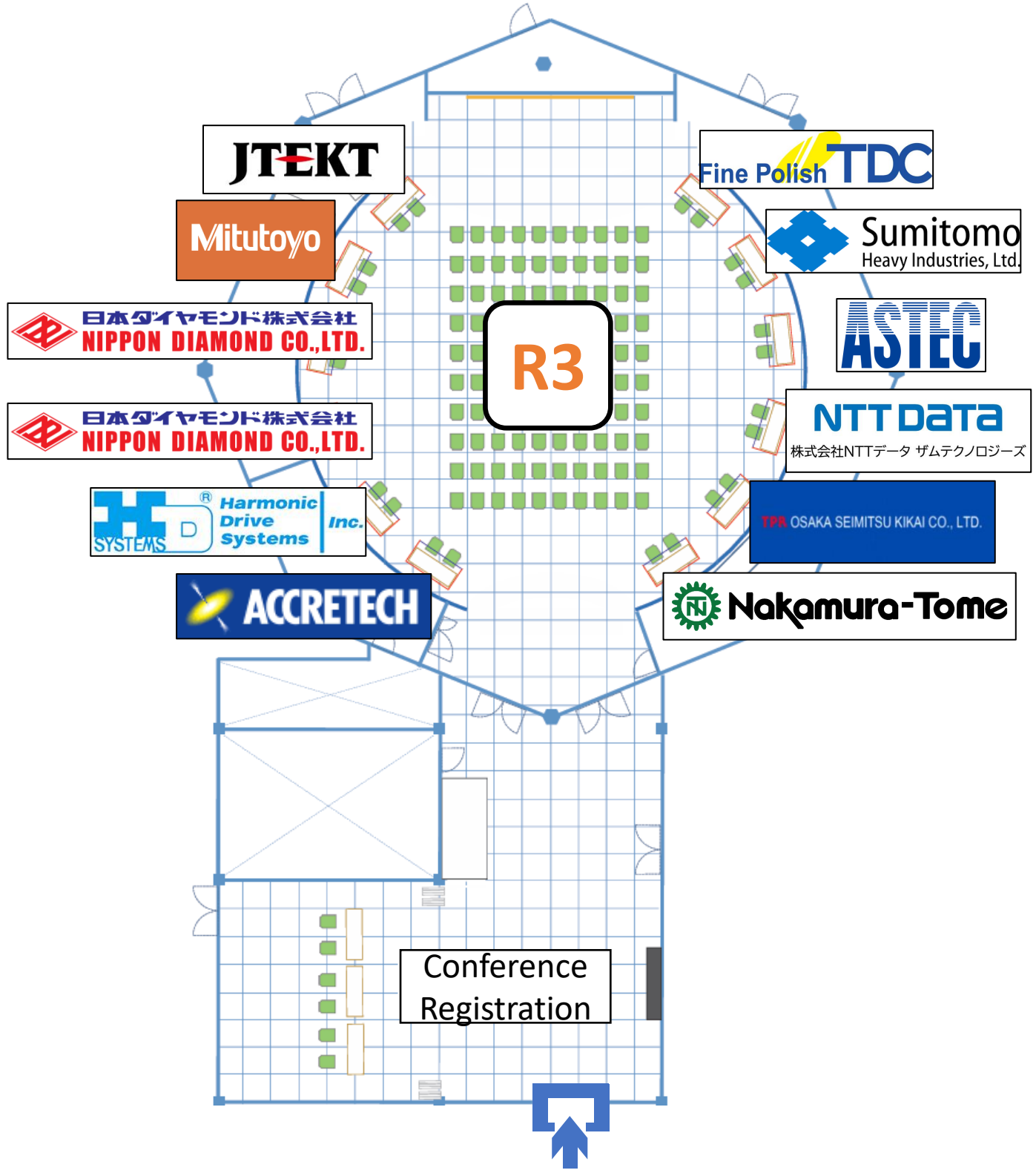
**ASTECC**



**Nakamura-Tome**

# Industrial Exhibitions

## Floor map



# Contributing to society through the power of "manufacturing services"

We are committed to manufacturing that opens up new possibilities  
by addressing the various challenges of today and the future.

We will continue to provide solutions to build an even brighter future for  
our customers around the world.

## OPEN POSSIBILITIES



**LOKUMA**

**OKUMA Corporation** [www.okuma.co.jp/english](http://www.okuma.co.jp/english)

**OPEN POSSIBILITIES**



# NTY<sup>3</sup>-100V

Starting with the implementation of "ChronoCut" to reduce idle time, numerous new technologies have been incorporated to enhance production speed. The machine reduces cycle time by up to 30%.

\*Effects vary depending on the shape and size of the workpiece

# Faster than the fastest



# Nakamura-Tome





世界の製造現場に  
革新と安心を。  
ファナックは止まらない工場を目指しています。

# NEW PRODUCTS

ファナックの新商品ラインアップ

## 最新の CNC・サーボとデジタルツイン

デジタルツイン

新しい市場要求に対応する最新 CNC  
Series 500i-A

高速・高精度・省エネルギーの新世代サーボシステム  
α-D series SERVO

## 自動化、生産性の向上に寄与するロボマシン

ROBODRILL α-D/B Plus series

ROBOSHOT α-S/B series

ROBOCUT α-C/C series

## 製造現場のデータを読み解き改善に導く IoT

工場のデータを収集・分析・活用し、課題を洗い出し、対策を見つけることで工場の生産性向上を支援いたします。

UPDATE  
FIELD system Basic Package

## 人手不足はファナックロボットで解決！

初めてでもすぐに使える

世界初！  
防爆協働ロボット

CRX-5i/A CRX-10i/A CRX-10iA/L CRX-20iA/L CRX-30i/A

NEW  
CRX-10iA/L Paint CR/50F-18B

800kg 可搬  
大型物流ロボット

サイバーセキュリティ対応  
ロボット制御装置

R-50i/A NEW M-710/70-21D M-950/500F-28A M-410/800F-32C NEW

## 「止まらない工場」を目指すファナックのサービス

Service First

生涯保守

ファナックは「サービスファースト」の精神のもと、世界に 270 以上のサービス拠点を置き、100ヶ国以上でファナック商品を生涯保守いたします。

ファナックは世界中のお客様の高い稼働率に貢献いたします。



# Mitutoyo



ありがとうの  
キモチも、  
測れるだろうか。



<https://www.mitutoyo.co.jp>

”はかる”がつなく、  
ものづくりの未来





# DMG MORI MX (Machining Transformation)

Process integration / automation / DX for your shop floor efficiency and GX

## Process Integration

A single simultaneous 5-axis machine (with turning function) or mill-turn center covers everything from machining to measurement



Mill-turn center  
NTX 500 with IMTR



Turning



Milling



Grinding



Measurement

## Automation & Peripheral Equipment

Solutions to the 3 obstacles of machining (chips, coolant, fog) to support stable production & automation

## Better Productivity, Cleaner Factory, Less CO<sub>2</sub>

Much less manual chip cleaning

AI Chip Removal



Optimizes pump control

Pump power use **-70%**

Manual tank cleaning 3 times ⇒ 1 time/year

zero-sludgeCOOLANT



Extends coolant life

CO<sub>2</sub> emissions from used coolant disposal reduced to **1/3**

Manual filter cleaning 6 hours ⇒ 0.1 hours/year

Built-in mist collector zeroFOG



Ductless and efficient fog collection

Motor power use **-35%**

## Japan's largest\* self-use solar power generation system at Iga Campus

DMG MORI started solar power generation in February 2023, and plans to meet approximately 30% of the Iga Campus' annual demand by 2025. Among other energy-saving initiatives are the biomass thermoelectric power generation for self-use and continued purchase of carbon-free electricity. Our environmentally friendly products also help make our customers' shop floors greener.

\* Based on DMG MORI's research of publicly available information on on-site solar power generation systems for self-use.



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Second Headquarters / Nara Product Development Center: 2-1 Sanjohonmachi, Nara City, Nara

DMG MORI MX

Q Search

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[www.dmgmori.com](http://www.dmgmori.com)





# 正確で実用的なプロセスデータ

**JIMTOF  
2024**

東7ホール  
E7026

膨大な量のデータが行き交い、処理される今日の生産現場。その現場でつながる化を実現し、最適なデータを確保するためのテクノロジーが、レニショーが新たにお届けするスマートなものづくりデータのためのプラットフォーム Renishaw Central です。

- ・ 現場にある機器や設備、機械すべてから加工データや測定データを収集し、解析。
- ・ 加工データからミスや不具合などの問題を、実際に起こる前に検出、予測そして修正。
- ・ プロセスの最適化、ダウンタイムの短縮、無駄の削減によって効率と生産性を向上。

スマートなものづくりを今、始めましょう。

[www.renishaw.com/central](http://www.renishaw.com/central)



101<sup>st</sup>

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魂 匠

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AUSP G



AUSP Rp



AUSP Rc



HVSP ZP



HVSP



VUSP



VUSP1.5P



VUSP CH



VUPO



MHRZ



MHSL



MHSP

AU Series

HV Series

VU Series

MH Series

タツプ一筋、100年  
彌満和の総力を結集。

Think threads with  
**YAMAWA**



# 常識を打ち破るマイクロ3次元リソグラフィ技術

高精度、「0.01mm-100mm」のクロススケール、複雑な三次元微細構造の精密加工に特化



精密実験室用器具の製作

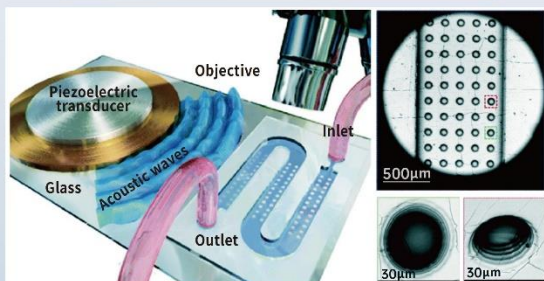


新製品の設計反復/  
小ロット生産に対応



難加工部品の量産化対応

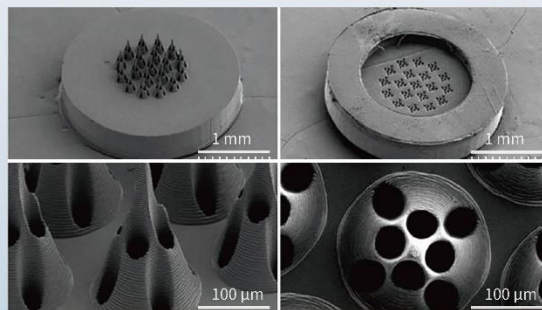
## 応用事例 [ 3D Printing+PDMS moldingによる循環腫瘍細胞(CTC)の分離 ]



出典: *Lab on a Chip*, 2021, 21, 2721

- キャピティの直径: **100 µm**
- キャピティの深さ: **80 µm**
- 高いCTC捕捉効率 (**96%**以上)を示した。

## 応用事例 [ 薬物送達:新規腫瘍治療のためのマイクロニードル ]



出典: *Advanced Functional Materials*, 2021: 2109187.

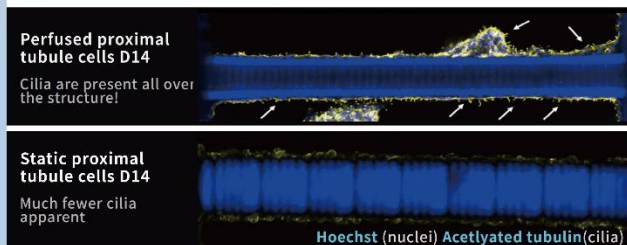
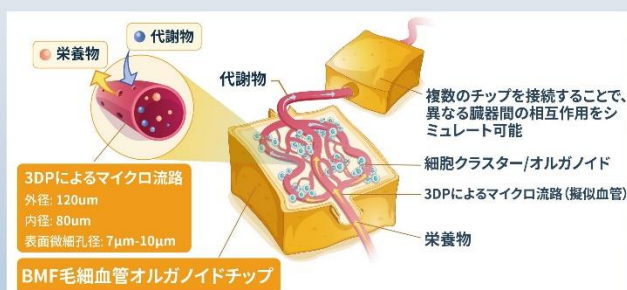
### 課題

- 特殊なマイクロニードルを超高解像度で製造することが必要。

### BMFによる解決策

- 実用的なサイズと微細構造(図の微細穴の直径は約40µm)を同時に備えている。
- 異なる腫瘍での検証用に、サイズやデザインをカスタマイズすることが可能。
- 材料の強度は腫瘍を貫通するに十分である。

## 産業化事例 [ 毛細血管オルガノイドチップ(細胞培養) ]



### in vitro培養のボトルネックを克服

- cm単位のオルガノイドの培養が可能。
- 数週間または数ヶ月にわたり連続的な培養が可能。
- 再現性が高い。
- 複数チップの相互接続で臓器間の相互作用のシミュレーションが可能。

### in vitro培養事例

近位尿管  
(Kidney proximal tubule)

- 14日間で完全な極性の近位尿管組織を形成。
- 高度に模倣された繊毛構造を有する(静置培養では形成できない)。
- 薬物の腎毒性試験に使用可能。



カーボンニュートラル や SDGs が これからの ニューノーマル。  
だからこそ、CO<sub>2</sub> を出さない

高周波  
焼入れ

or

高周波  
誘導加熱

or

炉加熱  
+  
高周波誘導加熱

という選択を。



富士電子工業株式会社

## 電気代を削減する 熱処理技術

弊社独自のコイルと方で、必要な箇所だけ  
急速に加熱し、冷却するから電気代が削減され、歪みも低く抑えられます。  
また、炉加熱の昇温リードタイムを高周波誘導加熱で担うことで  
昇温時間が約 1/3 に、エネルギー使用量が 40 ~ 60% の低減につながります。



## 試作・受託加工・装置 をひとつの場所で提供



それぞれの領域で得たノウハウをもって  
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## スマートメンテナンス でゼロダウンタイムを

ダッシュボードで装置の状態が一目で確認できるとともに  
毎月のデータ推移に基づいた装置診断で予兆保全を行います。



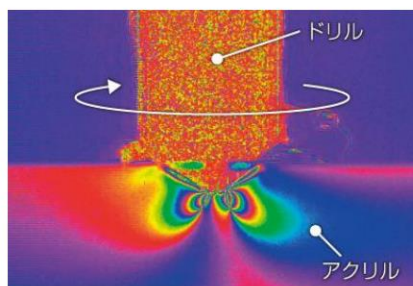
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〒581-0092 大阪府八尾市老原 6-71  
TEL:(072)991-1361/FAX:(072)991-1309

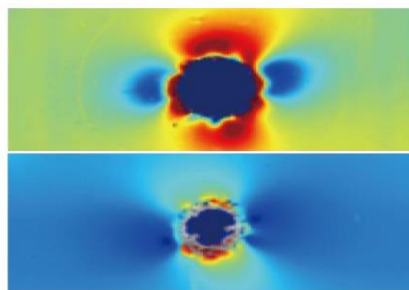
# A company focused on LIGHT

— 光にこだわる会社 —

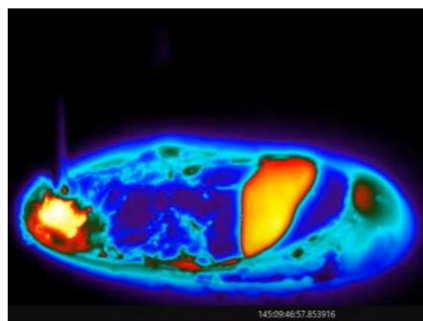
最高の光学コンテンツを最高の品質とともに



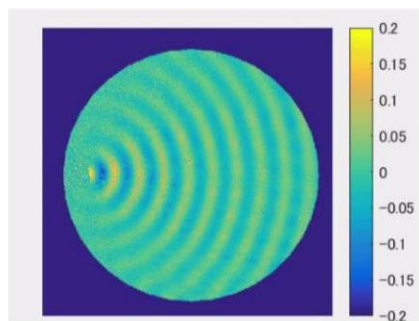
高速度偏光カメラ  
例：応力伝播の可視化



高精度複屈折計測  
例：加工跡の残留応力計測



高速度赤外線カメラ  
例：溶接池の温度分布可視化



音場イメージング  
例：各種音響効果の確認

アカデミック向け無償デモ計測キャンペーン

2024年10月1日～2025年3月末日

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# ジェイテックコーポレーションの 放射光用超高精度ミラー

## 世界最高へのキーテクノロジー

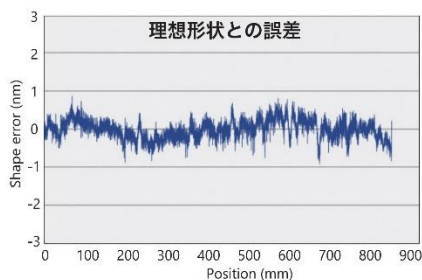
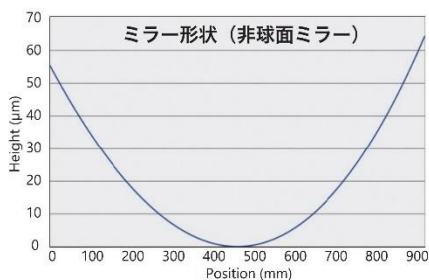
ジェイテックコーポレーションは大阪大学で開発された  
ナノ加工技術 (EEM®) ナノ計測技術 (MSI®/RADSI®) の実用化に成功  
放射光用高精度ミラーの設計・製作を実施



EEM® (Elastic Emission Machining) 固体表面間の化学反応を利用した超精密ナノ加工技術  
MSI® (Microstitching Interferometry) /RADSI® (Relative Angle Determinable Stitching Interferometry) 干渉計を応用した画期的なナノ計測技術

### 原子レベルの自由曲面加工最長 1 m まで対応可能

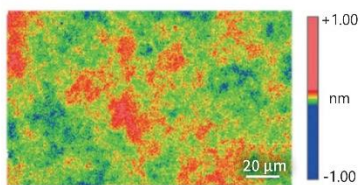
EEM®加工およびMSI®/RADSI®計測によるNC加工により、形状誤差PV2.0 nm以下の形状精度を実現



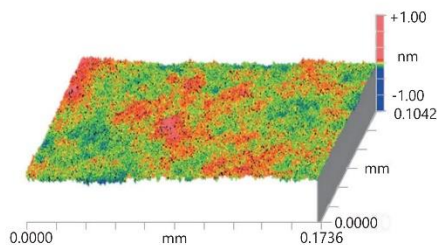
※上記形状誤差は、当社計測装置(MSI/RADSI)による計測データ

### 原子レベルの表面平滑化加工

EEM®加工により、表面粗さ0.1 nm RMS以下の表面平滑化を実現



PV	0.401 nm	Size X	0.17 mm
rms	0.045 nm	Size Y	0.10 mm
Ra	0.036 nm		



### 放射光用超高精度各種ミラー

シリコン、石英ガラスなどの希望の材質で希望の形状に加工、ミラー形状の設計および集光プロファイルの計算も可能



▲ AKBミラー



▲ 超高精度平面/KBミラー



▲ 回転Wolterミラー



▲ 形状可変ミラー



▲ チャンネルカット結晶



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  - ・パワースカイピングカッタ
  - ・ピニオンカッタ
  - ・シェーピングカッタ
  - ・フレージングカッタ
- ◆ 歯切関連治具各種
  - ・マスターギヤ
  - ・スプラインマンドリル
  - ・スプラインゲージ
  - ・ホブアーパー
  - ・ブローチ用案内駒
- ◆ 電着工具(ドレスギヤ・R歯研ウオーム)
- ◆ 歯切工具メンテナンス(再修整・再研磨・再コーティング等)
  - ・PVDコーティング
  - (TiN, TiAlN, AlCrN, ESCRNE, ECOS, NINOS, CLIOS, TiN-HQ 他)

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KSK

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ブース番号 南2ホール AM10

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[www.taiyokoki.com](http://www.taiyokoki.com)

■本社 (〒940-2045)  
新潟県長岡市西陵町221番35  
TEL.0258-42-8808



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