

# 01 Steel Business

Global leadership in IT, creating customer-focused value, and responding quickly to changes through continuous reform and strategic IT

Hironori Fukushima Senior Vice President



**IT Innovation Leading Department**

To address key business issues and also structural issues related to our business operations, our department works with other business divisions to facilitate the use of the latest ICT and to implement business reforms. This is competitive IT. We are also working to establish a secure IT environment in terms of infrastructure as well as application systems and then enhance this environment even further. This is defensive IT.

**Akira Nitta** Vice President

**Business Process Innovation Team**

Mission-critical systems at steelworks tend to become complicated and bloated. To remedy this situation, our team is reconfiguring business operations for such systems while applying the latest in ICT to fully upgrade these systems. The objective is to steadily reform our operations and create flexible systems that can adapt to operational changes. This is a major project that is unique in its inception.

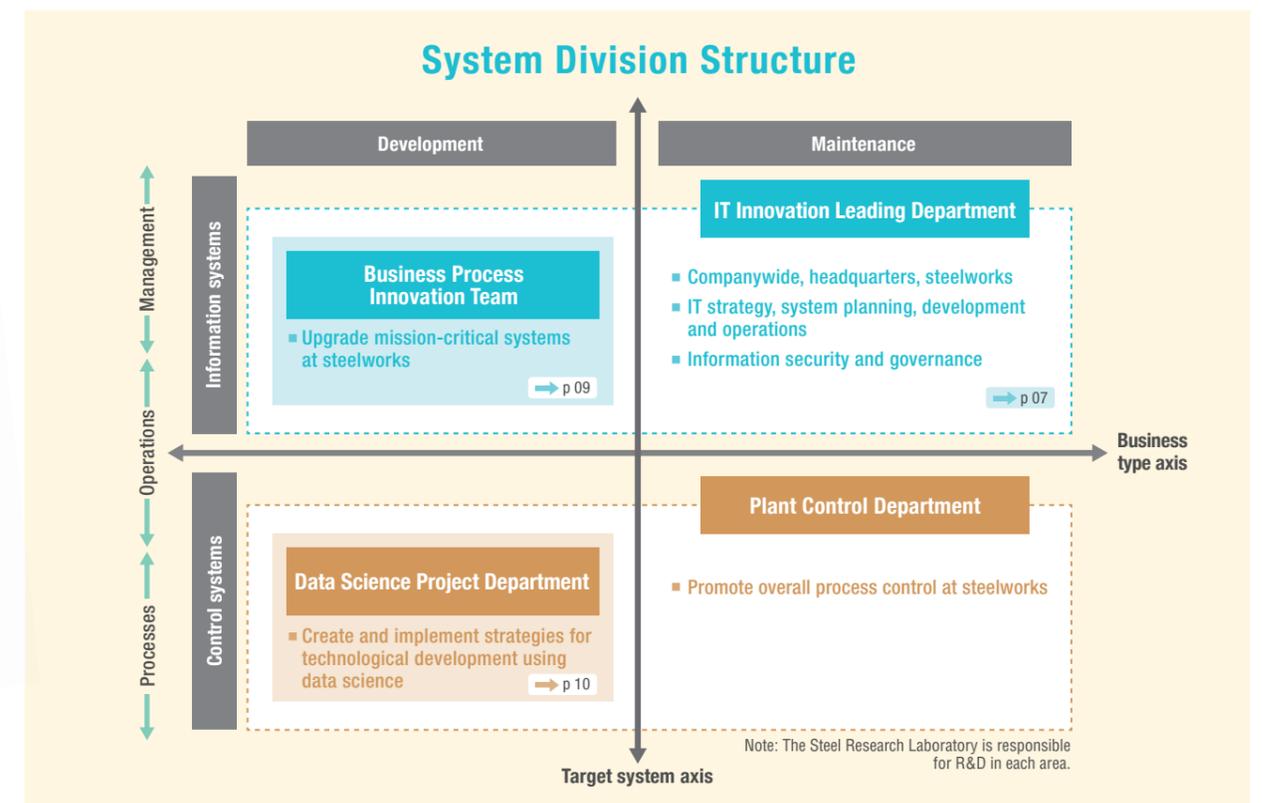
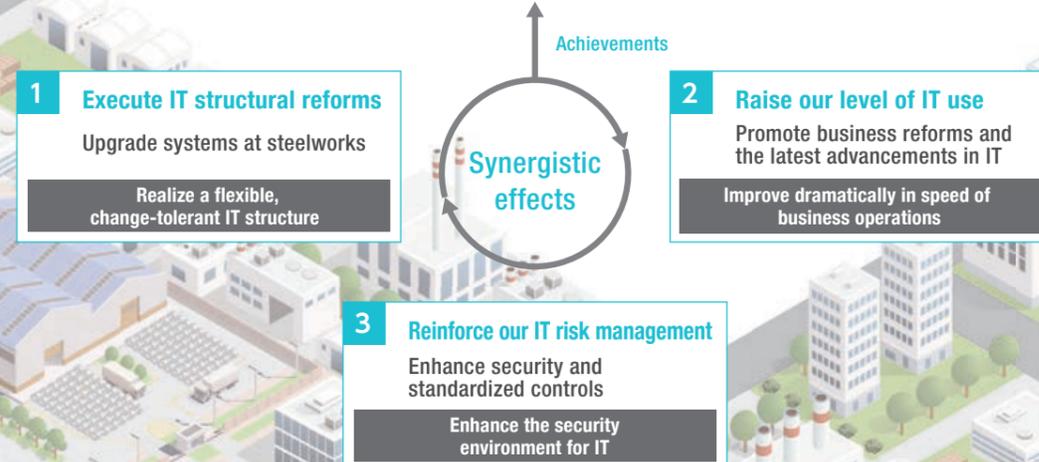
**Hiroshi Sekiguchi** Vice President

Industrial structures and business models are changing at unprecedented speed, reflecting rapid advances in ICT such as AI, IoT, and big data analysis. The steel business is no exception. Our systems division actively supports management and business divisions by helping them respond quickly and flexibly to changes in the business

environment through use of ICT, which ultimately contributes to corporate value.

Under our sixth medium-term business plan, we are emphasizing three strategic themes—execute IT structural reforms, raise our level of IT use, and reinforce our IT risk management—to realize our corporate vision.

## JFE Steel's IT Vision and Three Strategic Themes



**Data Science Project Department**

We take a companywide perspective in efforts to systematically and efficiently apply IoT technologies, AI, and data science mainly for equipment, processes, and operations. We have begun by strengthening our data-collection platform for all kinds of processes, and are working to raise quality assurance and quality control levels through data usage consistent across multiple processes, while also using data seamlessly throughout the company to boost operating efficiency and cut costs.

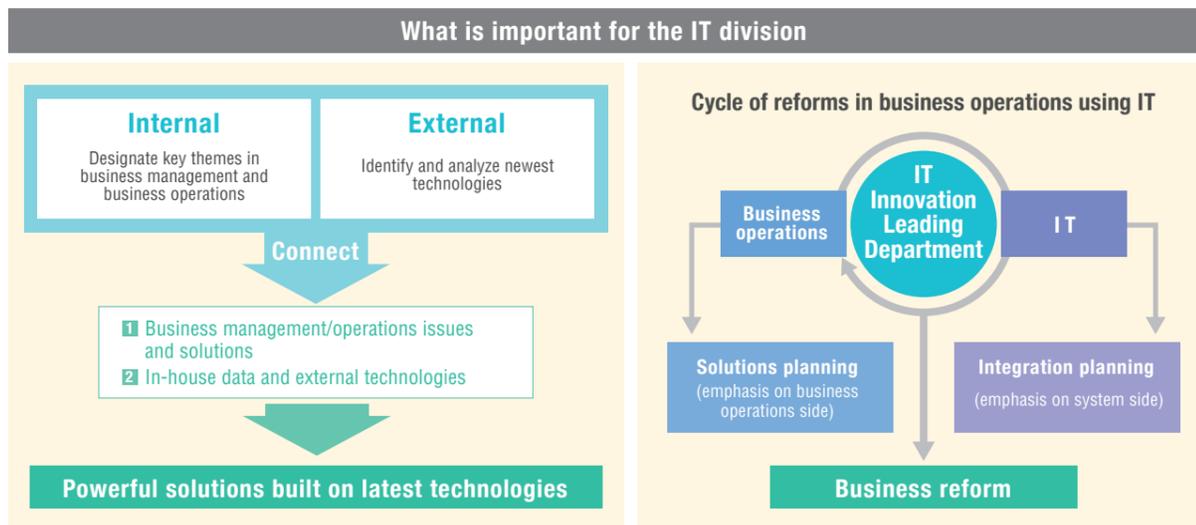
**Akira Kazama** Fellow



## IT Innovation Leading Department

The IT Innovation Leading Department's mission is to encourage reforms in business operations using the latest technologies, see that changes are implemented and then track the results in terms of IT optimization, particularly for infrastructure and security. What is important for us right now as an IT division is to work as a team, with each business division designating key themes in management and business operations. Together, we implement solutions that tie in the latest research in ICT and possible applications. Significant projects require coordination with the basic IT strategies of our IT Steering Committee and have the management team sign off on the plan before solutions are implemented.

**We encourage reforms in business operations using IT, see that changes are implemented and then track the results in terms of IT optimization.** (IT Innovation Leading Department's mission)



### Major activities to date

Projects	IT applications	Improved corporate value	Other (patents, awards, etc.)
<b>J-Smile<sup>®1</sup></b> (sale of steel products)	<ul style="list-style-type: none"> <li>Establish change-tolerant information structure based on data-oriented approach</li> </ul>	<ul style="list-style-type: none"> <li>Make business reforms and sales activities more efficient</li> <li>Establish system platform that immediately adjusts to changes in business</li> </ul>	<ul style="list-style-type: none"> <li>Patent 4826211</li> <li>2006 Ministry of Economy, Trade and Industry Minister's Award (IT strategy division) for contributing to greater use of IT in Japan</li> <li>2nd Prize at IT Japan Awards 2007, sponsored by Nikkei Business Publications, Inc.</li> </ul>
<b>J-Flessa<sup>®2</sup></b> (sale and production of steel products)	<ul style="list-style-type: none"> <li>Enhance ability to formulate plans using dedicated software package</li> <li>Connect planning data and evaluation data from peripheral systems using service-oriented architecture</li> </ul>	<ul style="list-style-type: none"> <li>Quickly respond to external changes through shorter PDCA cycle</li> <li>Improve accuracy of sales and production targets</li> <li>Share management information companywide</li> </ul>	<ul style="list-style-type: none"> <li>Patent 5499559</li> </ul>

1: J-Smile = JFE Strategic Modernization & Innovation Leading System  
2: J-Flessa = JFE Flexible Efficient Speedy Sales and Operation Management System

### JFE Voice!



#### Promote workstyle reform with business divisions

Through logistics divisions at steelworks and marketing divisions at the head office, I oversee the planning, development, and maintenance of head office systems. Drawing on insights gained through large-scale systems development projects, such as J-Smile and J-Flessa, in cooperation with the Accounting Department, we upgraded an accounting system shared by 81 companies groupwide. I will continue to work with business divisions and encourage changes in workstyles through the use of IoT technologies as well as changes in supply chain management systems.

Yuko Tamura IT Innovation Leading Department and Business Process Innovation Team

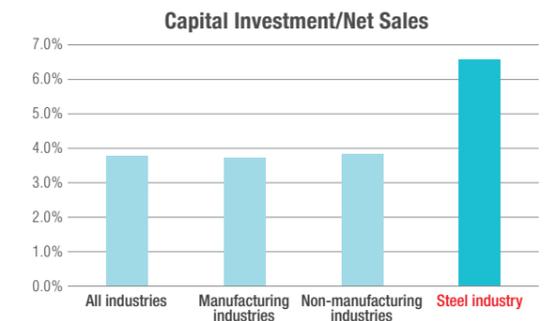
## First Domestic Application of AI for Steelmaking Equipment Maintenance

JFE Steel introduced AI for the maintenance of steelmaking equipment, the first time that AI was applied in the Japanese steel industry. When an equipment failure occurs, operations must be resumed quickly to minimize the impact of downtime on production. Previously, efforts to pinpoint the location and cause of a failure required referencing various manuals or consulting veteran engineers. Using AI, however, the company created a database of work that had been performed by veteran engineers, as well as the content of many operating manuals to facilitate cross-checking with past events and troubleshooting efforts. Engineers with limited experience can use this system to quickly retrieve helpful information and get equipment online again, thereby shortening any downtime. The system has been installed for selected equipment on a test basis. Based on initial successes, it was decided to roll out the system companywide in fiscal 2018.

**Characteristics of Steel Industry**  
(Characteristics of Process Industries)

Capital investment (percentage of net sales):  
All industries 3.8%; manufacturing industry 3.7%; **steel industry 6.6%**

→ Stable operation of equipment is a top priority in the steel industry  
(Maintain safety, stable supply and society's trust)

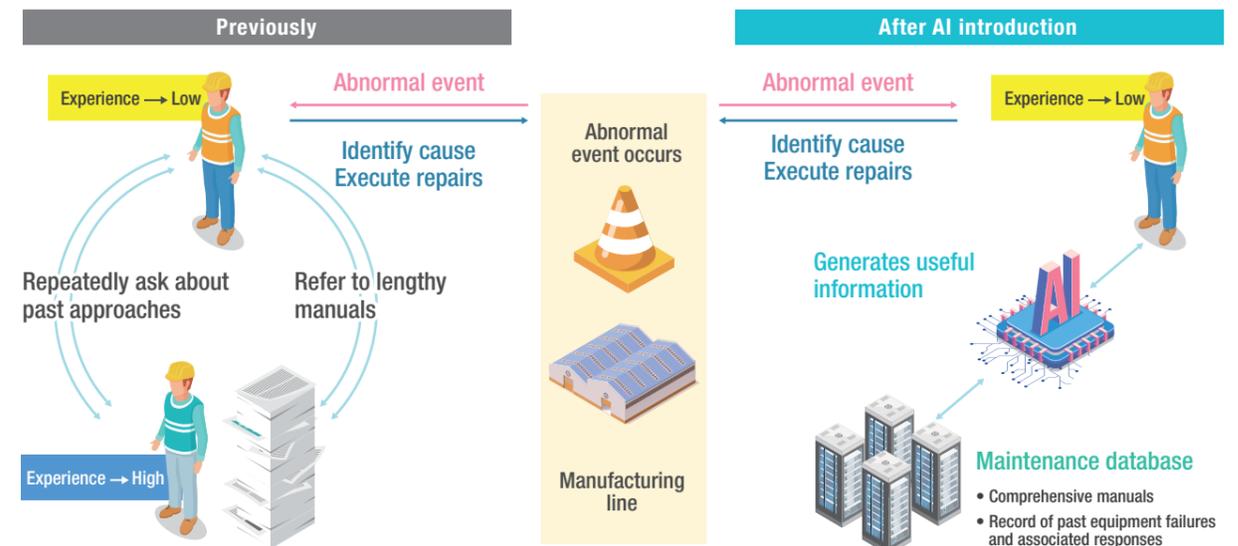


Source: Ministry of Finance, Business Outlook Survey (fiscal 2016)  
Subjects: Companies, excluding those in finance and insurance industries, with paid-in capital of ¥1 billion or more

### Use of AI for troubleshooting equipment issues

When equipment trouble occurs at a steelworks, employees use AI to search through records, standards, manuals, and other sources of guidance on dealing with the situation.

**Results:** 1 Reduces problem duration (production-line downtime) 2 Facilitates skills transfer and human resources development



### JFE Voice!



#### Raise ability of young employees to deal with equipment failure using AI

Steelmaking facilities operate around the clock, so we watch over the equipment in shifts. I was keen to find a process that would enable us to pinpoint the causes of equipment failures more efficiently as we transition from one generation of engineers to the next at our steelworks. The recently introduced AI system is great for drawing on the knowledge of veteran engineers possessing vast experience in dealing with malfunctions. The system enables young engineers to obtain knowledge from experienced engineers and raise their ability to respond to equipment failure.

Yasuhiro Shimamura West Japan Works (Kurashiki), Line Manager, Plant Control Department

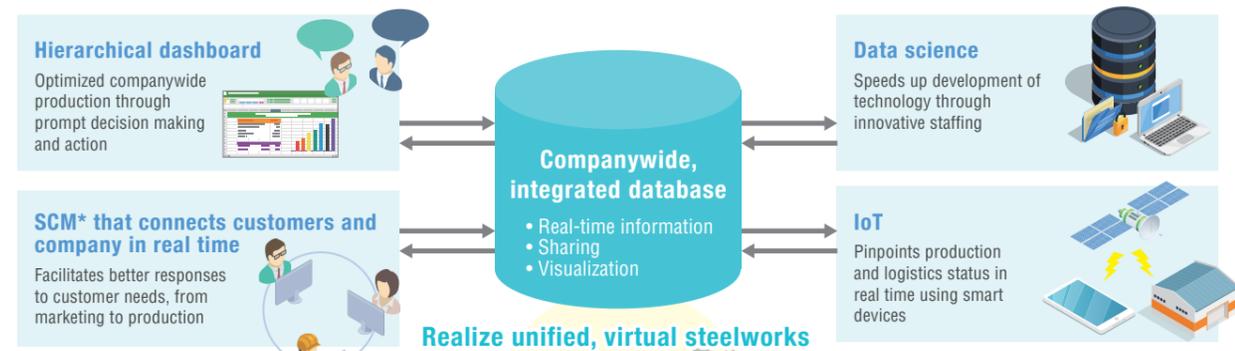
**Business Process Innovation Team**

**Upgrade mission-critical systems at steelworks using the latest ICT  
Create new value through reforms in business operations**

JFE Steel is pursuing the following strategies to upgrade fragmented mission-critical systems at steelworks: 1) achieve standardization and consistency in business operations at steelworks that may differ by location, 2) create a companywide integrated database using standardized terminology and a standard structure, and 3) build simple, open architecture through system sharing and modularization.

Through this system upgrade, all employees at JFE Steel will be able to access information companywide. Integration of business operations will allow domestic steelworks to form a unified virtual steelworks. Furthermore, JFE Steel will implement workstyle changes to create new value.

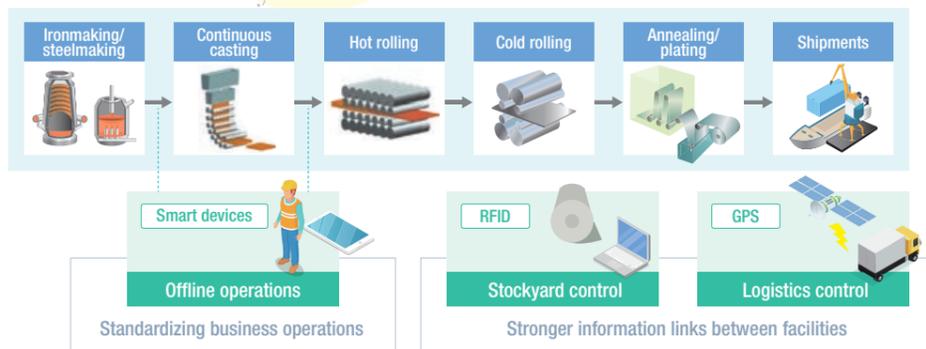
**New workstyles realized through system upgrades**



\*SCM = Supply Chain Management

**Enhanced production control**

JFE Steel fell behind in its systemization of offline operations but has been working to reverse the situation and realize standardization, and also link the movement of objects and equipment at manufacturing sites in real time using advanced IoT options. The companywide integrated database pulls together all this information for the formulation of ideal overall production targets and the realization of integrated production control beyond the domestic network of steelworks.



**JFE Voice!**

**Working toward a unified virtual steelworks of the future**

Since joining JFE Steel, I have been involved in the development of manufacturing and operating technology for production facilities at the company's steelworks. The project I'm working on now is a system for product design that creates a process for manufacturing based on the customer's order. A big part of this process is dependent on the skills of veteran engineers, making the system problematic in terms of sharing know-how. It's my goal to facilitate comparisons between steelworks with a structure common to all manufacturing sites, and enable quick confirmation of product designs using this solution.

**Kazuya Mori** Business Process Innovation Team

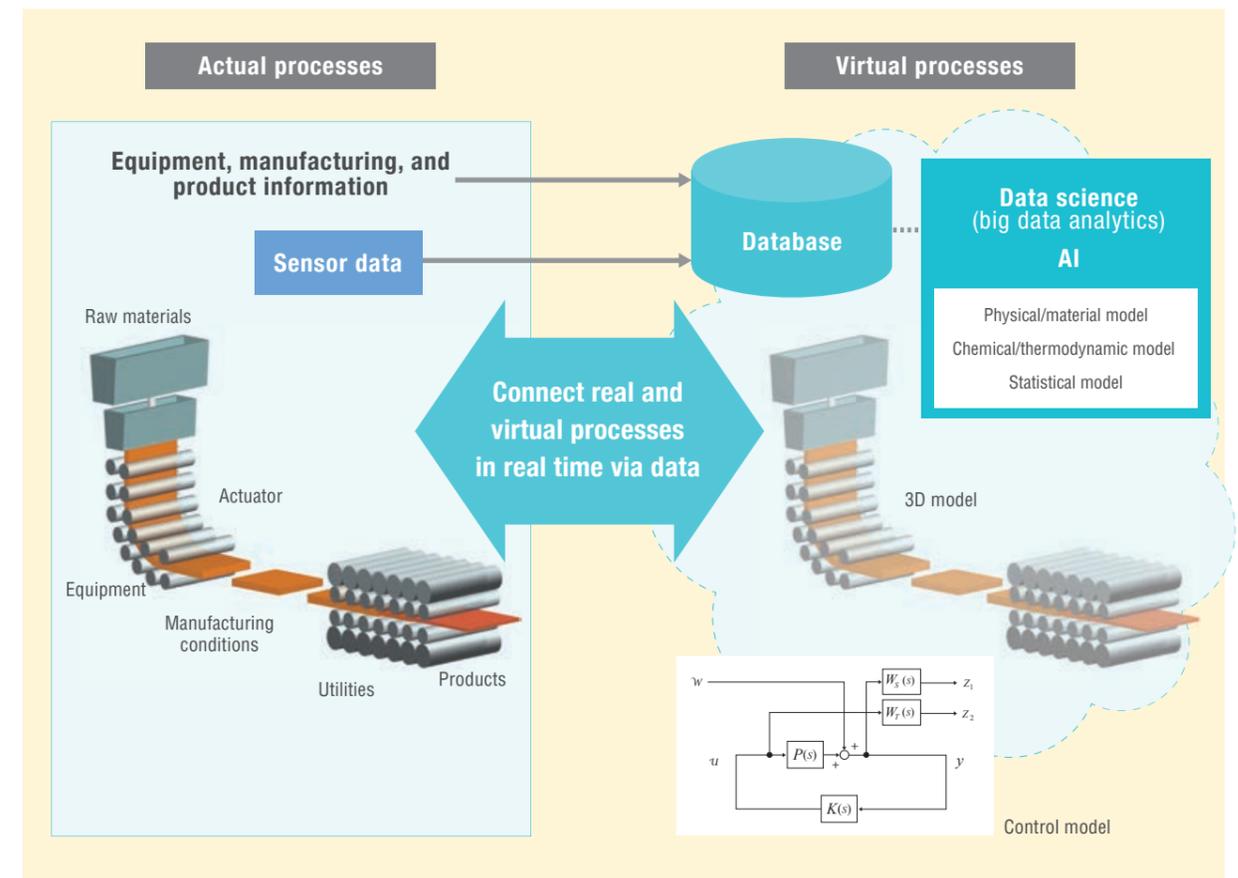


**Data Science Project Department**

**Data science for integrated/total automation of steelworks processes**

We use sensor data to combine actual processes with high-level virtual processes by merging disciplines such as physics, statistics, and AI, seeking a shift toward Cyber-Physical Systems (CPS) in steelmaking. It will then be possible to observe internal states and predict future states—conditions that are not visible in real space. The system will also underpin stable operations by monitoring equipment status to detect abnormalities, and it will lead to higher productivity by perceiving bottlenecks in any given process as well. In addition, virtual experiments can lead to process innovation and promote changes in workstyles by computerization of knowledge and expertise. In this department, our goal is to apply CPS to individual processes, then to individual factories, then to all steelmaking processes, and finally to the entire company. This will contribute to enhanced management from a business perspective.

**CPS processes based on IoT sensor data**



**JFE Voice!**

**I will boldly tackle whatever challenge appears in my path**

I am currently working on the development of a control model for steelmaking processes. It's extremely difficult to grasp steelmaking processes in their entirety and build a model that encompasses all facets of manufacturing. I use data science to build models and run experiments on the actual process at manufacturing sites to develop improvements. Going forward, I'm keen to apply CPS in steelmaking processes through highly accurate models and establish a high-level automated control system.

**Hiroto Kase** Steel Research Laboratory, Instrument and Control Engineering Research Department

