

【Name of project】(Adopted year: FY2019)

## Erasmus Mundus Japan-Master of Science in Imaging and Light Extended Reality (IMLEX)

【Summary of Inter-University Exchange Projects】

This project will establish an innovative multiple Master's degree program, integrating *Imaging*, *Lighting*, and *Information Technology* with *Extended Reality* (XR). The multidisciplinary IMLEX program features strong industrial involvement from Japan and Europe. The close collaboration is designed to prepare students to transfer knowledge from academia to industry and gain expertise to implement novel applications of XR technologies to meet the needs of industry and society.

【Summary of Exchange program】

In the IMLEX curriculum, students will learn basic knowledge and applied technological skills over four semesters (five semesters, including a preparatory period, for Japanese students).

- Semester 1: *Photonics* core courses (Finland)
- Semester 2: *Imaging* module (France) or *Lighting* module (Belgium)
- Semester 3: *Imaging* or *Lighting* in XR module (Japan)  
comprehensive courses in common module (Japan)
- Semester 4: Master's thesis (with consortium members)

IMLEX graduates will receive multiple Master's degrees from hosting Japanese and European institutions.

【Global Human Resource on the project】

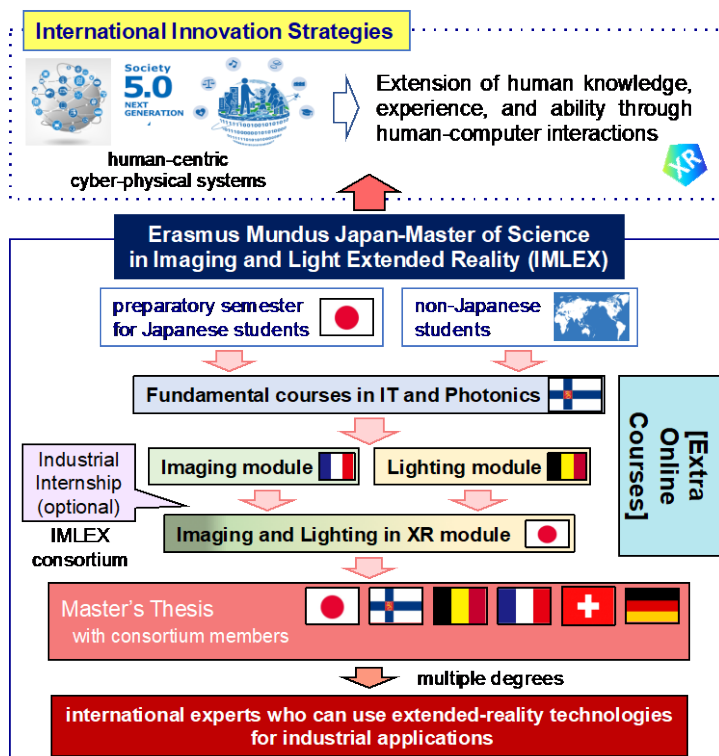
The program will prepare students to become competent in bridging scientific knowledge and industrial applications on the global stage. Graduates are expected to become capable of formulating new solutions for real-life problems through human-computer interactions. The project also aims at preparing a new generation of global experts and professionals with a broad view and competences going beyond the traditional domains in multidisciplinary and multicultural environment.

【Feature on the project】

The XR technologies covered by this multiple Master's degree program are in line with innovation strategies that are put forward by European Industry 4.0 and Japanese Society 5.0. The build-in collaboration with industry is an additional asset that will contribute to enhancing international industry-academia alliance in graduate education. The IMLEX program will also provide global opportunities for students to develop entrepreneurship and innovation skills through practical and/or work-based experience.

【Exchange number】

	2019	2020	2021	2022	2023
Outbound	0	8	8	8	8
Inbound	0	8	8	8	8



【Erasmus Mundus Japan-Master of Science in Imaging and Light in Extended Reality (IMLEX)】

(Adopted year: FY2019)

■ Exchange Programs



<IMLEX program logo>

Drawing on the strengths of each university in the consortium, on the EU side, the University of Eastern Finland (UEF) provides photonics core courses, University Jean Monnet Saint-Etienne (UJM) provides imaging-related courses and KU Leuven provides lighting-related courses. Each university also provides language-related courses including Japanese. On the Japan side, Toyohashi University of Technology allows students to take culture-related courses in cooperation with Chiba University and Utsunomiya University, while their deepening XR-related knowledge and skills. In addition, students are allowed to participate in corporate internships in Europe and Japan, and participation of persons related to the companies in the program is also planned. On the side of the European side, participation by students from countries outside of Europe is planned, and short-term exchanges of European and Japanese faculty members are to be implemented every year. Through these and other measures, the diversity of the program even from the cultural aspect has been established.

Student-Mobility

The acceptance of students into this program starts in fiscal 2020, with the selection of students conducted in fiscal 2019

○ Outbound

At Toyohashi University of Technology, eight applied in response to the invitation within the university and underwent the selection process. All of the eight students were successfully selected as program student in the meeting of the Academic and Management Board (AMB) held in March.

○ Inbound

There were 101 applicants on the Europe side, and 29 students were selected as potential program students in the AMB meeting in March (among which, 21 applicants were selected as substitute candidates). In the end, 11 students from among those selected were actually registered as students in the program.

	2019	
	Plan	Results
Outbound	0	0
Inbound	0	0

■ Forming the University Network with Quality Assurance

The Quality Assurance Board (QAB) and the Academic and Management Board (AMB) were established. The missions of each were specified as follows, together with the appointment of board members of the AMB and the QAB representing each of the consortium universities.

- The mission of the AMB is to decide upon and manage academic-related matters of the program and to manage the selection, course registration, etc. of students.
- The mission of the QAB is to establish and implement the quality assurance policy of the program and to engage in monitoring and quality assurance, promotion activities, etc.



<IMLEX program image>

■ Promotion of Student-Mobility Environment

- The university codes were amended to stipulate a term of study of two years and six months for the students entering into this program in April. In addition, the regulations concerning the implementation of the program were established and university rules were created in preparation for the inbound students in fiscal 2020.
- A system for collaboration with the European universities has been established through the enhancement of courses in the Department of Computer Science and Engineering using English, the designation of the faculty members who are to instruct the classes, and mutual visits and interchange between the faculty members of the European side and the Japan side prior to the acceptance of the students, all of which were conducted in association with the implementation of the IMLEX program. In addition, a system for collaboration with the cooperating universities in Japan (Chiba University and Utsunomiya University) has been established through collaborative operations concerning confirmation of the project details and program courses, guidance for inbound students, advance preparations, etc.

■ Internationalization of the university,

Information disclosure and Publication of outcome

The Department of Computer Science and Engineering, which will accept the students, has enhanced its courses in English. A website dedicated to this program was created and has published information such as the curriculums. In addition, a video introducing the program was created and published on the aforementioned website and the official YouTube channel of Toyohashi University of Technology as part of our efforts to disseminate the program.

■ Good Practices

○ Formation of the consortium by the partner universities

One faculty member and 4 administrative staff of Toyohashi University of Technology were dispatched to the University of Eastern Finland in October, and an organization managing the consortium was established with the three European universities, which led to the building of a system to implement an international joint education program with Europe. This has helped us to build a continuous cooperative relationship with the European universities and companies, and an acceleration in exchanges can be expected.

## 2. FY2020 Progress

【Toyohashi University of Technology】

【Erasmus Mundus Japan-Master of Science in Imaging and Light in Extended Reality (IMLEX)】  
(Adopted year: FY2019)

### ■ Exchange Programs



<IMLEX program logo>

The program commenced in September 2020 at University of Eastern Finland. Eight students from Japan and nine students from European universities participated in the program. The three European universities (University of Eastern Finland (UEF; Finland), University Jean Monnet Saint-Etienne (UJM; France) and KU Leuven (Belgium)) have established a system to implement the program online in response to the spread of the coronavirus disease (COVID-19). UEF provides photonics core courses, UJM provides imaging-related courses and KU Leuven provides lighting-related courses and the program has been run both online and on a face-to-face basis to cultivate human resources which the IMLEX program aspires.

Although the Japanese students are ready to go to Europe, their traveling abroad has been postponed due to the spread of COVID-19, and they have been taking the program courses online in Japan.

### Student-Mobility

#### ○ Outbound

In preparation for sending the Japanese students, pre-traveling education such as preparatory English learning and overseas safety orientation has been completed. However, as it has been impossible for them to travel to overseas countries due to an impact of the spread of COVID-19, they have taken the program courses online from Japan.

	2020	
	Plan	Results
Outbound	8	8
Inbound	8	9

#### ○ Inbound

The EU side also commenced implementing the program mainly online due to the spread of COVID-19. All of the EU side students have entered European countries by the end of October 2020 and took the program courses on site.

### ■ Forming the University Network with Quality Assurance

● The mission of the Academic and Management Board (AMB) established in the consortium were held five times in fiscal 2020 to discuss program implementation matters related to student recruits and the course management. In addition, meetings of the Quality Assurance Board (QAB) were held three times to discuss matters such as program quality assurance. The AMB is to decide upon and manage academic-related matters of the program and to manage the selection, course registration, etc. of students.

● The mission of the QAB is to establish and implement the quality assurance policy of the program and to engage in monitoring and keeping and developing the quality of the program, promotion activities, etc.



<A scene from IMLEX program online lectures>

### ■ Promotion of Student-Mobility Environment

• A system was established to hold lectures, etc. online as it has become difficult to provide the program on a face-to-face basis due to an impact of the spread of COVID-19. In fiscal 2020, the Japanese students could not go to Europe as planned, and continued taking the program courses in Japan.

• A dedicated space for students to receive online overseas lectures and remote education courses was established within Toyohashi University of Technology with the aim of allowing students to effectively receive such lectures and courses and thereby ensuring effective implementation of the program.

### ■ Internationalization of the university, Information disclosure and Publication of outcome

Toyohashi University of Technology worked to enhance its IMLEX website so that it serves as the source of information for students in Japan and overseas. Moreover, Toyohashi University of Technology created a general-purpose leaflet and a pamphlet as public relations for Japanese. Especially, pamphlets including detailed explanation were utilized to attract new recruits.

### ■ Good Practices

#### ○ Administration of the consortium by the partner universities

The organization operating the consortium with the three European universities established in fiscal 2019 has been promoting cooperation between the universities in the form of consortium and operating the program by holding meetings of the AMB and the QAB on a periodic basis.

#### ○ Enhancement of online lectures, etc. during the COVID-19 crisis

UEF commenced implementing the program in September 2020, online at first, due to the COVID-19 crisis. The enrollment guidance and all the lectures were provided online, in addition, hybrid experimental and other classes were held remotely utilizing technologies such as virtual reality, augmented reality and mixed reality.

### 3. FY2021 Progress

【Toyohashi University of Technology】

【Erasmus Mundus Japan-Master of Science in Imaging and Light in Extended Reality (IMLEX)】  
(Adopted year: FY2019)

#### ■ Exchange Programs



<IMLEX program logo>

The first group of students (who entered in 2020) from Europe studied online because they were not able to come to Japan. Research guidance was provided online and at European universities and companies. In line with the initial plan, Japanese students attended lectures and received research guidance at Toyohashi University of Technology.

The program commenced at the University of Eastern Finland in September 2021 for the second group of students. Two students from Japan and thirteen students from European universities participated in the program. The program was held at three European universities (University of Eastern Finland (UEF; Finland), University Jean Monnet Saint-Etienne (UJM; France), and KU Leuven (Belgium)) while measures were taken to prevent the spread of COVID-19. UEF provides photonics core courses, UJM provides imaging-related courses, and KU Leuven provides lighting-related courses, and the program has been held online and in person to cultivate human resources in line with the IMLEX program's goals.

#### Student Mobility

##### ○ Outbound

In preparation for sending the Japanese students (2nd group), pre-traveling education, such as preparatory English learning and overseas safety orientation, was provided. The students went to Finland at the end of August 2021, and they began studies at UEF. In January 2022, they went to UJM and KU Leuven to continue to the program.

	2021	
	Plan	Results
Outbound	8	2
Inbound	8	17

##### ○ Inbound

The European students from the first group were unable to travel to Japan in fiscal 2021 due to the spread of COVID-19, and the program was primarily held online. All of the European students from the second group were able to enter the European countries by September 2021, and they took the program courses on site.

#### ■ Forming the University Network with Quality Assurance

The Academic and Management Board (AMB) of the consortium met ten times (online) in fiscal 2021 to discuss program implementation matters related to student recruitment and course management. In addition, meetings of the Quality Assurance Board (QAB) were held three times to discuss matters such as program quality assurance.

- The mission of the AMB is to decide upon and manage academic-related matters of the program and to manage the selection, course registration, etc., of students.
- The mission of the QAB is to establish and implement the quality assurance policy of the program; to engage in monitoring; and to maintain and develop the quality of the program, promotional activities, etc.



<Lecture at UEF as a part of the IMLEX program>

#### ■ Promotion of a Student-Mobility Environment

- A system was established to hold lectures, etc., online as it has become difficult to hold the program in person due to the impact of the spread of COVID-19. In fiscal 2021, the European students could not come to Japan as planned due to border restrictions, but the program was continued in Europe.
- A dedicated space was established in fiscal 2020 for students to take online overseas lectures and remote education courses, and a space with VR equipment was also prepared so that Japanese and European students could study together.

#### ■ Internationalization of the University, Information Disclosure, and the Publication of Results

Toyohashi University of Technology worked to enhance its IMLEX website so that it serves as the source of information for students in Japan and overseas. Moreover, Toyohashi University of Technology created a general-purpose leaflet for promotion within Japan and, to attract students, pamphlets for promotion throughout the school.

#### ■ Good Practices

##### ○ Administration of the consortium by partner universities

The organization established in fiscal 2019 that operates the consortium with the three European universities promotes cooperation among the universities in the form of a consortium, and it operates the program by periodically holding meetings of the AMB and the QAB.

##### ○ Enhancement of online lectures, etc., during the COVID-19 crisis

Due to the effects of COVID-19, the program incorporated online aspects in both fiscal 2020 and 2021. Guidance and lectures were provided online as needed. In addition, hybrid classes utilizing technologies such as virtual reality, augmented reality, and mixed reality were held to perform experiments, etc., remotely.



# 4. FY2022 Progress

【Toyohashi University of Technology】

## 【Erasmus Mundus Japan-Master of Science in Imaging and Light in Extended Reality (IMLEX)】

(Adopted year: FY2019)

### ■ Exchange Programs



<IMLEX program logo>

In face of COVID-19, Toyohashi University of Technology (TUT) has been sending and receiving students while taking precautionary measures against infection. As the second group of students, 13 students from Europe were able to come to Japan as scheduled and started their studies at TUT in October 2022.

For the third group of students, the program commenced at the University of Eastern Finland (UEF) in September 2022 with eight students from Japan and thirteen students from European universities. UEF provides photonics core courses, University Jean Monnet Saint-Etienne (UJM) offers imaging-related courses, and KU Leuven provides lighting-related courses, and the program has been carried out in line with the IMLEX program's goals.

In September 2022, the program produced its first 15 graduates (seven from Japan and eight from Europe), who obtained triple degrees with TUT, UEF and UJM or KU Leuven.

### Student Mobility

#### ○ Outbound

In preparation for sending the Japanese students (3rd group), pre-traveling programs, such as preparatory English learning and overseas safety orientation, were provided. The students left for Finland in August 2022 and began their studies at UEF. In January 2023, they moved to UJM and KU Leuven to continue their participation in the program.

	2022	
	Plan	Results
Outbound	8	8
Inbound	8	13

#### ○ Inbound

All of the European students of the second group started their studies at TUT in October 2022 as scheduled.

### ■ Forming the University Network with Quality Assurance

The Academic and Management Board (AMB) of the consortium met eight times (online and in person) in fiscal 2022 to discuss program implementation matters related to student recruitment and course management. In addition, the Quality Assurance Board (QAB) held meetings three times to discuss matters such as program quality assurance.

- The mission of the AMB is to decide upon and manage academic-related matters of the program and to manage the selection, course registration, etc. of students.

- The mission of the QAB is to establish and implement the quality assurance policy of the program; to engage in monitoring; and to maintain and develop the quality of the program, promotional activities, etc.

### ■ Promotion of a Student-Mobility Environment

TUT has established a VR laboratory so that research on sensing, AI/IoT, robotics, etc., using XR technology, which is one of the university's specialties, can be used as teaching materials in educational settings quickly and effectively. At the laboratory, undergraduate students also take classes together with IMLEX students. Directly interacting with master's degree students who have studied cutting-edge technology at European universities provides undergraduate students with stimulating experiences, allowing them to open their eyes to the world.

### ■ Internationalization of the University, Information Disclosure, and the Publication of Results

TUT also worked with the university's public relations department to post information about Japanese students studying abroad and international students studying in Japan on Twitter and other social network systems. Additionally, TUT made the brochure for internal use available as a data file enabling many students to download the brochure themselves. Furthermore, TUT created a video of interviews with participating students to promote the program both inside and outside of the university.

### ■ Good Practices

#### ○ Administration of the consortium by partner universities

The organization established in fiscal 2019 that operates the consortium with the three European universities promotes cooperation among the universities in the form of a consortium, and it operates the program by periodically holding meetings of the AMB and the QAB. In fiscal 2022, waterfront measures against the COVID-19 pandemic were relaxed, and TUT was able to actually send faculty members to Europe to hold face-to-face meetings and discussions. Moreover, TUT could continue to strengthen cooperation with the EU through the consortium's governing body by utilizing online services.

#### ○ Enhancement of online lectures, etc.

In fiscal 2022, IMLEX programs were offered online as well as in-person. Guidance and lectures were provided online as needed. At the same time, hybrid classes were held utilizing technologies such as virtual reality, augmented reality, and mixed reality to perform experiments, etc., remotely.



<The first group of students (from Japan) who completed the program in September 2022>

# 5. FY 2023 Progress

【Toyohashi University of Technology】

## 【Erasmus Mundus Japan-Master of Science in Imaging and Light in Extended Reality (IMLEX)】

(Adopted year: FY 2019)

### ■ Exchange Programs



<IMLEX program logo>

In FY2023, Toyohashi University of Technology (TUT) could send and receive students normally, while paying attention to infection control, following the downgrading of COVID-19 to a category 5 infectious disease. Continuing the infection prevention measures, TUT received 11 students from Europe as the third class of students, who started their studies at TUT in October 2023.

For the fourth class of students, the program commenced at the University of Eastern Finland (UEF) in September 2023 with four students from Japan and nine students from European universities. UEF provides photonics core courses, University Jean Monnet Saint-Etienne (UJM) offers imaging-related courses, and KU Leuven provides lighting-related courses. In the program, students learn from skilled faculty members, using state-of-the-art equipment in the special fields of expertise of their respective universities, building the foundations of the next generation of leaders in line with the IMLEX goals.

In September 2023, the program produced its second class of 15 graduates (2 from Japan and 13 from Europe). This was the first year that students from EU could attend the commencement ceremony. Their family members also attended the ceremony. Efforts will be continuously made to run a full-fledged program.

### Student Mobility

#### ○ Outbound

In preparation for sending the Japanese students (4th class), pre-traveling programs, such as preparatory English learning and overseas safety orientation courses, were provided. The students left for Finland in August 2023 to begin their studies at UEF. In January 2024, they moved to UJM and KU Leuven to continue their participation in the program.

#### ○ Inbound

All of the European students of the third class started their studies at TUT in October 2023 as scheduled.

	2023	
	Plan	Results
Outbound	8	4
Inbound	8	9

### ■ Forming the University Network with Quality Assurance

The Academic and Management Board (AMB) of the consortium met ten times (online and in person) in FY 2023. In order to continue to operate this program beyond FY 2025, discussions were held on the future management of the program, including structural reform of the program and application for Erasmus+. In addition, the Quality Assurance Board (QAB) held meetings three times to discuss matters such as program quality assurance.

- The mission of the AMB is to decide upon and manage academic-related matters of the program and to manage the selection, course registration, etc. of students.
- The mission of the QAB is to establish and implement the quality assurance policy of the program; to engage in monitoring; and to maintain and develop the quality of the program, promotional activities, etc.



<The 2nd class of students (from Japan) who completed the program in September 2023>

### ■ Promotion of a Student-Mobility Environment

This year TUT received students for the second time. It was possible to understand in advance the issues that the inbound students would face after their arrival in Japan. Therefore, TUT held an online pre-arrival orientation program twice to help international students get started smoothly in Japan. The program provided the students with information on visa application, study at TUT, and other procedures to help them smoothly navigate the complicated procedures at the city office after arriving in Japan. Japanese students received English language courses for six months from the time they entered TUT until the start of the program, so that they would have no worries about communication after starting their study abroad. In addition, a crisis management orientation was held by Japan IR&C Corporation to ensure safety.

### ■ Internationalization of the university, Information disclosure and Publication of outcome

TUT also worked with the university's public relations department to stream the commencement ceremony on YouTube. Progress checks on the post-completion career paths of the first and second class of students were conducted, and the results were posted on the website along with the achievements to date (students received and dispatched).

In order to continue the program in the future, TUT has applied for the Erasmus+ program, which will start in 2025, together with the partner universities in the EU. This is the first time for TUT to receive funding from Erasmus as a full partner of the consortium to run a study abroad program, which further requires strong academic and administrative collaboration with the EU. In preparation for the application for Erasmus, members of the partner universities and the EU Commission visited TUT to actively exchange views and opinions.

### ■ Good Practices

#### ○ Administration of the consortium by partner universities

The organization established in FY 2019 that operates the consortium with the three European universities promotes cooperation among the universities in the form of a consortium, and it operates the program by periodically holding meetings of the AMB and the QAB. In FY 2023, TUT was able to actually send faculty members to Europe to hold face-to-face meetings and discussions. This year marks the fifth year since the program was launched. Due to the good relationship among the faculty members, various issues have been handled promptly resulting in making a high-quality program.

#### ○ Enrichment of partner companies

In FY 2023, further participation by partner companies was sought in anticipation of a new structure starting in FY 2025. Based on the successful program management to date, many new companies are expected to join as associate partners. (Organizations to join: YLE Innovations (Finland), Human Augmentation Research Center of National Institute of Advanced Industrial Science and Technology (AIST) (Japan), Sony Computer Science Laboratories (Japan), Varjo (Finland), SeeTrue (Finland), OptoFidelity (Finland), Speedernet (France), Hexadrone (France), etc.)