Master's/Doctoral Program in Life Science Innovation

Join the International Science and Technology City, Tsukuba

Master's Degree program (2 years) & Ph. D. program (3 years)

Join the International Science and Technology City, Tsukuba
The limited natural resources of Japan and its rapid population decline make it imperative to find solutions that are innovative and technology-based, making the pursuit for continuous human resource development very important. The rapidly aging population of Japan also causes a shortage of medical treatment and nursing care facilities. Therefore, to create a society where everyone can live his or her life to the fullest, there was a strong demand for innovation and the establishment of an academic program such as the “Life Science Innovation Program”.

Looking at the global trend, innovation in Life Science in Japan lags behind compared to many other developed countries because it takes a long time before any seed of technology is industrialized. In addition, once developing countries attain their economic growth, the focus usually shifts to the improvement of “Quality of Life” (QOL). Given the great demand for outstanding human resources in developed countries, the creation of “Life Science Innovation” becomes imperative in order to produce globally competitive human resources.

The Life Science Innovation Program offers degrees in the research fields - Disease Mechanism, Drug Discovery, Food Innovation and Environmental Management. What makes this program unique is that the students will be provided with an academic background and at the same time, gain technical expertise through internships at different national and private institutions in Tsukuba City. The knowledge gained on the field of specialization will help them to find innovative approaches that are cross-disciplinary and create synergies between fields.

Students of this program should be able to help create solutions to the emerging problems in society by first contributing to the academic community during their stay in the university and to society, throughout their lives, by engaging in the creation of innovations for the improvement of Quality of Life.

**An academic program jointly established with Tsukuba Science City**

Tsukuba is a city located in Ibaraki Prefecture, Japan and is also known as “Tsukuba Science City”, a planned science park developed in the 1960s and represents one of the world’s coordinated attempts to accelerate the rate of scientific discovery. There are 60 national institutes and more than 200 private research facilities in the city. Considering innovative approaches, the lecturers and supervisors of this program are not only the professors from our university but also from the private sector and the national research institutes of “Tsukuba Science City”, who are actively involved in industrialization processes, as part of this program’s innovation in graduate training. The professors, including those from the private companies and national institutes, have multiple roles in the program such as the creation of the curriculum, giving lectures, and supervising students who will undergo internships and conduct thesis research. Students who will graduate from this program will have a holistic view of Life Science Innovation and will be ready to compete in the global job market.
Various national institutes were established in Tsukuba district about 40 years ago to respond to the demands for the promotion of higher education in science and technology. Many research laboratories from industry were also established. Since then, there have been more than 300 national and industrial institutes in Tsukuba district, serving as the world-leading science city.

However, each institute had been conducting their own research and development, making it difficult to generate synergistic and innovative research and development. Therefore, we decided to establish a system to promote collaborative research & development in the life science field in Tsukuba district using what we know now as the Life Science Promotion Association of Tsukuba. The association was established in February 2012 to promote excellence in life science research in Tsukuba Science City.

The association also aims to contribute to society by helping in the revitalization of education, research and development, and industry. As of 2014, a total of 19 companies and academic research institutions located in Tsukuba district, Astellas Pharma, Eisai, Ono, KYOWA Hakko Bio, Taiho and so on, make up this association. Furthermore, using the extensive collection of bioresources, we are trying to develop a common platform for drug discovery through by developing a database that enables us to conceptualize how we can maximize the use of the available biomedical resources, as well as promotion of the same in Tsukuba district among its members. The project ‘Development of innovative pharmaceuticals and medical technologies’ of the Tsukuba Biomedical Resources Consortium was selected as one of the projects for the Tsukuba International Strategic Zone.

We hope that new businesses will be established through ‘industry-academic-government collaboration’ and by taking advantage of the bioresources made available to the members of the association. There has been no such system in Japan before but with our collective efforts, we created one. Now, the association, together with the University of Tsukuba, takes the lead in establishing an independent graduate school, the Master’s/Doctoral Program in Life Science Innovation in University of Tsukuba to contribute to the society through human resources development.

**Executive Director** Professor Makoto Asashima
The Master’s/Doctoral in Life Science Innovation academic program of University of Tsukuba (T-LSI) offers talented students from around the world the opportunity to enhance their unique experiences in becoming catalysts for innovation in the society by introducing new ways of thinking. T-LSI will provide great learning opportunities here and abroad, encouraging students’ interaction with leading world experts in its four specific fields of specialization – Disease Mechanism, Drug Discovery, Food Innovation, and Environmental Management.

T-LSI brings together a unique group of educators for this program - professors from the University of Tsukuba, scientists from various research institutes and private companies in Tsukuba, as well as professors from top-ranked universities abroad.

Students can choose the educational experience that will suit their interests. Excellent students may also get the chance to be mentored by professors from the Oxford Stem Cell Institute (Oxford, UK), University of Montpellier, University of Bordeaux or University of California in San Diego who are associated with the program. They also have a chance to engage in excellent research internships at leading Japanese pharmaceutical companies and world-class laboratories at research institutes based in Tsukuba Science City. The practical skills that they will gain from their internship in the private pharmaceutical companies will be their advantage in a very competitive international job market.

Program Leader

Professor Hiroko Isoda

The Master’s/Doctoral in Life Science Innovation academic program of University of Tsukuba (T-LSI) offers talented students from around the world the opportunity to enhance their unique experiences in becoming catalysts for innovation in the society by introducing new ways of thinking. T-LSI will provide great learning opportunities here and abroad, encouraging students’ interaction with leading world experts in its four specific fields of specialization – Disease Mechanism, Drug Discovery, Food Innovation, and Environmental Management.

T-LSI blends the expertise of the academe and the practical knowledge of private pharmaceutical companies and the Life Science Promotion Association of Tsukuba.
Faculty Voices

Renu Wadhwa

**Professor, School of Integrative and Global Majors**  
**Group Leader, National Institute of Advanced Industrial Science and Technology (AIST)**

With upcoming digital world, education and research technologies have revolutionized in last three decades. The libraries have been transformed from physical collection of information to virtual and electronic versions in the form of big databases. With this ease of access to information, the new challenge is how one could make the best of the information available. Parallel to this scenario, globalization of education and business has evoked new challenges for training the young generations to international standards of education and careers. Tsukuba University Life Science Innovation (T-LSI) program is one of the rare ones in the world that combine several aspects of basic and applied science learning and industrialization with an aim to “Sustain the Society and Support Life to the Largest”.

With my working experience in academia and pharmaceutical industry, I feel that there is indeed a strong need to bring the two together both in terms of training the talents, and bridging them to industry to promote innovation and industrialization of research. T-LSI is a thoughtful initiative built with the soul that “Sharing is the Solution”. It connects highly competent faculties of renowned national and international repute to the students of international backgrounds and offers a multifactorial platform of world-class education. Learning through academic, research, industry and government sectors; small class size enabling direct interactions with teachers, and focus on innovative career building are the highlights that would make T-LSI a program of choice.

Taka-Aki Sato

**Professor, School of Integrative and Global Majors**  
**Shimadzu Corporation**

Precision Medicine is very important approach for the personalized medicine. In particular, the integrated multi-omics analyses including genome, metabolome and proteome are necessary for the discovery of physiologically significant biomarker and drug target in human cancers. The R&D center for Precision Medicine (PMC) is currently focusing on the multi-omics analyses including the whole genome sequencing-based approaches for the development and/or progression of human cancers as well as the liquid biopsy. Furthermore, PMC has most advanced analytical instruments such as LC-MS/MS (liquid chromatography-mass spectrometer), MALDI-MS (matrix assisted laser desorption/ionization-mass spectrometry), GC-MS (gas chromatography-mass spectrometry) and NGS (next generation sequencer) for the multi-omics analyses. PMC also has an internship program collaborating with several industries and national institutes.

The Ph.D. candidates who are interested in these advanced molecular biological approaches, are very welcome to the T-LSI program.
Toshikazu Kamiya

T-LSI is a unique post-graduate program intended for students wishing to play a leading role in life science field wherever you will work in the future.

T-LSI provides students with opportunities to learn a variety of subjects through lectures, research, internship, group discussions, presentations, etc. In my class, Team Learning in Life Science Innovation, students are encouraged to improve their skills to create new projects that meet existing or potential demands in various life-science related segments. The students discuss many topics in the class with other students of different backgrounds and nationalities, which helps them make friends with each other quickly and broaden their scopes for their future directions.

You may not be sure what you should specialize in in the future. Don’t worry. Our mission is to help you make yourself more knowledgeable, more creative, and more flexible so that you can decide what you really want to do while keeping yourself continuously seeking for the demand from the society that you can contribute to for the forthcoming years. Learning about activities in industry in the Tsukuba Science City is also a great benefit of this program to know how innovative academic information can form itself as an actual product or a practical system. This way, we expect all the students of T-LSI will eventually attain a common goal: global improvement of people’s life.

Iwane Suzuki

To sustain environmental situations, enhancement of utilization of sustainable energy is very important. In general, among a various source of the sustainable energy, e.g. hydrant, wind, solar, wave, tide and geothermal produce electricity, whilst only biomass can be usable as a substitution of petroleum, which is used as fuels and materials for a plenty of daily necessities. We are focused on biomass production by microalgae, because their potential of oil production is rather high and the cultivation does not directly compete with the production of crops. In our group, we are studying regulation of metabolic pathway and transplants of biosynthetic pathway of usable compounds in several microalgae to improve and enhance productivity. For instance, we recently developed a novel artificial sensor to regulate its metabolism via regulation of gene expression in cyanobacteria and we also developed strains of cyanobacteria producing unusual modified fatty acid, i.e. a cyclopropane fatty acid and a branched fatty acid, via photosynthesis. Now we are going to apply this into the eukaryotic algae. We also attempting to produce other types of unusual fatty acids which can directly be applicable for the materials of polymers. Those who are interested in such fields are very welcome to join in our group.
The names of the professors who will supervise the Master’s degree thesis and the Internship Project are listed in the table. The main supervisors will be University of Tsukuba professors while professors from universities abroad who are associated with the program can potentially act as co-supervisors. Master’s degree students who plan to enroll in the Ph.D. courses will write a Ph.D. research proposal instead of a Master’s thesis. The quality and level of the proposal should be equivalent to those submitted for competitive research grants.

### Research Topics / Professors

#### Master course /

Ph.D. thesis research will be supervised by University of Tsukuba professors, with the research scientists and professors from institutes/companies as potential co-supervisors. Professors from the Oxford Stem Cell Institute (Oxford, UK), University of Montpellier, Wageningen University, and UC San Diego who are associated with the program will also serve as potential research co-supervisors. In addition to the submission of Ph.D. dissertation, students are also required to have at least one publication in an international refereed journal.

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<tr>
<th>Professors</th>
<th>Affiliation</th>
<th>Research Topic</th>
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<tr>
<td>Kuniya Abe</td>
<td>RIKEN</td>
<td>Animal Developmental Genetics</td>
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<td>Yuzuru Ito</td>
<td>National Institute of Advanced Industrial Science and Technology (AIST)</td>
<td>Developmental Biology/Stem Cell Biology</td>
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<td>Tadayaoshi Hayata</td>
<td>University of Tsukuba</td>
<td>Skeletal System Regulation</td>
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<td>Tomoko Kuwabara</td>
<td>AIST</td>
<td>Regulatory Analysis of Adult Stem Cells</td>
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<td>Yukio Nakamura</td>
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<td>Application of State-of-the-Art Cell Technology</td>
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<td>Nobuhiro Ohkohchi</td>
<td>University of Tsukuba</td>
<td>Tumor Oncology and Development of Surgical Emulation Systems</td>
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<td>Taka-Aki Sato</td>
<td>Shimadzu Corporation</td>
<td>Molecular Oncology</td>
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<tr>
<td>Renu Wadhwa</td>
<td>AIST</td>
<td>Biology of Cellular Aging, Cancer and Stress</td>
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<td>Masashi Yanagisawa</td>
<td>University of Tsukuba</td>
<td>Behavioral Neuroscience</td>
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<td>Yasuhiro Yasutomi</td>
<td>Tsukuba Primate Research Center</td>
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<td>Atsushi Yoshiki</td>
<td>RIKEN</td>
<td>Bioresource Science for Laboratory Mouse</td>
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<td>Sosaku Ichikawa</td>
<td>University of Tsukuba</td>
<td>Functional Carrier Design and Engineering</td>
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<td>Hiroko Isoda</td>
<td>University of Tsukuba</td>
<td>Natural product drug discovery</td>
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<td>Toshikazu Kamiya</td>
<td>Kyowa Hakko Bio Co., Ltd.</td>
<td>Biomaterial/Bioprocess Science</td>
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<td>Toshiyuki Kanamori</td>
<td>AIST</td>
<td>Transport Phenomena in biomedical system</td>
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<td>Yusaku Miyamae</td>
<td>University of Tsukuba</td>
<td>Chemical Biology</td>
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<tr>
<td>Keiji Miyata</td>
<td>Astellas Pharma Inc.</td>
<td>Translational Science for Drug Discovery</td>
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<tr>
<td>Sosuke Miyoshi</td>
<td>Astellas Pharma Inc.</td>
<td>Translational Science for Drug Discovery</td>
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<tr>
<td>Hiroshi Nagase</td>
<td>University of Tsukuba</td>
<td>Medicinal Chemistry</td>
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<td>Tetsuya Sakurai</td>
<td>University of Tsukuba</td>
<td>Mathematical Informatics</td>
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<tr>
<td>Shinji Sugisaka</td>
<td>AIST</td>
<td>Biochemical Engineering</td>
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<tr>
<td>Kentaro Yoshimatsu</td>
<td>Eisai Co., Ltd.</td>
<td>Medicinal Science</td>
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<td>Hiroko Isoda</td>
<td>University of Tsukuba</td>
<td>Food Functionality</td>
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<td>Toshikazu Kamiya</td>
<td>Kyowa Hakko Bio Co., Ltd.</td>
<td>Nutraceutical Science</td>
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<tr>
<td>Kenichi Kashiwagi</td>
<td>University of Tsukuba</td>
<td>Development Economics</td>
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<tr>
<td>Susumu Kawasaki</td>
<td>National Agriculture and Food Research Organization</td>
<td>Food Microbiology: Food Hygiene Laboratory</td>
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<tr>
<td>Ieao Kobayashi</td>
<td>National Agriculture and Food Research Organization</td>
<td>Multiscale Food Engineering</td>
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<tr>
<td>Masatomo Kobayashi</td>
<td>RIKEN</td>
<td>Science and Technology of Plant Resources</td>
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<td>Mitsutoshi Nakajima</td>
<td>University of Tsukuba</td>
<td>Food Engineering</td>
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<tr>
<td>Marcos Antonio Das NEVES</td>
<td>University of Tsukuba</td>
<td>Food Engineering</td>
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<tr>
<td>Kazuichi Sakamoto</td>
<td>University of Tsukuba</td>
<td>Nutrigenomics</td>
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<tr>
<td>Kunihiko Uemura</td>
<td>National Agriculture and Food Research Organization</td>
<td>Food Engineering: Advanced Food Technology Laboratory</td>
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<tr>
<td>Jun Watanabe</td>
<td>National Agriculture and Food Research Organization</td>
<td>Food Functionality: Functional Food Factor Laboratory</td>
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<tr>
<td>Hiroyuki Fuchino</td>
<td>National Institutes of Biomedical Innovation</td>
<td>Pharmacognosy and Natural Product Chemistry</td>
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<tr>
<td>Hirofumi Hara</td>
<td>Universiti Teknologi Malaysia</td>
<td>The tropics environmental microbiology</td>
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<tr>
<td>Masanobu Kawachi</td>
<td>National Institute for Environmental Studies</td>
<td>Algal Resources and Conservation</td>
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<tr>
<td>Tokuo Kawahara</td>
<td>National Institutes of Biomedical Innovation</td>
<td>Pharmacognosy and phytochemistry</td>
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<tr>
<td>Masanori Kukuchi</td>
<td>National Institute for Materials Science</td>
<td>Bioceramics</td>
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<tr>
<td>Masatomo Kobayashi</td>
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<td>Science and Technology of Plant Resources</td>
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<tr>
<td>Yoshito Kumagai</td>
<td>University of Tsukuba</td>
<td>Environmental Biology</td>
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<tr>
<td>Takeshi Nakayama</td>
<td>University of Tsukuba</td>
<td>Systematics of Protops</td>
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<td>Moriya Ohkuma</td>
<td>RIKEN</td>
<td>Microbial Resources and Diversity</td>
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<tr>
<td>Iwane Suzuki</td>
<td>University of Tsukuba</td>
<td>Functional Regulation of Photosynthesis</td>
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<tr>
<td>Kenji Tamura</td>
<td>University of Tsukuba</td>
<td>Soil Environmental Chemistry</td>
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<tr>
<td>Kayo Yoshimatsu</td>
<td>National Institutes of Biomedical Innovation</td>
<td>Biotechnology for Medicinal Plants</td>
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Curriculum

Educational Goals of the Program

Innovation based on life science requires an interdisciplinary approach towards the sustainable use of resources as well as their conservation and commercialization. The foundation of this process are excellent communication and management skills, being able to identify key issues, and finding and implementing innovative solutions to problems based on advanced knowledge and skills. Individuals who obtain such transferable skills can actively engage in the global business field in Medical care, Pharmaceutical, Food and Environmental industries.

Professors from top-ranked universities abroad

Professors from universities abroad who are associated with the program can give the students a chance to experience a “world class learning experience and environment” and in the process, acquire the necessary research and innovative product development skills.

Professor Michel Larroque (Univ. Montpellier)

Professor Remko Boom (Wageningen Univ.)

Partner Private and National Institutes

Professors from the different research institutes and private companies will share with the students, their practical point of view for Life Science Innovation through lectures, internships, and research supervision, sharing their knowledge and know-how, what motivates them, as well as their purpose and priorities in R&D.

Astellas Pharma Inc.
Eisai Co., Ltd.
Japan Aerospace Exploration Agency
KYOWA HAKKO BIO CO., LTD.
National Agriculture and Food Research Organization
National Institute for Environmental Studies
National Institute for Materials Science
National Institute of Advanced Industrial Science and Technology
National Institute of Agrobiological Sciences
National Institute of Biomedical Innovation, Health and Nutrition
National Museum of Nature and Science
RIKEN
TAIHO PHARMACEUTICAL CO., LTD.
The students take the core subjects which include introduction to the four fields - Liberal arts, Regulatory Science, Intellectual Property and Group Work. After the completion of the core courses, the students will take their major courses in their chosen field of specialization in preparation for their master's degree thesis, jointly supervised by the professors of University of Tsukuba and research institutes, or undergo Internship in the institutes. The lectures are optional for Ph. D. students but they are required to join laboratory seminars and Internships.

### Disease Mechanism
- Prominent Discoveries in Neuroscience
- Molecular & Cellular Biology of Disease I
- Molecular & Cellular Biology of Disease II
- Basic Bone Biology
- Advances in Cellular Regulation

### Drug Discovery
- Medicinal Chemistry / Pharmacology
- Organic Chemistry / Chemical Biology
- Drug Design Engineering
- Translational Science in Drug Discovery (Astellas Pharma)
- Drug Discovery Research & Project Management (Eisai)

### Core Subjects
- Introduction to Medicine
- Introduction to Drug Discovery
- Introduction to Food Science
- Introduction to Bioresource
- Introduction to Natural History
- Practices in Life Science Innovation
- Team Learning in Life Innovation Science
- Management in Pharmaceuticals and Food
- Life Science Innovation Seminar
- CITI (Research Ethics)
- Regulatory Science
- Bioinformatics
- Internships

### Food Innovation
- Food Functionality
- Food Business
- Food Safety
- Food Process Engineering
- Nutrigenomics

### Environmental Management
- Biomass Science
- Environmental Algology
- Habitat and Functional Compound
- Environmental Medicine
- Water Environment and Life Science
Fia Noviyanti

Being here is a dream come true for me! Studying in T-LSI Program is the best decision that I have ever made in life. Here I can broaden my knowledge by learning not only from my specialized subject but also from other specialized subjects. This program gave me the opportunity of a lifetime to learn about life science directly from experts. If you're interested for a research in life science, explore this fascinating country, and meet new people from different countries, T-LSI Program is the best choice. Don’t be afraid to study abroad. Take the chance!

Yuxin Wang

Since I enrolled University of Tsukuba, I was so happy that we could study together, to have classes, visits, and discussions. I still remember that when T-LSI was started in the first semester, there were only three master students in the classes. But now we are so welcome that so many students come from different countries. We can discuss in the class and ask any questions. It is so great and I am happy that I took this program.

Sukant Garg

T-LSI is a unique blend of sciences where all the ideas are greeted and conformed. We inspire innovation sincerely and believe in expounding from as early as the concept institution. Research and evolution are our fundamental objectives, and we have both proficiency and facility to carry it out.
Information

International Student Center of University of Tsukuba
http://www.global.tsukuba.ac.jp/isc?language=en

On-Campus Accommodation
https://www.tsukuba.ac.jp/english/campuslife/healthlife.html

Entrance Fee Exemption / Tuition Waiver
https://www.tsukuba.ac.jp/english/campuslife/exemption.html

Notice of Scholarships for International students
http://www.global.tsukuba.ac.jp/isc/student-support/scholarships?language=en

JASSO
http://www.jasso.go.jp/ryugaku/index.html

Tsukuba Scholarship
https://www.tsukuba.ac.jp/english/campuslife/scholarship_tsukuba.html#ryugaku

ABE Initiatives (JICA) : The applicants from African Nations can apply this scholarship program organized by JICA (2015-2017)

MEXT Scholarship:

http://tlsi.tsukuba.ac.jp/