

Program for Leading Graduate Schools

Graduate Course for System-inspired Leaders in Multidisciplinary Science

~System-inspired Leaders for Multidisciplinary Science (SiMS)~

Course Registration Guide

(As of 1 Apr. 2021)

Graduate Schools of Osaka Prefecture University

Graduate Schools of Osaka City University

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I. Graduate Course for System-inspired Leaders in Multidisciplinary Science (SiMS Program)

Today, there is an increasing need for researchers with a high level of education who can demonstrate strong leadership in the global community to make our industry more competitive and to achieve a sustainable society through innovations. Osaka Prefecture University and Osaka City University have been selected by the Ministry of Education, Culture, Science, Sports and Technology as the center for promoting the “Program for Leading Graduate Schools” in order to foster excellent students who will play leading roles in the academic, industrial and governmental sectors around the globe. In line with this, we offer the “Graduate Course for System-inspired Leaders in Multidisciplinary Science,” a five-year straight doctoral course designed to cultivate leaders with a global perspective for the industrial community.

1. Goal of this Program

Given the difficulties in securing energy and industrial resources while aiming at the realization of a sustainable society, Multidisciplinary Science constitutes the major foundation to attain the industrial style, as well as lifestyle, that enable us to sustain a stable environment and civilization. A few examples of the importance of Multidisciplinary Science research include developing an innovative technology to efficiently gather, accumulate and utilize renewable energy such as sunlight, and an interdisciplinary approach researching life phenomena at the molecular level to solve health, food or environment related problems. As such, Multidisciplinary Science advances could become the essential force to shake up preconditions for a sustainable society and inspire new ideas as to what it should be like. Furthermore, from the standpoint of material scientists, it appears that a multi-faceted perspective, which is applied to discover materials that reveal their functions in systems or to develop nanoscience to deal with big data and other new challenges in information technology, is indispensable in order to meet the challenges to a sustainable society where multiple elements are intertwined. In addition, the establishment of a new methodology in Multidisciplinary Science, which is based on multi-layered, interdisciplinary ideas inspired by “koto-zukuri (value creation),” is also essential. The SiMS Degree Program aims to foster research leaders who can deal with the challenges outlined above by equipping them with the qualities discussed in the following section.

2. Objectives of this Program

The SiMS Degree Program aims to equip students with the following qualities:

- A deep understanding of the relationship between engineering and nature, environment, society, history, mankind, and culture based on an in-depth general education; a sharp awareness of the impact of science and technology on society and nature; a strong sense of responsibility towards society and a high ethical standard as an engineer.
- Strong leadership with expertise and systematic understanding of technology based on an in-

depth knowledge of Multidisciplinary Science.

- The ability to design research strategies stemming from multi-layered, interdisciplinary ideas inspired by systems thinking.
- The ability to achieve breakthroughs, as well as the management skills, to bring about industrial innovations utilizing the output of fundamental R&D.
- The ability to disseminate one's ideas widely and have them deeply rooted in the global community through strong leadership.
- Quality as a "system-inspired" research leader well versed with multi-layered, interdisciplinary ideas inspired by incorporating the idea of "koto-zukuri (value creation)" into the process of "mono-zukuri." Such leaders will be able to bring about innovations in electronics, energy and life science, which will never be fleshed out from a perspective confined to a single layer of multidisciplinary science.
- The management skills to enable creation of new industries, which are internationally competitive and contribute to the realization of a sustainable society that is safe and secure, taking advantage of the knowledge obtained in this program.

3. Curriculum Policy (Curriculum organization and implementation policy)

- (1) The five-year straight curriculum is organized with the objective of achieving the goals set forth by the "Graduate Course for System-inspired Leaders in Multidisciplinary Science."
- (2) Aiming to bring about innovations in such fields as electronics, energy and life science, which will never be fleshed out from a perspective confined to a single layer of Multidisciplinary Science, we have designed our curriculum to foster "system-inspired" leaders well versed with multi-layered interdisciplinary ideas through an education of how to incorporate the idea of "koto-zukuri (value creation)" into the process of "mono-zukuri." Furthermore, we have organized our curriculum in an interdisciplinary manner and through industry-academia-government collaboration so that we can cultivate researchers who can conceive new ideas of "koto-zukuri (value creation)" utilizing the deep knowledge of materials and systems and apply a comprehensive perspective towards our society instead of just being preoccupied with research for its own sake.
- (3) The literacy course in our curriculum provides a general education in philosophy and ethics of science to help students take a holistic view of science.
- (4) The interdisciplinary courses in our curriculum are designed to foster multi-layered and interdisciplinary research capabilities. Students are exposed to a broad range of disciplines, which will enable them to think holistically and raise questions flexibly.
- (5) The ideation course and the global course, which are an essential part of our degree program, are designed to foster (1) "systems thinking" to take a holistic view of complex events or phenomena; (2) "design thinking" to create new ways of thinking; and (3) "management skills" to flesh them out into innovations in a comprehensive manner.
- (6) The entrepreneurship course and the global course are provided in a mixed manner with focus on

lecture, research, and exercises. Instructors include foreign scholars. We also invite instructors from the business community. Various issues in the globalized industry are raised with the objective of fostering the system-inspired ability to deal with them.

4. Diploma Policy (Assessment and Degree Grant Policy)

The ultimate goals of our program are the pursuit of truth and the creation of knowledge; the development of science and technology in harmony with the ecosystem; the contribution to the development of a sustainable society and the creation of culture; and to bring about industrial innovations in such fields as energy, electronics, and life science.

An education in line with these ultimate goals is offered throughout this program. In order for the students enrolled in this program to be certified for a diploma, they need to develop the abilities to identify, assess and solve problems; enhance creativity and personality; and acquire expertise and high ethical standards as well as in-depth general knowledge, along with the following qualities:

- A solid basic knowledge of Material Science required to lead a specialized field in Material Science.
- The ability to design research strategies stemming from multilayered, interdisciplinary ideas inspired by systems thinking.
- The ability to achieve breakthroughs and management skills to bring about industrial innovations utilizing the output of fundamental R&D.
- The ability to disseminate one’s ideas widely and have them deeply rooted in the global community through strong leadership.

In this program, the major assessment criteria will be whether a student has been able to (1) discover problems in our society or industry by taking a system-inspired, holistic view; (2) design and complete one’s own course-work and research plan to solve these problems; and (3) foster an ability to achieve breakthroughs and management skills to create industrial innovations in such fields as energy science, electronics, and life science.

5. Graduate Schools and Departments in which the Degree Program is offered and the Major names which offer the Degree Program

[Graduate Schools of Osaka Prefecture University]

Graduate School	Department	Course Name by Department which offers the SiMS Degree Program
Engineering	-Mechanical Engineering -Aerospace and Marine-System Engineering	<ul style="list-style-type: none"> • Leading Program Course • Leading Program Course in Aerospace Engineering • Leading Program Course in Marine System Engineering

	<ul style="list-style-type: none"> -Electronics Mathematics and Physics -Electrical Engineering and Information Science -Material Science and Engineering -Quantum and Radiation Engineering 	<ul style="list-style-type: none"> • Leading Program Course in Physics and Electronics • Leading Program Course in Electrical and Information Systems • Leading Program Course in Computer Science and Intelligent Systems • Leading Program Course in Applied Chemistry • Leading Program Course in Chemical Engineering • Leading Program Course in Material Science • Leading Program Course
Life and Environmental Sciences	<ul style="list-style-type: none"> -Applied Life Sciences -Environmental Science and Technology 	<ul style="list-style-type: none"> • Leading Program Course • Leading Program Course
Sciences	<ul style="list-style-type: none"> -Physical Science -Molecular Science -Biological Science -Mathematics and Information Sciences 	<ul style="list-style-type: none"> • Leading Program Course • Leading Program Course • Leading Program Course • Leading Program Course
Humanities and Sustainable System Sciences	Sustainable System Sciences	<ul style="list-style-type: none"> • Leading Program Course in Knowledge and Information Systems • Leading Program Course in Environmental System Sciences (environmental studies) (social systems theory) (cognition and behavior theory)

[Graduate Schools of Osaka City University]

Graduate School	Department	Course by Department which offers the SiMS Degree Program
Engineering	-Mechanical & Physical Engineering	Leading Program Course
	-Physical Electronics & Informatics	Leading Program Course
	-Applied Chemistry & Bioengineering	Leading Program Course
	-Urban Engineering	Leading Program Course

II. Course Registration Guidelines

1. Registering for the Courses and Earning Credits

Students in the Leading Program Courses must register for the subjects specified by the curriculum of the affiliated graduate school department as well as the subjects in the curriculum of the SiMS Degree Program, and earn the credits required to complete the respective curricula.

2. Curriculum of the SiMS Degree Program

The curriculum of the SiMS Degree Program is shown in the Appendix (see the next page).

3. Course Registration Reminders

(1) Signing up for the Courses, Grading, etc.

Course application, grades, credits, the academic calendar, etc., are specified by graduate schools of Osaka Prefecture University or graduate schools of Osaka City University.

(2) Registration for Special SiMS Research (compulsory, two credits)

Special SiMS Research is a course that allows students to conduct research for about three months in a laboratory of a different field/specialization from the affiliated laboratory. The registration flow is as follows:

1. Determine in which year to register for the course. Apply for the course at the beginning of the predetermined academic year.
2. Consult the mentor (see III-3. Individual Mentoring by Persons with Experience as a Corporate Executives) to select the laboratory, etc., for the course. (To search laboratories accepting students for Special SiMS Research, their research subjects and other information, click “Laboratory Rotation” on the SiMS website and then log in to “Special SiMS Research Laboratory Rotation.” The ID, password and when the website is updated will be informed separately.)
3. Meanwhile, with permission from the research advisor, determine the desired period for taking the course.
4. Submit the prescribed application to the mentor.
5. The mentor and the faculty from the laboratory will discuss the application details and determine whether the laboratory will accept the student or not, as well as the requirements for acceptance and other necessary matters.
6. The mentor and the faculty in charge of review from the laboratory will have a discussion and confirm whether the application is consistent with the object of the program or not.
7. The mentor will inform the student of the results of the discussion (accepted or not, requirements for acceptance, etc.)
8. Start to take the course (start to conduct research in a different field).
9. Submit the mentor weekly reports during the course period, as well as a report at the completion of the course.

It takes times to confirm, students must get an early start on consulting.

(3) Registration for Global Leadership Workshop (outside Japan)

By the third year(L3,D1) at the latest, students determine the destination for research outside Japan (strongly recommend to apply for the subsidy program such as “Tobitate! Study Abroad Initiative” by Ministry of Education, Culture, Sports, Science and Technology to get scholarship in advance.) and complete the course during the fourth year(L4,D2). Otherwise, it may be affected research progress for a doctoral degree. Preparation and procedures will be informed separately.

(Appendix) Curriculum and Accreditation of the SiMS Program for International Students Courses	Subject title	Number of Credits	Academic year	The number of credits for designated subjects, etc
Literacy courses	Scientific Literacy	*2 (Compulsory)	2	4 credits or more
	International environmental Issues	2	1-2	
	Special Seminar for Scenario Task Oriented Planning	2	2	
	Technology-based Entrepreneurship Course	*2 (Compulsory)	1-2	
Interdisciplinary courses	Special SiMS Research	*2 (Compulsory)	2	2 credits or more
	Special Communication Seminar based on multidisciplinary science	2	2	
Ideation courses	Special Seminar for Strategic Reasoning and Thinking	*2 (Compulsory)	1-2	2 credits or more
	Ideation and Globalization Workshop	2	3-5	

(Appendix) Curriculum and Accreditation of the SiMS Program for International Students Courses	Subject title	Number of Credits	Academic year	The number of credits for designated subjects, etc
Global courses	Special Seminar for Global Communication	2	2	2 credits or more
	Global Leadership Workshop	*2 (Compulsory)	3-5	
Entrepreneurship courses	Technology-based Entrepreneurship Course-I(TEC-I)	2	3-5	4 credits or more, including 2 credits from 8 courses (TEC-II A-H)
	Technology-based Entrepreneurship Course-II(TEC-II)	(Compulsory)	3-5	
	-A	1		
	-B	1		
	-C	1		
	-D	1		
-E	1			
-F	1			
-G	1			
-H	1			
Technology-based Entrepreneurship Course-III(TEC-III)	2	3-5		
Technology-based Entrepreneurship Course-IV(TEC-IV)	2	3-5		
Total				14 credits or more including 10 credits for compulsory subjects

4. Course Application Reminders

(1) In the case where a student who enrolled in the Leading Program Course in the second year in the master's course has already completed a subject that is identical to a SiMS subject and has earned credits for the subject, the student is automatically deemed as having completed the SiMS subject and earned credits for it. Therefore, the title, credits, and other information of the SiMS subject, not those of the specialized subject in the standard curriculum, will appear in the

student's attendance book and transcript for the second year and onward. The credits are counted, however, toward the completion requirements of the field at the department.

- (2) Credits earned by completing the Technology-based Entrepreneurship Course as one of the literacy courses are counted toward the completion requirements of the affiliated graduate school department.
- (3) Student must use the online registration system when applying for SiMS subjects in a similar manner to ordinary subjects.
- (4) Subjects in the standard curriculum of the department may not appear on the course application screen. When a subject of the SiMS Program and a subject of the department are identical, only the SiMS subject will appear (see the table below).

Subjects in SiMS curriculum	Subjects in the standard curriculum
International environmental Issues	Special lecture of international environmental Issues
Technology-based Entrepreneurship Course	Technology-based Entrepreneurship Course
Special Seminar for Strategic Reasoning and Thinking	Special Seminar for Strategic Reasoning and Thinking
Technology-based Entrepreneurship Course I-IV	Technology-based Entrepreneurship Course I-IV

5. Taking Courses Jointly Offered by Graduate Schools of Osaka Prefecture University and Graduate Schools of Osaka City University

When students of the graduate schools of Osaka Prefecture University take courses offered by the graduate schools of Osaka City University, or vice versa, they need a student (Leading Program student) ID of the graduate school that offers the course.

6. Assessment of Progress

Progress in the SiMS Degree Program is assessed as stated in the table below.

Assessment method	Assessment schedule	Qualifications for Examination and Defense
SiMS Qualifying Examination	At the end of the third academic year(L3)	Detailed information will be provided separately.
SiMS Defense	At the end of the fifth year(L5)	Those who are expected to meet the doctoral program requirements of the affiliated graduate school department and expected to earn 14 or more credits including 10 credits for compulsory subjects as shown in the Appendix.

* SiMS Defense may be given ahead of schedule to those who have satisfied the qualifications for the examination mentioned in the table above.

*Explanation of the date, method and other information of the SiMS Qualifying Examination, etc., will be provided in advance.

7. Requirements for advancement

Students must satisfy the following requirements to be advanced to the fourth year(L4,D2) of the SiMS Program.

- (1) Finish the master's program and get enrolled in the doctoral program.
- (2) Pass the SiMS Qualifying Examination (SiMS QE) *mentioned in the section 6.

*Assessment, method and other information of the SiMS Qualifying Examination (SiMS QE) will be provided separately.

8. Requirements for completion of the SiMS Degree Program

Students must satisfy the following requirements to be certified as having completed the SiMS Program.

- (1) Meet the requirements of the doctoral program of the affiliated graduate school department.
- (2) Pass the SiMS Defense review mentioned in the section 6.

9. Additional Remark on the Diploma on the Completion of the SiMS Degree Program

Those who have completed the SiMS Degree Program will receive a diploma of the degree offered by the affiliated graduate school department, which will have an additional remark on the completion of the System-inspired Leaders for Multidisciplinary Science (SiMS) Degree Program. A transcript issued at the completion of the program will clearly state the completion of the Leading Program of the affiliated graduate school department.

10. Loss of Qualification for Enrollment

Those who are determined as being disqualified to continue studying in the SiMS Degree Program as a result of a review of their study results and attitude in the program will lose the qualification for enrollment in the program. However, this will not prevent them from continuing their enrollment in the affiliated graduate school department and writing a thesis at the department.

III. Student Support

1. Education and Research Expenses

Expenses for participation in academic meetings and overseas training required in the course of the SiMS Degree Program will be paid within the limits of the budget. Application procedures for payment will be informed as needed.

2. Individual Mentoring by Persons with Experience as Corporate Executives

A mentor will be assigned to each student upon enrollment in the SiMS Degree Program. All students can receive comprehensive support from their mentors with regard to taking courses in the program, planning independent research, laboratory rotation, study abroad and other matters.

3. Corporate Internship and Career Path Support

Center for advanced education of entrepreneurship and innovation, which has turned out many doctoral researchers for industry, provides support in selecting a host for internship and designing a career path.

IV. Other

1. Purchase of Personal Accident Insurance for Students Pursuing Education and Research and other insurance

Those who are enrolled in the SiMS Degree Program must take out, for the period of their enrollment, Personal Accident Insurance for Students Pursuing Education and Research (Gakkensai) and liability insurance incidental to Gakkensai, or insurance equivalent to these.

2. SiMS Office, Center for advanced education of entrepreneurship and innovation

SiMS Office performs administrative work associated with the SiMS Degree Program.

The office will provide information on registration, student support and other necessary matters, via email, phone, bulletin board, or other means. If you have any questions, contact the following:

Room 312, 3rd floor of A6 Building

Nakamozu Campus of Osaka Prefecture University (Refer to the map of back cover)

TEL: +81-72-254-7852 FAX: +81-72-254-8293

E-mail: SiMS-office@ml.osakafu-u.ac.jp

URL: <http://sims-program.osakafu-u.ac.jp/>

3. Contact

Contact to the above 2. (SiMS Office) about Conference and inquiries about Leading Degree Program.