September, 2017

Education Acedemy of Computational Life Sciences

Program for Leading Graduate Schools

2017 Fall
Curriculum Guide

Education Academy of Computational Life Sciences

Program for Leading Graduate Schools

1. Outline of the Program

Life science methodologies are changing drastically with development of information technology and advanced measurement techniques. Currently, new types of specialists are required: specialists who can employ leading-edge computer science approaches, such as data-driven methodologies to derive valuable knowledge from massive data sources and high-speed simulation on supercomputing environments, in life science researches. Responding to these emerging trends, ACLS provides the multidisciplinary education program across multiple fields to produce specialists who possess not only the expertise in their major fields but also the knowledge and experience in their subspecialty fields. Specifically, ACLS produces the following Γ (Gamma) Type specialists:

-Distinguished life science specialists with an ability to utilize leading-edge computer science technologies

-Distinguished computer science specialists with an ability to comprehend life science methodology and concepts

Life sciences and computer science are now progressing rapidly. It is unrealistic for a student to specialize in both fields during his / her graduate school years. In fact, incomplete education in these fields could be even disadvantageous for a student's career path. In this program, we focus on providing our students with solid education in their main areas of expertise in life sciences or computer science to secure their career paths. We then provide them with fundamental knowledge in their secondary specialties and with experiences of collaborative problem solving where students solve complex problems by cooperating with students from a different major.

2. Selection Method

Right after the students of the associated five graduate majors enroll in their graduate schools (in April or October), we conduct a selection interview for the academy focused on first-year master's students in the five associated graduate majors of two schools.

Associated Graduate Majors:

- School of Life Science and Technology
  - Department of Life Science and Technology
    - Graduate Major in Life Science and Technology
    - Graduate Major in Human Centered Science and Biomedical Engineering
- School of Computing
  - Department of Mathematical and Computing Science

- ✧ Graduate Major in Mathematical and Computing Science
- ✧ Graduate Major in Artificial Intelligence

➢ Department of Computer Science

- ✧ Graduate Major in Computer Science
- ✧ Graduate Major in Artificial Intelligence

3. Curriculum for Foreign Students Majoring in Life & Computer Sciences

1) Students must acquire credits required by each graduate major. [Compulsory]

2) Students must acquire 2 credits of Workshop on Group Problem-Solving (ACLS) and 2 credits of Creative Collaboration Works on Life Sciences (ACLS) in the master's course. They must also acquire 2 credits from fundamental courses, according to each student's major field. [Compulsory]

3) Students must acquire 4 credits of Global Communication on Computational Life Sciences A/B (ACLS) and Global Presentation on Computational Life Sciences A/B (ACLS) in the master's program, and 2 more credits of Global Debate on Computational Life Sciences (ACLS) or Global Writing on Computational Life Sciences (ACLS) in the doctoral program. [Compulsory]

4) Students must acquire 2 credits of a class in the advanced courses of the master's course and 3 more credits of classes in the advanced courses before graduation from the doctoral course. [Compulsory]

5) Students must acquire 1 credit from a Short-term Internship on Computational Life Sciences, a 1- to 2-week project at a corporation, a national institute and so on in the master's program (ACLS). [Compulsory]

6) Students must acquire 2 credits from an International Internship on Computational Life Sciences for Doctoral students (ACL.C601) or an International Internship on Computational Life Sciences for Master's students (ACL.C401), a 3-month project at a university, institute, or corporation abroad. [Compulsory]

7) To graduate, doctoral students must present satisfactory midterm progress reports, and then pass a doctoral thesis review in each graduate major, and the final oral examination by ACLS.

Credit requirements for the ACLS program

	Credit requirements at the master's level	Credit requirements at the doctoral level
Courses for the student's graduate major	Credits specified by the student's department for his/her graduate major (this includes conducting master's research)	Credits specified by the student's department for his/her graduate major (this includes conducting doctoral research)
a) Fundamental Courses	A minimum of 4 credits (including 4 credits from the compulsory courses) ◎ART.T453, ◎ZBA.A402	A minimum of 6 credits
b) Advanced Courses	A minimum of 2 credits	A minimum of 5 credits
c) Science and Technology Communication Courses	A minimum of 4 credits (including 4 credits from the compulsory courses) <◎ZBA.A403, ◎ZBA.A406> or <◎ZBA.A404, ◎ZBA.A405>	A minimum of 6 credits
d) Internship Courses	A minimum of 1 credit (including 1 credit from the compulsory course) ◎LST.C505	A minimum of 3 credits ◎ACL.C601 or ◎ACL.C401

◎ Compulsory

a) Fundamental Courses

	Code	Course Title	Credit	Quarter	Academic unit or major
For Life Science Students	ART.T452	Modeling of Continuous Systems	2	1Q	Artificial Intelligence
	ART.T451	★Mathematics of Discrete Systems	2	2Q	Artificial Intelligence
	ART.T457	Workshop on Building Advanced Computer Network	2	2Q	Artificial Intelligence
For Computer Science Students	LST.A203	Biochemistry I	2	1Q	Life Science and Technology
	LST.A401	★Molecular and Cellular Biology	2	1Q	Life Science and Technology
	LST.A208	Molecular Biology I	2	2Q	Life Science and Technology
	LST.A213	Molecular Biology II	2	3Q	Life Science and Technology
	LST.A218	Biochemistry II	2	4Q	Life Science and Technology
	LST.A246	Bioinformatics（LST）	2	4Q	Life Science and Technology
For Both students	ART.T453	◎(★)Workshop on Group Problem-Solving （ACLS） <Compulsory course in Master's Degree Program>	2	2Q (Intensive)	Artificial Intelligence
	ZBA.A402	◎(★)Creative Collaboration Works on Life Sciences （ACLS） <Compulsory course in Master's Degree Program>	2	3～4Q (Intensive)	Life Science and Technology

◎Compulsory
★taught in English
◇career development courses for School of Life Science and Technology
◆career development courses for School of Life Science and Technology／School of Computing

b-1) Advanced Courses for Life Science or Computer Science Students

	Code	Course Title	Credit	Quarter	Academic unit or major
For Life Science Students	CSC.T421	★Human Computer Interaction	2	1Q	Computer Science
	MCS.T404	Logical Foundations of Computing	2	1Q	Mathematical and Computing Science
	ART.T546	★Design Theory in Biological Systems	2	2Q	Artificial Intelligence
	ART.T547	Multimedia Information Processing	2	2Q	Artificial Intelligence
	MCS.T403	★Statistical Learning Theory	2	3Q	Mathematical and Computing Science
	MCS.T407	★High Performance Computing	2	3Q	Mathematical and Computing Science
	ART.T464	Information Organization and Retrieval	2	4Q	Artificial Intelligence
For Computer Science Students	LST.A402	★Organic and Bioorganic Chemistry	2	1Q	Life Science and Technology
	LST.A404	★Cell Physiology	2	2Q	Life Science and Technology
	LST.A405	★Design of Bioactive Molecules	2	2Q	Life Science and Technology
	LST.A411	★Biomolecular Engineering	2	2Q	Life Science and Technology
	LST.A410	★Advanced Neuroscience	2	4Q	Life Science and Technology

◎Compulsory
★taught in English
◇career development courses for School of Life Science and Technology
◆career development courses for School of Life Science and Technology／School of Computing

b-2) Advanced Courses for Both Students

	Code	Course Title	Credit	Quarter	Academic unit or major
For Both Students	ART.T541	★Intelligent Systems	2	1Q	Artificial Intelligence
	ART.T543	★Bioinformatics	2	1Q	Artificial Intelligence
	ART.T545	(★)Molecular Simulation	2	2Q	Artificial Intelligence
	LST.A413	Career Development Seminars	2	1～2Q	Life Science and Technology
	HCB.C432	Fundamentals of Research Application for Life Innovation	2	1～2Q	Human Centered Science and Biomedical Engineering
	TIM.C514	Biomedical Technology and Social Systems I	1	3Q	Technology and Innovation Management
	TIM.C515	Biomedical Technology and Social Systems II	1	4Q	Technology and Innovation Management
	ZBA.A401[1)]	★Directed Collaboration Works	2	3～4Q	Life Science
	LST.A418[2)]				Life Science and Technology
	ZBA.A409	Topics 1 in Computational Life Sciences (ACLS)	1	1～2Q (Intensive)	Life Science
	ACL.A631	Topics 1 in Computational Life Sciences for Doctoral Students			ACLS
	ZBA.A503	Topics 3 in Computational Life Sciences (ACLS)	1	1～2Q (Intensive)	Life Science
	ACL.A633	Topics 3 in Computational Life Sciences for Doctoral Students			ACLS
	ZBA.A407	Introduction to Business Plan (ACLS)	1	3～4Q (Intensive)	Life Science
	ACL.A601	◆Introduction to Business Plan for Doctoral Students			ACLS
	ZBA.A408	★Introduction to Bioethics (ACLS)	1	3～4Q (Intensive)	Life Science
	ACL.A602	◆★Introduction to Bioethics for Doctoral Students			ACLS
	ZBA.A410	Topics 2 in Computational Life Sciences (ACLS)	1	3～4Q (Intensive)	Life Science
	ACL.A632	Topics 2 in Computational Life Sciences for Doctoral Students			ACLS
	ZBA.A504	Topics 4 in Computational Life Sciences (ACLS)	1	3～4Q (Intensive)	Life Science
	ACL.A634	Topics 4 in Computational Life Sciences for Doctoral Students			ACLS

1) for students admitted in AY2015 or before.　2) for students admitted in AY2016 or later

◎Compulsory

★taught in English

◇career development courses for School of Life Science and Technology

◆career development courses for School of Life Science and Technology／School of Computing

c) Science and Technology Communication Courses

Code	Course Title	Credit	Quarter	Academic unit or major
ZBA.A403	◎★Global Presentation on Computational Life Sciences A (ACLS) <Compulsory in Master's Degree Program>	2	1～2Q	Life Science
ZBA.A404	◎★Global Presentation on Computational Life Sciences B (ACLS) <Compulsory in Master's Degree Program>	2	3～4Q	Life Science
ZBA.A405	◎★Global Communication on Computational Life Sciences A (ACLS) <Compulsory in Master's Degree Program>	2	1～2Q	Life Science
ZBA.A406	◎★Global Communication on Computational Life Sciences B (ACLS) <Compulsory in Master's Degree Program>	2	3～4Q	Life Science
ZBA.A501	★Global Writing on Computational Life Sciences (ACLS)	2	1～2Q	Life Science
ACL.A603	★Global Writing on Computational Life Sciences for Doctoral Students			ACLS
ZBA.A502	★Global Debate on Computational Life Sciences (ACLS)	2	3～4Q	Life Science
ACL.A604	★Global Debate on Computational Life Sciences for Doctoral Students			ACLS

※Global Communication A and Global Communication B are identical in content.
Global Presentation A and Global Presentation B are identical in content.
Students are required to take either A or B.

d) Internship Courses

Code	Course Title	Credit	Quarter	Academic unit or major
LST.C505	◎◇Short-term Internship on Computational Life Sciences <Compulsory in Master's Degree Program>	1	1Q 2Q 3Q 4Q	Life Science and Technology
ACL.C401[3)]	◆International Internship on Computational Life Sciences for Master's students	4	1～2Q 3～4Q	ACLS
ACL.C601	◎◆International Internship on Computational Life Sciences for Doctoral Students	4	1～2Q 3～4Q	ACLS

3) The credits of ACL.C401 can be recognized as the credits of ACL.C601.

◎Compulsory
★taught in English
◇career development courses for School of Life Science and Technology
◆career development courses for School of Life Science and Technology／School of Computing

2017 3Q (22 September - 28 November)

			1 2	3 4	5 6	7 8	9 10
			9 : 00-10:30	10 : 45-12:15	13 : 20-14:50	15 : 05-16:35	16:50-18:20
Mon	Advanced Courses	For Life Science Students	★Statistical Learning Theory G511 Watanabe, Kabashima				
Tue	Advanced Courses	For Life Science Students		★High Performance Computing H119A Matsuoka, Endo			
	Fundamental Courses	For Computer Science Students				Molecular Biology II H101 Kimura, Ito, et al.	
	Science and Technology Communication Courses		◎★Global Presentation on Computational Life Sciences B H115 Meldrum		◎★Global Presentation on Computational Life Sciences B J233 Meldrum		
Wed							
Thu	Advanced Courses	For Life Science Students	★Statistical Learning Theory G511 Watanabe, Kabashima				
Fri	Advanced Courses	For Life Science Students		★High Performance Computing H119A Matsuoka, Endo			
	Fundamental Courses	For Computer Science Students				Molecular Biology II H101 Kimura, Ito, et al.	
Sat	Advanced Courses	For Both Students					Biomedical Technology and Social System Ⅰ Tamachi CIC 913 Sengoku

★taught in English

2017 4Q (29 November - 10 February)

			1 2	3 4	5 6	7 8	9 10
			9 : 00-10:30	10 : 45-12:15	13 : 20-14:50	15 : 05-16:35	16:50-18:20
Mon	Advanced Courses	For Life Science Students			Information Organization and Retrieval W611 Fujii, Tokunaga		
		For Computer Science Students	★Advanced Neuroscience J221, W831 Ichinose, Suzuki, et al.				
Tue	Fundamental Courses	For Computer Science Students			Bioinformatics (LST) H101 Ito, Kurokawa, et al.	Biochemistry II H101 Komada, Wachi, et al.	
	Science and Technology Communication Courses		◎★Global Presentation on Computational Life Sciences B H115 Meldrum		◎★Global Presentation on Computational Life Sciences B J233 Meldrum		
Wed							
Thu	Advanced Courses	For Life Science Students			Information Organization and Retrieval W611 Fujii, Tokunaga		
		For Computer Science Students	★Advanced Neuroscience J221, W831 Ichinose, Suzuki, et al.				
Fri	Fundamental Courses	For Computer Science Students			Bioinformatics (LST) H101 Ito, Kurokawa, et al.	Biochemistry II H101 Komada, Wachi, et al.	
Sat	Advanced Courses	For Both Students					Biomedical Technology and Social System Ⅱ Tamachi CIC 913 Sengoku

★taught in English

AY 2017 3-4Q (22 September, 2017 - 10 February, 2018) Intensive Courses Schedule

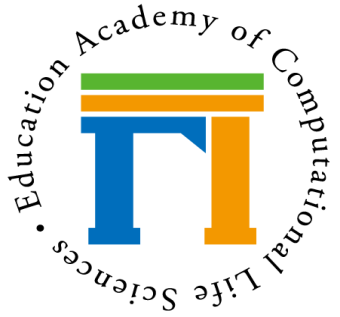
Fundamental Courses	◎(★)Creative Collaboration Works on Life Sciences(ACLS)		
	Ito, et al.		
	Choose 2 themes from below		
	①Theme E: 8/28-9/1		
	Seio, Yano		
	②Theme F: 9/15, 9/19-9/22		
	Nakamura, Kamachi, Ito		
	③Theme B : <wet①>10/12, 10/13		
	<wet②>10/18, 10/19		
	<dry>TBA		
	Iwasaki, Ito, Yamada, Kurokawa		
	④Theme D : 12/18-12/22		
	Akiyama, Konishi, Matsuzaki		

Advanced Courses	Introduction to Business Plan (ACLS) ◆Introduction to Business Plan for Doctoral Students	★Introduction to Bioethics (ACLS) ★◆Introduction to Bioethics for Doctoral Students	Topics 2 in Computational Life Sciences (ACLS) Topics 2 in Computational Life Sciences for Doctoral Students
	Tokunaga, Uchikoga	Tokunaga, et al.	Konagaya, Yamamura
	①-④J232、Main Bldg., B04 ⑤⑦J232	①J3-405, Main Bldg., B04 ②J233, Main Bldg., B04 ③J233, W8E-1003L	
	①10/20(Fri) 13:20-14:50	①11/16(Thu) 13:20-16:35	Kaoru Mogushi, Juntendo University
	Daisuke Katagiri,□ Amine Pharma Reseach Institute Co., Ltd.	Mutsuaki Suzuki, National Institute of Genetics	
		②12/14(Thu) 13:20-16:35	Schedule: TBA
	②10/20(Fri) 15:05-16:35	③1/11(Thu) 13:20-16:35	
	Takafumi Yamamoto, TODAI TLO, Ltd.	Masui Tohru, Keio University	
	③10/27(Fri) 13:20-14:50		
	Shoko Takahashi, Genequest Inc.		
	④10/27(Fri) 15:05-16:35		
	Kazumasa Ohta, Hamagin Research Institute, Ltd.		
	⑤11/17(Fri) 15:05-16:35		
	⑥11/24(Fri) 15:05-16:35		
	⑦12/ 8(Fri) 15:05-16:35		
	Tomohiro Naya, Naya CPA Office Kazumasa Ohta, Hamagin Research Institute, Ltd.		
	Topics 4 in Computational Life Sciences (ACLS) Topics 4 in Computational Life Sciences for Doctoral Students	Directed Collaboration Works	
	Ito	Kajiwara, Mihara	
	Schedule: TBA	Schedule: TBA	

Science and Technology Communication Courses	◎★Global Communication B on Computational Life Sciences	★Global Debate on Computational Life Sciences ★Global Debate on Computational Life Sciences for Doctoral Students
	Yamaguchi, et al.	Yamaguchi, et al.

Internship Courses	◎◇Short-term Internship on Computational Life Sciences	◆International Internship on Computational Life Sciences for Master's Students	◎◆ International Internship on Computational Life Sciences for Doctoral Students
	Kajiwara	Kajiwara	Kajiwara

Note:
This brochure is focused on providing overall information on ACLS curriculums.
For registration, students are suggested to refer to “Graduate school program list of syllabus ” issued by the university.



Ver. 2017.10.17