subjects are designated as required, or elective required subjects. In the second academic year, students take common basic subjects in information science to establish a foundation for study after choosing their course, and to obtain the knowledge required for choosing a course and/or career after graduation.

In the third year, they choose either the data science or the informatics course according to their own interest and aptitude. This program provides such a complex curriculum for the early stages of education in the undergraduate school in order to develop people who have a broad perspective that covers multiple fields, as well as a high level of capabilities as specialists in their own field.

(Data science course)

The data science course is organized in a way that attaches importance to data analysis based on statistics, and consists of academic fields related to the development of specialists, such as data analysts and information service analysts, who are engaged in processing and analysis of huge amounts of information such as big data and high-dimensional data. In this course, students learn the system of knowledge and skills for solving high-dimensional, data-based problems by fully exercising their knowledge of statistics and skills in information processing. Through this process, this course educates students to be able to solve problems by quantitative and logical thinking based on data, to use diverse points of view and advanced information processing capabilities, and to understand the theoretical system of statistics and data analysis in order to precisely and efficiently analyze various information.

(Informatics course)

The informatics course aims to educate students to study basic and systematic knowledge and skills related to data analysis, and to systematically learn computer software and architecture, operating systems, computer networking, and information processing technologies in various media to enable them to become system engineers who support the basis of the information-intensive society of today. In addition, this course educates students to study subjects related to the structure and development of information processing systems, parallel distributed processing and machine learning, intelligent calculation such as data mining, data analysis, and model construction using network systems, in order to develop information service engineers who can provide the most appropriate system solutions based on many forms of information technology.

In the fourth year, as a preparation for graduation thesis, students attend seminars provided in both the data science course and the informatics course under the guidance of the faculty members who are engaged in instruction for the thesis. In the seminar, students have the opportunity to familiarize themselves with state-of-art results in the academic field through colloquiums on research papers and textbooks in the specialized area in order to learn and acquire the study methods in each area, the methods for identifying and solving problems, capabilities for literature based research, and presentation and communication skills required for discussion of the research. In preparing their graduation thesis, students use the specialized knowledge, skills, and abilities that they have acquired in the Informatics and Data Science Program to pursue an advanced research topic. For preparation of the graduation thesis, therefore, they are required to have not only knowledge of the specialized area but also an ability for research planning, a positive attitude, a cooperative mindset, and the capacity for continuous effort. This program educates students to comprehensively improve these capabilities in order to enable them to acquire the ability to identify and solve new problems on their own. Specifically, students individually

define a research topic related to data science or informatics. Also, students are engaged in research, experimentation, and discussion under the guidance of the faculty member who is engaged in instruction for the thesis, and organize and present their results in their thesis. In these activities, they establish their acquired skills related to the development of an information infrastructure, information processing techniques, and the use of technology for producing new added value through data analysis.

3.Diploma policy (policy for awarding degrees and goal of the program)

This school educates students to become specialists with advanced capabilities in each of data science and informatics, as well as the basic abilities that consist of processing techniques based on the information technology, which are the basis of the information-intensive society of today, as well as advanced data analysis capabilities. In addition, this school aims to develop people who are capable of appropriately managing, processing, and analyzing information that has swelled significantly, and become complicated, due to such phenomena as the accumulation of big data, technological breakthroughs in fields related to artificial intelligence (AI), and the development of the IoT.

This program will award the degree of Bachelor of Science in Informatics and Data Science to students who have acquired the knowledge and abilities described below, and earned the required credits defined for the educational course:

Achievement target A. Skills related to the development of an information infrastructure, information processing techniques, and technology for producing new added value through data analysis.

Achievement target B. Ability to identify and solve new problems on their own by quantitative and logical thinking based on data, diverse perspectives, and advanced skills for information processing and analysis.

Achievement target C1. Knowledge and capabilities required for solving problems, while understanding that various problems of human beings, societies, and individuals can be interpreted in different ways according to social conditions, culture, etc.

Achievement target C2. Skills for communication, reading, and writing in English, capabilities required for giving a good, clear oral presentation, and documentation and communication skills that contribute to active discussion.

Achievement target D1. Knowledge and skills required for understanding the theoretical system of statistics and data analysis, and for precisely and efficiently analyzing qualitative/quantitative information in big data.

Achievement target D2. Ability to develop strategies and plans for an organization based on statistical evidence by using a wide range of knowledge and skills related to data science.

Achievement target D3. Ability to examine social needs and issues which are interlinked in a complex manner, using a top-down view to solve the problems through quantitative and logical thinking based on data, diverse perspectives, and advanced skills in information processing and analysis.

Achievement target I1. Knowledge and ability required for collecting and processing high-dimensional data using information processing technologies based on scientific logic, while understanding the theoretical system that forms the basis of informatics.

Achievement target I2. Ability to provide the most appropriate system solution to a cross-sectional problem in the diversified and complicated information society based on the many forms of cutting edge

information technology.

Achievement target I3. Knowledge related to hardware and software, and the programming skills required for efficiently processing data.

Achievement target E. Creative and logical thinking ability for analyzing practical issues and challenges in order to provide rational solutions that match social needs, as well as the capability to realize these solutions.

4.Curriculum policy (policy for arranging and implementing the curriculum)

To enable students to achieve the targets that are defined for the program, the curriculum of the Informatics and Data Science Program is organized and implemented according to the policies described below. Academic achievement is evaluated based on the grade scores for the subjects and the level of achievement against the target defined for this program.

・In the first academic year, students take liberal arts core subjects, common subjects (foreign language subjects and health and sports subjects), and fundamental subjects (subjects related to mathematics and statistics). These subjects respectively correspond to the achievement targets A, B, C1, and E; those of C1 and C2; and those of A and B.

・In the second academic year, all students take the specialized core subjects. The same specialized core subjects are designated for both courses, and all of them are designated as required subjects or elective required subjects. Specialized core subjects consist of information mathematics subjects (corresponding to the achievement targets A and B), probability and statistics subjects (achievement targets A, B, D1, D2, and D3), computer science subjects (achievement targets A, B, I1, I2, and I3), and applied mathematics subjects (achievement target I1).

・In the third academic year, students take subjects that are deeply related to either the data science course or the informatics course. Different specialized subjects are designated (required subjects, elective required subjects, free elective subjects, and subjects without designation) for each course. They consist of data science subjects that correspond to one or more of the achievement targets D1, D2, and D3, and informatics subjects the correspond to one or more of the achievement targets I1, I2, and I3. Students also take Seminar for Information Data Science I and II (corr4en-U0(n AMCID 43s-5( )5(f)3(or)6(th)11(i)-2

To determine acceptance into the English-based Bachelor's Degree program, all applicants are required to have an individual consultation with the faculty committee members in School of Informatics and Data Science. Teach-in-English course is managed with two languages simultaneously, which is categorized into Type B, except in a few classes. In this program, students are allocated to one of the two courses at the end of the second academic year. To be allocated to a course, students are required to earn 68 or more credits by the end of the second academic year.

6.Obtainable qualifications

Educational personnel certification (Information teaching and Mathematics) is awarded to the student who earns the required credits.

7.Class subjects and their contents

* For class subjects, refer to the subject table in Attachment 1. (The subject table is to be attached.)

* For the details of the class subjects, refer to the syllabus that is published each academic year.

8.Academic Achievement

The evaluation criteria are specified for each evaluation item for academic achievement, and the achievement level against the criteria is designated at the end of the semester.

The evaluation score for each evaluation item is converted to a numerical value (S = 4, A = 3, B = 2, and C = 1) and the evaluation standard for academic achievement, from when the student entered the university to the end of the last semester, is determined using these values while applying weightings. The evaluation standards consist of three levels, i.e. Excellent, Very Good, and Good.

Academic achievement	Evaluation standard
Excellent	3.00 - 4.00
Very Good	2.00 - 2.99
Good	1.00 - 1.99

Achievement evaluation	Numerical conversion
S (Excellent: 90 or more points)	4
A (Very good: 80 - 89 points)	3
B (Good: 70 - 79 points)	2
C (Passed: 60 - 69 points)	1

* Refer to the relationship between evaluation items and evaluation criteria described in Attachment 2.

* Refer to the relationship between evaluation items and class subjects described in Attachment 3.

* Refer to the curriculum map in Attachment 4.

9.Graduation thesis (graduation research) (meaning, student allocation, timing, etc.)

○ Meaning

Graduation Thesis is a comprehensive subject in which students utilize the specialized knowledge, skills, and abilities that they have acquired in the Informatics and Data Science Program to pursue an advanced research topic. To take this subject, therefore, they are required to have not only knowledge of the specialized area but also an ability for research planning, a positive attitude, a cooperative mindset, and the capacity for continuous effort. This program educates students to comprehensively improve these capabilities in order to allow them to acquire the ability to identify and solve new problems on their own. Detailed objectives are as follows:

1. To acquire the ability to develop a research plan for their research objective on their own, and to carry out their research according to that plan.

2. To develop skills for collecting materials related to the research objective, understanding the objective, and identifying problems.

3. To develop capabilities for analyzing problems related to the research objective and providing solutions that match social needs.

4. To develop skills required for research activity related to reading, writing, and searching for information in English.

5. To develop documentation skills for organizing research results and describing the meaning and efficacy of the obtained results in logical and consistent text.

6. To develop presentation skills for delivering the research results clearly and orally, and communication skills for active discussion.

○ Student allocation method and timing

Requirements for starting the research for graduation thesis are defined in the Student Handbook.

Students in their fourth or senior year, who satisfy the requirements for starting the research for their graduation thesis, are allocated to a laboratory according to their wishes. The allocation method will be explained to the students at a briefing session that will be held before the allocation process. For students to be allocated to laboratories, an assembly and/or open laboratory event is held in February or March to show the details of research topics.

10. Responsibility

(1) Responsibility for PDCA (plan, do, check, and act) cycle

This program is executed by faculty members who support the education in the Informatics and Data Science Program. The dean of School of Informatics and Data Science takes on the responsibility for implementation of the program. It is mainly the Informatics and Data Science Program committee that reviews and makes decisions related to the processes of the PDCA cycle (plan, do, check, and act) in the council of the School of Informatics and Data Science (this is held, in principle, on the first Thursday of every month). In some cases, a working group may be organized according to direction by the dean of School in order to intensively work on a case. When it is required to consider and take some action in either of the courses, laboratories which are mainly engaged in the concerned course will take responsibility. In such a case, the dean of the school designates the person in charge.

(2) Evaluation of the program

○ Perspectives for evaluation of the program

・ Are class subjects arranged appropriately, while considering the aims of study and education in this program? Are the contents of classes appropriate?

・Have students, on average, achieved the level that is required of them?

・Is the system for achieving an upward spiral in the program functioning according to an appropriate cycle?

○ Evaluation method

・Each subject in the program is evaluated based on student evaluation of the classes and achievement evaluation results.

・For evaluation of the upward spiral in quality of the program, questionnaires for students are conducted in an appropriate cycle, and the opinions of ex-students and companies are collected.

○ Policy and method for feedback to students

・For individual classes, the faculty member who is in charge of the class makes comments on the evaluation of the class and the achievement evaluation results.

・Actions taken, such as changes to the structure of the program, are published on the web site of School of Informatics and Data Science and/or another medium with the reason.

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Basic Specialized Subjects for Imformatics and Data Science Program

◎ Required subject
○ Compulsory elective subject
△ Free elective subject

Subject Type	Class Subjects	Credits	Data Science	informatics	Y1-1	Y1-2	Y1-3	Y1-4	Y2-1	Y2-2	Y2-3	Y2-4	Y3-1	Y3-2	Y3-3	Y3-4	Y4-1	Y4-2	Y4-3	Y4-4	Note
Core Subjects	Discrete Mathematics I	2	◎	◎		4															
	Discrete Mathematics Ⅱ	2	◎	◎			4														
	Programming I	2	◎	◎	2																
	Programming Ⅱ	2	◎	◎			2														
	Programming Ⅲ	2	◎	◎						2											
	Programming Ⅳ	2	◎	◎							3										
	Theory of Automata and Languages	2	○	◎					4												
	Digital Circuit Design	2	○	◎						4											
	Programming Languages	2	○	○							4										
	Algorithms and Data Structures	2	◎	◎						4											
	Fundamentals of Probability Theory	2	◎	◎				4													
	Inferential Statistics	2	◎	○					4												
	Linear Regression Model	2	◎	○						4											
	Statistical Test	2	○	○						4											
	Stochastic Modeling	2	○	○							4										
	Numerical Computation	2	○	○							4										
	Mathematical Programming	2	○	○					4												
	System Optimization	2	○	○						4											
	Mathematical Analysis	2	○	○						4											
	Multivariate Analysis	2	○	○						4											
	Basic and practice in Categorical data analysis	2	○	○						4											
	Mechanism how programs run on computer	2	○	○							4										
	Operating Systems	2	○	○						4											
	Databases	2	○	○							4										
	Information Theory	2	○	○					4												
	Practical English I	1	◎	◎									4								
	Practical English Ⅱ	1	◎	◎											4						
Specialized Subjects	Informatics and data science Exercise I	1	◎	◎									3								
	Informatics and data science Exercise II	1	◎	◎										3							
	Informatics and data science ExerciseⅢ	1	◎	◎											3						
	Informatics and data science ExerciseⅣ	1	◎	◎												3					
	Software Engineering	2	○	○									4								
	Theory of Computing	2	△	○									4								
	Image Processing	2	△	○										4							
	Visual Computing	2	△	○											4						
	Artificial Intelligence and Machine Learning	2	△	○										4							
	Computer Network	2	△	○												4					
	Human Computer Interaction	2	△	○											4						
	Parallel and Distributed Processing	2		○																	
	Software Management	2		○																	
	Natural Language Processing	2	○	○										4							
	Information Society and Security	2	○	○										4							
	Digital Signal Processing	2		○									4								
	Data Mining	2	○	△									4								
	Survey design	2	○	△									4								
	Nonparametric analysis	2	○	△										4							
	Big Data	2	○	○												4					
	Behaviormetrics	2	○	△									4								
	Econometrics	2	○	△										4							
	Time Series Analysis	2	○	△											4						
	Biostatistics	2	○													4					
	Stochastic Processes	2	○													4					
	Financial Engineering	2	○													4					
	Computer Science Seminar I	1	◎														4				
	Computer Science Seminar II	1	◎															4			
	Data Science Seminar I	1		◎													4				
	Data Science Seminar II	1		◎														4			
	Intelligence Science Seminar I	1															4				
	Intelligence Science Seminar II	1																4			
	Graduation Thesis	3	◎	◎															6		
	Information Processing and Industry	2	○	○					4												
	Data Science and Management	2	○	○							4										
	Frontier of Informatics and Data Science	2	○	○									4								
	Research Project	2	○	○										4							
	Long-term Fieldwork I																				
	Long-term Fieldwork II																				

Category	Course	Units	Grade											
Liberal Arts Education	Introduction to University Education	2	1st grade	100	1									100
Liberal Arts Education	Introductory Seminar for First-Year Students	2	1st grade	25	1	25	1	25	1			25	1	100
Liberal Arts Education	Peace Science Courses	2	1st grade	100	1									100
Liberal Arts Education	Area Courses	8	1st grade	100	1									100
Liberal Arts Education	Basic English Usage I	1	1st grade							100	1			100
Liberal Arts Education	Basic English Usage II	1	1st grade							100	1			100
Liberal Arts Education	Communication I A	1	1st grade							100	1			100
Liberal Arts Education	Communication I B	1	1st grade							100	1			100
Liberal Arts Education	Communication II A	1	1st grade							100	1			100
Liberal Arts Education	Communication II B	1	1st grade							100	1			100
Liberal Arts Education	Communication III A	1	2nd grade							100	1			100
Liberal Arts Education	Communication III B	1	2nd grade							100	1			100
Liberal Arts Education	Communication III C	1	2nd grade							100	1			100
Liberal Arts Education	Basic Foreign Languages I	2	1st grade							100	1			100
Liberal Arts Education	Basic Foreign Languages II	2	1st grade							100	1			100
Liberal Arts Education	Health and Sports Subject	2	1st grade	100	1									100
Liberal Arts Education	Elements of Calculus	2	1st grade			50	1	50	1					100
Liberal Arts Education	Seminar in Basic Mathematics I	1	1st grade			50	1	50	1					100
Liberal Arts Education	Seminar in Basic Mathematics II	1	1st grade			50	1	50	1					100
Liberal Arts Education	Statistical Data Analysis	2	1st grade			50	1	50	1					100
Liberal Arts Education	Calculus I	2	1st grade			50	1	50	1					100
Liberal Arts Education	CalculusI II	2	1st grade			50	1	50	1					

Category	Course	Credits	Grade	1	2	3	4	5	6	7	8	Total
Specialized Education	Informatics and data science, Exercise Ⅰ	1	3rd grade			33	33		34			100
Specialized Education	Informatics and data science, Exercise Ⅱ	1	3rd grade			33	33		34			100
Specialized Education	Informatics and data science, Exercise Ⅲ	1	3rd grade	34		33	33					100
Specialized Education	Informatics and data science, Exercise Ⅳ	1	3rd grade	34		33	33					100
Specialized Education	Theory of Computing	2	3rd grade		50	50						100
Specialized Education	Image Processing	2	3rd grade						100			100
Specialized Education	Visual Computing	2	3rd grade						100			100
Specialized Education	Artificial Intelligence and Machine Learning	2	3rd grade		100							100
Specialized Education	Computer Network	2	3rd grade			50			50			100
Specialized Education	Human Computer Interaction	2	3rd grade						100			100
Specialized Education	Parallel and Distributed Processing	2	3rd grade						100			100
Specialized Education	Software Management	2	3rd grade								100	100
Specialized Education	Natural Language Processing	2	3rd grade		100							100
Specialized Education	Information Society and Security	2	3rd grade								100	100
Specialized Education	Data Mining	2	3rd grade	50		50						100
Specialized Education	Survey design	2	3rd grade					100				100
Specialized Education	Nonparametric analysis	2	3rd grade	50		50						100
Specialized Education	Big Data	2	3rd grade			50			50			100
Specialized Education	Behaviormetrics	2	3rd grade	100								100
Specialized Education	Econometrics	2	3rd grade							100		100
Specialized Education	Time Series Analysis	2	3rd grade					100				100
Specialized Education	Biostatistics	2	3rd grade							100		100
Specialized Education	Biomedical Statistics	2	3rd grade							100		100
Specialized Education	Stochastic Processes	2	3rd grade							100		100
Specialized Education	Financial Engineering	2	3rd grade							100		100
Specialized Education	Data Analysis for Medical and Welfare Policies	2	3rd grade					100				100
Specialized Education	Society and Data Analysis	2	3rd grade							100		100
Specialized Education	Total Quality Management and Data Analysis	2	3rd grade							100		100
Specialized Education	Education Policy and Data Analysis	2	3rd grade					100				100
Specialized Education	Data Science Seminar Ⅰ	1	4th grade	33				33	34			100
Specialized Education	Data Science Seminar Ⅱ	1	4th grade	33				33	34			100
Specialized Education	Informatics Seminar Ⅰ	1	4th grade		33				33	34		100
Specialized Education	Informatics Seminar Ⅱ	1	4th grade		33				33	34		100
Specialized Education	Graduation thesis	3	4th grade					50			50	100

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