2006 Applicant Guidelines for Doctoral Programs (First Stage) of Graduate School of Information Science, Nagoya University

Important Notice: The Japanese version of Applicant Guidelines for Doctoral Programs of Graduate School of Information Science, Nagoya University serves as the official guidebook. This English translation is provided only for applicants' convenience.

The Graduate School of Information Science invites applicants for admission to the first stage of doctoral programs (considered a master's course) for the academic year 2006, in accordance with these guidelines.

1. Qualifications for Application

Applicants must meet one of the following conditions:

(1) University graduates, or will graduate from university by March 31, 2006
(2) Persons who have obtained or will obtain, by March 31 2006, a bachelor's degree from the National Institution for Academic Degrees, which as specified by the School Education Law Article 68 Item 2 Section 3 No.1
(3) Persons who have completed, or will complete by March 31, 2006, 16 years of academic education in a foreign country
(4) Persons who have completed, or will complete by March 31, 2006, 16 years of academic education in Japan through correspondence courses run by foreign educational establishments
(5) Applicants who have completed an undergraduate course of a foreign university in Japan, which is an educational establishment approved in that particular foreign country (the applicants must have completed 16 years of school education in that foreign country's educational system) and those who have qualifications approved by the Ministry of Education, Culture, Sports, Science and Technology, Japan
(6) Persons who have qualifications approved by the Minister of Education, Culture, Sports, Science and Technology, Japan. (Notification No.5 of the Ministry of Education, 1953)
(7) Persons who have completed or will complete more than 3 years at university by March 31, 2006 or those who have completed 15 years of education in an educational system in a foreign country or enrolled in a foreign university in Japan, which is approved by that foreign country's school education system (the applicants must be recognized to have completed 15 years in an educational system), and those who have qualification approved by the Ministry of Education, Culture, Sports, Science and Technology, Japan and who have been recognized by our Graduate School as having excellent results of the required credits. (Note)
(8) Persons who will be 22 years of age or over as of March 31, 2006, and have been recognized by our Graduate School, based on the results of individual examinations of the applicant's qualifications, as having academic abilities equivalent or superior to university graduates. (Note)

(Note) Those who submit application forms on the basis of No.7 or 8 above must contact the Graduate School by May 25, 2005.

2. Numbers of Students to Be Admitted

Dept. of Computer Science and Mathematical Informatics	21
Dept. of Information Engineering	21
Dept. of Media Science	17
Dept. of Complex Systems Science	32
Dept. of Systems and Social Informatics	15

3. Application Period

Applications will be accepted between June 15 (Wed.) and June 21 (Tue.), 2006, 4 p.m. **Only postal applications are acceptable.**

4. Application Documents

Documents required for all applicants

(1) Application Form (Complete form prescribed by our Graduate School)
(2) Examination Card and Photograph Card (Complete cards prescribed by our Graduate School)
(3) Objectives and study plan (Complete form prescribed by our Graduate School)
(4) Personal History (Complete form prescribed by our Graduate School)
(5) Receipt of Payment, Record of Receipt (Enter only your name in forms prescribed by our Graduate School)
(6) 2 self-addressed envelopes (one for sending Examination Card, the other for correspondence)
You must submit 2 self-addressed envelopes prescribed by our Graduate School with the address at which you will receive the envelopes, prefecture code, and name. A 350-yen stamp should be attached to the envelope for correspondence.
(7) Address label (Write necessary items on label prescribed by our Graduate School)
(8) Certificate for (prospective) graduation or a document certifying qualification for application
(9) Official transcript of academic records (issued by your last university)
(10) Examination fee (30,000 yen by postal money order, on which name and address of designated payee should not be written)

Documents to be submitted preferably for reference

(1) If the applicant has a dissertation or other material that indicates his/her research abilities, it is desirable to submit a copy of such material and, if necessary, an abstract.
(2) If a foreign applicant studying in Japan has taken the Japanese Language Proficiency Test, it is desirable to submit a certificate or score report thereof. When submitting a copy, write “This document is identical to the original” on the copy, which should then be signed and/or stamped with your seal.
(3) If the applicant has taken an English proficiency test (STEP, TOEIC, TOEFL etc.), it is desirable to submit a certificate or score report thereof. When submitting a copy, write “This document is identical to the original” on the copy, which should then be signed and/or stamped with your seal.

Documents to be submitted in special cases

(1) Applicants for Dept. of Computer Science and Mathematical Informatics, Dept. of Information Engineering, Dept. of Media Science, or Dept. of Systems and Social Informatics, who wish to take the oral examination should submit a form for the oral examination (written in the form prescribed by our Graduate School), student handbook, a document which proves (prospective) graduation and the number of credits required for graduation (a copy is accepted). (Those who take the examination directly after graduating from undergraduate school need not submit it.)
(2) Foreign applicants residing in Japan must submit an alien registration certificate issued by their municipality office. However, those with permanent residency need not submit this document. Overseas residents must submit a document certifying nationality and resident’s eligibility (for example, a copy of your passport showing nationality and resident status).
(3) Applicants serving in government and other public offices, companies and other organizations, and who will remain in service even after enrollment, must submit the organization’s written consent regarding application for admission (no prescribed form).

5. Application Procedures

Applicants must put all documents required for application in the envelope prescribed by our Graduate School for sending application documents, and send it **by registered mail.** We will only accept applications that are delivered to us no later than 4:00 p.m., June 21 (Tue.), 2005.

Points of note

(1) Be careful not to submit incomplete application documents since they will not be accepted.
(2) After an application has been filed, we will not allow any changes to application documents, nor refund examination fees.

6. Selection

6.1 Outline of Selection Method

The method used for selection differs according to the department as shown below.

A. Dept. of Complex Systems Science
Successful applicants for admission to our department will be selected on the basis of overall evaluation of the result of “written and oral examinations” and application documents.

B. For Dept. of Computer Science and Mathematical Informatics, Dept. of Information Engineering, Dept. of Media Science and Dept. of Systems and Social Informatics, successful applicants will be selected on the basis of overall evaluation of the result of “oral examination” or “Written and oral examinations” and application documents.
Among the applicants, those who are “in the 4th year of university and have obtained three quarters of the credits necessary for graduation (except for optional and pedagogical subjects), and have received Excellent or A in more than 5 credits can request the “oral examination.” Should you wish to take the “oral examination,” you must submit the **oral examination request form** at the time of application. From among those who wish to take the oral examination, applicants (who qualify) will be selected and take the “oral examination.” Successful applicants of the “oral examination” do not have to take “written and oral examinations.” However, unsuccessful applicants of the “oral examination” will have to take “written and oral examinations.”
The “oral examination” will take place as long as it does not go over the set maximum number of applicants to undertake “oral examinations” and by respective departments. The result of selection will be communicated to all the applicants who submitted the request form when sending the Examination Card. In addition, the number of successful applicants for “oral examination,” though it differs from department to department, is very low.

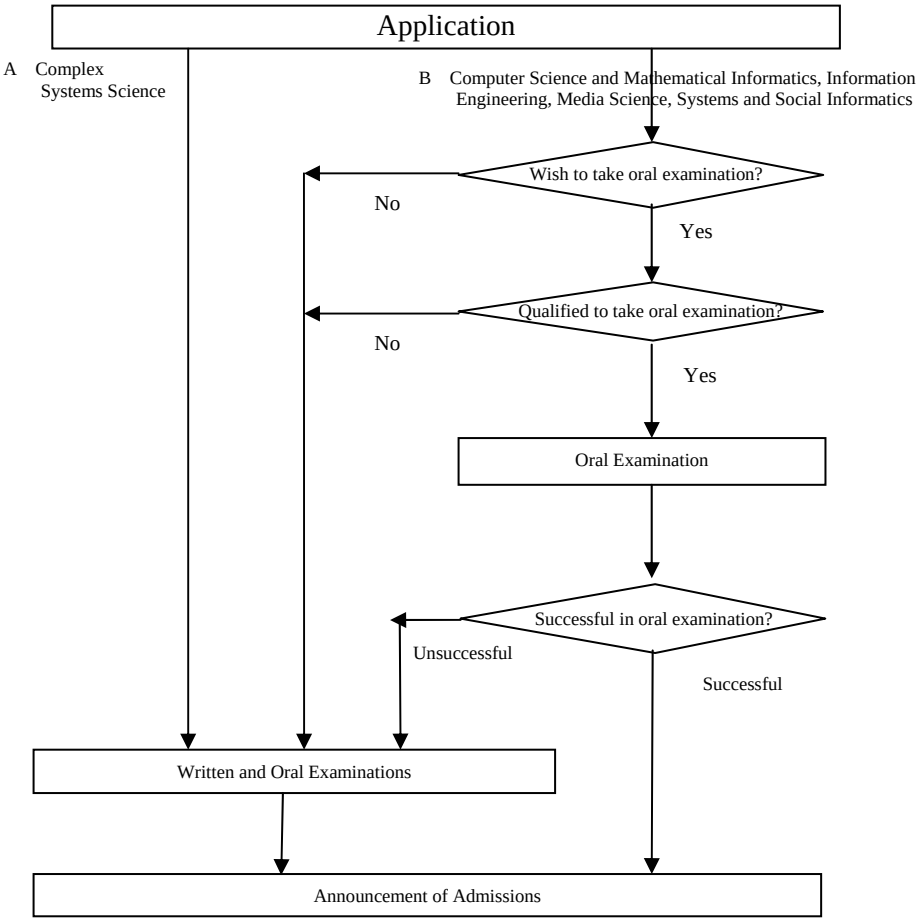

Fig. Outline of Selection

6.2 Acceptance of the Results of External English Examinations

Those applicants who submitted results of external English examinations such as TOEIC (limited to open examinations), TOEFL-PBT (Written examination of TOEFL), and TOEFL-CBT (TOEFL examination by computer), the results will be converted to suit our Graduate School and will be compared with the result of the English examination of the entrance examinations and the better result will be taken as the final result. When an applicant does not take the English examination undertaken by our Graduate School, s/he will be considered as "absent" regardless of the results of external examinations.
Conversion table for English external examinations are available on http://www.is.nagoya-u.ac.jp/for-prep-exam.html.

6.3 Details of Selection Methods

(1) The schedules of "Oral examination" and "Written and oral examination" are shown below.
(2) Announcement of the examination venues will be posted on the examination day at the entrance to the Graduate School of Information Science building (see attached map).
(3) Applicants must arrive at the examination rooms at least 30 minutes before the starting time of the examination and follow the instruction of the clerk in charge.

A. Oral examination July 16 (Sat.)
The oral examination will comprise questions and answers about the subjects specified below for approximately 30 minutes per person. The result will be communicated to the applicants by mail after about one week.

Department	Time	Subject
Computer Science and Mathematical Informatics	12:00 -	Basics about Mathematics or Computer Science, and the major academic field of the professor with whom the candidate wishes to work
Information Engineering	12:00 -	English, Information Engineering (fundamentals of computer science, computer hardware, computer software)
Media Science	12:00 -	Questions will be asked on the basic subjects such as English, Mathematics, Physics, Psychology etc. that candidates have studied over three years at university, taking into consideration the candidate's department.
Systems and Social Informatics	12:00 -	Questions will be asked on the basic knowledge that candidates have acquired in their undergraduate studies, taking into consideration the candidate's department.

B. Written examination August 9 (Tue.)

(1) English 10:00 - 11:00 for all candidates

One dictionary (English-Japanese or English into mother tongue) can be used. However, an electronic dictionary and Japanese-English dictionary or any dictionary that has more functions than what is permitted above will not be allowed.

(2) Academic field

Department	Time	Examination subjects (Items in parentheses are topics to be covered.)
Computer Science and Mathematical Informatics	12:30 - 15:30	There will be 10 – 12 questions on the subjects below and you should select 4 questions to be answered: basic mathematics (linear algebra, calculus), discrete mathematics, theory of computation, mathematical logic, probability theory, numerical analysis, differential equation, information systems (including control regulation), algorithm design method, automata theory, programming
Information Engineering	12:30 - 15:30	From the following A and B subject groups, answer as below. (Choose 4 subjects in total to answer.) Group A: Out of the three subjects, select two to answer. (1) Calculus, linear algebra (2) Probability, statistics (conditional probability, probability distribution, generating function, test) (3) Programming Group B: Out of the three subjects, select two to answer. (1) Fundamentals of computer Science (automata theory, mathematical logic, discrete mathematics, control theory) (2) Computer hardware (logic circuit, computer hardware, computer architecture, information network) (3) Computer software (algorithm, operating system, compiler, nonprocedural language, software design)
Media Science	12:30 - 15:30	Choose three subjects out of the following 8 subjects and give answers. Calculus, linear algebra Probability, statistics (conditional probability, probability distribution, generating function, test) Programming Digital signal conditioning (z transformation, discrete Fourier transform and FFT, filter) Sensation/perception (Questions on basic knowledge of sensation/perception) Learning/memory (Questions on basic knowledge of learning/memory) Thinking/Problem solving (Questions on basic knowledge of thinking/problem-solving) Cognitive Synthesis (Questions on sensation/perception, learning/memory, thinking/problem-solving to test logical thinking ability. Out of three essay tests, choose one to answer.)

Department	Time	Subjects　Question range is shown within brackets.
Complex Systems Science	12:30 - 15:30	Out of 20 questions from the following fields, choose 3 questions to answer. Basics of Mathematics (linear algebra, calculus) Basics of Physics (dynamics, electromagnetics, quantum mechanics, thermofluid mechanics) Basics of Chemistry (organic chemistry, biochemistry, physic chemistry, quantum chemistry) Basics of Biology (molecular biology, molecular genetics, taxonomy, ecology) Basics of Geoscience (rocks/mineralogy, geophysics, geochemistry) Basic of Information Science (algorithm, programming, basics on computer, basics of complex system) Basics of Anthropology (environmental archeology, eco-anthropology, scientific study of cultural property) Basics of Engineering (mechanics of materials, thermohydrodynamics, metering and control)
Systems and Social Informatics	12:30 - 15:30	Short essay (Requisite) Choose 2 subjects out of the following 11 subjects to answer. Probability/statistics Programming Data Engineering (database, information management system) Knowledge Engineering (knowledge processing, patternized information processing) Digital Signal Conditioning (z transformation, discrete Fourier transform and FFT, filter) System Software (operating system, information network) Electronic Sociology System (electronic government and regional informatization, web system and cg, information technology and education/museum) Information Design (information and design, visual literacy, media and art) Basics of Philosophy (history of philosophy, scientific philosophy, ethics, sociological philosophy, aesthetics) Logical Thinking (logistic, critical thinking) Information Science and Society (editing information, information and ethics, information and art) For further details about content of the examinations, please refer to the following website. http://www.ss.is.nagoya-u.ac.jp/exam.html

C. Oral Examination

Department	Time
Dept. of Computer Science and Mathematical Informatics	9:30 -
Dept. of Information Engineering	9:30 -
Dept. of Media Science	9:30 -
Department of Complex Systems Science	9:30 -
Department of Systems and Social Informatics	9:30 -

7. Announcement of Admissions

Announcement of admissions will be posted at noon, August 12 (Fri.), 2005, at the entrance to the Graduate School of Information Science building. The results will also be communicated to each applicant by mail.

8. Registration Procedures

Registration procedures will be communicated to the prospective students in early March 2006. The procedures should be carried out toward the end of March 2006.

9. Registration and Tuition Fees

Registration fee should be paid at the time of enrollment.
(1) Registration fee: 282,000 yen
(2) Tuition fee: 267,900 yen for spring semester (535,800 yen for full year)
(Notes) Tuition for Fall semester can be paid together with that for Spring semester, if so desired. If tuition and other fees are revised at time of enrollment or while you are enrolled in our institution, the revised payment amount will apply from time of revision.

10. For Overseas Applicants

(1) Objectives and Study Plan may be written in English.
(2) Convenience for Written Examinations

Table 7

	English (Written Examination)	Department (Written Examination)
Dept. of Computer Science and Mathematical Informatics	When translating Japanese into English, hiragana will be printed beside each kanji. English-English dictionary may be used instead of English into your own mother tongue.	May answer in English (Use of one dictionary allowed)
Dept. of Information Engineering		May answer in English There will be English translation for specific terminologies and hiragana will be printed beside difficult kanji. You may bring one dictionary of Japanese into your mother tongue.
Dept. of Media Science		May answer in English. There will be English translation for specific terminologies and hiragana will be printed beside difficult kanji. You may bring one dictionary such as Japanese-English dictionary.
Dept. of Complex Systems Science		May answer in English.
Dept. of Systems and Social Informatics		May answer in English. There will be English translation for specific terminologies and hiragana will be printed beside difficult kanji. You may bring one dictionary such as Japanese-English dictionary.

11. Other Points of Note

(1) If you have any questions about admissions to our Graduate School, such as application qualifications or documents and selection process, please inquire in advance at the office below.
(2) For details of research activities of professors/researchers, visit our website below.
http://www.is.nagoya-u.ac.jp
(3) Since Nagoya University restricts vehicle entry on to the campus, use public transportation when visiting University for examinations.
(4) For information (Q & A) regarding admission, you may refer to: http://www.is.Nagoya-u.ac.jp/exam-q-and-a.html
(5) Among unsuccessful applicants, those who so desire may learn the results of the examinations by subject.
Request should be made between: August 22 (Mon.) and September 21 (Wed.), 2005, from 10:00 to 16:00 hours. (Except for Saturdays, Sundays and Holidays)
Applications : Use the form for "Request for Entrance Examination Results" prescribed by our Graduate School

Academic & Students Affairs Section
Graduate School of Information Science, Nagoya University
Furo-cho, Chigusa-ku, Nagoya City, Aichi Prefecture
464-8601
Tel. +81-52-789-4721
http://www.is.nagoya-u.ac.jp/
E-mail: admission@is.nagoya-u.ac.up

Nagoya University Graduate School of Information Science

● Outline

Recent information technology development has a profound influence in a wide range of fields covering human life, culture, art, science and economics. It has also changed our society greatly. The highly information-oriented society is under construction and is supported by both theories of information processing and telecommunications. Today the world is going through a so-called information technology revolution, which demands fast and furious changes in social structure and social organization. In this modern society, it is acknowledged that “information” regulates how a society should be, and dominates human intellectual activities.

Information is a factor in human society which is as important as material objects and energy. In various fields of study, such as engineering, natural sciences, humanities, social sciences and arts, it enables us to recognize, understand and communicate modern society’s phenomena by abstracting their essence. Information technology is indispensable in all aspects of the planning, construction, and operation of systems in our daily life. It is also a technology with which to generate and identify, process and interpret, control and maintain information itself. Demand for social information technology is increasing constantly. Information science, which places information technology central to all information activities in humans, society and nature, needs to be prepared and developed, and society as a whole awaits its effect.

In our Graduate School, “Information Science” which integrated and collaborated different disciplines that had some relation with information supply needed to be promoted as a comprehensive discipline to respond to the needs of modern society. From the aspect of education, it is necessary to prepare an environment in which such human resources are nurtured, who could act as leaders and take responsibility for the construction of a discipline essential to the highly information-oriented society.

Taking these situations into consideration, it is necessary to develop specialists in the advanced information technology field, who can create a highly information-intensive society; to this end the Graduate School of Information Science was established at our university in April 2003.

● Degree

In the first stage of the doctorate course in our Graduate School, those who have completed requisite studies will be awarded the degree Master of Information Science. However, under certain circumstances, Master of Engineering or Master of Arts could also be awarded.

● Outline of Departments

Our Graduate School comprises the Department of Computer Science and Mathematical Informatics, Department of Information Engineering, Department of Media Science, Department of Complex Systems Science and Department of Systems and Social Informatics. In regard to the names and contacts of professors and researchers in respective departments, please refer to http://www.is.nagoya-u.ac.jp/

1) Department of Computer Science and Mathematical Informatics

Our Department conducts study and research in the basic domain of Computer Science including design, analysis and efficiency in information processing, as well as in the domain of Mathematical Informatics, which aims to apply information-related domains through construction and analysis of mathematical models of various phenomena.

The nucleus of our Department consists of the basic domain of Computer Science including Algorithm Theory, Computation Theory, Logical representation of Knowledge, Mathematical Science related to Information Science especially applications to study of algebra and its application to coding theory and cryptography, mathematical logic and computation theory, quantum computing theory, construction of mathematical models and research of numerical analysis, and the domain of probability analysis and its application to information theory.

In brief, in our Department, selected scholars are nurtured as highly specialized engineers and researchers in Basic Information Science.

Divisions	Outline
Basics on Mathematical Informatics Theory	Basics on Mathematical Informatics Theory is indispensable to encourage progress and fresh development of information science. In this course, education and research will be undertaken to solve mathematical problems including logical structure of information, algebraic structure, and the computer's basic features using mathematical methodology of mathematical logic, algebra, analysis, probability theory and statistics.
Information Mathematics Models	In this course education and research will be undertaken in the construction of mathematical models for phenomena in nature and society, which develop in terms of time and space as well as mathematical solutions on challenges related to mathematical analysis of generation, communication and accumulation of information. Furthermore, to realize these in computer-based work, mathematical and computational tools will be developed and analyzed.
Computing Theory	Education and research will be carried out on theoretical computer science which covers theory of algorithms and computational complexity as well as logic, semantics and programming. In concrete terms, the course covers graph algorithms, approximation algorithms, parallel/distributed algorithms, computational geometry and cryptography as well as formal models such as computational models, formal semantics and automatic theorem proving.

2) Department of Information Engineering

In this department, we study and research optimal hardware and software for user-friendly and secure information systems by using information engineering methodology. We concern ourselves with the design and development of such information engineering systems.
Furthermore, based upon the experience of study and research in our Department if Information Engineering, formerly in the Faculty of Engineering, which accommodating the remarkable development of semiconductor integrated circuit technology and information communication technology, we aim to create further developments in information engineering.
Through the development of semiconductor integrated circuit technology, compact size information systems and integrated systems are embedded in machinery such as home electrical appliances and automobiles. Such information processing machinery is, in turn, connected to a mega-sized information system, and can be used in the mobile environment. As a result the software architecture which underpins the information system being constructed becomes larger and more complex.
In this department, by providing education and study of principles and technology, which can be applied to the design and construction of information systems for the next generation, we hope to nurture specialists who will be able to take leading roles as highly advanced information engineers and scientists.

Divisions	Outline
Integrated Circuits and Systems	Integrated systems embedded in various devices such as home electrical appliances are used in daily life and demand high dependability and real-time property as well as severe constraint on cost. Its development indispensably requires co-design and concurrent design of hardware and software, and new development principles and methodology are necessary. In this course, education and study will be carried out in integrated system design, CAD, processor architecture and real-time operating systems, which are the nucleus of any integrated system.
Software Science and Technology	In constructing an information system, and having clarified the requirement of the system by analysis and specification, large-scale and complex software needs to be developed swiftly with precision. Furthermore, taking the advances of software and hardware technology into consideration, it is very important to propose and realize information systems that will be the bases of new social infrastructure. In this course, software science and technology will be studied in both theoretical and practical aspects to develop highly reliable and efficient software as well as to handle large volumes of data with precision, high speed and safety. In addition, in the mobile environment, we will study methods to enable effective use of PDAs (personal digital assistance) and means of information exchange between PDAs.
Information Network Systems	In the design of an information network that links various information processing devices composing information systems, we have to select the optimum equipment of communication from amoung various ones, and have to develop a communication method using it which enables efficient and secure communication. . We also have to develop algorithms, as well as methods for synchronization and communication between computing units, for effective computation on a computational grid. In this course, education and research will cover such subjects as organization of information networks, information security, intelligent information search, large-scale data analysis, ultra-distributed/parallel processing methods.

3) Department of Media Science

Information plays a major role in various human activities in industry, economy, society, education, art, medicine/social welfare, and the home. In such an information-based society, information needs to be produced and expressed swiftly with precision.
In this Department, we are in the core of the 21st Century "Intelligent Media (Speech and Images) Integration for Social Information Infrastructure"; it is necessary to collaborate with Center for Integrated Acoustic Information Research which aims to integrated comprehension of multi-dimensional acoustic signals from the viewpoint of multi-faced aspects such as signal structure, information conversion, linguistics, spatial physics and cognitive approach. Media science will be advanced as a trinity of basic science, engineering and cognitive science.
In this Department, our purpose is to study and research the basics of media science, the creation of intelligent machinery which process and express media, and to study ways to clarify the recognition function of human beings that are indispensable in developing a functional information society, and eventually hope to nurture competent media scientists and media engineers.

Divisions	Outline
Science of Speech and Images	Study and research will be carried out on mathematics of pattern information processing, image processing, sound signal processing, image space generation, speech/sound space generation, image recognition, speech recognition, natural language processing and multi-modal information expression. Through this study, we will be able to deepen our understanding of processing and by multimedia – speech and images – computation, the basic theory of multi-media information generation, methodologies of processing/conversion/recognition of multimedia such as speech/images, and express/generate information through multi-media.
Intelligent Media Engineering	In this course we undertake study and research on computer vision, computer audition, natural language generation, censor fusion, idea support technology, ultra-realism creation, intellectual human interface. Through such learning, we will be able to deepen our understanding of methodologies to realize intelligent media such as intellectual agents including intelligent recognizing machines, and intelligent robots' sensing that support various human activities such as design/medicine/ education/communication and its application to industry, medical welfare and education sector.
Cognitive Information Theory	In this course through studying research on integrated perception in a multi-modal environment, recognition process and memory of speech/language, its cause, process of discovery/creation, and language acquisition and understanding process, we will undertake research on the environment which is most effective for communication and creation as well as the method and system of language acquisition. This will in turn lead us to study further experimental and biological (brain/imaging) methodology, being an high-level cognitive process of human perception, memory, discovery and creation. Through such research, we will attempt to deepen our understanding by computer science methodology, its modeling, various functions such as human perception/recognition, memory, language and thinking and the unraveling of effects of human function modules and actual modeling. Furthermore, since audio-visual art such as fine art/music accounts for much of human life, we will continue our study into information processing/expression methodologies of human sensitivity, and seek the enlargement of sensitivity domains and possibility of creation, and emotional information search.
Information Media Space Organization Theory	Since it is indispensable to develop an information environment for supporting or enlarging human intellectual activities in fields such as education, research, development and art, it is necessary to undertake study and research on information media space organization which describes information via multimedia, enlargement and creation methods of the intellectual world, and organization methods of the multi-modal interface which facilitates communication with information space.

4) Complex Systems Science

Complex systems in nature and society comprise the network of many and varied elements such as molecules, neurons, agents which can communicate, convert and accumulate information, and which can therefore be understood as a distributive information system. A main feature of such complex systems is to generate dynamically and autonomously an order structure and function, which cannot be expected from the basic component's features.
Complex systems science, by deeming self-organization process of such order and function as information processing, aims to acquire a universal viewpoint. The objective is to investigate various natural and artificial systems and through synthesizing theories, experiments and computation methods, we will attempt to clarify the principle of universal information processing, which is hidden in varied objects.
In this course, we will study the development of innovative computation methodologies to analyze complex systems without using established reductionist methodology, but we will develop constructive method by "understanding by creating" model systems. By opening up distributive methodology which designs information systems based on self-organization of distributed elements, we hope to nurture engineers and scientists who are able to initiate new ideas through using organization theory thinking and distributive thinking.

Divisions	Outline
Multi-liberal System Information Theory	Complex systems in nature are autonomous cooperative systems that operate as aggregates in which many organization elements interact. To understand the information structure of such a system, it is important to understand the characteristics of the aggregates that interact among many groups with different degrees of freedom. In this course, we focus on communication, conversion and accumulation of information interacting among Many body systems and investigate new principles of information science from the viewpoint of information physics. Furthermore, obtained statistical results will be applied to the analysis of group information phenomena in nature and society.
Material Information Theory	Material base that assumes communication, conversion and accumulation of information in nature is movement, reaction and structure of its molecules and collective entities. This course aims to analyze the information flow in complex molecule phenomena, which is integrated and organized into function discovery, and by using simulation, Many body system, algorithm development and Non-equilibrium theory and plastic dynamics, principles that design and create, we will inquire into the creation of information function material, and carry out studies on material-based information processing. Furthermore, research will be carried out on innovative information technology related to the simulation of molecule systems such as the development of ultra-parallel computation and special computers for dynamics.
Life Information Theory	A living organic body comprised of molecules, cells and tissues shares information. It can be said that it is a distributive information system that communicates a lot of information for the mutual benefit of control and maintenance. Furthermore, its relationship is a hierarchical information system formed in a complex manner between matter and species. In this course, an organization/process related to communication, conversion, increase, and accumulation of wide-ranged life information is understood as dynamic change of bioactive natural product into various living molecules such as nucleic acid and protein, which will be clarified through experiments such as synthetic organic chemistry, bioorganic chemistry, molecular function analysis and molecular biology. Study and research will be in the field of new bioinformatics.

Divisions	Outline
Emergent Systems Theory	Emergent phenomenon comprise the core concept that characterizes complex systems. The emergent phenomenon is the autonomous emergence of information process function, information process structure and information dynamics, which are based on dynamic interaction among many components. In this course, we aim to educate and study the understanding and application of emergent phenomenon in complex systems. To this end it is necessary to inquire into emergent phenomenon information organization, which is based on the construction of a computation theory model, realization of complex systems simulation, and its verification and application in the real world. Thus we will study and undertake research into the establishment of new principles of information processing.
Complex Systems Computation Theory	Non-linear dynamic systems and activities that humans carry out in natural science such as production activities is accepted as complex systems, and by constructing a mathematical model, and by numeric simulation, the model is verified and optimized. This should help clarify communication, conversion and accumulation mechanisms of information in complex systems. Thus, complex systems including forecast and control/design methods as well as higher precision/high-speed solution is developed. This will lead to the construction of new information process principle/information process system and hence we will undertake studies and research into computer theory in complex systems informatics.
Information Visualization Theory	Setting physical phenomena and dynamic interaction which shows non-linear behavior as the objective, large-scale computation and high-precision measurement and analysis is carried out. We aim to construct complex systems informatics that can extract useful information from spatiotemporal phenomena. For example, to extract necessary information and clarify it from Flow system that shows complex behavior, or from various massive data in the interaction between ecology/environment systems and humans, visualizations, discovery science and knowledge processing will be studied.

5) Department of Systems and Social Informatics

In this Department, the social environment in which development of information technology enhances an information-intensive society, our research takes the viewpoint of physical matter/phenomena of the real world and fusion of logical objectives/processes. The study will be focused on environment, organization, and function which are cooperatively and complementarily fusion-capable and which are organized by the real world and virtual world that is superior for human society. Paradigm or model that fosters, creates and educates humans as well as that which is related to the construction of activity space supported by human wisdom and creative action is already established. Therefore, we would like to explore construction and architecture of a social system that is knowledge-dependent through the use of information technology, and for another, we would like to evaluate and consider the various problems that are generated in the social environment and social organization through the development of information technology. This will lead to research into the human role and organization of human society in an integrated space between the real world and virtual world.

In this course, from the standpoint of nurturing human resources that can meet the needs of the information age, we would like to raise for the awareness of the importance of information processing education, information technology development/application, functional design/development of social information systems, databases for social information environment, and development/construction of a user interface. Thus, we aim to educate competent personnel who can actively support and develop the information society.

Divisions	Outline
Knowledge Society system Theory	Human intellectual activities are supported by repetition of knowledge generation, refining, integration and fomentation, and each develops into new activities. In an information-oriented society in which knowledge is the basis, it is necessary to address any information model that assists human intellectual activities, knowledge control/management architecture and any social information system that claims to realize all these. In this course, from the standpoint of the fusing/matching of the real world and virtual world, we will study the knowledge-oriented society system that can most effectively assist human activity space. Furthermore, in the virtual space that develops in the information-oriented society, handling of intellectual property becomes an important challenge. It is necessary to secure quality intellectual property and its distribution. We will also study its management/application from a technological viewpoint.
Electronic Society Design Theory	Extended dissemination of the Internet and Intranet and its penetration into social systems has realized various mechanisms of the real world as in a virtual world. Accordingly human life space and social environment is being transformed on a large-scale. In this course, we will reconsider the system of the real society, and use information formation processes for the modeling of electronic systems. Furthermore, research will be on construction and design methodology of the social information system and its contents in the fields of education, administration, museums and images. In addition, taking into account communication system design in an electronic-intensive-dependent society, research will be carried out on information design and usability, visual literacy and public art that is linked to computerization.
Information Creation Theory	Approach to information, heretofore, focused on efficient communication of existing information, and its primary concern was the application of computerized information processes to individual sciences, and hence the standpoint taken was from that of basic thinking. In this course, to form an approach that goes beyond that, we try not only sending communication via information but also establishing various settings where information is to be created. While clarifying the common factor, we would like to delve deeper into the significance and value of what is happening and what it means for human life, through philosophical studies taking history of thought into consideration. Furthermore, we accept the problem of information ethics that takes place in the encounter between “pursuit of information communication efficiency” and “study of information creation”, aiming to expand such discussions.
Infrastructure Environment of Information-Oriented Society Theory	In environmental activities, which take place in the setting where virtual space and real space become fused, which is the result of an information-oriented society, actions which have different values from the one real world are constructing new situations. In this course we will explore the criteria for intellectual significance and value standards, which should be the role model of human action that is evolved in the information-oriented society. We aim to establish an organization that will lead to the creation of principles in information space and information environment design as well as a framework for intellectual systems. Our research will be on a social environment infrastructure system which is brought about by the formation of an information setting where use/management/construction of information is integrated, including situation recognition/comprehension/composition/distributive technology as well as social state infrastructure design, and semantics of expression of action. There will be instruction on intellectual artificial organization methods among humans who have interactive ability. This will lead to the nurturing of scientists and engineers who can create a social environment infrastructure that supports new communication styles.