Special Subjects (プログラム共通科目)

						S	Semeste	er	
Course	Subjects		Teachers	Credits	23- I	23- П	24- I	24- II	25- I
	★Collaborating PBL(Compulsory)	共学PBL	TBD	2		0			
	★Synthetic Seminar(Compulsory)	総合セミナー		2		Intensive			
All Courses	★Intensive International Seminar for Interning Study(Compulsory)	国際インターン研修		2	Intensive				
	Corporate Interning Study	企業インターン研修		2					
	Regional Collaborative Career Workshop	地域連携キャリア研修	H. Koga	2		(C	(С

Core Subjects (専門選択必修科目)

						Semeste			
Course	Subjects		Teachers	Credits	23- I	23- П	24- I	24- II	25- I
	(A) Advanced Mathematical Structure for Information Science	情報数理構造特論	M. Hirotomo	2				\bigcirc	
Data Science Course	(A) Mathematical Analysis and Computation	数理解析特論	T. Kimura	2		0		0	
Data Science Course	(A) Computational Science	計算科学特論	Y. Hieida	2		\bigcirc		\bigcirc	
	Mathematical Data Science	データサイエンス数理特 論	T. Minamoto	2	\bigcirc		\bigcirc		\bigcirc
	(B) Advanced Study of Artificial Intelligence	人工知能特論	Y. Okazaki	2	0		0		0
	(B) Learning Algorithms	学習アルゴリズム特論	N. Yamaguchi	2		\bigcirc		0	
Computer Science and	(B) Information Visualization	情報可視化特論	O. Fukuda	2				\bigcirc	
Course	(B) IT and Innovation	ITイノベーション特論	T. Kakeshita	2			\bigcirc		
	(B) Advanced Computer Network	情報ネットワーク特論	E. Hanada	2				0	
	(B) Object Oriented Programming	オブジェクト指向プログ ラミング特論	S. Tadaki	2			\bigcirc		
	Advanced Thermal Energy Engineering	熱エネルギー工学特論	A. Miyara	2		\bigcirc		0	
Energy and Mechanical Engineering Course	Advanced Heat Engine Technology	エネルギー機関特論	Y. Mitsutake	2	0		0		\bigcirc
	Advanced Fluid Mechanics for Energy	流体エネルギー力学特論	Y. Kinoue	2	\bigcirc		\bigcirc		\bigcirc
	Advanced Robotics	ロボット工学特論	K. Sato	2		\bigcirc		0	
Mechanical Systems Engineering Course	Advanced Surface Engineering	表面工学特論	H. Hasegawa	2	0		\bigcirc		\bigcirc
	Advanced Computational Mechanics	計算力学特論	Y. Tadano	2		\bigcirc		0	
	Advanced Wireless Communication Systems	ワイヤレス通信システム 特論	I. Toyoda	2	0		\bigcirc		\bigcirc
Electrical and Electronic Engineering Course	Advanced Adaptive Systems Theory	適応システム特論	H. Itoh	2		\bigcirc		0	
	Advanced Hardware Interface Engineering	ハードウェア・インター フェース工学特論	H. Fukumoto	2		0		0	
	Numerical Analysis in Biomedical Engineering	医工数值解析特論	K. Muramatsu	2	\bigcirc		0		\bigcirc
Biomedical Engineering Course	Bioinformatics Programming	バイオインフォマティク ス特論	H. Douzono	2	\bigcirc		0		\bigcirc
	Neuro-Biological Information Processing	脳生体情報工学特論	T. Sugi	2		\bigcirc		\bigcirc	

Outline of Core Subjects

Data Science Course

< Advanced Mathematical Structure for Information Science > (情報数理構造特論)

This lecture introduces cryptograph and algebra. The main topics are mathematical structure and algebric principle applied in cryptograph.

< Mathematical Analysis and Computation > (数理解析特論)

In this lecture, we will discuss about 1) some methods for numerical Analysis, 2) mathematical backgrounds of numerical computation, 3) mathematical and numerical validation of computational error.

< Computational Science > (計算科学特論)

Birth-death processes are used as models of natural and social phenomena. This lecture treats how to simulate a birth-death process from the basics which contain mathematical background. The ability to write Python programs and prior knowledge of probability (for example, the variance of the binomial distribution) are assumed.

< Mathematical Data Science> (データサイエンス数理特論)

Prof. T. Minamoto This lecture introduces mathematical concepts concerning data and computer science and provides a basis for further study in data science. Topics covered are mathematical modeling, statistics, machine learning, etc. The lecture describes connections between each of these mathematical concepts and modern data science applications.

Computer Science and Information Technology Course

<Advanced Study of Artificial Intelligence > (人工知能特論)

From the perspective of problem solving, which is one of the important themes of artificial intelligence, we take up important points in artificial intelligence research, give lectures on each theme, and conduct exercises based on the contents.

< Learning Algorithms > (学習アルゴリズム特論)

Assoc. Prof. N. Yamaguchi In this lecture, we will learn several learning algorithms for AI. Especially, we will learn 1) introduction to AI, 2) clustering, 3) pattern recognition, 4) reinforcement learning, and 5) search.

< Information Visualization > (情報可視化特論)

This subject explains various information visualization techniques and information visualization tools through lectures and exercises for accurate and efficient information understanding and information transmission.

<IT and Innovation > (IT イノベーション特論)

Information technology is necessary for building a future society such as Society 5.0 and DX (Digital Transformation). This lecture aims to expand students' perspectives through lectures on methodologies for creating various services using IT. Students will learn methodologies for creating various services using IT; service management techniques for continuously providing created services; competitive strategies for protecting the created services and establishing superiority over competitors.

Assoc. Prof. Y. Hieida

Assoc. Prof. T. Kimura

Assoc. Prof. M. Hirotomo

Assoc. Prof. T. Kakeshita

Prof. Y. Okazaki

Prof. O. Fukuda

< Information Network > (情報ネットワーク特論)

Today, we live in an "information network society," and information systems are the technological infrastructure. The intentions of this lecture are as follows;

1) To foster an understanding of the various digital communication technologies used in information systems 2) To foster an attitude of self-motivated pursuit of specialized knowledge that should be known in managing information networks.

< Object Oriented Programming > (オブジェクト指向プログラミング特論)

Object-oriented programming is a programming scheme where data and their operations are combined as objects. The OOP enables us to make programming have seamless connections to target models. Moreover the OOP contributes effective programming processes through abstract programming and reusability of components. This lecture explains the scheme of the OOP with realistic examples.

Energy and Mechanical Engineering Course

< Advanced Thermal Energy Engineering>(熱エネルギー工学特論)	Drof A Miyara
Finite difference method for heat transfer problemsConduction heat transferConvection heat transfer	r foi. A. Miyara
< Advanced Heat Engine Technology> (エネルギー機関特論) 1) Engineering Thermodynamics	Prof. Y. Mitsutake
2) Heat Conduction Problems < Advanced Fluid Mechanics for Energy >(流体エネルギー力学特論)	Prof. Y. Kinoue
Basic theories of fluid dynamics and fluid mechanics are given in the lecture Mechanical Systems Engineering Course	
<advanced robotics=""> (ロボット工学特論) 1) Kinematics of Robot 2) Dynamics of Robot 3) Control methods of Robot</advanced>	Prof. K. Sato
<advanced engineering="" surface=""> (表面工学特論) Material science, processing and design Surface science and treatment Machine processing </advanced>	Prof. H. Hasegawa
<advanced computational="" mechanics=""> (計算力学特論) Mathematical foundation of computational mechanics Nonlinear solid mechanics Nonlinear finite element method </advanced>	Prof. Y. Tadano

Prof. E. Hanada

Prof. S. Tadaki

Electrical and Electronic Engineering Course

<Advanced Wireless Communication Systems > (ワイヤレス通信システム特論)

The main topics of this subject are as follows:

- 1) Introduction to wireless communication technologies
- 2) Fundamental technologies in wireless communications

3) Advanced technologies used in wireless LAN and FWA systems

<Advanced Adaptive Systems Theory > (適応システム特論)

In this class, we will learn several methods for making machines that can automatically learn how to behave in unknown environments. Especially, we will learn (1) reinforcement learning, (2) stochastic modeling, and (3) optimal control in partially observable domains.

<Advanced Hardware Interface Engineering> (ハードウェア・インターフェース工学特論)

Assoc. Prof. H. Fukumoto In this lecture, we will learn the hardware interface for computer applications. Especially, we will learn about computer architecture, Input/output interface standard, usage method, and usage example.

Biomedical Engineering Course

< Numerical Analysis in Biomedical Engineering >(医工数值解析特論)

Various algorithms and techniques, such as methods of solving differential equations, nonlinear equations, large scale linear equations, inverse problems, etc., on numerical analysis are lectured.

< Bioinformatics Programming > (バイオインフォマティクス特論)

In this lecture, the bioinformatics is lectured including the basic life science, informatics, and programming for bioinformatics of sequence-alignment, hidden Markov model and neural networks using C language and Python.

< Neuro-Biological Information Processing>(脳生体情報工学特論)

Information processing and numerical analysis for biomedical and/or neuro-biological signals are discussed. Focus is to improve the knowledge on neurophysiological sciences and the skill for information processing of biomedical data.

Assoc. Prof. H. Douzono

Prof .H. Itoh

Prof. I. Toyoda

Prof. K. Muramatsu

Prof. T. Sugi

Curriculum for the students of Data Science Course

(データサイエンスコース授業科目)

Major Subjects					S	Semeste	er	
Subjects		Teachers	Credits	23- I	23- II	24- I	24- II	25- I
(A) Theory of Applied Mathematics I	応用数学特論 I	K. Handa	2	0				0
(A) Theory of Applied Mathematics II	応用数学特論Ⅱ	Y. Hibino	2		0			
(A) Advanced Mathematical Science I	数理科学特論 I	Y. Hibino	2				0	
(A) Advanced Mathematical Science II	数理科学特論Ⅱ	K. Handa	2				0	
(A) Advanced Numerical Analysis I	数値解析特論 I	T. Kinoshita	2	0				0
(A) Advanced Numerical Analysis II	数値解析特論Ⅱ	T. Kinoshita	2			0		
(B) Advanced Study of Machine Learning System	機械学習システム特論	K. Nakayama	2	0		0		0
(B) PBL on Cyber Physical System	サイバーフィジカルシステム開 発PBL	O. Fukuda	2		0		0	
(B) Advanced Lecture on Remote Sensors and Remote Sensing	実世界センシング特論	H. Okumura	2	0				0
(B) Advanced Lecture on Modeling of Remotely Sensed Data	実世界モデリング特論	H. Okumura	2			0		
(B) Requirements Engineering	要求工学特論	T. Kakeshita	2	0				0
(B) Software Design	ソフトウェア設計特論	M. Ohtsuki	2	0				0
(B) Information System Security	情報システムセキュリティ特論	Hori, Hirotomo	2		0		0	
(B) Software Quality Assurance	ソフトウェア品質保証特論	M. Ohtsuki	2			0		
Data Science Internship A	データサイエンスインターン シップA	T. Minamoto	2		i	ntensiv	ve	
Data Science Internship B	データサイエンスインターン シップB	T. Minamoto	2		i	ntensiv	ve	
★Advanced Study on Data Science I (Compulsory)	データサイエンス特別研究 I	Minamoto, Hirotomo, Kimura, Hibino, Handa, Okumura, Hanada, Kakeshita, Yamaguchi, Matsumae, Nakayama, Fukuda, Kinoshita, Hori, Otani	5	0		0		
★Advanced Study on Data Science II (Compulsory)	データサイエンス特別研究 Ⅱ	same as above	5		0		0	
★Advanced Study on Data Science III (Compulsory)	データサイエンス特別研究Ⅲ	same as above	10			0		
★Advanced Study on Data ScienceIV (Compulsory)	データサイエンス特別研究IV	same as above	10				0	

*Master of Science: You need to earn "A" more than 4 credits in total of Core Subject and Major Subject.

*Master of Engineering: You need to earn "B" more than 4 credits in total of Core Subject and Major Subject.

Data Science Course

< Advanced Applied Mathematics I > (応用数学特論I)

Certain applications of mathematics will be explained.

< Advanced Applied Mathematics II > (応用数学特論II)

Assoc. Prof. Y. Hibino Introduction to probability theory, especially the canonical representation of Gaussian processes.

< Advanced Mathematical Sciences I > (数理科学特論I)

Quantum probability and its application to graph theory.

< Advanced Mathematical Sciences II > (数理科学特論II)

Some topics on mathematical sciences will be discussed.

< Advanced Numerical Analysis I > (数值解析特論I)

In this lecture, the theory of finite element method, error analysis and its implementation will be explained.

< Advanced Numerical Analysis II > (数值解析特論II)

Assoc. Prof. T. Kinoshita In this lecture, the theory of numerical verification method and its applications will be explained.

< Advanced Study of Machine Learning System > (機械学習システム特論)

Assoc. Prof. K. Nakayama This class explains the fundamentals and the concepts of machine learning System.

< PBL on Cyber Physical System > (サイバーフィジカルシステム開発 PBL)

Prof. O. Fukuda In this Problem-Based Learning (PBL) class, we will discuss how to solve real-world problems based on cyberphysical system. The student groups aim to solve problems with under the supervisor's support.

< Advanced Lecture on Real-world Sensing > (実世界センシング特論)

Prof. H. Okumura This class aims to learn about advanced sensors and sensing systems to obtain analog data from real world to computers and to learn how to handle these data effectively through contents of lectures, investigation research and discussion.

< Advanced Lecture on Remote Sensors and Remote Sensing > (実世界センシング特論)

This class aims to learn how to acquire various information from data and images obtained by remote sensing using satellite sensors and to conduct analysis exercises using actual images and data.

< Requirements Engineering >(要求工学特論)

Assoc. Prof. T. Kakeshita When building useful information systems, software engineers must analyze the needs of various stakeholders regarding the system and plan those that satisfy them. In addition, techniques to create complete specifications, free of ambiguities and inconsistencies, minimize the risks associated with information system development. In this course, students will learn various techniques for planning, analyzing requirements, and developing specifications for information systems.

Prof. H. Okumura

Assoc. Prof. Y. Hibino

Prof. K. Handa

Prof. K. Handa

Assoc. Prof. T. Kinoshita

< Software Design >(ソフトウェア設計特論)

In recent years, as social systems have become increasingly IT-oriented, various systems have been developed as software. The hardware and middleware that serve as the foundation for such systems have also developed, requiring in-depth knowledge of these systems in their development. In this course, students will learn the basics of design among the various knowledge and techniques required for such development in a practical manner using PBL materials.

< Information System Security >(情報システムセキュリティ特論)

This lecture introduces basic and common matters required for the construction of secure information systems. To recognize the importance of information security and information security technology, and to master the basic technologies and related laws.

< Software Quality Assurance >(ソフトウェア品質保証特論)

In today's world, where software is used in all aspects of society, including daily life, how to assure software quality is an important issue. Software quality assurance has been addressed since the days of rocket orbit calculations in the 1960s. In this lecture, you will learn what software quality assurance is and how to ensure quality. Then, we will learn about various techniques to assure software quality, especially testing techniques.

Prof. T. Minamoto In collaboration with local governments and industries that utilize data science, the internship program provides the student with the opportunity to work in a day-to-day professional environment under the supervision of an experienced professional and with the guidance of our course staff. This program also aims to foster positive interaction between the student and experienced information management professionals in local governments, institutions, businesses, and other agencies.

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< Advanced Study on Data Science I > (データサイエンス特別研究 I)

This study includes postgraduation research such as experiments, reading on research paper, and so on.

< Advanced Study on Data Science Ⅱ > (データサイエンス特別研究Ⅱ)

Prof. T. Minamoto et al. This study includes postgraduation research such as experiments, reading on research paper, writing on abstracts and so on.

<Advanced Study on Data Science Ⅲ>(データサイエンス特別研究Ⅲ)

This study includes postgraduation research such as interim presentation, experiments, reading on research paper, writing on abstracts and so on.

<Advanced Study on Data Science IV>(データサイエンス特別研究IV)

Prof. T. Minamoto et al.

This study includes postgraduation research such as presentation outside the University, experiments, reading on research paper, writing on abstracts and so on.

Lect. M. Ohtsuki

Lect. M. Ohtsuki

Prof. Y. Hori, Assoc. Prof. M. Hirotomo

Prof. T. Minamoto et al.

Prof. T. Minamoto et al.

Curriculum for the students of Computer Science and Information Technology Course

(知能情報工学コース授業科目)

Major Subjects				S	emeste	er		
Subjects		Teachers	Credits	23- I	23- II	24- I	24- II	25- I
Advanced Study of Machine Learning System	機械学習システム特論	K. Nakayama	2	0		0		0
PBL on Cyber Physical System	サイバーフィジカルシス テム開発PBL	O. Fukuda	2		0			
Advanced Lecture on Remote Sensors and Remote Sensing	実世界センシング特論	H. Okumura	2	0				0
Advanced Lecture on Modeling of Remotely Sensed Data	実世界モデリング特論	H. Okumura	2			0		
Requirements Engineering	要求工学特論	T. Kakeshita	2	\bigcirc				0
Software Design	ソフトウェア設計特論	M. Ohtsuki	2	\bigcirc				0
Software Quality Assurance	ソフトウェア品質保証特論	M. Ohtsuki	2			0		
Advanced Study of Operating Systems	オペレーティングシステ ム特論	E. Hanada	2		0			
Advanced Network-based System	ネットワーク指向システ ム特論	M. Otani	2		0			
Advanced Information Infrastructure Systems	情報基盤システム学特論	Y. Hori	2		0			
Advanced Ubiquitous Information Environment	ユビキタス情報環境特論	M. Otani	2				0	
Advanced Parallel and Distributed Algorithms	並列分散アルゴリズム特 論	S. Matsumae	2		0		0	
Modeling and Simulations	モデル化とシミュレー ション特論	S. Tadaki	2	\bigcirc				
High Performance Computing	高性能計算特論		2					
Information System Security	情報システムセキュリ ティ特論	Hori, Hirotomo	2		0		0	
★Advanced Study on Computer Science and Information Technology I (Compulsory)	知能情報工学特別研究 I	Fukuda, Hanada, Okumura, Tadaki, Minamoto,Kakeshita, Matsumae, Okazaki, Hieida, Nakayama, Otani, Ohtsuki, Kimura, Hirotomo, Yamaguchi, Hori	5	0		0		
★Advanced Study on Computer Science and Information Technology II (Compulsory)	知能情報工学特別研究Ⅱ	same as above	5		0		0	
★Advanced Study on Computer Science and Information Technology III (Compulsory)	知能情報工学特別研究Ⅲ	same as above	10			0		
*Advanced Study on Computer Science and Information Technology IV (Compulsory)	知能情報工学特別研究IV	same as above	10				0	

Computer Science and Information Technology Course

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<Software Quality Assurance > (ソフトウェア品質保証特論)

Lect. M. Ohtsuki

In today's world, where software is used in all aspects of society, including daily life, how to assure software quality is an important issue. Software quality assurance has been addressed since the days of rocket orbit calculations in the 1960s. In this lecture, you will learn what software quality assurance is and how to ensure quality. Then, we will learn about various techniques to assure software quality, especially testing techniques.

<Advanced Study of Operating Systems > (オペレーティングシステム特論)

Prof. E. Hanada

Practical study of operating systems as a basic element of information systems; lectures on their structure and operation and system programming (programming over system calls), using UNIX as an example.

< Advanced Network-based System > (ネットワーク指向システム特論)

Assoc. Prof. M. Otani

Use of internet-based information systems is advancing rapidly, and technology is advancing along with it. In this course, the current state of information systems and next-generation communication technologies will be introduced, while discussing future information systems.

Assoc. Prof. K. Nakayama

Assoc. Pref. T. Kakeshita

Prof. O. Fukuda

< Advanced Information Infrastructure Systems > (情報基盤システム学特論)

Prof. Y. Hori

Information infrastructure systems are the foundations of the society in which we live. This lecture will focus on the design and operation of information infrastructure systems based on an understanding of the basic concepts of information infrastructure systems.

< Advanced Ubiquitous Information Environment > (ユビキタス情報環境特論)

Assoc. Prof. M. Otani

Prof. S. Matsumae

Ubiquitous computing refers to an environment in which computers are present everywhere in society and daily life and information can be accessed anytime, anywhere without awareness. In this course, learn about the knowledge and technologies required to structure a ubiquitous computing environment.

< Advanced Parallel and Distributed Algorithms > (並列分散アルゴリズム特論)

Fundamental algorithms and their properties are discussed along with learning about the basic models and architectures in parallel and distributed processing. Students are encouraged to deepen their understanding by solving simple exercises.

< Modeling and Simulations > (モデル化とシミュレーション特論)

Prof. S. Tadaki

Fundamental concepts of modeling and computer simulations are the main theme of this lecture. Fundamental equations, phenomenological modeling and stochastic modeling are discussed in mainly physical phenomena. And numerical methods of differential equations and visualization of results, relations between continuous and discrete models, fundamentals of stochastic processes are also discussed. Understanding modeling processes enables us to understand fundamental processes and expect results.

< Information System Security > (情報システムセキュリティ特論)

Prof. Y. Hori, Assoc. Pref. Hirotomo

This lecture introduces basic and common matters required for the construction of secure information systems. To recognize the importance of information security and information security technology, and to master the basic technologies and related laws.

< Advanced Study on Computer Science and Information Technology I - IV > (知能情報工学特別研究I~IV)

E. Hanada etc.

The purposes of this series of lectures are cultivating fundamental research skills, such as reading academic papers and developing codes. Skills for conducting research and communication are improved through discussion in seminars with mentors and colleagues.

Curriculum for the students of Energy and Mechanical Engineering Course (機械エネルギー工学コース授業科目)

Major Subjects			Semester					
Subjects		Teachers	Credits	23- I	23- II	24- I	24- II	25- I
Advanced Fluid Engineering	流体工学特論	S. Matsuo	2	0		0		0
Advanced Thermodynamics	熱力学特論	K. Ishida	2	0		0		0
Advanced Mechanics of Materials	材料力学特論	N. Hattori	2	0		0		0
Advanced Dynamics of Machinery	機械力学特論	T. Tsujimura	2		0		0	
Advanced Mechanical Engineering PBL	機械システム工学PBL	S. Hagihara etc	2		0		0	
Advanced Instrument and Control Engineering	計測制御特論	K. Sato	2	0		0		0
Advanced Heat Transport Engineering	熱輸送工学特論	K. Kariya	2	0		0		0
Advanced Heat and Mass Transfer	熱物質移動工学特論	H. Arima	2	0		0		0
Advanced Fluid Energy	流体エネルギー特論	N. Shiomi	2		0		0	
Advanced Fluid System Engineering	流動システム工学特論	T. Murakami	2		0		0	
Advanced Ocean Engineering	海洋工学特論		2					
Advanced Offshore Wind Turbine Engineering	洋上風車工学特論	S. Yoshida	2		0		0	
Advanced Energy Conversion	エネルギー変換特論	Y. Ikegami	2	0		0		0
Advanced Ocean Measurement	海洋環境特論	Y. Imai	2	0		0		0
★Advanced Study in Mechanical and Energy Engineering I (Compulsory)	機械エネルギー工学特別研究 I	Ishida,Ikegami,Kinoue,M atsuo,Mitsutake,Miyara,I mai,Kariya,Shiomi,Murak ami,Yoshida	5		0		0	
★ Advanced Study in Mechanical and Energy Engineering II (Compulsory)	機械エネルギー工学特別研究Ⅱ	same as above	5	0		0		0
★Advanced Study in Mechanical and Energy Engineering III (Compulsory)	機械エネルギー工学特別研究Ⅲ	same as above	10		0		0	
★Advanced Study in Mechanical and Energy Engineering IV (Compulsory)	機械エネルギー工学特別研究IV	same as above	10	0		0		0

Energy and Mechanical Engineering Course

< Advanced Fluid Engineering>(流体工学特論)	Drof S Matsua
1) Fundamental Fluid Dynamics.	1 Ioi. S. Matsuo
2) Shock Wave Phenomena.	
3) Effective Utilization of Fluid Energy.	
4) Application to Biomedical Fluid Engineering.	
<advanced thermodynamics=""> (熱力学特論)</advanced>	Laat K Ishida
Lectures on advanced applications of thermodynamics to energy conversion and energy	gy transfer processes.
< Advanced Mechanics of Materials>(材料力学特論)	Duck N. Hattari
1) Strassas in the electic range	Proi. N. Hattori
2) Fracture mechanics	
3) Preventing mechanical failure.	
< Advanced Dynamics of Machinary > (機械力学株社)	
< Advanced Dynamics of Machinery > (陵板刀子村)	Prof. T. Tsuiimura
1) Dynamics of Rigid Machines	iion ii isajiinana
2) Nonlinear Dynamics Analysis	
3) Linked Structure Dynamics Applications	
<advanced engineering="" mechanical="" pbl="">(機械システム工学 PBL)</advanced>	Drof S. Hagibara ata
1) Exercise for understanding of problems of companies	rioi. 5. maginara etc.
2) Exercise for finding solution of problems of companies	
<advanced and="" control="" engineering="" instrument="">(計測制御特論)</advanced>	Duck V. Sata
1) Classical Control Theory	Froi. K. Sato
2) Modern Control Theory	
3) Robust Control Theory	
< Advanced Heat Transport Engineering > (熱輸送工学特論)	Assoc Prof K Kariya
1) The first and second law of thermodynamics	Assoc. 1101. IX.IXariya
2) Phase equilibrium	
3) Analysis of heat engines	
< Advanced Heat and Mass Transfer > (執物質移動工学特論)	
· · · · · · · · · · · · · · · · · · ·	Assoc. Prof. H. Arima
1) Basic of Mass Transfer	
2) Analysis of Fundamental Equation for Heat and Mass Transfer	
3) Problem on Boundary Layers of Heat and Mass Transfer	
<advanced energy="" fluid="">(流体エネルギー特論)</advanced>	
	Assoc. Prof. N. Shiomi
1) Turbomachinery	
2) Experimental Fluid Dynamics	

<advanced engineering="" fluid="" system="">(流動システム工学特論)</advanced>	soo Prof T Murakami
 Computational fluid dynamics Finite element method for structure analysis Fluid Structure Interaction 	
<advanced engineering="" ocean="">(海洋工学特論)</advanced>	
Ass1) Sea Environment2) Numerical Method for Load and Response of Structure3) Design of Offshore Structure	soc. Prof. 1. Murakami
<advanced engineering="" offshore="" turbine="" wind="">(洋上風車工学特論)</advanced>	Drof S. Voshida
 Theory of Sea Waves Hydro Dynamics of Offshore Structures Conversion of Ocean Energy 	1 Ioi. S. Iosinua
< Advanced Energy Conversion > (エネルギー変換特論)	
 Optimization of Energy System Ocean Thermal Energy Conversion Exergy of Energy System 	Prof. Y. Ikegami
< Advanced Ocean Measurement > (海洋環境特論)	Assoc. Prof. Y. Imai
<advanced and="" energy="" engineering="" i="" in="" mechanical="" study="">(機械エネルギー工学特</advanced>	別研究 I)
 Understand the background and significance of research. Learn knowledge necessary for conducting research and develop research basis. 	Prof. A. Miyara etc.
<advanced and="" energy="" engineering="" ii="" in="" mechanical="" study="">(機械エネルギー工学物</advanced>	特別研究Ⅱ)
 Conduct experiment and/or theoretical analysis and/or numerical simulation. Consider obtained results and present to other students and teachers. 	Prof. A. Miyara etc.
< Advanced Study in Mechanical and Energy Engineering III>(機械エネルギー工学)	特別研究Ⅲ)
 Review related literature and acquire broad understanding of research. Understand obtained results deeply by discussion with other students and teachers. 	ггоі. А. Міуага есс.
< Advanced Study in Mechanical and Energy Engineering IV > (機械エネルギー工学	特別研究IV)

Prof. A. Miyara etc.

- Develop original idea for study and summarize study results.Write Master thesis and give final presentation.

Curriculum for the students of Mechanical Systems Engineering Course (機械システム工学コース授業科目)

Major Subjects				Semester					
Subjects		Teachers	Credits	23- I	23- II	24- I	24- ∏	25- I	
Advanced Fluid Engineering	流体工学特論	S. Matsuo	2	0		0		\bigcirc	
Advanced Thermodynamics	熱力学特論	K. Ishida	2	0		0		0	
Advanced Mechanics of Materials	材料力学特論	N. Hattori	2	0		0		0	
Advanced Dynamics of Machinery	機械力学特論	T. Tsujimura	2		0		0		
Advanced Mechanical Engineering PBL	機械システム工学PBL	S. Hagihara etc	2		0		0		
Advanced Instrument and Control Engineering	計測制御特論	K. Sato	2	0		0		0	
Advanced Materials Science for Engineers	機械材料学特論	S. Morita	2	\bigcirc		\bigcirc		\bigcirc	
Advanced Precision Machine	精密機器工学特論	B. Zhang	2	0		0		0	
Advanced Lubrication Engineering	潤滑工学特論	T. Mawatari	2		0		0		
Advanced Applied Dynamics	応用力学特論	T. Tsujimura	2		0		0		
Advanced Manufacturing Processes	生産加工学特論	F. Ohshima	2		0		0		
Advanced Solid Mechanics	固体力学特論	S. Hagihara	2	0		0		0	
Advanced Strength of Materials	材料強度学特論	S. Taketomi	2	0		0		0	
★Advanced Study in Mechanical and System Engineering I (Compulsory)	機械システム工学特別研究 I	Sato,Zhang,Tsujimura,Ha gihara,Hattori,Ohshima,T aketomi,Tadano,Hasegaw a,Mawatari,Morita	5		0		0		
★ Advanced Study in Mechanical and System Engineering II (Compulsory)	機械システム工学特別研究Ⅱ	same as above	5	0		0		0	
★Advanced Study in Mechanical and System Engineering III (Compulsory)	機械システム工学特別研究Ⅲ	same as above	10		0		0		
★Advanced Study in Mechanical and System Engineering IV (Compulsory)	機械システム工学特別研究IV	same as above	10	0		0		0	

Mechanical Systems Engineering Course

< Advanced Fluid Engineering>(流体工学特論)	Prof S. Matsua
1) Fundamental Fluid Dynamics.	Froi. S. Watsuo
2) Shock Wave Phenomena.	
3) Effective Utilization of Fluid Energy.	
4) Application to Biomedical Fluid Engineering.	
<advanced thermodynamics=""> (熱力学特論)</advanced>	I4 I/ I_L:J_
Lectures on advanced applications of thermodynamics to energy conversion and	energy transfer processes.
< Advanced Mechanics of Materials>(材料力学特論)	Prof N Hattari
1) Stresses in the elastic range	1101. IN. Hattoff
2) Fracture mechanics	
3) Preventing mechanical failure.	
< Advanced Dynamics of Machinery > (機械力学特論)	
	Prof. T. Tsujimura
1) Dynamics of Rigid Machines	, i i i i i i i i i i i i i i i i i i i
2) Nonlinear Dynamics Analysis	
3) Linked Structure Dynamics Applications	
<advanced engineering="" mechanical="" pbl="">(機械システム工学 PBL)</advanced>	Prof S. Hagibara atc
1) Exercise for understanding of problems of companies	1101. 5. maginara etc.
2) Exercise for finding solution of problems of companies	
<advanced and="" control="" engineering="" instrument="">(計測制御特論)</advanced>	
1) Classical Control Theory	Prof. K. Sato
2) Modern Control Theory	
3) Robust Control Theory	
<advanced engineers="" for="" materials="" science=""> (機械材料学特論)</advanced>	Assoc Prof S Morita
1) Microstructural feature of materials	
2) Phase diagrams of ferrous and non-ferrous metallic materials	
3) Mechanical properties of industrial materials	
< Advanced Precision Machine>(精密機器工学特論)	Duef D. Zhang
1) Principle of Ultra-Precision Machining	Froi. B. Zhang
2) Developments in Ultra-Precision Machining	
3) Machine Tools for Ultra-Precision Machining	
<advanced engineering="" lubrication=""> (潤滑工学特論)</advanced>	Asson Duct T Manual .
1) Principle of Lubrication	Assoc. r foi. 1. Mawatari
2) Lubricaton Regimes	
3) Mechanisms of Fluid Lbrication	
·	

<Advanced Applied Dynamics > (応用力学特論)

Prof. T. Tsujimura The purpose of this subject is dynamical analyses of various phenomena in mechanical systems.

<advanced manufacturing="" processes=""> (生産加工学特論)</advanced>	Assoc Prof E Obshime
 Principle of Machine Tools Theory of Manufacturing Processes Computer Graphics for Manufacturing Processes 	Assoc.proi. p. Onsnima
<advanced mechanics="" solid="">(固体力学特論)</advanced>	Duct C Heribaua
 Solid mechanics Finite Element Method Computational Mechanics of Solids 	Proi. S.Haginara
<advanced materials="" of="" strength="">(材料強度学特論)</advanced>	Assoc Duck S. Takatami
 Strength of materials and kinds of failure Some fractographic studies and their mechanisms Initiation and propagation of fatigue cracks Case studies and analysis of failure etc. 	Assoc. Prol. S. Taketomi
<advanced and="" engineering="" i="" in="" mechanical="" study="" system=""> (機械システム工学特別</advanced>	研究 I) Prof N Hattori etc
 Understand the background and significance of research. Learn knowledge necessary for conducting research and develop research basis. 	The first of the f
<advanced and="" engineering="" ii="" in="" mechanical="" study="" system=""> (機械システム工学特</advanced>	別研究Ⅱ) Prof N. Hattori eta
 Conduct experiment and/or theoretical analysis and/or numerical simulation. Consider obtained results and present to other students and teachers. 	r toi. N. fractori etc.
<advanced and="" engineering="" iii="" in="" mechanical="" study="" system="">(機械システム工学</advanced>	特別研究Ⅲ) Prof N. Hattori ata
 Review related literature and acquire broad understanding of research. Understand obtained results deeply by discussion with other students and teachers. 	1 101. IN. Hattorf etc.
< Advanced Study in Mechanical and System Engineering IV > (機械システム工学:	特別研究IV) Prof N Hattori etc
	1 101. IN HAUDIT EU.

Develop original idea for study and summarize study results.Write Master thesis and give final presentation.

Curriculum for the students of Electrical and Electronic Engineering Course (電気電子工学コース授業科目)

Major Subjects Semester								
Subjects		Teachers	Credits	23- I	23- П	24- I	24- II	25- I
Advanced Information Electronics on Materials	物質情報エレクトロニクス特論		2					
Advanced Quantum Opto-electronics	光量子エレクトロニクス特論	Q. Guo	2		0		0	
Advanced Integrated Circuit Process Engineering	集積回路プロセス工学特論	T. Tanaka	2	0		0		0
Electronic System Design and Integration Technology	電子情報システム設計特論	S. Sasaki	2	0		0		0
Microwave Integrated Circuits	マイクロ波集積回路特論	T. Ohishi	2	0		0		0
Advanced Utilization of Synchrotron Light	シンクロトロン光利用科学技術工学特論	K. Takahashi	2		0		0	
Advanced Engineering of Computational Intelligence	計算論的知能工学特論	H. Wakuya	2	0		0		0
Graphical User Interface	グラフィカル・ユーザ・インターフェー ス特論		2					
Advanced Processing Plasma Engineering	プロセスプラズマ工学特論	Y. Ohtsu	2	0		0		0
Advanced Pulsed Power Engineering	パルスパワー工学特論	S. Ihara	2		0		0	
Advanced Semiconductor Device Engineering	半導体デバイス工学特論	M. Kasu	2		0		0	
Microwave Circuit Design Engineering	高周波回路設計特論	T. Tanaka	2		0		0	
Advanced Data Analysis Engineering	データ解析工学特論	S. Hara	2		0		0	
Advanced New & Saved Energy Engineering	新・省エネルギー工学特論	E. Nishiyama	2		0		0	
Advanced Electrical and Electronic Engineering	電気電子工学特論		2					
Education as Electrical and Electronic Business-person	電気電子実務者教育特論		2					
★Advanced Study in Electrical and Electronic Engineering I (Compulsory)	電気電子工学特別研究 I	Toyoda,Kasu,Ohishi,O htsu,Tanaka,Guo,Ihara, Hara,Wakuya,Sasaki,T anaka,Itoh,Fukumoto,N ishiyama,Takahashi, Saito, Misawa	5	0		0		0
★Advanced Study in Electrical and Electronic Engineering II (Compulsory)	電気電子工学特別研究Ⅱ	same as above	5		0		0	
★Advanced Study in Electrical and Electronic Engineering III (Compulsory)	電気電子工学特別研究Ⅲ	same as above	10	0		0		0
★Advanced Study in Electrical and Electronic Engineering IV (Compulsory)	電気電子工学特別研究IV	same as above	10		0		0	

Electrical and Electronic Engineering Course

<Advanced Information Electronics on Materials > (物質情報エレクトロニクス特論)

In the electronics field, the knowledge about quantum theory becomes more and more important in order to understand the electron behavior from a microscopic standpoint. Namely, the knowledge about quantum theory is required in order to understand not only the electrical and optical properties of semiconductor but also the principles of new electronic and optical devices. The fundamental and systematical knowledge about quantum theory is given in this subject.

<Advanced Quantum Opto-electronics > (光量子エレクトロニクス特論)

The aim of this course is to give fundamental knowledge on various physical processes of optoelectronic transition, in order to understand technologies for applications in light emitting diodes, detectors, and solar energy conversion devices

<Advanced Integrated Circuit Process Engineering > (集積回路プロセス工学特論)

This subject starts with an introduction of physics and properties of semiconductors and fundamentals of pn-junction, followed by a generic overview of MOSFET and bipolar transistor. Integrated circuit process technologies including crystal growth, oxidation, thin film growth, thermal diffusion, ion implantation, lithography, and etching will be introduced.

<Electronic System Design and Integration Technology > (電子情報システム設計特論)

Assoc. Prof. S. Sasaki

The main topics of this subject are as follows:

1) Introduction to Packaging Technology for High-Speed Information equipment

2) Noise of the power supply line

3) Cross-talk Noise

- 4) Cooling technology
- 5) IC package and packaging technology
- 6) Interconnection technology for high speed signal

7) Multi chip Module technology

<Microwave Integrated Circuits > (マイクロ波集積回路特論)

Prof. T. Ohishi

High frequency and high power amplifier used in microwave integrated circuits for radar and radio frequency communication system is mainly lectured.

The topics of this lecture are as follows:

1. semiconductor devices for micorwave integrated circuit

2. microwave integrated circuit components

3. high frequency power amplifier

<Advanced Utilization of Synchrotron Light > (シンクロトロン光利用科学技術工学特論)

Prof. K. Takahashi

Basic aspects on synchrotron light application, such as synchrotron light source, beamline, X-ray detection, ultrahigh-vacuum, and experimental methods will be reviewed, in order to understand the scientific and industrial application of synchrotron light.

< Advanced Engineering of Computational Intelligence > (計算論的知能工学特論)

Prof. H. Wakuya

Brain is one of the keywords of the 21st century. As an approach to investigate its mysterious functions, fundamental knowledge on computational intelligence is discussed. Also, recent topics of neurocomputing technology, biomedical engineering and welfare engineering are dealt with.

Prof. Q. Guo

Prof. T. Tanaka

<Graphical User Interface > (グラフィカル・ユーザ・インターフェース特論)

First we will learn the fundamental programming for GUI using Xt Intrinsics in X Window System to grasp the concept of the Toolkit programming. After learning Xt Intrinsics, we will use another GUI Toolkits such as Gtk+ and Qt to implement advanced applications with better user interface.

<Advanced Processing Plasma Engineering > (プロセスプラズマ工学特論)

Fundamental characteristics are introduced for processing plasma engineering. Ionized gas production methods such as DC, AC, RF and microwave discharges are lectured. The plasma applications are also explained.

<Advanced Pulsed Power Engineering > (パルスパワー工学特論)

1) Fundamentals of energy storage and pulsed power generation.

2) Pulse forming networks, switching devices.

3) Applications of pulsed power technology.

< Advanced Semiconductor Device Engineering > (半導体デバイス工学特論)

In order to realize energy sustainable society, high-efficient power transistors are necessary. For the purpose, widegap semiconductors such as SiC, GaN, diamond are lectured.

< Microwave Circuit Design Engineering > (高周波回路設計特論)

In this lecture, first, students learn theory of transmission line and a method to use smith chart. Next, students learn theory of high frequency active device and circuit by a standard schooling style.

<Advanced Data Analysis Engineering > (データ解析工学特論)

The structure and mechanism of photovoltaic systems are explained. Data analysis in photovoltaic power systems is also discussed.

<Advanced New & Saved Energy Engineering > (新・省エネルギー工学特論)

- 1) Fundamentals of wireless energy transfer.
- 2) Wireless power transfer using Microwave.
- 3) Wireless power transfer via magnetic resonance coupling.

<Advanced Electrical and Electronic Engineering > (電気電子工学特論)

<Advanced as Electrical and Electronic Business-person > (電気電子実務者教育特論)

< Advanced Study in Electrical and Electronic Engineering I > (電気電子工学特別研究 I)

Prof. Y. Ohtsu etc.

< Advanced Study in Electrical and Electronic Engineering Ⅱ>(電気電子工学特別研究Ⅱ)

Prof. Y. Ohtsu etc.

< Advanced Study in Electrical and Electronic Engineering Ⅲ > (電気電子工学特別研究Ⅲ)

Prof. Y. Ohtsu etc.

< Advanced Study in Electrical and Electronic Engineering IV > (電気電子工学特別研究IV)

Prof. Y. Ohtsu etc.

Assoc. Prof. S. Hara

Assoc. Prof. E. Nishiyama

Prof. M. Kasu

Assoc. Prof. S. Ihara

Assoc. Prof. T. Tanaka

Prof. Y. Ohtsu

Curriculum for the students of Biomedical Engineering Course (生体医工学コース授業科目)

Major Subjects				Semester				
Subjects		Teachers	Credits	23- I	23- II	24- I	24- II	25- I
Biomedical Engineering Special Lecture I	生体医工学特別講義 I	Course Teachers	2		0		0	
Biomedical Engineering Special Lecture II	生体医工学特別講義Ⅱ	Course Teachers	2	0	0	0	0	0
Dynamics in Biomedical Engineering	医工力学特論	Khan MD.	2	0		0		0
Biorobotics	バイオロボティクス特論	K. Izumi	2	0		0		0
Biomedical Sensing System Engineering	医工計測工学特論	A. Kimoto	2	0		0		0
Statistics in Biomedical Engineering	医工統計学特論	K. Teramoto	2	0		0		0
Fluid Simulation in Biomedical Engineering	医工流体シミュレーション特論	T. Sumi	2	0		0		0
Biomedical Interface Device Engineering	医工インターフェース機器特論		2					
Biomedical System Control Engineering	医工システム制御特論	S. Goto	2	0		0		0
Medical Device Design	医療機器設計学特論	T. Hashimoto	2		0		0	
Biomedical Photonics	バイオメディカルフォトニクス 特論		2					
★Advanced Study in Biomedical Engineering I (Compulsory)	特別研究I	Course Teachers	5		0		0	
★Advanced Study in Biomedical Engineering II (Compulsory)	特別研究Ⅱ	Course Teachers	5			0		0
★ Advanced Study in Biomedical Engineering III (Compulsory)	特別研究Ⅲ	Course Teachers	10		0		0	
★ Advanced Study in Biomedical Engineering IV (Compulsory)	特別研究IV	Course Teachers	10			0		0

Biomedical Engineering Course

< Biomedical Engineering Special Lecture I > (生体医工学特別講義 I)

All faculty members of Biomedical Engineering Course give lectures in their own fields on mechanical, electrical and electronic, and medical engineerings.

< Biomedical Engineering Special Lecture Ⅱ>(生体医工学特別講義Ⅱ)

Course Teachers There is a possibility that special seminar, etc. will be held. The details will be notified if this lecture will be offered.

< Dynamics in Biomedical Engineering>(医工力学特論)

Assoc. Prof. Khan MD. The content of the course includes the fundamentals of biomedical engineering dynamics related to the kinematics of joints and links. Modeling of relative motion in multi-joint system concerning to the biomedical engineering application includes to the course content as well.

< Biorobotics > (バイオロボティクス特論)

Robot dynamics and various biological methods of control, signal processing, and optimization are lectured.

< Biomedical Sensing System Engineering > (医工計測工学特論)

Imaging techniques using X-ray and electrical impedance, and biomedical measurement using electrical, ultrasonic, and optical sensors are lectured.

< Statistics in Biomedical Engineering > (医工統計学特論)

Prof. K. Teramoto

This class introduces the theory and practice of time series analysis, with an emphasis on practical skills. Having completed this course, you will be able to model and forecast a time series as well as read papers from the literature and start to do original research in time series analysis.

< Fluid Simulation in Biomedical Engineering >(医工流体シミュレーション特論)

Assoc. Prof. T. Sumi

Fundamental theory of computational fluid dynamics and its practical applications to biomedical engineering are lectured.

< Biomedical Interface Device Engineering > (医工インターフェース機器特論)

Fundamental device technology of sensor and actuator are mainly explained in this lecture. Such devices are applied as man-machine interface on medical and care equipments. Especially, the interface device using image sensor is lectured.

< Biomedical System Control Engineering >(医エシステム制御特論)

In this class, system control, which plays an important role of biomedical engineering and welfare devices, is discussed.

<Medical Device Design > (医療機器設計学特論)

Assoc. Prof. T. Hashimoto

This lecture describes the knowledge of fluid engineering required for designing medical devices related to fluid.

Course Teachers

Assoc. Prof. K. Izumi

Assoc. Prof. A. Kimoto

Prof. S. Goto

< Biomedical Photonics > (バイオメディカルフォトニクス特論)

This course gives an overview of fundamentals and applications in various biomedical optical imaging modalities, such as fluorescence imaging, optical coherence tomography, photoacoustic imaging and others.

<Advanced Study in Biomedical Engineering I>(特別研究 I)

To carry out their researches on biomedical engineering, students learn fundamental knowledge by investigating related papers, decide their research topics, and make their research plans.

< Advanced Study in Biomedical Engineering II > (特別研究 II)

To establish their research methods, students carry out their researches by applying fundamental knowledge got in Advanced Study in Biomedical Engineering I. Moreover, students analyze the obtained research results to make preparation for their research presentations.

<Advanced Study in Biomedical Engineering Ⅲ>(特別研究Ⅲ)

Students continue their researches by themselves. Moreover, students decide the topic of their master thesis.

<Advanced Study in Biomedical Engineering IV>(特別研究IV)

Course Teachers Students continue to their researches by themselves. Moreover, students complete their master thesis and make master thesis defenses.

Course Teachers

Course Teachers

Course

Teachers

Doctoral Course

Outline of subjects

Course of Mathematical and Information Science

<Advanced Mathematical and Information Science> (数理・情報サイエンス特論)

In this course, the faculty members will lecture advanced expertise and skills in mathematics, information science, information engineering, and data science in the omnibus style. The purpose of this course is to get in touch with the specialized knowledge of the peripheral fields of mathematical and information science. The goal of this course is to acquire the essential qualifications for your doctoral research.

Course of Mechanical and Electrical Energy Engineering

<Advanced Mechanical and Electrical Energy Engineering>(機械・電気エネルギー工学特論)

Advanced specialized knowledge and technology in the fields of mechanical engineering, electrical and electronic engineering related to industrial technologies ranging from energy creation to energy utilization, including energy conversion, transportation, and storage will be lectured in omnibus form.

Course of Biological and Material Engineering

<Advanced Biomaterial Systems> (生体物質システム学特論)

Based on materials science, materials engineering, electrical engineering, and mechanics, advanced and specialized knowledge and techniques of functional materials, such as bio-, optical, and electrical/magnetic-related materials and nanomaterials, or the interaction between organisms and systems will be lectured in omnibus form.