허 日夕 0				
	総合化字特別研究第一[Research in Chemical Sciences and Engineering I]			
責任教員 Instructor	総合化学院代議員(大学院総合化学院)			
担当教員 Other Instructors	Provided by supervisor			
科目種別 Course Type				
開講年度 Year	2025	時間割番号 Course Number		
期間 Semester	Full Year	単位数 Number of Credits	4	
授業形態 Type of Class	Experiment	対象年次 Year of Eligible Student	1~3	
対象学科 クラス Eligible Depa	rtment/Class			
ナンバリングコード Numbering	Code	CHEM_REQUI 7001		
補足事項 Other Information				
授業実施方式 Class Method		1 対面授業科目《対面のみ》		
キーワード Key Words				
Chemical science and engineer	ing, science, engin	eering, thesis writing		
授業の目標 Course Objective	S			
Conduct specific research und	er the guidance of	f supervisors to acquire ability to solve pro	blems about chemistry and write	
research papers.				
到達目標 Course Goals				
Acquire ability to solve specific	e problems using va	rious knowledge and logical reasoning and w	rite research papers.	
授業計画 Course Schedule				
Search specific subjects about	chemistry, conduc	t research on them with highly expertized m	anner, and publish the results as	
research papers.				
準備学習 (予習・復習)等の内容	容と分量 Homewor	k		
Continuous efforts are required	l for experiments,	lata analysis, preparation of presentation and	d writing research papers.	
成績評価の基準と方法 Gradin	g System			
Evaluation is based on the inte	erim presentation,	research activities in laboratory, published r	esearch papers during the doctor	
course.				
他学部履修の条件 Other Face	ulty Requirements			
テキスト・教科書 Textbooks				
Lecture				
。 参照ホームページ Websites				
The second secon				
研究室のホームページ Websites of Laboratory				
備者 Additional Information				
The registration of this course	is not required sin	nce the credit appraisal is made at the time	of completion or withdrawal after	

I ne registration of this course credit acquisition.

科目名 Course Title	総合化学研究・	指導法[Research in Chemical Sciences and	Engineering III]	
Lecture 題目 Subtitle				
青仟教員 Instructor	※合化学院代議員(大学院総合化学院)			
相当教員 Other Instructors	Provided by supervisor			
科目種別 Course Type				
開講年度 Year	2025	時間割番号 Course Number		
期間 Semester	Full Year	単位数 Number of Credits	2	
授業形態 Type of Class	Seminar	対象年次 Year of Eligible Student	1~3	
対象学科・クラス Eligible Depa	rtment/Class		I	
ナンバリングコード Numbering	Code	CHEM REQEL 7101		
補足事項 Other Information				
授業実施方式 Class Method		1 対面授業科目《対面のみ》		
キーワード Key Words				
Development and improvement	of experimental te	echniques: teaching and research skills: pre	sentation skills: Chemical English	
授業の目標 Course Objective	S	•		
Graduate course students are	requested to pla	y leaderships in both teaching and resea	rch. This course examines how to	
manage research experiments	and to present stu	dent's achievements in Japanese and Engli	ish. Also, the course examines how	
to gain teaching skills and abili	ties.			
到達目標 Course Goals				
Through the course, students	will be able to			
– get abilities on development	and/or improveme	nt of experimental techniques and equipme	nt	
- get high teaching and resear	ch skills			
- get high presentation skills in	n both Japanese an	d English		
– play leadership in each resea	rch field and teach	ing		
授業計画 Course Schedule				
On the basis of evaluating the teaching and research achievements of each student, the course offers on-the-job-training to				
- get abilities in development and/or improvement of experimental skills and/or experimental equipment				
– get high oral and poster pres	entation skills			
- get speaking, hearing, and writing abilities in English				
- get high teaching and resear	ch skills			
– play leaderships in both rese	arch and teaching			
準備学習(予習・復習)等の内	容と分量 Homewo	rk		
Preparatory works for laborato	ry experiments			
成績評価の基準と方法 Gradir	ng System		()	
Evaluate based on total attitud	es in teaching (50%	6), experimental and scientific achievement	s (50%).	
他字部履修の条件 Other Fac	ulty Requirements			
テキスト・教科書 Textbooks				
Lecture 指定図書 Reading List				
参照ホームページ Websites				
研究室のホームページ Websites of Laboratory				
ш 				
備考 Additional Information				

원모성 가내	止 地硕人 12 兴旺				
科日名 Course little	先 编 総 合 化 字 将	先端総合化学特論 I [Modern Trends in Chemical Sciences and Engineering I]			
請義題日 Subtitle	総合化字符論 I [Modern Trends in Physical and Material Chemistry]				
頁仕教員 Instructor	島田 敏宏 [SHIMADA Toshihiro] (大字院上字研究院)				
担当教員 Other Instructors	RIULARI SOU (理子师九阮), IUMUGIDA IONEl (电十件子研允所), HAIANI Masaki (理子				
	研究院), YOKO	AURA Seiya (上字研究院), FUJII Yuta (.	上字研究院),IWAI Mana (上字研究		
	院), JEONG SEC	NGWOO (上字研究院)			
科目種別 Course Type					
開講年度 Year	2025	時間割番号 Course Number	095111		
期間 Semester	Intensive	単位数 Number of Credits	1		
授業形態 Type of Class	Lecture	対象年次 Year of Eligible Student	~		
対象学科・クラス Eligible Depa	rtment/Class				
ナンバリングコード Numbering	Code	CHEM_REQEL 7111			
補足事項 Other Information					
授業実施方式 Class Method		1 対面授業科目《対面のみ》			
キーワード Key Words					
molecular materials, ferroeled	trics, metal com	plexes, corrosion, electrochemistry, in	organic materials, ceramics, opto-		
functional materials, heterogen	eous catalysts, 2D	semiconductors, chemical sensors, nanor	naterials, magnetism		
授業の目標 Course Objective	S		· · · · · · · · · · · · · · · · · · ·		
This course is intended to pr	ovide cutting-edge	e research topics on physical and mater	rials chemistry. The topics include		
molecular ferroelectrics, metal	complexes with va	rious functions, observation of detailed su	urface processes in electrochemistry,		
inorganic materials, opto-fund	tional materials,	heterogeneous catalysts, 2D semicondu	ctors as sensors, chemo-functional		
nano-materials.					
到達目標 Course Goals					
Through a series of lectures, st	udents understand	l various fields of chemistry and are exped	cted to expand their horizons.		
授業計画 Course Schedule					
Detailed schedule will be inform	ned one month befo	ore the start of this course.			
List of lecture titles in this cou	rse:				
- Next-generation of life science	e based on nanobi	otechnology			
- Materials Chemistry of Nano	tubes				
- Studies on polariton chemistr	y: strong coupling	between light and matter			
- Organic Conductors and Sem	iconductors				
- All Solid State Lithium Ion B	attery Technology				
– Electrochemical Fabrication	of Micro- and Nano	ostructures on Metal Surfaces: Technique	es and Applications		
- Proton-conducting ceramics	and their application	on to energy conversion devices			
- Chemical insights on magneti	sm and spintronics				
準備学習 (予習・復習)等の内容	容と分量 Homewor	k			
Students will be required to su	omit reports after t	he lectures.			
成績評価の基準と方法 Gradin	g System				
Students are required to attend	l at least 70% of th	e lectures. Evaluation as pass/fail will be	based on the submitted reports.		
他学部履修の条件 Other Faculty Requirements					
テキスト・教科書 Textbooks					
講義指定図書 Reading List					
参照ホームページ Websites					
https://hokkaidosummerinstitu	https://hokkaidosummerinstitute.oia.hokudai.ac.jp/en/courses/CourseDetail=G058				
研究室のホームページ Websites of Laboratory					
備考 Additional Information					
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科目名 Course Title	先端総合化学特論 I [Modern Trends in Chemical Sciences and Engineering I]			
講義題目 Subtitle	総合化学特論 II [Modern Trends in Organic Chemistry and Biological Chemistry]			
責任教員 Instructor	鈴木 孝紀 [SUZUKI Takanori] (大学院理学研究院)			
担当教員 Other Instructors	TANINO Keiji (理学研究院), MITA Tsuyoshi, SHIMIZU Yohei (理学研究院), ISHIYAMA			
	Tatsuo (工学研究院), YAMAMOTO Takuya (工学研究院), Chai GOPALASINGAM (理学研			
	究院)			
科目種別 Course Type				
開講年度 Year	2025	時間割番号 Course Number	095112	
期間 Semester	Intensive	単位数 Number of Credits	1	
授業形態 Type of Class	Lecture	対象年次 Year of Eligible Student	~	
対象学科・クラス Eligible Depar	rtment/Class			
ナンバリングコード Numbering	Code	CHEM_REQEL 7111		
補足事項 Other Information				
授業実施方式 Class Method		2 対面授業科目《一部遠隔》		
キーワード Key Words				
Physical Organic Chemistry,	Organic Synthesis,	Computational Chemistry, Biological Che	mistry, Life Chemistry, Organic	
Reaction, Organic Transformat	ions, Polymer Chem	istry		
授業の目標 Course Objectives	5			
The progress in the fields of or,	ganic chemistry and	biochemistry is remarkable. In this course,	you will learn the basic concepts	
necessary for understanding re	esearch in the fields	s of advanced organic chemistry and bioch	emistry, give an overview of the	
latest trends, and then learn a	about cutting-edge	research results. You will discuss various	topics in organic chemistry and	
biochemistry research. The go	al is to be able to	write reports that include suggestions for	your own ideas on cutting-edge	
organic and biochemical researc	ch.			
到建日標 Course Goals	noonto noodod to u	adapatand advanced appania abamistry and	his shamiaal nagaanah	
2. You can explain the basic co	oncepts needed to u	rania chemistry and biochemical topics	biochemical research.	
2. You can discuss among stud	onts with different h	ackgrounds		
4 You can make research prop	osals that incornora	te vour own ideas		
4. Tou can make research proposals that incorporate your own ideas. 招誉計画 Course Schedule				
1. Guidance (Suzuki)				
2. Advanced structural organic chemistry (Suzuki): Dication Near IR Rioimaging				
3. Advanced organic synthetic chemistry (Tanino): Carbocycles. Ring Strain. Ene-divne				
4. Advanced computational reaction chemistry (Mita): Radial reaction. Carbon dioxide. Computational chemistry				
5. Advanced life chemistry (Chai): Metalloenzyme, Nitric Oxide, Structural Biology				
6. Advanced organic reaction c	hemistry (Shimizu):	Catalysis, Chemoselectivity		
7. Advanced organic transformation	ation chemistry (Ish	iyama): Transition metal-catalyst, borylatio	n, diboron	
8. Advanced polymer chemistry	v (Yamamoto): Polyc	yclic polymer, Supramolecular chemistry, S	elf-organization	
(Course is scheduled on Sept 2	2nd - 4th, 2025)			
準備学習 (予習・復習)等の内容	容と分量 Homework			
In this course, you will be give	en an assignment ea	ch time. You choose two assignments and	submit an answer (report) by the	
specified date.				
成績評価の基準と方法 Gradin	成績評価の基準と方法 Grading System			
You will be evaluated by learning attitude (20%) and two submitted reports (80% in total). You will be given assignment by				
instructors each time, among which you choose two assignments to submit. Attendance of 70% or more classes is the minimum				
condition to evaluate a student.				
世子印度廖ジ末叶 Uther Faculty Requirements				
ニキット・教社書 Tayahaala				
ナイヘト。秋仲書 I extDooks				
洋美化中國書 Deading List				
請義指定因書 Reading List				
会昭士/ペ_☆ ₩-ト-ン・				
愛照小ームハーン WeDsites https://bokkaidagummania=titus	to oin hokudoi o	/on/oourgos/CourseDate:1-C045		
nttps.//nokkaldosummermstitute.ola.nokudal.ac.jp/en/courses/CourseDetam=G045				
wi元主ッハーム、ーン WedSit	町先主の小一ムハーン Wedsites of Ladoratory			
備老 Additional Information				

科目名 Course Title	先提総合化学转論Ⅱ[Modern Trends in Chemical Sciences and Engineering II]			
諸義題日 Subtitle	Leading and Advanced Molecular Chemistry and Engineering IA - 2025[Leading and			
	Advanced Molecular Chemistry and Engineering $IA = 2025$			
青年教昌 Instructor	猪能 泰英 [INOKUMA Yasubide] (大学院工学研究院)			
担当教旨 Other Instructors	Jonas Mindomark (Uppsala University)			
私日種別 Course Type	Jonas windemar	k (Oppsala Oliversity)		
	2025	中間刺来日 Osume Number	005191	
用語牛皮 Tear	2020	时间刮钳亏 Course Number	1	
州间 Semester	Lecture	中位数 Number of Gredits		
「技業が感 Type of Class 対象学科・クラス Eligible Dope	rtmont/Close	为家中次 Tear of Eligible Student		
		CHEM DEOEL 7191		
テノハリングコートNumbering	Gode	CHEM_REQEL /121		
補足事項 Other Information				
授某美施方式 Class Method		対面授業科目《対面のみ》		
キーワード Key Words				
Organic chemistry, Electroche	mistry, Battery, F	unctional molecules, Electrolyte		
授業の目標 Course Objective	S			
Organic and materials chemis	try is becoming	very important to provide functional mat	erials that support our sustainable	
society. In this lecture, leadin	g researchers from	n abroad and Hokkaido University will give	e intensive lectures on cutting edge	
research in materials chemistry	, particularly in b	attery development, and students will obta	in an understanding of the synthetic	
design, application and device	development of fu	nctional molecules.		
到達目標 Course Goals				
On completion of this course,	students will be	able to explain and discuss the basic princ	ciples of functional molecule design,	
electrochemical measurements	and device proces	ssing.		
授耒計画 Course Schedule				
Course Schedule (the order of	the following lectu	ires is subject to change)		
1. Basic electrochemistry: oxic	lation and reduction	on .		
2. Fundamentals of both electr	on and ion transp	ort in polymer materials		
3. Synthesis of ion- and electro	on-conducting pol	ymers	1 1 11 1 1 1	
4. Applications for Battery: se	olid-state batterie	s, organic battery electrode materials, po	olymer solar cells and light-emitting	
electrochemical cells	あし八月 ロ			
準備学習(予習・復習)寺の内	谷ど分重 Homewo	rk		
Students will be asked to write	a report at the er	id of lecture.		
成績評価の基準と方法 Gradir	ig System			
Grades are judged based on cla	ass attitude during	the course and report.		
他子即復嗲の宋叶 Other Fac		5		
テキフト・教科書 Taythaaka				
) イスト-教科書 Textbooks				
送姜华宁团章 Deading List				
参照ホームページ Websites				
https://hokkaidosummerinstitute.oia.hokudai.ac.ip/en/courses/CourseDetail=G054				
研究室のホームページ Websites of Laboratory				
https://www.eng.hokudai.ac.in	https://www.eng.hokudai.ac.in/labo/lor/HP/index.e.html			
https://www.uu.se/en/contact	-and-organisation	 /staff?guerv=N6-658		
備考 Additional Information		,		

科目名 Course Title	先端総合化学特	論Ⅱ[Modern Trends in Chemical Sciences ε	and Engineering II]	
講義題目 Subtitle	Leading and Advanced Molecular Chemistry and Engineering IB - 2025[Leading and Advanced			
	Molecular Chemistry and Engineering IB – 2025]			
責任教員 Instructor	美多 剛 [MITA Tsuyoshi] (総合イノベーション創発機構化学反応創成研究拠点)			
担当教員 Other Instructors	Robert R. Knowle	s (Princeton University),		
	HUANG Chung-Y	Yang, JIN Mingoo		
科目種別 Course Type				
開講年度 Year	2025	時間割番号 Course Number	095122	
期間 Semester	Intensive	単位数 Number of Credits	1	
授業形態 Type of Class	Lecture	対象年次 Year of Eligible Student	~	
対象学科・クラス Eligible Depa	rtment/Class			
ナンバリングコード Numbering Code		CHEM_REQEL 7121		
補足事項 Other Information				
授業実施方式 Class Method 1 対面授業科目《対面のみ》				
キーワード Key Words				

Synthetic organic chemistry, Photoredox reactions, Radical reactions, Molecular photochemistry in solid-state

授業の目標 Course Objectives

This course will feature Professor Robert R. Knowles, a leading expert in photoreactions at Princeton University and a former member of the MacMillan research group, which was awarded the Nobel Prize in Chemistry. Students will learn about the fundamentals and applications of radical reactions using photocatalysts, as well as the latest advancements in photocatalytic technology. A key focus will be on Proton-Coupled Electron Transfer (PCET), a concept proposed by Professor Knowles that has been widely applied to various photoreactions due to its high versatility.

The goal of this course is to develop an understanding of the fundamental principles of photoredox catalysis and to explore how these principles can be applied to the design and optimization of chemical reactions. In photoredox catalytic reactions, catalysts activated by light facilitate electron transfer, enabling efficient chemical transformations. This process is environmentally friendly and holds great potential for sustainable chemical synthesis. The course will provide a detailed discussion of specific reaction examples, particularly focusing on applications in C-C bond formation.

To complement Professor Knowles' lectures, Professor Mita will provide foundational instruction on photochemical and radical reactions. Associate Professor Huang will introduce new applications, including photoredox defluorination reactions and the photochemical switching of indigo compounds. Associate Professor Jin will lecture on structural changes of solid-state molecules induced by light.

到達目標 Course Goals

Through this course, students will be able to understand how light influences chemical reactions and molecular functions, gaining deeper knowledge of the design and application of photocatalytic reactions. In particular, students will learn the fundamental principles of photoredox catalysis, understand how light-driven electron transfer processes function in organic synthesis, and apply these concepts to reaction design and optimization.

With lectures from Professor Robert R. Knowles, a leading expert in photoreactions at Princeton University and a former member of the MacMillan group, which was awarded the Nobel Prize in Chemistry, students will explore the fundamentals and applications of radical reactions using photocatalysis, as well as the latest advancements in photocatalytic technology. Special emphasis will be placed on the Proton-Coupled Electron Transfer (PCET) mechanism proposed by Professor Knowles, which has been widely applied in diverse photoreactions. Students will be able to understand its fundamental principles and learn how to apply it to various organic transformations. By studying concrete examples, particularly C-C bond formation, students will develop the ability to consider its applications in sustainable organic synthesis.

To support the understanding of photocatalytic reactions, additional lectures will be provided by other faculty members. Professor Mita will cover the fundamentals of photochemical and radical reactions, helping students build a strong foundation. Associate Professor Huang will introduce new photoredox defluorination reactions and photo-switchable indigo derivatives, allowing students to explore applied research. Associate Professor Jin will discuss the photophysical properties of solid-state molecular assemblies and their functional applications, helping students understand molecular behavior in solid state.

By integrating these perspectives, students will be able to develop a comprehensive understanding of the relationship between light, chemical reactions, and molecular functions, equipping them with practical knowledge for further studies and research in the field of photochemistry.

授業計画 Course Schedule

June 10 (Tue) 2,3,4

Mingoo Jin - Solid-State Molecular Photophysics and Functions I Mingoo Jin - Solid-State Molecular Photophysics and Functions II Dennis Chung-Yang Huang - Radicals and Photoreactions

June 11 (Wed) 2,3,4

Tsuyoshi Mita - Basics of Radical Reactions (Photochemical and Electrochemical Generation of Radicals) Robert Knowles - Visible-Light-Driven Reactions I Robert Knowles - Visible-Light-Driven Reactions II June 12 (Thu) 3,4 Robert Knowles - Visible-Light-Driven Reactions III Robert Knowles - Special Lecture 準備学習 (予習・復習)等の内容と分量 Homework No preparation required. Only review is needed. 成績評価の基準と方法 Grading System Evaluation will be based on learning attitude (20%) and reports (80%). However, attendance of at least 70% of the classes is the minimum requirement for evaluation. Students must choose one of the assigned topics from each professor and submit the report by the deadline. 他学部履修の条件 Other Faculty Requirements テキスト・教科書 Textbooks 資料を用意する。 Materials will be provided. 講義指定図書 Reading List 参照ホームページ Websites 研究室のホームページ Websites of Laboratory https://knowleslab.princeton.edu/ https://mitagrouphp.icredd.hokudai.ac.jp/en.html https://sites.google.com/view/huang-chemlab/ https://jingrouphp.icredd.hokudai.ac.jp/en.html

科目名 Course Title	先端総合化学特論Ⅱ[Modern Trends in Chemical Sciences and Engineering II]			
講義題目 Subtitle	Leading and Advanced Molecular Chemistry and Engineering IIA - 2025[Leading and			
	Advanced Molecular Chemistry and Engineering IIA – 2025]			
責任教員 Instructor	村越 敬 [MURAKOSHI Kei] (大学院理学研究院)			
担当教員 Other Instructors	Yen-Ku WU (National Yang Ming Chiao Tung University)			
科目種別 Course Type				
開講年度 Year	2025	時間割番号 Course Number	095123	
期間 Semester	Intensive	単位数 Number of Credits	1	
授業形態 Type of Class	Lecture	対象年次 Year of Eligible Student	~	
対象学科・クラス Eligible Depa	rtment/Class			
ナンバリングコード Numbering	Code	CHEM_REQEL 7121		
補足事項 Other Information				
授業実施方式 Class Method		1 対面授業科目《対面のみ》		
キーワード Key Words				
retrosynthesis, asymmetric syn	thesis, catalysis, ca	ascade reaction, step economy		
授業の目標 Course Objective	6			
The goal of this short course	is to provide stud	lents with an understanding of the strate;	gies, methodologies, and problem-	
solving approaches involved in	the total synthesis	s of natural products. By examining classi	c and modern examples of complex	
molecule synthesis, students v	vill develop the ab	oility to analyze synthetic problems and o	design reasonable routes to target	
compounds.				
到連日標 Course Goals	onto will be oble to	(1) Evaluin law concents and principles	in not norm that is an alwais of not unal	
By the end of the course, stud	ents will be able to	: (1) Explain key concepts and principles i	in retrosynthetic analysis of natural	
(3) Evaluate case studies of	total synthesis and	d extract insights for inpovative synthetic	ic planning (4) Analyze synthesis.	
(3) Evaluate case studies of	officient solutions	a extract misights for innovative syntheti	ic plaining. (4) Analyze synthetic	
problems and propose togical, encient solutions. 将类計面 Course Schedule				
1. The Art and Science of Total Synthesis				
2. Functional Group Transformations in Total Synthesis				
3. Cascade Reactions and Read	tive Intermediates	in Total Synthesis		
4. Modern Strategies for Natur	al Products Synthe	sis		
5. The Quest for Pseudo Natur	al Products			
準備学習 (予習・復習)等の内容	容と分量 Homewor	k		
Reviewing named reactions, fur	nctional-group tran	sformations, and common protecting group	ps is highly recommended. Students	
are recommended to read the c	original papers cited	l in each class.		
成績評価の基準と方法 Gradin	g System			
One final written exam will be a	given to students fo	or the grading.		
他学部履修の条件 Other Faculty Requirements				
テキスト・教科書 Textbooks				
祥美也中國書 Deading List				
蔣教指正凶者 Keading List				
会照ホームページ Wabaitaa				
PRK/// A / / P Medsiles				
The 空気のホームページ Websites of Laboratory				
https://www.ykwulab.com/yen	kuwu			
備考 Additional Information				

科目名 Course Title	先端総合化学特論 II [Modern Trends in Chemical Sciences and Engineering II]			
講義題目 Subtitle	Leading and Advanced Molecular Chemistry and Engineering IIB - 2025[Leading and			
	Advanced Molecular Chemistry and Engineering IIB - 2025]			
責任教員 Instructor	村越 敬[MURAK	KOSHI Kei] (大学院理学研究院)		
担当教員 Other Instructors	Chang Yun SON (Seoul National University)		
科目種別 Course Type				
開講年度 Year	2025	時間割番号 Course Number	095124	
期間 Semester	Intensive	単位数 Number of Credits	1	
授業形態 Type of Class	Lecture	対象年次 Year of Eligible Student	~	
対象学科・クラス Eligible Depart	対象学科 · クラス Eligible Department/Class			
ナンバリングコード Numbering (トンバリングコード Numbering Code CHEM_REQEL 7121			
補足事項 Other Information	事項 Other Information			
授業実施方式 Class Method	授業実施方式 Class Method 1 対面授業科目《対面のみ》			
キーワード Key Words				
Physical Chemistry, Molecular Dynamics Simulations, Statistical Thermodynamics, Computational Materials Design,				
Energy/bio-materials				
授業の目標 Course Objectives				
This course explores the principles and computational techniques of modern statistical mechanics and molecular dynamics				
(MD) simulations, with an emphasis on their utilization for energy/bio-materials design. Students will learn (1) the theoretical				
foundations of statistical mech	nanics and MD si	imulations, (2) how these methods enabl	e the prediction of macroscale	

thermodynamic properties from molecular interactions, and (3) the application of these methods to design and study energy and biomaterials. Topics include the theoretical foundations of statistical mechanics, MD simulation algorithms, and practical applications in the fields of energy storage materials, organic electronics, drug design, and biorefinery. The course combines lectures and hands-on computational exercises, equipping students with the tools to address challenges in chemistry, physics, biology, and materials science.

到達目標 Course Goals

The goal of this course is to help students (1) understand the principles of statistical mechanics and molecular dynamics simulations, and (2) gain a general perspective on what is currently possible with the state-of-art theory, MD simulation, and AI techniques to model and analyze functional materials for energy and bio applications.

授業計画 Course Schedule

- 1. From molecules to functional materials: an introduction to statistical mechanics and MD simulations
- 2. Fundamentals: Foundations of statistical mechanics
- 3. The Language of Uncertainty: Probability and Stochastic Processes in Statistical Mechanics
- 4. The Engine Behind Simulations: Molecular Dynamics Theory and Algorithms
- 5. Powering the future: Simulating energy materials
- 6. Life's building blocks: Simulating biomaterials
- 7. Pushing Boundaries: Advanced Techniques and Practical Applications

準備学習 (予習・復習)等の内容と分量 Homework

To read the basic parts of Physical Chemistry and Statistical Thermodynamics textbooks at undergraduate level is highly recommended.

成績評価の基準と方法 Grading System

One final written exam will be given to students for the grading.

他学部履修の条件 Other Faculty Requirements

テキスト・教科書 Textbooks

講義指定図書 Reading List

参照ホームページ Websites

https://hokkaidosummerinstitute.oia.hokudai.ac.jp/en/courses/CourseDetail=G057

研究室のホームページ Websites of Laboratory

https://songroup.github.io/sonlab-website/

科目名 Course Title	先端総合化学特論 II [Modern Trends in Chemical Sciences and Engineering II]			
講義題目 Subtitle	Chemical Engineering Thermodynamics[Chemical Engineering Thermodynamics]			
責任教員 Instructor	菊地 隆司[KIKU	ICHI Ryuji] (大学院工学研究院)		
担当教員 Other Instructors				
科目種別 Course Type				
開講年度 Year	2025	時間割番号 Course Number	095125	
期間 Semester	Intensive	単位数 Number of Credits	1	
授業形態 Type of Class	Lecture	対象年次 Year of Eligible Student	~	
対象学科・クラス Eligible Department/Class				
補足事項 Other Information				
授業実施方式 Class Method 1 対面授業科目《対面のみ》		1 対面授業科目《対面のみ》		
キーワード Key Words				

Chemical Engineering Thermodynamics, Phase Equilibrium, Chemical Equilibrium, Material-Energy Conversion, Exergy

授業の目標 Course Objectives

Thermodynamics is lectured to utilize it in chemical engineering. Basic laws of heat phenomena are reviewed for advanced applications. This lecture helps you understand that thermodynamics deals with conversion of materials and energy. Preservation and loss of energy is lectured by introducing a concept of "exergy". You can learn the quality of energy is expressed in terms of exergy, and energy/material conversion systems are to be analyzed to minimize exergy loss for designing clean energy systems. Fuel cell systems and hydrogen production processes are used as examples for exergy analysis.

到達目標 Course Goals

You can extend basic knowledge on thermodynamics in small closed systems to large open systems such as reactors, power plants, and chemical plants. You can understand the concept of exergy, that is, exergy quantifies the available amount of energy based on environmental conditions, and learn the method to calculate exergy for respective energy forms. You can also learn to express exergy losses accompanied with energy conversion by using energy conversion diagram.

授業計画 Course Schedule

First half of this course you will review and expand the concept of chemical thermodynamics to chemical engineering thermodynamics. Second half you will learn the concept of exergy, calculation procedure of exergy, and drawing of energy conversion diagram.

1. World trends regarding hydrogen and energy, introduction to hydrogen production

2. Basic concept of chemical engineering thermodynamics, chemical thermodynamics, energy balance in closed and flow systems, energy balance of chemical processes

- 3. Ideal gas and real gas, compression and expansion
- 4. Chemical equilibrium, equilibrium of heterogeneous reactions
- 5. Introduction to exergy concept, exergy change in energy conversion, energy diagram for energy conversion
- 6. Calculation procedure for exergy of various energy forms
- 7. Exergy for mixing and separation processes, synthesis of process systems
- 8. Exergy analysis of conversion processes in chemical engineering

準備学習 (予習・復習)等の内容と分量 Homework

It is required to study physical chemistry for preparation for the class. Materials are distributed for each class. Homework is assigned every class to well understand the course content. Unit of class is 1, which corresponds to 45 hours study. By considering total time of class, additional study of 3.6 hours is necessary before and after each class.

成績評価の基準と方法 Grading System

Grade will be evaluated based on the grades of small questions and report assignments assigned during the lecture. The evaluation is based on 40% of the small questions and 60% of the report assignments.

テキスト・教科書 Textbooks

必要な教材は毎回配布する。参考書は、講義指定図書のとおり。

Handout made by the instructor will be delivered.

講義指定図書 Reading List

熱力学(基本の理解と応用)/石田愈:培風館, 1995 演習化学工学熱力学(第2版)/大竹伝雄・平田光穂:丸善, 1991

エクセルギー工学/吉田邦夫編:共立出版,1999

参照ホームページ Websites

https://hokkaidosummerinstitute.oia.hokudai.ac.jp/en/courses/CourseDetail=G061

研究室のホームページ Websites of Laboratory

https://apchem.eng.hokudai.ac.jp/en/lab/chemical-system-engineering/

科目名 Course Title	科目名 Course Title 先端総合化学特論Ⅱ[Modern Trends in Chemical Sciences and Engineering II]					
講義題目 Subtitle	Separation Process Engineering I[Separation Process Engineering I]					
責任教員 Instructor	向井 紳 [MUKAI Shin] (大学院工学研究院)					
担当教員 Other Instructors						
科目種別 Course Type						
開講年度 Year	2025	時間割番号 Course Number	095126			
期間 Semester	Intensive	単位数 Number of Credits	1			
授業形態 Type of Class	Lecture	対象年次 Year of Eligible Student	\sim			
対象学科・クラス Eligible Depa	rtment/Class					
ナンバリングコード Numbering	Code	CHEM_REQEL 7121				
補足事項 Other Information	项 Other Information					
授業実施方式 Class Method	授業実施方式 Class Method 1 対面授業科目《対面のみ》					
キーワード Kev Words						
Porous Materials, Adsorption						
授業の目標 Course Objective	S					
In this course, you can learn	the basic principles	of separation processes with a particular	r focus on processes using porous			
materials such as adsorption.	1 1					
到達目標 Course Goals						
By the end of this course, a su	ccessful learner will					
1. Understand the mechanisms	which cause adsorp	tion				
2. Understand methods to obta	in adsorption isothe	erms, and become able to describe the cha	racteristics of the material from its			
isotherm						
3. Understand general adsorpt	ion theories and ad	sorption equations, and become able to a	analyze adsorption isotherms using			
them						
授業計画 Course Schedule						
This course will be held as an i	n–person class at S	apporo Campus.				
1. Overview of Adsorption Phe	nomena and Adsorb	ents				
2. Adsorption Phenomena						
3. Typical Adsorbents and The	ir Production Proce	sses				
4. Adsorption Mechanisms						
5. Adsorption Isotherms						
6. Adsorption Theories and Ad	sorption Equations	(Henry Equation, Freundlich Equation, La	ngmuir Equation)			
7. Adsorption Theories and Ad	sorption Equations	(BET Equation)				
8. Examination						
準備学習 (予習・復習)等の内容と分量 Homework						
Students are encouraged to r	ead relevant mater	ials ahead of time and review what they	have been taught, especially the			
contents of quizzes after classe	s to deepen their u	nderstanding.				
成績評価の基準と方法 Gradir	g System					
The attendance rate must be o	over 70% to be quali	fied to take the final project. Evaluations	will be made based on (1) learning			
attitude (20%), (2) quiz score	s (20%) and final e	examination scores (60%). Quizzes will	be used to evaluate the level of			
understanding of each class and examinations will be used to evaluate the achievement level of this course.						
他子部履修の条件 Other Fac	lity requirements					
ニキフト 教社書 Tauthaala						
/ てへ1 *ス1*音 16XW00KS						

評報拍正凶會 Keading List						
<u> 金四十 / ぷ かいい</u>						
愛照ホームへーン Websites https://heiliai	4					
nttps://nokkaidosummerinstitu	.ie.oia.nokudai.ac.jp	/ en/ courses/ CourseDetail=G059				
研究至のホームヘーン Websit	es of Ladoratory					
頒 有 Additional Information						
Prerequisite courses includ	e undergraduate-l	evel mathematics, transport phenome	ena, thermodynamics, statistical			
thermodynamics, and separation process.						

科目名 Course Title	先端総合化学特論Ⅱ[Modern Trends in Chemical Sciences and Engineering II]				
講義題目 Subtitle	Separation Process Engineering II[Separation Process Engineering II]				
責任教員 Instructor	荻野 勲 [OGINO Isao] (大学院工学研究院)				
担当教員 Other Instructors	Ron C. Runnebaur	m (University of California, Davis)			
科目種別 Course Type			Y		
開講年度 Year	2025	時間割番号 Course Number	095127		
期間 Semester	Intensive	単位数 Number of Credits	1		
授業形態 Type of Class	Lecture	对象年次 Year of Eligible Student	~		
対象字科 クラス Eligible Depai	rtment/Class				
ナンハリンクコード Numbering Code CHEM_REQEL 7121					
補足争項 Other Information	定 争 現 Other Information				
授耒美施方式 Class Method		1 対面授美科日《対面のみ》			
キーワード Key Words					
Porous Materials, Adsorption,	Membrane Separatio	on, Chromatography			
	3				
adcomption and membrane consi	pies of separation p	rocesses with a particular locus on process	es using porous materiais such as		
adsorption and memorane separ	ation.				
1 Understand the roles of sena	ration operation in	industrial processes			
2 Understand the classification	of separation proc	esses in terms of rate and equilibrium			
3. Deepen understanding on the	ermodynamics and t	ransport phenomena relevant to the design	of separation processes		
4. Understand the fundamental	principles of indust	rial adsorption and membrane separation pr	rocesses and perform basic design		
of these processes					
5. Perform the basic design of o	levices and product	s equipped with adsorption and membrane-	separation functions		
授業計画 Course Schedule					
1. Roles of industrial separation	n processes				
2. Thermodynamics and transpo	ort phenomena relev	vant to separation processes			
3. Adsorption process					
4. Case study 1					
5. Case study 2					
6. Membrane separation proces	S				
7. Case study 3					
8. Project 進備学習(予習・復習)等の内容	····································	,			
午順子日(ア日-後日)寺の内 Students are encouraged to rea	子とり重 Holliework	l relevant materials aboad of time. Student	s are required to submit assigned		
homework	ad the textbook and	relevant materials allead of time. Student.	s are required to sublint assigned		
成績評価の基準と方法 Gradin	g System				
Students must maintain a 70% a	attendance rate or h	higher to be eligible for the final project. Ex	valuations will be performed using		
three factors: learning attitude	e (20%), which inclu	udes engagement and participation, assign	ment scores (30%), which assess		
understanding of class materi	al and separation	principles, and the final project score	(50%), which evaluates practical		
application of skills learned.					
他学部履修の条件 Other Facu	ulty Requirements				
テキスト・教科書 Textbooks					
1. Separation Process Principle	s: With Application	s Using Process Simulators, 4th Edition/J	. D. Seader, Ernest J. Henley, D.		
Keith Roper: John Wiley & Sons, Inc., 2016					
2. Product and Process Design Principles: Synthesis, Analysis and Evaluation, 4th Edition/Warren D. Seider, Daniel R.					
Lewin, J. D. Seader, Soemantri Widagdo, Kafiqui Gani, Ka Ming Ng:Wiley, 2016					
明教IHC区画「Reading List 現代化学工学/権太健治 恭野文丸 編·産業図書 2001					
- シロマロナエナ/ 1回平)にロ、狄: 参昭ホームページ Waheitae	切い1Lナムチ/ 簡平硬石、狄玎久凡 禘: (生業凶者, 2001 会昭士一 / ページ Wabaitaa				
https://hokkaidosummerinstitu	te.oia.hokudai ac in	/en/courses/CourseDetail=G060			
研究室のホームページ Websites of Laboratory					
備考 Additional Information					
Prerequisite courses include	e undergraduate-le	evel mathematics, transport phenomen	a, thermodynamics, statistical		
thermodynamics, and separation	n process.				
It is desirable for students to be able to understand numerical methods to solve differential equations.					

科目名 Course Title	先端総合化学特論 II [Modern Trends in Chemical Sciences and Engineering II]			
講義題目 Subtitle	Leading and Advanced Materials Chemistry and Engineering IA – 2025[Leading and Advanced			
	Materials Chemistry and Engineering IA – 2025]			
責任教員 Instructor	三浦 章 [MIURA Akira] (大学院工学研究院)			
担当教員 Other Instructors	Christopher J. Bartel (University of Minnesota)			
科目種別 Course Type				
開講年度 Year	2025	時間割番号 Course Number	095128	
期間 Semester	Intensive	単位数 Number of Credits	1	
授業形態 Type of Class	Lecture	対象年次 Year of Eligible Student	~	
対象学科・クラス Eligible Depa	rtment/Class			
ナンバリングコード Numbering	Code	CHEM_REQEL 7121		
補足事項 Other Information				
授業実施方式 Class Method		1 対面授業科目《対面のみ》		
キーワード Key Words				
Materials Chemistry, Python, M	Machine Learning			
授業の目標 Course Objective	S			
This course will introduce stud	lents to the key as	pects that make up machine learning proje	ects, with an emphasis on the types	
of data and problems often enc	ountered in solid-s	tate chemistry.		
到達目標 Course Goals				
By the end of this course, stu	udents will underst	and how machine learning can be applied	d to solid-state chemistry, what is	
needed to initiate a machine lea	arning project, and	how to train, validate, and interpret mach	ane learning models using Python.	
按耒計画 Course Schedule	1. 1	1		
1) Applications and basics of m	achine learning in (cnemical sciences		
2) Introduction to supervised le	earning: data, featu	res, models		
a) introduction to data science	with Python: num	by, pandas, matplotlib		
 4) vanualing supervised learning 5) Training machine learning 	ig models	skloam		
6) Interpretable machine learning m	odels with Python:	SNIEdHI		
7) Finding and analyzing a new	τolerance factor fo	r perovskite stability		
8) Collaboration between experi	imentalists and the	Perovanie and muy		
準備学習(予習・復習)等の内容	容と分量 Homewor	k		
1-5 hours of practice and home	ework using Python			
成績評価の基準と方法 Gradin	g System			
Homework	-			
他学部履修の条件 Other Face	ulty Requirements			
テキスト・教科書 Textbooks				
講義指定図書 Reading List				
参照ホームページ Websites				
https://hokkaidosummerinstitute.oia.hokudai.ac.jp/en/courses/CourseDetail=G047				
研究室のホームページ Websit	研究室のホームページ Websites of Laboratory			
https://strchem.eng.hokudai.a	c.jp/			
https://bartel.cems.umn.edu/	https://bartel.cems.umn.edu/			
備考 Additional Information				
Laptop is needed.	Laptop is needed.			

科目名 Course Title	先端総合化学特論Ⅱ[Modern Trends in Chemical Sciences and Engineering II]				
講義題目 Subtitle	Leading and Advanced Materials Chemistry and Engineering IB - 2025[Leading and Advanced				
	Materials Chemis	Materials Chemistry and Engineering IB - 2025]			
責任教員 Instructor	忠永 清治[TAI	ANAGA Kiyoharu](大学院工学研究院)			
担当教員 Other Instructors	Nataly Carolina I	Rosero Navarro (Institute of Ceramic and Gl	ass)		
	FUJII Yuta (工学	研究院)			
科目種別 Course Type					
開講年度 Year	2025	時間割番号 Course Number	095129		
期間 Semester	Intensive	単位数 Number of Credits	1		
授業形態 Type of Class	Lecture	対象年次 Year of Eligible Student	~		
対象学科・クラス Eligible Depa	rtment/Class				
ナンバリングコード Numbering	Code	CHEM_REQEL 7121			
補足事項 Other Information					
受業実施方式 Class Method 1 対面授業科目《対面のみ》					
キーワード Key Words	キーワード Key Words				

Electrochemical devices; Electrolyte; Electrode; Nano-structure; Batteries

授業の目標 Course Objectives

Recently, safe, low-cost, high-energy density, and long-lasting electrochemical devices for energy conversion and storage are highly required for mobile devices, electric vehicles, and storage for renewable energy to build a sustainable society. Development of novel materials and structural/morphological control of these materials are key issues. The aim of this course is to describe the importance of electrochemical devices and materials science involved in the development of such electrochemical devices. Fundamental concepts in electrochemical energy conversion and storage are overviewed at first, and then the materials chemistry for the electrochemical devices will be described. The preparation process for materials of electrochemical devices for batteries, and the development of all-solid-state batteries are also described.

到達目標 Course Goals

By the end of this course you will be able to

- 1. explain and compare various electrochemical energy conversion and storage systems
- 2. understand the basic requirements for materials used in electrochemical energy conversion and energy storage devices
- 3. explain the effects of structure and morphology on the properties of electrochemical devices
- 4. understand and discuss materials and electrochemical devices in future energy storage system

授業計画 Course Schedule

As an HSI course, Dr. Nataly Carolina ROSERO-NAVARRO (Institute for Ceramics and Glass, CSIC, Spain) will give most of the lectures.

The following topics will be covered during this course.

- 1. Fundamental concepts about electrochemical energy conversion and storage
- 2. Materials used in electrochemical devices
- 3. Introduction of inorganic materials science for electrochemical devices
- 4. Nanostructured materials applied to electrodes for lithium and sodium ion batteries
- 5. Fundamentals of solid electrolyte
- 6. All-solid-state lithium secondary batteries
- 7. Overview of recent trends in materials for electrochemical devices and future energy storage system
- 8. Students presentation on topics in electrochemical devices

準備学習 (予習・復習)等の内容と分量 Homework

Students will be expected to download class notes from WEB page and read designated chapter in advance. Students should read some papers on electrochemical devices during this course and make presentation.

成績評価の基準と方法 Grading System

- Grade will be determined by how well one's achievement in this course through
- 1. a report on nanostructured materials in electrochemical devices (weightage 80%), and
- 2. a presentation on one's research or some topics in electrochemical devices (weightage 20%).

他学部履修の条件 Other Faculty Requirements

テキスト・教科書 Textbooks

No textbook required. Handouts will be distributed.

講義指定図書 Reading List

"Recent Advances in Energy Storage Materials and Devices", Li Lu edited, Materials Research Forum LLC, ISBN 978-1945291265 (2017).

"Ceramic Electrolytes for All-Solid-State Li Batteries", M. Kotobuki, S. Song, C. Chen, and Li Lu, World Scientific Pub Co Inc ISBN: 978-9813233881(2018).

参照ホームページ Websites

https://hokkaidosummerinstitute.oia.hokudai.ac.jp/en/courses/CourseDetail=G048

研究室のホームページ Websites of Laboratory

http://www.eng.hokudai.ac.jp/labo/inorgsyn/

원모성 고비	中山公人儿学时				
科日名 Course little	先端総合化字符論 II [Modern Trends in Chemical Sciences and Engineering II]				
請義題日 Subtitle	Leading and Advanced Materials Chemistry and Engineering II – 2025[Leading and Advanced				
	Materials Chemistry and Engineering II - 2025				
責任教員 Instructor	村越 敬 [MURAKOSHI Kei] (大学院理学研究院)				
担当教員 Other Instructors	Boyang HUA (Nanjing University)				
科目種別 Course Type					
開講年度 Year	2025	時間割番号 Course Number	095130		
期間 Semester	Intensive	単位数 Number of Credits	1		
授業形態 Type of Class	Lecture	対象年次 Year of Eligible Student	\sim		
対象学科・クラス Eligible Depa	rtment/Class				
補足事項 Other Information					
授業実施方式 Class Method		1 対面授業科目《対面のみ》			
キーワード Kev Words					
Single-molecule fluorescence,	FRET, RNA foldin	g			
授業の目標 Course Objective	s	0			
This course introduces the co	- ncept of RNA fold	ing, structures, and functions. We will tal	k about the different types of RNAs		
and their important and diverse	e roles in cells. In	order to study RNAs, researcher need to	employ a variety of tools. The class		
will discuss techniques commo	nly used in the fi	eld to synthesize, label, isolate, and char	acterize RNAs in vitro and in vivo.		
including some advanced single	e-molecule fluores	scence techniques After this we will use	real research examples to illustrate		
how real problems about RNA	hiology are solved	using the various tools we have covered			
到達目標 Course Goals	olology are bollog				
The goal of this course is to	help students (1) understand the physical and chemical	basis of RNAs: (2) understand the		
biological processes that RNA	s are involved in:	(3) understand the modern tools, especia	lly the single-molecule fluorescence		
tools that are used to study	the complex and	dynamic mechanisms of RNA function a	nd regulation. (4) get the students		
familiar with and interested in t	the field of RNA bi	ology and single-molecule highly sign	na regulation, (1) get the stadents		
招酬 Man and Interested In		longy and single molecule prophysics.			
1 Introduction to RNA folding	structures and f	unctions			
2 RNA types and their reles in	, structures, and r	unctions			
2. Rulk techniques for PNA su	thosis monipulat	ion and abaractorization			
4 Single-melecule fluorescone	a techniques for P	NA studios			
4. Single molecule molescence	DNA biology	NA studies			
5. Frontier research topics on	RINA DIOIOgy				
進備学習 (予習・復習)等の内	容と分量 Homewo	rk			
To read the basic parts of Bio	chemistry textbo	oks at undergraduate level is highly recor	nmended. Several seminal literature		
will also be recommended					
成績評価の基準と方法 Gradir	ig System				
One final written exam will be a	given to students i	for the grading.			
他学部履修の条件 Other Fac	ulty Requirements	1			
テキスト・教科書 Textbooks					
請義指定図書 Reading List					
参照ホームページ Websites					
https://hokkaidosummerinstitute.oia.hokudai.ac.jp/en/courses/CourseDetail=G049					
研究室のホームページ Websites of Laboratory					
備考 Additional Information					

科目名 Course Title	先端総合化学特論Ⅱ[Modern Trends in Chemical Sciences and Engineering II]		
講義題目 Subtitle	Leading and Advanced Materials Chemistry and Engineering IIIA - 2025[Leading and		
	Advanced Materials Chemistry and Engineering IIIA - 2025]		
責任教員 Instructor	村越 敬 [MURAKOSHI Kei] (大学院理学研究院)		
担当教員 Other Instructors	YOSHIO Masafum	i (NIMS), MASUDA Takuya (NIMS), KITA	AURA Ryo (NIMS), TSUJIMOTO
	Yoshihiro (NIMS)		
科目種別 Course Type			
開講年度 Year	2025	時間割番号 Course Number	095131
期間 Semester	Intensive	単位数 Number of Credits	1
授業形態 Type of Class	Lecture	対象年次 Year of Eligible Student	\sim
対象学科・クラス Eligible Department/Class			
ナンバリングコード Numbering	Code	CHEM_REQEL 7121	
補足事項 Other Information			
授業実施方式 Class Method		1 対面授業科目《対面のみ》	

キーワード Key Words

Supramolecular Chemistry, Inorganic Material Chemistry, Quantum Material Chemistry, Electrochemistry, Advanced Characterization Techniques, Device Fabrication

授業の目標 Course Objectives

In this course, students will explore the chemistry and physics of nanostructured organic and inorganic materials, including quantum materials, with a focus on their applications in ionic, electronic, and optoelectronic devices. They will also gain expertise in advanced interface analysis techniques. The lectures will cover the design and synthesis of functional materials through various methods, such as molecular self-assembly, flux growth, chemical vapor deposition, and epitaxial crystallization. These materials diverse applications, including actuators, sensors, batteries, photovoltaics, and photoemitters. Additionally, the course will introduce advanced characterization techniques, including X-ray photoelectron spectroscopy, vibrational spectroscopy, electron microscopy, and scanning probe microscopy. Students will learn how nanoscale structural control in organic and inorganic materials enhances their properties and enables novel functionalities. They will also develop a deeper understanding of surface chemistry transformations and heterointerface phenomena.

到達目標 Course Goals

The goal of this course are as follows: Understand structural control in organic assemblies, inorganic crystals, and atomically thin films, and grasp the fundamental operating principles of ionic, electronic, and photonic devices. Gain insight into materials design, engineering, and processing, and as well as the relationships between structure and properties, to optimize material functionality. Develop problem-solving skills and explore innovative solutions based on acquired knowledge. By achieving these objectives, students will cultivate the expertise necessary to make meaningful contributions on a global scale in their respective fields.

授業計画 Course Schedule

- 1. Overview of the Course and Structural Control of Organic Nanomaterials
- 2. Organic and Inorganic Electrochemical Devices
- 3. Secondary Batteries and Advanced Analytical Techniques
- 4. Exercises on Electrochemical Devices and Discussion on Future Devices
- 5. Structure and Function of Inorganic 2D Thin Films
- 6. Physics of 2D Materials and Fundamentals of Inorganic Crystals
- 7. Structural Control and Functionality of Inorganic Crystals

8. Exercises on Structural Symmetry and Physical Properties of Inorganic Crystals, Discussion on Future Devices, and Course Summary

準備学習 (予習・復習)等の内容と分量 Homework

To read the basic parts of Organic and Physical Chemistry textbooks at undergraduate level is highly recommended.

成績評価の基準と方法 Grading System

One final written exam will be given to students for the grading.

テキスト・教科書 Textbooks

講義指定図書 Reading List

参照ホームページ Websites

https://hokkaidosummerinstitute.oia.hokudai.ac.jp/en/courses/CourseDetail=G050 研究室のホームページ Websites of Laboratory

원모장이 가네	中地级人力学生				
件日名 Course little 講美語日 Cutatula	先端総合化字符論Ⅱ[Modern Trends in Chemical Sciences and Engineering II]				
語我起日 Subtitle	Leading and Advanced Materials Chemistry and Engineering IIID $= 2025$ [Leading and Advanced Materials Chemistry and Engineering IIID $= 2025$]				
青年教員 Instructor	Advanced Materials Chemistry and Engineering IIID 2025] 自田 敏安 [SHIMADA Toshibiro] (大学院工学研究院)				
日当教員 Other Instructors	西山 東江 [JIIII				
私日種別 Courses Type					
	2025	时间刻妥且 Osume Number	005122		
用調牛皮 Tear	ZUZD Intensive	时间刮曲方 Course Number	1		
授業形能 Type of Class	Locturo	中区数 Number of Oregits 対象在次 Vear of Fligible Student	\sim		
対象学科・クラス Fligible Dena	rtment/Class				
	Code	CHEM REOFL 7121			
補足事項 Other Information	Oue	CHEM_REQUE /121			
福定事項 Outor Information		4 遠隔授業科日《遠隔のみ》			
		- 丞腩及未行口《逯쪰·207//			
+					
	~				
投来の日標 Course Objective	s combined with eve	reises. In the lecture basic knowledge	of statistical methods and machine		
loarning for materials research	Un the evereises	we start from basic python programmi	or statistical methods and machine		
librarias including tonsorflow s	cikit loarn stan G	we start from basic python programmin Py atc. and databases	ig and instruct now to use various		
noraries including tensornow, s	Cikit learn, stail, O	y etc. and databases.			
到達日標 Course Goals					
1 Understanding the basics of	data science and m	achine learning especially about terminol	Ogy		
2. Learning how to use librarie	s and databases for	python.			
3. Practical usage of packages	for materials inform	atics.			
授業計画 Course Schedule					
1. Neural networks					
2. Rdkit library for chemicals					
3. Machine learning for molecu	les				
4. Sckit learn – library for mac	hine learning				
5. Reinforced learning toward p	orotein-folding analy	ysis			
6. Genetic algorithm					
7. Bayesian concept					
8. Interpritation of machine lea	rning results				
9. Generative AI					
準備学習(予習・復習)等の内容	容と分量 Homework	K			
Requirement: personal compute	er equipped with a l	keyboard and internet connection			
Homework: After each day, ho	mework will be assig	gned.			
成績評価の基準と方法 Gradin	ig System				
After each day, homework will	be assigned. The a	nswer and final report will be used for gra	adıng.		
	uity Requirements				
テキスト・教科書 Textbooks					
None					
講義指定図書 Reading List					
Any textbooks or websites on python language					
参照ホームページ Websites					
https://hokkaidosummerinstitute.oia.hokudai.ac.jp/en/courses/CourseDetail=G053					
研究室のホームページ Websit	es of Laboratory				
https://www.eng.hokudai.ac.jp	/labo/kotai/en/ind	ex.html			
https://www.eng.hokudai.ac.jp	/labo/inorgsyn/cov	ver-e.htm			
備考 Additional Information					
Required Equipment for a class	(Laptop, etc.)				
A computer with python insta	alled. Instruction o	f installation will be given to registered	students prior to the course.The		
participants may be contacted in advance for preparation of python language.					

科目名 Course Title	先端総合化学特論Ⅱ[Modern Trends in Chemical Sciences and Engineering II]		
講義題目 Subtitle	Instrumentation Chemistry[Instrumentation Chemistry]		
責任教員 Instructor	長谷川 靖哉[H/	ASEGAWA Yasuchika] (大学院工学研究院))
担当教員 Other Instructors			
科目種別 Course Type			
開講年度 Year	2025	時間割番号 Course Number	095133
期間 Semester	Intensive	単位数 Number of Credits	1
授業形態 Type of Class	Lecture	対象年次 Year of Eligible Student	~
対象学科・クラス Eligible Depa	rtment/Class		
ナンバリングコード Numbering	Code	CHEM_REQEL 7121	
補足事項 Other Information			
授業実施方式 Class Method 1 対面授業科目《対面のみ》			
キーワード Key Words			
Chemical Information, elemental analysis, conditional analysis, structural analysis in nano- and micro-area.			

授業の目標 Course Objectives

Grounding in physical, organic and inorganic chemistry.

In this course, instrumentation chemistry containing elemental analysis, configurational analysis, structural analysis in nanoand micro-area are introduced. Based on their studies, students learn fundamental knowledges and various information about chemical analysis of organic and inorganic materials.

到達目標 Course Goals

Students learn principle, variety and characterization of instrumentation chemistry for material analysis. Based on instrumentation chemistry containing elemental analysis, configurational analysis, structural analysis in nano- and micro-area, students make the most of their knowledges for construction of their chemical research.

授業計画 Course Schedule

1-2. introduction of instrumentation chemistry: importance for structural analysis on the material surface, classification of chemical instruments, grounding in high vacuum engineering

3. configurational analysis (TEM, SEM, AFM, STM)

4. elemental analysis (AES, EPMA, XPS, XRF)

5. structural analysis (XRD, EXAFS, HEED, LEED, SAXS)

6. photo-physical analysis (UV-Vis absorption spectra, fluorescence and phosphorescence spectra, emission lifetime, Raman spectra)

7. MS spectral analysis (EI-MS, CI-MS, ESI-MS, MALDI-MS, SIMS)

8. examination

準備学習 (予習・復習)等の内容と分量 Homework

Pre-examination for review of instrumentation chemistry

成績評価の基準と方法 Grading System

The attendance rate must be over 70% to be qualified to take the final exam. Evaluations will be made based on (1) learning attitude (20%), (2) exercise (10%), (3) final examination scores (70%).

他学部履修の条件 Other Faculty Requirements

テキスト・教科書 Textbooks

講義指定図書 Reading List

参照ホームページ Websites

https://hokkaidosummerinstitute.oia.hokudai.ac.jp/en/courses/CourseDetail=G051

研究室のホームページ Websites of Laboratory

https://www.eng.hokudai.ac.jp/labo/amc/en/en-index.html

科目名 Course Title	先端総合化学特論 II [Modern Trends in Chemical Sciences and Engineering II]				
講義題目 Subtitle	Functional Solid State Materials Chemistry[Functional Solid State Materials Chemistry]				
責任教員 Instructor	島田 敏宏 [SHIMADA Toshihiro] (大学院工学研究院)				
担当教員 Other Instructors					
科目種別 Course Type					
開講年度 Year	2025	時間割番号 Course Number	095134		
期間 Semester	Intensive	単位数 Number of Credits	1		
授業形態 Type of Class	Lecture	対象年次 Year of Eligible Student	~		
対象学科・クラス Eligible Depa	rtment/Class				
ナンバリングコード Numbering	Code	CHEM_REQEL 7121			
補足事項 Other Information					
授業実施方式 Class Method		4 遠隔授業科目《遠隔のみ》			
キーワード Key Words					
electronic materials and device	s, thermoelectrics,	solar cells, hard materials, solid state pl	nysics		
授業の目標 Course Objectives	S				
The first goal is to understand	the "heart" of chem	nistry and physics of solid state function	nal materials and obtain the ability to		
design and crate new materials	. The second goal is	s to understand what is written in literat	ure with theoretical description. The		
lecture and the homeworks will	be organized to ach	nieve this goal.			
到達目標 Course Goals					
By the end of this course you w	vill be able to				
1. Explain how the devices exp	lained in the lecture	e works.			
2. Obtain basic knowledge of se	olid state materials.				
3. Read advanced literature abo	out the related topic	cs.			
授業計画 Course Schedule					
Topics other than the following	; list can also be lec	tured according to request.			
1. Introduction to solid state cl	hemistry / physics a	and thermoelectricity			
2. Semiconductors focused on s	solar cells				
3. Transparent conductors (oxi	des, nanowires, gra	phene)			
4. Advanced ligand field theory	and basics of photo	ophysics – lasers, nonlinear optics, optic	cal fibers		
5. Interfaces: work function and	d chemistry of semic	conductor junction devices			
6. Phase memory materials (DV	/D-R/W, shape mer	nory alloys)			
7. Ferroelectrics and liquid cry	stal				
8. Thermography and strongly	correlated electron	systems			
Related theoretical concepts w	ill be introduced eve	ery time.			
準備字智(予智・復智)等の内省	容と分重 Homework		、 、		
Preparation: read the handout	posted on the websi	te (URL will be given at the first lecture	»).		
Homework: solve the problem g	given in the lecture	and write a brief final report.			
成稿評価の基準と方法 Gradin	ig System	and the final report			
Grading is based on the quiz gr	ven at each lecture	and the linal report.			
他子部履修の余件 Other Faculty Requirements					
ニキフト・教科書 Tauthaala					
アイハト" 秋件書 Lextbooks					
inandout win be given prior to the recture via website 諸義指定図書 Reading List					
語教用化図書 reauling List					
参昭ホームページ Wabaitaa					
https://hokkaidosummorinetitu	te oja hokudaj ao in	/en/courses/CourseDetail=C052			
研究室のホームページ Webeit	es of l aboratory				
https://www.eng.hokudai.ac.in	/laho/kotai/on/inde	ay html			
備者 Additional Information					

科日夕 Courso Title	生神絵ヘル学株書	AΠ[Modorn Tronds in Chamical Salanaas a	nd Engineering II]		
	元师称言心子符册 IL Modern Trends in Chemical Sciences and Engineering II				
調機題日 Subtitle	Leading and Advanced Biological and Polymer Chemistry and Engineering IA - 2025[Leading				
	and Advanced Bio	logical and Polymer Chemistry and Engineer	ring IA - 2025]		
貢任教員 Instructor	坂口 和靖 [SAKA	AGUCHI Kazuyasu」(大字院埋字研究院)			
担当教員 Other Instructors	Paul Francois (Un	iversity of Montreal)			
	ABE Kazuhiro (理	学研究院), NAKAGAWA Natsumi (理学研	究院)		
科目種別 Course Type					
開講年度 Year	2025	時間割番号 Course Number	095135		
期間 Semester	Intensive	単位数 Number of Credits	1		
授業形態 Type of Class	Lecture	対象年次 Year of Eligible Student	~		
対象学科・クラス Eligible Depa	rtment/Class				
+ vill vin - K Numbering	Code	CHEM REOFL 7121			
対 兄 車 佰 Other Information	Code				
		1 ムデダックロ//ムデッス》			
授耒美施方式 Class Method		1 対面授業科日《対面のみ》			
キーワード Key Words					
systems biology, gene regulator	ry networks, machin	e learning, mathematical modelling			
授業の目標 Course Objectives	8				
1. Introducing the fundamental	principles of system	ns biology			
2. Introducing techniques for m	odeling complex bio	ological networks			
3. Explore the intersection be	tween biological sys	stems and machine learning in the context	of gene regulatory networks and		
deep learning.					
4. Develop the skills to analy	ze biological data	using systems biology models and machin	e learning algorithms to extract		
meaningful insights.	0		5 5		
到達目標 Course Goals					
1 To appreciate how gene regi	ilatory networks (G	RNs) shape cellular dynamics			
2 To appreciate how non-lines	rity and interaction	s can be modeled to give rise to complex bi	ological dynamics		
3. To appreciate how the struct	ture of gone notwor	ks relates to artificial noural networks	ological dynamics		
· · · · · · · · · · · · · · · · · · ·	ture of gene networ				
及未前回 Course Schedule	- D:-1				
Day 1 Introduction to system	s blology				
Gene regulatory network	Gene regulatory networks				
Modelling Production, de	gradation, regulation	on			
Non-linearity in network	.S				
Day 2 : Systems Modelling					
Network motifs : transcr	iption				
Feed forward and Feedba	ack				
Gene networks vs neuro	ns dynamics				
Positive and negative fee	dbacks. Selector ge	enes, speed, genetic oscillators			
Day 3: Regulation layers					
Feed forward gene netwo	orks				
Case study : the gap ger	e patterning system	n in drosophila			
A gene regulatory netwo	rk view of the perce	eptron, a perceptron view of embryonic patt	erning		
Information encoding			-		
Day 4: From gene networks to	machine learning				
Multilaver perceptrons a	nd Deep learning.				
Latent space and autoen	coders for gene reg	ulatory networks			
進備学習 (予習・復習)等の内容	容と分量 Homework				
Read the articles in the "Readi	ng List″				
成績評価の基準と方法 Gradin	g System				
Assignment on specified topics	(60%). Active stude	nt participation in class (40%)			
小SSignment on Specification (100), Active statent participation in Class (400)					
テキスト・教科書 Textbooks					
港单化中网会 n					
語教育正凶者 Keading List					
<reading list=""></reading>	00070				
https://doi.org/10.1038/natur	e02678				
https://10.1016/s0955-0674(0)3)00017-6				
https://doi.org/10.1073/pnas.	2113651119				
Reference Books : An Introduc	tion to Systems Bio	logy, Design Principle of Biological Circuits	, Uri Alon; Why Machines Learn.		
The Elegant Math Behind Modern AI, Anil Ananthaswamy					

参照ホームページ Websites

https://hokkaidosummerinstitute.oia.hokudai.ac.jp/en/courses/CourseDetail=G042

研究室のホームページ Websites of Laboratory

https://www.francoisresearch.org

https://www.chem.sci.hokudai.ac.jp/~biochem/en

https://www.chem.sci.hokudai.ac.jp/~molbio/home-en/

科目名 Course Title	先端総合化学特計	総合化学特論Ⅱ[Modern Trends in Chemical Sciences and Engineering II]		
講義題目 Subtitle	Leading and Advanced Biological and Polymer Chemistry and Engineering IB - 2025[Leading			
	and Advanced Bio	and Advanced Biological and Polymer Chemistry and Engineering IB – 2025]		
責任教員 Instructor	磯野 拓也 [ISONO Takuya] (大学院工学研究院)			
担当教員 Other Instructors	Brian J. Ree (Kear	1 University)		
	SATOH Toshifumi	(工学研究院),LI FENG (工学研究院)		
科目種別 Course Type				
開講年度 Year	2025	時間割番号 Course Number	095136	
期間 Semester	Intensive	単位数 Number of Credits	1	
授業形態 Type of Class	Lecture	対象年次 Year of Eligible Student	~	
対象学科・クラス Eligible Depa	rtment/Class			
ナンバリングコード Numbering Code		CHEM_REQEL 7121		
補足事項 Other Information				
授業実施方式 Class Method 2 対面授業科目《一部遠隔》				
キーワード Key Words				

Polymer characterization, Statistical dynamics, Phase transition, Mechanical properties, and Morphology

授業の目標 Course Objectives

The current state of polymer science enables targeted synthesis of specialized polymers for a wide variety of specific purposes. This unique aspect of polymer science calls for the evaluation of their chemical structure, physical properties, and morphology for truly comprehending their behavior. Therefore, having a sound comprehension of the core principles in physics will aid in developing novel materials to new practical applications. Specific topics such as statistical dynamics, phase equilibria, thermal properties, mechanical properties, morphology and self-assembly characteristics will be explored. Therefore, having a sound comprehension of the core principles in physics will aid in developing novel materials to new practical applications.

到達目標 Course Goals

This course is intended to be an introduction to polymer characterization methods and physics of macromolecules. Beginning with ideal single chain behavior, concepts and principles will be expanded and deepened to accommodate various boundary conditions that represent real situations involving novel polymers. By the end of the course, the students are expected to be familiar with the core principles and diverse situations in preparation for handling and understanding the behaviors of various novel polymers they will develop in the future.

授業計画 Course Schedule

- 1. Introduction of Polymers: A Brief History and Reflection
- 2. Innate Statisticality and Configuration of Polymers: Ideal to Real
- 3. Statistical Dynamics of Polymer Solutions
- 4. Phase Equilibria in Various Polymer Systems
- 5. Polymer Physical Properties I : Thermal and Phase Transition Characteristics
- 6. Polymer Physical Properties II : Mechanical Characteristics
- 7. Polymer Physical Properties III: Morphology and Self-assembly
- 8. Experimental Horizons of Polymer Characterization and Application

準備学習 (予習・復習)等の内容と分量 Homework

Final report on the subjects relating to the characterization and physical properties of polymers involving the application of the concepts learned from the lectures.

成績評価の基準と方法 Grading System

Your grade will be determined by how well you demonstrate your achievement of the course goals through

1. Participation to the discussion (10%)

2. Final report regarding to "characterization and physical properties of polymers" (90%)

他学部履修の条件 Other Faculty Requirements

テキスト・教科書 Textbooks

No textbook required, all teaching materials/slides to be provided

講義指定図書 Reading List

参照ホームページ Websites

https://hokkaidosummerinstitute.oia.hokudai.ac.jp/en/courses/CourseDetail=G043

研究室のホームページ Websites of Laboratory

http://poly-ac.eng.hokudai.ac.jp/index_e.html

科日名 Course Title	失避総合化学性論 II [Modern Trands in Chamical Sciences and Engineering II]			
護義題目 Subtitle	Advanced Applied Biochemistry[Advanced Applied Biochemistry]			
青仟教員 Instructor	Advanced Applied Dicelemistry[Advanced Applied Dicelemistry] 松本 謙一郎 [MATSUMOTO Kenichiro] (大学院工学研究院)			
担当教員 Other Instructors	HACHISUKA Shin-ichi (工学研究院), FUIITA Masahiro (RIKEN)			
科目種別 Course Type				
開講年度 Year	2025	時間割番号 Course Number	095137	
期間 Semester	Intensive	単位数 Number of Credits	1	
授業形態 Type of Class	Lecture	対象年次 Year of Eligible Student	~	
対象学科・クラス Eligible Depa	rtment/Class			
ナンバリングコード Numbering	Code	CHEM_REQEL 7121		
補足事項 Other Information				
授業実施方式 Class Method		1 対面授業科目《対面のみ》		
キーワード Key Words				
Genetic information, protein s	tructure, molecula	r mechanism, biosynthetic mechanism, ani	mal cells, secondary metabolites,	
biopolymers, bioremediation, p	hysical chemistry, (Genetic engineering, Bioinformatics		
授業の目標 Course Objectives	3			
To learn synthesis, structure	, function, and no	ovel engineering subjects on of biomolecu	les in the fields of life science,	
information, medicine, and envi	ronment.			
到達目標 Course Goals				
Students are expected to uno	lerstand deeply th	e topics of genetic information, protein s	tructure, animal cell cultivation,	
secondary metabolites, biopo	lymers, and clean	environments in the fields of life scie	nce, information, medicine, and	
environment.				
授莱計画 Course Schedule				
1-4: Structure, function and analytical methods of RNA and other biomolecules				
5-8: Strategies of metabolic pathways, and principles of enzymatic reactions, Genetic engineering, Bioinformatics				
年帽子目(ア目・後日)寺の内 Students review the lecture cou	tents by the next	n time. Students submit a report after the lect	liro	
成績評価の基準と方法 Gradin	g System	time. Students submit a report after the feet	sure.	
Active class participation and r	enorts			
The attendance rate must be o	ver 70% to be quali	fied to be graded.		
他学部履修の条件 Other Faci	ulty Requirements	neu to be gruded.		
テキスト・教科書 Textbooks				
講義指定図書 Reading List				
参照ナー / ページ Wabaitaa				
$\gamma_{\rm max}$ $\gamma_{\rm max}$ $\gamma_{\rm max}$ $\gamma_{\rm max}$				
The Residue and The Structure and The Structu				
https://biosynchem.eng.hokud	ai.ac.jp/			
備考 Additional Information				

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	「先端総合化学特論Ⅱ[Modern Trends in Chemical Sciences and Engineering II]				
請義題日 Subtitle	Introduction to Basic Biological Chemistry[Introduction to Basic Biological Chemistry]				
貢仕教員 Instructor	成不 义大 [MOTEGI Fumio] (遺伝于柄制御研究所)				
担当教員 Other Instructors	TAKAOKA Akinori (遺伝子病制御研究所), ABE Kazuhiro (埋字研究院)				
科目種別 Course Type					
開講年度 Year	2025	時間割番号 Course Number	095138		
期間 Semester	Intensive	単位数 Number of Credits	1		
授業形態 Type of Class	Lecture	対象年次 Year of Eligible Student	~		
対象学科 クラス Eligible Depa	artment/Class				
ナンバリングコード Numbering	ç Code	CHEM_REQEL 7121			
補足事項 Other Information					
授業実施方式 Class Method		1 対面授業科目《対面のみ》			
キーワード Kev Words					
cell growth and differentiation	on, gene express	ion, oncogene, immunity, infectious disc	ease, Membrane proteins, Primary		
transporters	,	,	,		
授業の目標 Course Objective	S				
The class focuses on fundam	ental aspects of r	nolecular mechanisms that underlie basic	biological phenomena such as cell		
growth, cell differentiation, in	mmunity and cellu	dar asymmetry. How disorder of the reg	culatory mechanism causes diseases		
including cancer and infection	us disease will be	discussed. In addition, various technolo	gies for imaging dynamic molecular		
behaviour in living cells, X-ray	v crystallography,	Crvo-EM, will be also discussed.	9100 101 mm.g.m.g. 4,		
到達目標 Course Goals	, or j stance				
Students to be able to unders	stand the basic re	gulatory mechanisms of gene expression.	cell growth and immune system and		
developing mechanisms for the	related diseases.	Sumony moonwinging of going appro,	Soli gionen and ministre system		
授業計画 Course Schedule					
Day 1 2. Fumio Motegi					
Interior design of cellular asym	ımetrv				
Dav 3. Akinori Takaoka	inicery				
Molecular signalings in host de	ofonse system				
Day 4. Kazuhiro Abe	Jone by stem				
Membrane transport proteins i	including active tar	nenartore			
進備学習(予習・復習)等の内	惑と分量 Homewo	rk			
Review the contents of each le	ecture by the next	time			
成績評価の基準と方法 Gradi	ng Svstem				
Report of the task (100%)					
他学部履修の条件 Other Fac	ulty Requirements				
	· · · · ·				
テキスト・教科書 Textbooks					
講義指定図書 Reading List					
参照ホームページ Websites					
https://hokkaidosummerinstitute.oia.hokudai.ac.jp/en/courses/CourseDetail=G044					
研究室のホームページ Websi	tes of Laboratory				
https://www.motegilab.com					
https://www.igm.hokudai.ac.in/sci/index-english.html					
https://www.hem.sci.hokudai.ac.jp/sci/index_english.html https://www.hem.sci.hokudai.ac.jn/~molbio/home-en/					
備者 Additional Information					

科目名 Course Title	総合化学研究インターンシップ[Internship]				
講義題目 Subtitle	ショート・ビジット[Short Visit]				
責任教員 Instructor	仙北 久典 [SENBOKU Hisanori] (大学院工学研究院)				
担当教員 Other Instructors					
科目種別 Course Type					
開講年度 Year	2025	時間割番号 Course Number	095151		
期間 Semester	Intensive	単位数 Number of Credits	1		
授業形態 Type of Class	Internship	対象年次 Year of Eligible Student	~		
対象学科・クラス Eligible Depa	rtment/Class				
ナンバリングコード Numbering	Code	CHEM_REQEL 7141			
補足事項 Other Information					
授業実施方式 Class Method		1 対面授業科目《対面のみ》			
キーワード Key Words					
Internship					
授業の目標 Course Objective:	6				
For overseas internship, stud	lents develop glo	bal vision by their experience overseas	, gain expertise and experimental		
techniques which seem to be ha	ard to obtain in Jaj	pan.			
到達目標 Course Goals					
For overseas internship, studer	its start to contac	t with where to do internship, then improv	e skills of communication, language,		
research practice, research ne	twork and commu	nity formation etc, so that they can raise	consciousness as an engineer or a		
researcher.	on the owneries of	at only level of basis studies the se	nut the experience to colleborative		
researches with a practical love	ep the experience	at only level of basic studies, try to ap	ply the experience to conaborative		
招生計画 Course Schedule	er mi the luture.				
The program will be generally of	onducted following	the schedule below			
The program will be generally e		s the senedule below.			
1 Announcement					
2 Application (not equal to Re	gistration)				
3. Preparation	810 01 001011)				
4. Internship for about between	n two weeks and tw	vo months			
5. Submission of a report for the	ne internship, pres	entation			
準備学習 (予習・復習)等の内容	容と分量 Homewor	ĸ			
Students need to do preliminar	y search and to pr	epare ecperiments in advance.			
成績評価の基準と方法 Gradin	g System				
Basically, students must submit	a report and do a	presentation in English language.			
They will be evaluated by the a	bove elements.				
他学部履修の条件 Other Faci	ulty Requirements				
テキスト•教科書 Textbooks					
使用しない 					
請義指定図書 Reading List 住田 よい、					
使用しない 会図ナーノ ページ W-L-1					
予照ホームヘーン Websites					
研究主のホームハーン Websites of Laboratory					
准书 Additional Information					

封日夕 Course Title	※ 今 ル 学 西 売 ♪	(A-) () () T[Internation]			
神日石 Course Nue 講美明日 Subtitle	総合化字研究インターシンツノ[Internship]				
語教題日 Subuue 吉仁約日 Instructor	ALP インターシンツノ [ALP Internship] 由軍 県子 [NAKATOMI Akika] (大学院理学研究院)				
月世教員 Instructor		ATOMI ARKO (入于阮垤于幼 九阮)			
	2025	吐 間 刻 妥 日 の 	005152		
用調平度 Year	2025	时间刮合方 Course Number	095152		
利间 Semester 怪学形能 Tures of Olesse	Intensive	单位数 Number of Credits			
技業が感 Type of Class 対象学科 クラス Eligible Depa	rtment/Class	对家中次 fear of Eligible Studerit			
イン イン イン イン イン イン イン イン イン イン	Codo	CHEM PEOEL 7142			
オロード Nullibering	Code	CHEM_NEQLE /142			
福定事項 Outer Information 協業実施支式 Class Mathed		1 計画授業利日//計画の7)			
技業実施方式 Class Metriod		1 刈面这条件日\ 刈面のみ//			
+					
技業の日標 Course Objective AI P Corporate Internshin: Stu	s donts improvo thoir	skill and knowledge by being engaged	in an actual work relating their future		
ALF Corporate internship. Stu	dents improve then	skill and knowledge by being engaged	in an actual work relating their future		
AIP Overseas Internshin: For	overseas internshir	students develop global vision by thei	r experience overseas, gain expertise		
and experimental techniques w	hich seem to be har	d to obtain in Ianan	r experience overseas, gain expertise		
到達目標 Course Goals					
Students start to contact with	n where to do inte	rnship, then improve skills of commun	ication, language, research practice,		
research network and communi	ty formation etc, so	that they can raise consciousness as a	n engineer or a researcher.		
For overseas internship, stud	ents should try no	t to keep the experience at only leve	el of basic studies, try to apply the		
experience to collaborative res	earches with a prac	tical level in the future.			
授業計画 Course Schedule					
ALP Corporate Internship:					
\cdot Period of Internship: As a rule	e, the internship pe	riod is more than 2 weeks within 12 mor	iths.		
· Posts: Domestic posts may co	onsist of corporate r	esearch institutions or plant.			
· In principle, deadlines for sub	missions are four w	eeks prior to departure.			
\cdot Obtain the Personal Accident	Insurance for Stud	ents Pursuing Education and Research (PAS) prior to travel.		
ALP Overseas Internship:					
• Period of Internship: As a rule	e, the internship pe	riod is more than 1 month within 12 mor	nths.		
• Posts: Overseas posts will ma	inly consist of unive	ersity research institutions or corporation	on.		
• In principle, deadlines for sub	missions are six we	eks prior to departure.			
• Obtain travel insurance prior	to travel.				
Students are required to submi 進備学習(実習・復習)等へ内容	t a report within on 応レムー レー・・・・	e month of completing the internship.			
年順子首(ア首·復首)寺の内 Students need to de preliminar	合と方 <u>■</u> nomework	nore experiments in advance			
成績評価の其進と方法 Gradin	y search and to pre	pare experiments in advance.			
展asically students must submi	t a report and do a	presentation (in English language for ov	orsoas internshin)		
They will be evaluated by the a	Dasically, students must submit a report and do a presentation (in English language for overseas internship).				
mey win be evaluated by the above elements. 他学部履修の各性 Other Faculty Requirements					
Only ALP students can take this course.					
マート 教科書 Textbooks					
使用しない。					
講義指定図書 Reading List					
使用しない。					
参照ホームページ Websites					
https://phdiscover.jp/hu/alp/					
研究室のホームページ Websites of Laboratory					
偏考 Additional Information					

科目名 Course Title	総合化学研究イン	/ターンシップ [Internship]	
講義題目 Subtitle	ジョブ型研究インターンシップ「Cooperative Education through Research Internship]		
責任教員 Instructor	仙北 久典 [SENBOKU Hisanori] (大学院工学研究院)		
担当教員 Other Instructors			
科目種別 Course Type			
開講年度 Year	2025	時間割番号 Course Number	095153
期間 Semester	Intensive	単位数 Number of Credits	1
授業形態 Type of Class	Internship	対象年次 Year of Eligible Student	~
対象学科 • クラス Eligible Department/Class			
ナンバリングコード Numbering Code		CHEM_REQEL 7142	
補足事項 Other Information			
授業実施方式 Class Method		1 対面授業科目《対面のみ》	
キーワード Key Words			
Domestic internship			
授業の目標 Course Objectives			
Students improve their skill and knowledge by being engaged in an actual work relating their future career.			
到達目標 Course Goals			
Students start to contact with where to do internship, then improve skills of communication, language, research practice,			
research network and community formation etc, so that they can raise consciousness as an engineer or a researcher.			
函集計画 Course Sebadula			
The program will be generally conducted following the schedule below			
The program will be generally conducted following the senedale below.			
1 Announcement			
2. Application (not equal to Registration)			
3. Preparation			
4. Internship for two months or more			
5. Recieve evaluation form from the company			
準備学習 (予習・復習)等の内容と分量 Homework			
Students need to do preliminary search and to prepare experiments in advance.			
成績評価の基準と方法 Grading System			
Pass/fail will be determined based on the evaluation forms submitted by the companies.			
他子 印度修 の 宋十 Other Faculty Requirements			
ニナフレ お付き て			
ナイヘト・叙州書 Textbooks			
法差指定図書 Reading List			
使用しない			
参照ホームページ Websites			
https://coopj-intern.com/			
研究室のホームページ Websites of Laboratory			
備考 Additional Information			
Only MEXT "ジョブ型研究イン	ターンシップ" part	cipants can register for this program.	