

Academic Year 2018

Special Integrated Science Course

Syllabus (Classes)

April 1st, 2018

Osaka University, Graduate School of Science

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1 Master Course

1. Master Course

(SISC)Organic Biochemistry

Course Code	24S043
Course Number	
Credits	1
Instructor	KAJIHARA Yasuhiro Office:
Office Hours	Anytime, but I need an e-mail before.
Eligibility	Graduate students, G30 students
Schedule	Summer Term Period: Tue1
Room	理/D301 講義室
Type of Class	Lecture Subject
Course Objective	The aim of this class is to understand natural product chemistry such as carbohydrates and proteins.
Learning Goals	understanding of natural products and their functions
Requirements, Prerequisites	This class by English will be given once every two years (2012: English)
Special Note	This class will give a lecture on the topics including carbohydrate chemistry, glycobiology, protein-carbohydrate interaction, and glycoprotein chemistry.
Class Plan	1:molecular recognition-1 carbohydrate 2:molecular recognition-2 protein 3:molecular recognition-3 enzyme 4:Enzyme reaction-1 5:Enzyme reaction-2 6:Inhibitor-1 7:transition state theory
Independent Study Outside of Class	reading of journals
Textbooks	Several resumes will be given.
References	Stryer Biochemistry
Grading Policy	Grading is based on submission of report
Other Remarks	

(SISC)Chemistry on Catalysis

Course Code	24S042
Course Number	
Credits	1
Instructor	SASAI Hiroaki Office:
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Office Hours	
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Eligibility	
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Schedule	Winter Term Period: Tue2
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Room	理/D301 講義室
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Type of Class	Lecture Subject
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Course Objective	Recent transition metal catalyses, and organocatalyses, especially enantioselective catalyses will be covered.
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Learning Goals	Learning goals of this course is understanding basic methodology of catalytic reaction mechanism such as kinetic isotope effect, crossover experiment, and asymmetric amplification.
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Requirements,	none
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Prerequisites	
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Special Note	
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Class Plan	Seven lectures and one examination
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Independent	minimum requirement is 14 hours in total
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Study Outside of	
Class	
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Textbooks	
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References	
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Grading Policy	based on attendance to the course and examination
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Other Remarks	

(SISC)Natural Product Chemistry

Course Code	24S049	
Course Number		
Credits	1	
Instructor	FUKASE Koichi Office:	
Office Hours		
Eligibility	Department of Chemistry, Master's course	Optional
Schedule	Spring Term	Period: Tue1
Room	理/D301 講義室	
Type of Class	Lecture Subject	
Course Objective	This course deals with the importance of the role of chemistry in rapidly growing interdisciplinary research areas spanning chemistry and biology, with a focus on research related to bioactive glycoconjugates. Students are expected to gain an understanding of the body of research that has evolved from use of chemical approaches including the chemical synthesis of sugar chains as well as new techniques.	
Learning Goals	Students can understand the chemical synthesis of oligosaccharides and peptides.	
Requirements, Prerequisites	None specified	
Special Note		
Class Plan	<p>[Course Content]</p> <p>Overview of bioactive glycoconjugates; Chemical synthesis of carbohydrates; Glycoconjugates with immunoenhancement activity on the surface layer of bacteria; Chemical synthesis of bioactive peptides</p> <p>[Class plan]</p> <ol style="list-style-type: none"> 1. Overview of bioactive glycoconjugates 2. Chemical synthesis of carbohydrates: Selective protection of functional groups 3. Chemical synthesis of carbohydrates: Reactions involving glycosidic bond formation 4. Glycoconjugates with immunoenhancement activity on the surface layer of bacteria: Structure, chemical synthesis, and function of peptidoglycans 5. Glycoconjugates with immunoenhancement activity on the surface layer of bacteria: Chemical synthesis and function of lipopolysaccharides 6. Chemical synthesis of bioactive peptides Part 1 7. Chemical synthesis of bioactive peptides Part 2 7.5. Summary 	
Independent Study Outside of Class	Students are required to review each lecture and prepare a report.	
Textbooks		
References	Appropriate reviews and other papers will be introduced as needed.	
Grading Policy	The final grade is based on comprehensive evaluation of reports, discussions, and results of the final examination.	

Other Remarks

1. Master Course

(SISC)Advanced Chemical Experiment(For Students Enrolled Fall)

Course Code	24S010
Course Number	24CHEM6G014
Credits	1
Instructor	FUNAHASHI Yasuhiro Office: SHIMOYAMA Atsushi Office:
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Office Hours	
Eligibility	Department of Chemistry, Bioscience, Macromolecular Science / Master Course(Special Integrated Science Course) each academic year optional required
Schedule	Intensive Period: Other
Room	その他
Type of Class	Experimental Subject
Course Objective	This course provides hands-on training in analytical methods, as well as didactic training in the fundamental principles of the techniques.
Learning Goals	Students understand practical analytical techniques.
Requirements, Prerequisites	
Special Note	
Class Plan	[Course Content] NMR spectroscopy, ESR spectroscopy, X-ray diffraction analysis, mass spectrometry, and electron microscopy.
Independent Study Outside of Class	Students are required to review the lecture content for doing practical experiments in their research works.
Textbooks	
References	
Grading Policy	The evaluation of each course is performed.
Other Remarks	

(SISC)Topics in Inorganic Chemistry

Course Code	24S048
Course Number	
Credits	1
Instructor	FUNAHASHI Yasuhiro Office: ISHIKAWA Naoto Office: YOSHIMURA Takashi Office:
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Office Hours	
Eligibility	Department of Chemistry, Master course Optional
Schedule	Spring and Summer Term Period: Mon2
Room	理/D307 講義室
Type of Class	Lecture Subject
Course Objective	This course deals with selected topics and the relevant basics of inorganic chemistry, including coordination chemistry, magnetochemistry, radiochemistry, and bioinorganic chemistry.
Learning Goals	For instance, students will be able to understand i) relationship between electronic configuration and magnetic properties of d and f orbitals in coordination chemistry, ii) the fundamental chemistry of radioisotopes and application in radiochemistry, and iii) functions and reaction mechanisms of transition metal-containing metalloproteins in bioinorganic chemistry.
Requirements,	None specified
Prerequisites	
Special Note	
Class Plan	1. Overview of Selected Topics in inorganic chemistry 2. Coordination chemistry and magnetochemistry 1 3. Coordination chemistry and magnetochemistry 2 4. Radiochemistry 1 5. Radiochemistry 2 6. Bioinorganic Chemistry 1 7. Bioinorganic Chemistry 2
Independent Study Outside of Class	Students are required to review and further investigate the lecture content every week. Based on these independent studies, they should make reports and understand all the contents in detail.
Textbooks	
References	
Grading Policy	The final grade is totally evaluated on reports and examinations of each topic.
Other Remarks	This lecture will start on May 16. The following schedules will be shown in the first lecture.

1. Master Course

(SISC)Analytical Chemistry for Interface

Course Code	24S064
Course Number	24CHEM6G003
Credits	1
Instructor	TSUKAHARA Satoshi Office:
Office Hours	
Eligibility	Graduate students, SISC students Master course Optional
Schedule	Fall Term Period: Fri2
Room	理/B301 講義室
Type of Class	Lecture Subject
Course Objective	Principle of interfacial tension, methods for determination of interfacial tension, some interface-specific spectroscopy, some chemical phenomena at liquid/liquid interface.
Learning Goals	You can understand some chemical phenomena occurring at liquid/liquid interfaces.
Requirements, Prerequisites	
Special Note	
Class Plan	<ol style="list-style-type: none">1. Thermodynamics of interfacial tension2. Method for the determination of interfacial tension (I)3. Method for the determination of interfacial tension (II)4. Specific interfacial phenomena5. Interface-specific spectroscopy6. Second-harmonic generation, sum frequency generation7. Total-internal reflection, conclusion
Independent	Before lecture, you should read the documents.
Study Outside of Class	After lecture, you should read the documents again and you should check your notebook and the calculations.
Textbooks	Documents distributed by me.
References	
Grading Policy	Reports and attendance
Other Remarks	

(SISC)Structural Organic Chemistry

Course Code	24S045
Course Number	
Credits	1
Instructor	KUBO Takashi Office:
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Office Hours	
Eligibility	Department of Chemistry, Bioscience, Macromolecular Science / Master Course(Special Integrated Science Course) each academic year optional
Schedule	Fall Term Period: Tue4
Room	理/D301 講義室
Type of Class	Lecture Subject
Course Objective	This course provides a overview of the fundamental principles of organic structure and property.
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Learning Goals	
Requirements,	
Prerequisites	
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Special Note	
Class Plan	【Course Content】 Lectures regarding the following topics are provided. 1.Chemical bonds 2.Conjugation 3.Steric hindrance 4.Aromaticity 5.Charge transfer complexes and electoro-conductive materials 6.Free radicals and magnetic materials
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Independent Study Outside of Class	
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Textbooks	
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References	
Grading Policy	Grading will be done based on the results of attendance and examination.
Other Remarks	

1. Master Course

(SISC)Advanced Chemical Experiment(For Students Enrolled Spring)

Course Code	24S807
Course Number	24CHEM6G014
Credits	1
Instructor	FUNAHASHI Yasuhiro Office: SHIMOYAMA Atsushi Office:
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Office Hours	
Eligibility	Department of Chemistry, Bioscience, Macromolecular Science / Master Course(Special Integrated Science Course) each academic year optional required
Schedule	Full Year Period: Other
Room	その他
Type of Class	Experimental Subject
Course Objective	This course provides hands-on training in analytical methods, as well as didactic training in the fundamental principles of the techniques.
Learning Goals	Students understand practical analytical techniques.
Requirements, Prerequisites	
Special Note	
Class Plan	[Course Content] NMR spectroscopy, ESR spectroscopy, mass spectrometry, and etc.
Independent Study Outside of Class	Students are required to review the lecture content for doing practical experiments in their research works.
Textbooks	
References	
Grading Policy	The evaluation of each course is performed.
Other Remarks	

(SISC)Introductory Biology

Course Code	24S057
Course Number	24BISC5K201
Credits	2
Instructor	TAK YON-SOO Office:
Office Hours	Monday-Friday 09:00 - 16:30
Eligibility	
Schedule	Spring and Summer Term Period: Wed1
Room	理/B307 講義室
Type of Class	Lecture Subject
Course Objective	The Introductory Biology course provides fundamental knowledge required to solve questions in current biology. We offer a comprehensive introduction to basic cellular and molecular biology. The contents are organized into three areas: Chemistry of Cells, Molecules of Cells, and Engineering of Cells.
Learning Goals	In completing this course, you should be able to understand topics in current biology and to apply the knowledge to your research project.
Requirements, Prerequisites	
Special Note	
Class Plan	<p>The following contents will be covered:</p> <ol style="list-style-type: none">1. Introduction: Biology Today2. Essential Chemistry for Biology3. The Molecules of Life - Proteins and Protein Structure4. The Molecules of Life - Enzymes, and Glycolysis5. Cellular Reproduction: Cells from Cells6. Patterns of Inheritance7. Practice Exam8. The Structure and Function DNA9. How and Why Genes Are Regulated10. Genome Structure, Chromatin, and the Nucleosome11. DNA Metabolism - Replication and Repair12. DNA Metabolism - Homologous Recombination13. DNA Technology - Genetic Engineering14. DNA Technology - Bioinformatics15. Summary and Final Exam <p>NOTE: This syllabus is subjected to change based on the needs of the class.</p>
Independent Study Outside of Class	This class encourage student's independent studies by using of online materials or discussion with instructors.
Textbooks	handouts
References	Campbell Essential Biology (Global Edition). Eric J. Simon, et al., Person, 2015 Molecular Biology of the Gene (7/e), James D. Watson et al., CSH Press, 2013

1. Master Course

Grading Policy	Reading related assignments: 40%
	Report or Exam: 30%
	Attendance: 30%

Other Remarks

(SISC)Basic Biology II

Course Code	24S002
Course Number	24BISC5K130
Credits	2
Instructor	Professors in Department of Biology
	KAKIMOTO Tatsuo
	SHINOHARA Akira
	NAKAGAWA Takuro
	Masato Okada
Office Hours	any time. Just send e-mail to get the reservation
Eligibility	
Schedule	Fall and Winter Term Period: Other
Room	その他
Type of Class	Lecture Subject
Course Objective	
Learning Goals	
Requirements,	By learning basic knowledge, skill to apply the knowledge in a wider view
Prerequisites	will be trained. It is important to know how molecular biology and molecular genetics have been developed. Particularly, what kinds of experimental data helps develop basic concepts in the fields.
Special Note	
Class Plan	<ol style="list-style-type: none">1. Repair of collapsed DNA replication forks2. recombination and telomere3. recombination in immune system4. genome instability and aging5. epigenetics and genome stability6. chromosome dynamics and genome stability7. chromosome morphogenesis in meiosis <p>Each topics will be give at least twice.</p>
Independent	
Study Outside of	
Class	
Textbooks	No needs on typical text books. Refer famous textbooks such as Molecular biology of Genes, JD Watson et al. More importantly, papers must-read will be referred during the class.
References	
Grading Policy	attendance and reports given
Other Remarks	

1. Master Course

(SISC) Biological Science III

Course Code	24S034
Course Number	24BISC5K130
Credits	0
Instructor	KURISU Genji Office:
Office Hours	
Eligibility	Graduate student of SISC each academic year
Schedule	Optional
Schedule	Intensive Period: Other
Room	蛋/1 階講堂
Type of Class	Lecture Subject
Course Objective	Biological phenomena are based on the structure and the interaction of biological molecules. We will study the biology for the analysis of biomolecular structure and the related biological functions by biophysical methods. These studies need the experimental techniques for biological sample preparation and understanding of biology. Thus we will learn advanced biology at molecular levels as well as the methods based on chemistry and physics.
Learning Goals	Student can read research papers on physical biology
Requirements,	Basic biology, chemistry and physics as studied in undergraduate courses
Prerequisites	
Special Note	Topics are related to the study of structure and function of biological molecules by methods for structural biology. The methods for sample preparation, magnetic resonance experiments and computer analysis of the data are important subjects in this course.
Class Plan	This will be shown in the class.
Independent	Read review papers on Bioscience based on physical chemistry
Study Outside of	
Class	
Textbooks	This will be shown in the class.
References	This will be shown in the class.
Grading Policy	Results and process for the study, presentation of the research paper will be evaluated.
Other Remarks	Students are required to study actively by themselves. Reading of research papers and conducting experiments are not enough. Students should elucidate the relationship between their own research results and what already known.

(SISC)Basic Biology I

Course Code	24S001
Course Number	24BISC5K130
Credits	2
Instructor	Professors in Department of Biology KAKIMOTO Tatsuo SHINOHARA Akira FURUYA Hidetaka NAKAGAWA Takuro Masato Okada
Office Hours	any time. Just send e-mail to get the reservation
Eligibility	Master each academic year
Schedule	Spring and Summer Term Period: Other
Room	その他
Type of Class	Lecture Subject
Course Objective	To learn basic knowledge on genome-chromosome functions. We will focus on genome stability and instability.
Learning Goals	By learning basic knowledge, skill to apply the knowledge in a wider view will be trained. It is important to know how molecular biology and molecular genetics have been developed. Particularly, what kinds of experimental data helps develop basic concepts in the fields.
Requirements,	
Prerequisites	
Special Note	
Class Plan	<ol style="list-style-type: none">1. DNA repair-in general2. DNA double-strand break repair3. meiotic recombination4. diseases associated with defects in the recombination5. cancer and genome instability6. chromosome dynamics in mitosis7. chromosome dynamics in meiosis <p>Each topics will be give at least twice.</p>
Independent Study Outside of Class	
Textbooks	No needs on typical text books. Refer famous textbooks such as Molecular biology of Genes, JD Watson et al.
References	
Grading Policy	attendance and reports given
Other Remarks	

1. Master Course

(SISC)Current Topics II「i-biomacromolecular science」

Course Code	24S015	
Course Number	24CHEM6P200,24BISC6P200,24MASC6P200	
Credits	1	
Instructor	OKUDA Mitsuhiro	Office:
	HASHIZUME Akihito	Office:
	IMADA Katsumi	Office:
Office Hours		
Eligibility	Graduate School of Science, Master's and Doctoral Programs From M1 to D3 Optional	
Schedule	Intensive	Period: Other
Room	掲示により通知	
Type of Class	Lecture Subject	
Course Objective	The course will present an overview of the main classes of biomacromolecules, including proteins, nucleic acids, and polysaccharides, from the viewpoint of polymer science. The physico-chemical properties and self-assembly of biomacromolecules in solutions will be presented. A second objective of the course is to illustrate how biomacromolecules are converted into building blocks of biomaterials, with emphasis on the chemical modification of biomacromolecules and on the self-assembly in solution and on interfaces. Basic knowledge of organic chemistry and polymer science is required.	
Learning Goals	The course is aimed to equip graduate students with the tools needed to understand contemporary research articles related to biomacromolecules and to carry out innovative research in the fields of biomaterials and drug delivery systems.	
Requirements,		
Prerequisites		
Special Note		
Class Plan		
Independent	Students are required to read the references indicated.	
Study Outside of		
Class		
Textbooks	Not specified.	
References	1. Relevant chapters in organic textbooks, such as: J.McMurry, Organic Chemistry: a Biological Approach; 2007, Thomson Corp. 2. C. S. Tsai, Biomacromolecules: Introduction to Structure, Fonction and Informatics. 2007, Wiley. 3. Selected reviews and articles will be provided ahead of the course.	
Grading Policy	Course attendance and participation (50%) Report (50 %)	
Other Remarks		

(SISC)Current Topics I「Carbohydrates:biofunction and chemical synthesis」

Course Code	24S014
Course Number	24CHEM6P200,24BISC6P200,24MASC6P200
Credits	1
Instructor	FUKASE Koichi Office:
Office Hours	Not applicable.
Eligibility	Doctor course and Master course students Optional
Schedule	Intensive Period: Other
Room	掲示により通知
Type of Class	Lecture Subject
Course Objective	Lecture for Special Integrated Science Course. Prof. Dr. Shang-cheng Hung will give the lecture. The topics is glycochemistry and glycobiology.
Learning Goals	Basic knowledge in glycochemistry and glycobiology will be obtained.
Requirements, Prerequisites	
Special Note	Dr. Shang-cheng Hung is a Distinguished Research Fellow & Director of Genomics Research Center, Academia Sinica, Taipei, Taiwan.
Class Plan	<ol style="list-style-type: none">1. Carbohydrates and Life (I)2. Carbohydrates and Life (II)3. Metabolism of Carbohydrates4. Regioselective One-pot Protection of Carbohydrates5. Stereoselective One-pot Glycosylation of Carbohydrates6. Probing Specific Cell-Surface Heparan Sulfate-Protein Interactions7. Molecular Origami
Independent Study Outside of Class	Students are required to review the seminar.
Textbooks	Not applicable.

1. Master Course

References	<p>1. Insights into Interactions of Mycobacteria with the Host Innate Immune System from a Novel Array of Synthetic Mycobacterial Glycans. Zheng RB, Jégouzo SAF, Joe M, Bai Y, Tran HA, Shen K, Saupe J, Xia L, Ahmed MF, Liu YH, Patil PS, Tripathi A, Hung SC, Taylor ME, Lowary TL, Drickamer K. ACS Chem Biol. 2017 Dec 15;12(12):2990-3002. doi: 10.1021/acschembio.7b00797.</p> <p>2. Synthetic heparin and heparan sulfate: probes in defining biological functions. Tsai CT, Zulueta MML, Hung SC. Curr Opin Chem Biol. 2017 Oct;40:152-159. doi: 10.1016/j.cbpa.2017.09.012.</p> <p>3. Stereoselective one-pot synthesis of polypropionates. Ho GM, Zulueta MML, Hung SC. Nat Commun. 2017 Sep 25;8(1):679. doi: 10.1038/s41467-017-00787-y.</p> <p>4. Structure of the Complex between a Heparan Sulfate Octasaccharide and Mycobacterial Heparin-Binding Hemagglutinin. Huang TY, Irene D, Zulueta MM, Tai TJ, Lain SH, Cheng CP, Tsai PX, Lin SY, Chen ZG, Ku CC, Hsiao CD, Chyan CL, Hung SC. Angew Chem Int Ed Engl. 2017 Apr 3;56(15):4192-4196. doi: 10.1002/anie.201612518..</p> <p>5. Structural basis for oligomerization and glycosaminoglycan binding of CCL5 and CCL3. Liang WG, Triandafillou CG, Huang TY, Zulueta MM, Banerjee S, Dinner AR, Hung SC, Tang WJ. Proc Natl Acad Sci U S A. 2016 May 3;113(18):5000-5. doi: 10.1073/pnas.1523981113.</p>
Grading Policy	<p>1. Participation 50% (including group discussion, problem solving etc. activities) 2. Written reports 50%</p>

Other Remarks

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URL http://www.sci.osaka-u.ac.jp/ja/campuslife/coursedescription_d/

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