2020

Syllabi

Science
(Undergraduate Courses)

Rikkyo University

CA001

Course Title	Introduction to Mathematics		
Instructor	Sato Nobuya		
Semester	Spring Semester	Credit	2 Credits
Course Number	MAT1000	Language	Japanese

Course Objectives

Learn the basic ways of thinking and use of symbols needed to study mathematics and the basics of linear algebra (vectors and matrices).

Course Contents

In the first half you will learn the fundamentals of sets and mappings. In the second half you will learn the fundamentals of vectors and matrices, which are required in order to study “Linear Algebra 1” in the fall semester.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA001&syllabuslink=1

CA002

Course Title	Exercises in Introduction to Mathematics		
Instructor	Sato Nobuya		
Semester	Spring Semester	Credit	1 Credit
Course Number	MAT1000	Language	Japanese

Course Objectives

Through various examples, students deepen their understanding of what they learned in the lectures.

Course Contents

This focuses on solving practice problems based on the lectures of “Introduction to Mathematics.”

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA002&syllabuslink=1

CA003

Course Title	Linear Algebra 1		
Instructor	Saito Yoshihisa		
Semester	Fall Semester	Credit	2 Credits
Course Number	MAT1100	Language	Japanese

Course Objectives

Learn the basics of linear algebra. Specifically, you will be able to add, multiply and calculate the determinant of matrices precisely. You will also understand the application of calculations using matrices, such as for solving simultaneous linear equations. You will also become familiar with abstract concepts such as matrix rank and linear mapping.

Course Contents

Linear algebra is an indispensable tool in mathematics and physics and has a wide range of applications. “Introduction to Mathematics” touches on the basics, but full-scale study occurs here in “Linear Algebra 1” and in “Linear Algebra 2” in the spring semester of year 2.

In “Linear Algebra 1,” students begin by learning basic computation methods for numerical vectors and matrices, then learn basic calculation methods for the determinant of square matrices and inverse matrices. It also touches on the application of matrix concepts such as solving simultaneous linear equations using matrices and linear mapping. These applications prepare you for more abstract discussions that you will study in “Linear Algebra 2.”

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.

<URL>

https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA003&syllabuslink=1

CA004

Course Title	Exercises in Linear Algebra 1		
Instructor	Saito Yoshihisa		
Semester	Fall Semester	Credit	1 Credit
Course Number	MAT1100	Language	Japanese

Course Objectives

Learn the basics of linear algebra. Specifically, you will be able to add, multiply and calculate the determinant of matrices precisely. You will also understand the application of calculations using matrices, such as for solving simultaneous linear equations. You will also become familiar with abstract concepts such as matrix rank and linear mapping.

Course Contents

Linear algebra is an indispensable tool in mathematics and physics and has a wide range of applications. “Introduction to Mathematics” touches on the basics, but full-scale study occurs here in “Linear Algebra 1” and in “Linear Algebra 2” in the spring semester of year 2.

In “Linear Algebra 1,” students begin by learning basic computation methods for numerical vectors and matrices, then learn basic calculation methods for the determinant of square matrices and inverse matrices. It also touches on the application of matrix concepts such as solving simultaneous linear equations using matrices and linear mapping. These applications prepare you for more abstract discussions that you will study in “Linear Algebra 2.”

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.

<URL>

https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA004&syllabuslink=1

CA005

Course Title	Introduction to Differential and Integral Calculus		
Instructor	Kakei Saburou		
Semester	Spring Semester	Credit	2 Credits
Course Number	MAT1300	Language	Japanese

Course Objectives

Learn the basic theory and calculation methods for real single-variable functions, such as differentiation and limits.

Course Contents

We will start with a review of high-school calculus, and then explain how to handle it more rigorous manner. In “Introduction to Differential and Integral Calculus” and “Exercises in Introduction to Differential and Integral Calculus” in the spring semester, we focus on differentiation. University-level mathematics places high emphasis on rigorous logic; the objective of this lecture is to touch on what it means to “treat rigorously” through the studies on calculus.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA005&syllabuslink=1

CA006

Course Title	Exercises in Introduction to Differential and Integral Calculus		
Instructor	Kakei Saburou		
Semester	Spring Semester	Credit	1 Credit
Course Number	MAT1300	Language	Japanese

Course Objectives

Learn the basic theory and calculation methods for real single-variable functions, such as differentiation and limits.

Course Contents

We will start with a review of high-school calculus, and then explain how to handle it more rigorous manner. In "Introduction to Differential and Integral Calculus" and "Exercises in Introduction to Differential and Integral Calculus" in the spring semester, we focus on differentiation. University-level mathematics places high emphasis on rigorous logic; the objective of this lecture is to touch on what it means to "treat rigorously" through the studies on calculus.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA006&syllabuslink=1

CA007

Course Title	Differential and Integral Calculus 1		
Instructor	Kakei Saburou		
Semester	Fall Semester	Credit	2 Credits
Course Number	MAT1300	Language	Japanese

Course Objectives

Understand the theory of differentiation and integration for real single variable functions, and learn their practical use through application to concrete examples.

Course Contents

Based on the contents of the “Introduction to Differential and Integral Calculus” lecture, the basic theory of differentiating and integrating single variable functions is studied. In “Differential and Integral Calculus 1” and “Exercises in Differential and Integral Calculus 1” in the fall semester, we focus on integration. In particular, the objective is to define the concept of definite integrals in the mathematically rigorous form of the “Riemann Integral” and to derive the basic properties based on that definition. The course also handles integration over infinite intervals, which has important applications. The basic properties of function series are studied by touching on specific functions.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA007&syllabuslink=1

CA008

Course Title	Exercises in Differential and Integral Calculus 1		
Instructor	Kakei Saburou		
Semester	Fall Semester	Credit	1 Credit
Course Number	MAT1300	Language	Japanese

Course Objectives

Understand the theory of differentiation and integration for real single variable functions, and learn their practical use through application to concrete examples.

Course Contents

Based on the contents of the “Introduction to Differential and Integral Calculus” lecture, the basic theory of differentiating and integrating single variable functions is studied. In “Differential and Integral Calculus 1” and “Exercises in Differential and Integral Calculus 1” in the fall semester, we focus on integration. In particular, the objective is to define the concept of definite integrals in the mathematically rigorous form of the “Riemann Integral” and to derive the basic properties based on that definition. The course also handles integration over infinite intervals, which has important applications. The basic properties of function series are studied by touching on specific functions.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA008&syllabuslink=1

CA009

Course Title	Introduction to Computer Science 1		
Instructor	Komori Yasushi		
Semester	Spring Semester	Credit	2 Credits
Course Number	MAT1400	Language	Japanese

Course Objectives

The objective of this course is to learn the basics of computers, which are essential in modern life.

Course Contents

In this lecture, students learn the fundamentals of computer science. Starting with numerical representation methods in data processing, the structure and operating principles of computer hardware and software is explained.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA009&syllabuslink=1

CA010

Course Title	Exercises in Introduction to Computer Science 1		
Instructor	Komori Yasushi/Kojima Shota		
Semester	Spring Semester	Credit	1 Credit
Course Number	MAT1400	Language	Japanese

Course Objectives

The objective of this course is to learn the basics of computers, which are essential in modern life. Studies focus on word processing, spreadsheet and presentation software.

Course Contents

Deals with the use of computers as stationary (what is known as “information literacy”). Learn about uses of computer technology that are necessary for university life, such as preparing a report using a Japanese word processor and retrieving information with a web browser. Also learn about how to transmit information using computers, such as by using presentation software.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA010&syllabuslink=1

CA011

Course Title	Introduction to Computer Science 2		
Instructor	Komori Yasushi		
Semester	Fall Semester	Credit	2 Credits
Course Number	MAT1400	Language	Japanese

Course Objectives

The objective is to learn the fundamentals of programming through learning the C language, which is one of the programming languages.

Course Contents

With the theme of learning and studying mathematics using computers, learn the fundamentals of computing such as programming in the C language. First, students learn about programming fundamentals such as conditional judgments, loops and functions, and learn how to think like a computer to analyze and solve problems. Next, students aim to apply this computational approach to a variety of mathematical problems to deepen their studies.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA011&syllabuslink=1

CA012

Course Title	Exercises in Introduction to Computer Science 2		
Instructor	Komori Yasushi		
Semester	Fall Semester	Credit	1 Credit
Course Number	MAT1400	Language	Japanese

Course Objectives

The objective is to learn the fundamentals of programming through learning the C language, which is one of the programming languages.

Course Contents

With the theme of learning and studying mathematics using computers, learn the fundamentals of computing such as programming in the C language. First, students learn about programming fundamentals such as conditional judgments, loops and functions, and learn how to think like a computer to analyze and solve problems. Next, students aim to apply this computational approach to a variety of mathematical problems to deepen their studies.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA012&syllabuslink=1

CA013

Course Title	Linear Algebra 2		
Instructor	Aoki Noboru		
Semester	Spring Semester	Credit	2 Credits
Course Number	MAT2100	Language	Japanese

Course Objectives

Understand the matrix and vector theories learned in “Linear Algebra 1” from a more abstract point of view. Specifically, students begin by understanding concepts such as the basis of vector space, linear independence, dimensions and subspace, then understand linear mapping in vector spaces and its matrix representation.

Course Contents

In “Linear Algebra 1” you learned about specific numerical vector and matrix operations, but in “Linear Algebra 2” you will learn about vector space and linear mapping as abstractions. The difference between these is whether the “basis” of the vector space is fixed or not. The perspective of calculation and theory can be much improved by giving more flexibility to the method of finding the “basis,” and abstractions done here have important applications. In the lessons, after vector space is explained, linear mapping within the vector space and its matrix representation is described. The relationship between the method of finding the basis of the vector space and the matrix representation of a linear map is an important theme. Related to this, the diagonalization of square matrices is explained. Finally, applications of diagonalization are explained.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA013&syllabuslink=1

CA014

Course Title	Exercises in Linear Algebra 2		
Instructor	Aoki Noboru		
Semester	Spring Semester	Credit	1 Credit
Course Number	MAT2100	Language	Japanese

Course Objectives

Understand the matrix and vector theories learned in “Linear Algebra 1” from a more abstract point of view. Specifically, students begin by understanding concepts such as the basis of vector space, linear independence, dimensions and subspace, then understand linear mapping in vector spaces and its matrix representation.

Course Contents

In “Linear Algebra 1” you learned about specific numerical vector and matrix operations, but in “Linear Algebra 2” you will learn about vector space and linear mapping as abstractions. The difference between these is whether the “basis” of the vector space is fixed or not. The perspective of calculation and theory can be much improved by giving more flexibility to the method of finding the “basis,” and abstractions done here have important applications. In the lessons, after vector space is explained, linear mapping within the vector space and its matrix representation is described. The relationship between the method of finding the basis of the vector space and the matrix representation of a linear map is an important theme. Related to this, the diagonalization of square matrices is explained. Finally, applications of diagonalization are explained.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA014&syllabuslink=1

CA015

Course Title	Intoroduction to Theory of Groups		
Instructor	Aoki Noboru		
Semester	Fall Semester	Credit	2 Credits
Course Number	MAT2100	Language	Japanese

Course Objectives

This is the first lecture in abstract algebra. Using the symmetric group as an example, group theory is introduced on a beginner level. The goal of this lecture is to become familiar with abstract algebraic thinking, and it is a prerequisit for the Algebra lecture in the 3rd year.

Course Contents

Point symmetry, planar symmetry, rotation symmetry, and other symmetries are often encountered in nature. Group theory is a method of treating symmetries in a mathematical way, as groups are transformations which preserve symmetries. The aim of this lecture is to become familiar with abstract algebra, by learning how to formally deduce properties from axioms. Using many concrete examples the students will get familiar with the concept of groups, and will undestand the fundamental concepts of ″structure″ and ″homomorphism″ of algebra.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA015&syllabuslink=1

CA016

Course Title	Exercises in Intoroduction to Theory of Groups		
Instructor	Aoki Noboru		
Semester	Fall Semester	Credit	1 Credit
Course Number	MAT2100	Language	Japanese

Course Objectives

This is the first lecture in abstract algebra. Using the symmetric group as an example, group theory is introduced on a beginner level. The goal of this lecture is to become familiar with abstract algebraic thinking, and it is a prerequisit for the Algebra lecture in the 3rd year.

Course Contents

Point symmetry, planar symmetry, rotation symmetry, and other symmetries are often encountered in nature. Group theory is a method of treating symmetries in a mathematical way, as groups are transformations which preserve symmetries. The aim of this lecture is to become familiar with abstract algebra, by learning how to formally deduce properties from axioms. Using many concrete examples the students will get familiar with the concept of groups, and will undestand the fundamental concepts of ″structure″ and ″homomorphism″ of algebra.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA016&syllabuslink=1

CA017

Course Title	Differential and Integral Calculus 2		
Instructor	Sugiyama Kenichi		
Semester	Spring Semester	Credit	2 Credits
Course Number	MAT2300	Language	Japanese

Course Objectives

Students will deepen their understanding of differentiation and integration of multivariable functions by applying it to various examples.
The objective is to attain mastery of the differentiation and integration of multivariable functions. In particular, to acquire computational and applicational skills.

Course Contents

This class builds upon the concepts learned in “Differential and Integral Calculus 1” and teaches the concept of multivariable differentiation. Starting with a review of differentiating single variables, students learn how the various concepts that appear there extend to cases with multiple variables. As application, students learn to solve extreme value problems. They also study the basic concepts of convergence and learn about the implicit function theorem and the inverse mapping theorem, which are important for applied calculus.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA017&syllabuslink=1

CA018

Course Title	Exercises in Differential and Integral Calculus 2		
Instructor	Sugiyama Kenichi		
Semester	Spring Semester	Credit	1 Credit
Course Number	MAT2300	Language	Japanese

Course Objectives

Students will deepen their understanding of differentiation and integration of multivariable functions by applying it to various examples.
The objective is to attain mastery of the differentiation and integration of multivariable functions. In particular, to acquire computational and applicational skills.

Course Contents

This class builds upon the concepts learned in “Differential and Integral Calculus 1” and teaches the concept of multivariable differentiation. Starting with a review of differentiating single variables, students learn how the various concepts that appear there extend to cases with multiple variables. As application, students learn to solve extreme value problems. They also study the basic concepts of convergence and learn about the implicit function theorem and the inverse mapping theorem, which are important for applied calculus.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA018&syllabuslink=1

CA019

Course Title	Differential and Integral Calculus 3		
Instructor	Sato Nobuya		
Semester	Fall Semester	Credit	2 Credits
Course Number	MAT2300	Language	Japanese

Course Objectives

Learn about differentiation and integration methods for multivariable functions. The fall semester focuses on integration methods.

Course Contents

After reviewing the integration method of single variable functions, students learn the integration method of double and triple variable functions. Learn about the definition of integrals and the fundamental properties of integrals such as linearity and inequality. The basic theorems are studied because the actual integration calculations can be reduced to calculations for integrating single variable functions. Furthermore, since integration can be performed by skillfully transforming the integral variables, students learn the general formula for transforming variables for this. In addition, students learn about line integrals that are integrated along curves and surface integrals that are integrated over surfaces. Students also learn about integral theorems (Green's theorem, Gauss's theorem, Stokes' theorem) which apply for these integrals.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA019&syllabuslink=1

CA020

Course Title	Exercises in Differential and Integral Calculus 3		
Instructor	Sato Nobuya		
Semester	Fall Semester	Credit	1 Credit
Course Number	MAT2300	Language	Japanese

Course Objectives

Learn about differentiation and integration methods for multivariable functions. The fall semester focuses on integration methods.

Course Contents

This focuses on solving practice problems based on the lectures of “Differential and Integral Calculus 3.”
Basic exercises are conducted to understand the lecture contents while also dealing with basic single variable function differentiation and integration methods as well as multi-variable differentiation topics covered in “Differential and Integral Calculus 2” of the spring semester. Students also deal with various applications and developmental issues together with basic exercises. Theories can be comprehended by using them for the first time. Students should make good use of this practice time.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA020&syllabuslink=1

CA092

Course Title	General Topology A		
Instructor	Saito Yoshihisa		
Semester	Fall Semester	Credit	2 Credits
Course Number	MAT2000	Language	Japanese

Course Objectives

Learn the fundamentals of topological space and the topology of Euclidean space.

Course Contents

Sets are simply collections of elements, and there is no connection between these elements. Topological spaces make it possible to consider the convergence and mapping continuity of elements in a set by adding information such as their proximity and the connection between them. In first-year differentiation and integration lectures, students learned about continuous mapping according to the (ε , δ)-definition of limit, but here the idea of topology is used. In "General Topology A," students learn about basic topology concepts.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA092&syllabuslink=1

CA163

Course Title	Electronic Computer 1		
Instructor	Oi Shu		
Semester	Spring Semester	Credit	2 Credits
Course Number	MAT2430	Language	Japanese

Course Objectives

The first half teaches how to use the LaTeX document processing system. In the second half, students learn the basic usage of the Maxima formula processing system and apply it to mathematical experiments.

Course Contents

This lecture is conducted together with “Electronic Computer 2.” “Electronic Computer 1” is composed of lectures, while actual practice using computers is performed in “Electronic Computer 2.”

The first half deals with the document processing system LaTeX, which is particularly good at describing and expressing formulas, and is a de facto standard in the creation of mathematics documents. The objective is to learn its basic usage and to be able to actually create and present a mathematics report in LaTeX.

In the second half, students learn how to use the Maxima formula processing system to solve computational and mathematical problems with a computer. After that, practice is performed on the subject of elementary number theory.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.

<URL>

https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA163&syllabuslink=1

CA164

Course Title	Electronic Computer 2		
Instructor	Oi Shu		
Semester	Spring Semester	Credit	2 Credits
Course Number	MAT2430	Language	Japanese

Course Objectives

The first half teaches how to use the LaTeX document processing system. In the second half, students learn the basic usage of the Maxima formula processing system and apply it to mathematical experiments.

Course Contents

This lecture is conducted together with “Electronic Computer 1.” “Electronic Computer 1” is composed of lectures, while actual practice using computers is performed in “Electronic Computer 2.”

The first half deals with the document processing system LaTeX, which is particularly good at describing and expressing formulas, and is a de facto standard in the creation of mathematics documents. The objective is to learn its basic usage and to be able to actually create and present a mathematics report in LaTeX.

In the second half, students learn how to use the Maxima formula processing system to solve computational and mathematical problems with a computer. After that, practice is performed on the subject of elementary number theory.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.

<URL>

https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA164&syllabuslink=1

CA165

Course Title	Electronic Computer 3		
Instructor	Oi Shu		
Semester	Fall Semester	Credit	2 Credits
Course Number	MAT2430	Language	Japanese

Course Objectives

Following “Introduction to Computer Science,” students learn programming with the C language and learn about basic algorithms and how to apply them to mathematics.

Course Contents

This lecture is conducted together with “Electronic Computer 4.” ”Electronic Computer 3” is composed of lectures of the syntax of the C language and methods of their application to mathematics, while “Electronic Computer 4” is composed of practical exercise practice using computers. Make sure to register for “Electronic Computer 3” and “Electronic Computer 4” as a set.
The first few lectures are reviews of basic matters, with explanations of points to be mindful of when actually programming, debugging methods and separate compilation.
Then it moves on to essential topics for using the C language such as pointers and structures.
The second half is basic data structures and algorithms, especially array sorting and search methods.
Because this course involves the practical application of the C language, it is assumed that students have basic knowledge of the C language and are capable of creating a program. Make sure to acquire such knowledge within the first few review periods.
“Electronic Computer 1 and 2” are not required, but it is advisable to take them as a set.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA165&syllabuslink=1

CA166

Course Title	Electronic Computer 4		
Instructor	Oi Shu		
Semester	Fall Semester	Credit	2 Credits
Course Number	MAT2430	Language	Japanese

Course Objectives

Following “Introduction to Computer Science,” students learn programming with the C language and learn about basic algorithms and how to apply them to mathematics.

Course Contents

This lecture is conducted together with “Electronic Computer 3.” ”Electronic Computer 3” is composed of lectures of the syntax of the C language and methods of their application to mathematics, while “Electronic Computer 4” is composed of practical exercise practice using computers. Make sure to register for “Electronic Computer 3” and “Electronic Computer 4” as a set.
The first few lectures are reviews of basic matters, with explanations of points to be mindful of when actually programming, debugging methods and separate compilation.
Then it moves on to essential topics for using the C language such as pointers and structures.
The second half is basic data structures and algorithms, especially array sorting and search methods.
Because this course involves the practical application of the C language, it is assumed that students have basic knowledge of the C language and are capable of creating a program. Make sure to acquire such knowledge within the first few review periods.
“Electronic Computer 1 and 2” are not required, but it is advisable to take them as a set.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA166&syllabuslink=1

CA168

Course Title	Information Science 1		
Instructor	Fujii Teruhisa		
Semester	Spring Semester	Credit	2 Credits
Course Number	MAT2430	Language	Japanese

Course Objectives

To understand information systems, students systematically and concretely learn the techniques for constructing and operating a database systems, and use SQL to practice constructing and managing them. The objective is to learn the core technology of information systems.

Course Contents

Information systems have become indispensable in our social lives. In this lesson, an outline of the information systems and the mechanism of the database that plays a central role within them are explained. In addition, the construction method and operation method are explained, and practical exercises are performed. First, the theory of the database is explained. Next, SQL which is a database operation language, is systematically explained with concrete examples, along with practice exercises. Furthermore, in order to grasp the whole image of the database, students construct and operate databases as a practical exercise using easy-to-understand examples such as ″ University course study″ and ″Learning school″. Since the training tasks are upgraded in order from the basic level, students can always master the development and operation techniques of the database system.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA168&syllabuslink=1

CA169

Course Title	Information Science 2		
Instructor	Fujii Teruhisa		
Semester	Fall Semester	Credit	2 Credits
Course Number	MAT2430	Language	Japanese

Course Objectives

To understand information systems, students learn techniques for designing information systems and learn techniques for analyzing the real world and designing information systems. They can acquire necessary knowledge about process-oriented approach and object-oriented approach as an analysis and design concept. Furthermore, They can acquire the technique to practice the means.

Course Contents

In this course, I explain the DFD design method and UML design method that play a central role in information system development. Students practice using more concrete and familiar examples. In the DFD design, “Library” and “Learning school” are examples. In the UML designs, ″Can juice vending machines″, ″Ticket sales systems″, and ″Smart phones″ are examples. Since the training tasks are upgraded in order from the basic level, students can always master the information system design techniques.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA169&syllabuslink=1

CA170

Course Title	Information Science 3		
Instructor	Fujii Teruhisa		
Semester	Spring Semester	Credit	2 Credits
Course Number	MAT2430	Language	Japanese

Course Objectives

Information Science 3 is a subject that aims to acquire theoretical knowledge and practical skills on the basic mechanism of communication networks. Communication networks have become the most important infrastructure in modern industrial and economic societies. Students theoretically learn the lower layers structure of TCP/IP that supports communication networks, and learn practical techniques through computer experiments.

Course Contents

Students learn the structure of the physical layer, datalink layer, and network layer as theoretical knowledge of TCP/IP. They understand each mechanism as knowledge and confirm how it actually works by experiments. We actually handle one Linux-based machine per person, and visually learn the mechanism and movement of packets by conducting various experiments on the datalink layer and network layer. They learn how to realize local transfer by MAC address in the datalink layer and global transfer by IP address in the network layer.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA170&syllabuslink=1

CA171

Course Title	Information Science 4		
Instructor	Fujii Teruhisa		
Semester	Fall Semester	Credit	2 Credits
Course Number	MAT2430	Language	Japanese

Course Objectives

Information Science 4 is a subject that aims to acquire theoretical knowledge and practical techniques on applied mechanisms of communication networks. Communication networks are the most important means for cultural and economic activities in modern industrial and economic societies. Student theoretically learn the upper layers structure of TCP/IP that supports communication networks, and learn practical techniques through computer experiments.

Course Contents

Students learn the structure of the transport layer and application layer as theoretical knowledge of TCP/IP. They understand each mechanism as knowledge and confirm how it actually works by experiments. Actually, they handle Linux-based machines, and visually learn the mechanism and behavior of packets through various experiments on the transport layer and application layer. They learn the mechanisms of a Web server and browser, how to send information on a homepage, how to convert domain names and IP addresses, how to remotely log in, how to transfer files, how to send and receive e-mail, and so on.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA171&syllabuslink=1

CA173

Course Title	Information Science 6		
Instructor	Kakei Saburou/Yokoyama Kazuhiro/Yasuda Masaya		
Semester	Spring Others	Credit	2 Credits
Course Number	MAT2430	Language	Japanese

Course Objectives

Students learn about the mathematical theories computers use to process various types of data such as images, sound and video through practical exercises using computers.

Course Contents

Sounds, images and videos are frequently used on the network. In addition, videos are easily viewed with mobile phones and dedicated broadcasts are also arranged. The important point here is how to represent high-quality audio and images using a small amount of data. This is based on Fourier transforms, which is one of the splendid applications of mathematics to be experienced.
On the final day, students investigate how to mathematically create 3D images and confirm this through practical exercises.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA173&syllabuslink=1

CA178

Course Title	Special Topics in Electronic Computer 3		
Instructor	Izu Tetsuya		
Semester	Spring Others	Credit	2 Credits
Course Number	MAT3430	Language	Japanese

Course Objectives

With the spread of the Internet, the risk of cyber attacks are increasing. This class introduces the information security for avoiding and responding such attacks, including cryptography from the mathematical point of view as a fundamental technology.

Course Contents

The main purpose of the information security is to establish Confidentiality, Integrity and Availability of ICT systems. This class introduces cyber attacks (in a wider sense) against such systems, and related detection, protection, avoidance, and response technologies. Also, cryptography as a fundamental for such technologies is examined from the mathematical point of view.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA178&syllabuslink=1

CA179

Course Title	Special Topics in Information Science 1		
Instructor	Shinohara Naoyuki		
Semester	Spring Semester	Credit	2 Credits
Course Number	MAT3430	Language	Japanese

Course Objectives

Students cultivate a better understanding of primality tests which are algorithms for determining whether a given natural number is prime, to learn about the key generation of RSA cryptosystem.

Course Contents

RSA cryptosystem is a public-key cryptosystem which is currently the most widely used. Two distinct 1024-bit prime numbers are used as the secret keys of users of RSA. For the key generation of RSA, natural numbers are randomly chosen, and primality tests are used against them. Miller-Rabin test and Lucas test are well-known primality tests, for example, they are included in FIPS PUB 186-4 which is a standards documentation published by National Institute of Standards and Technology. In this lecture, those two primality tests are discussed. Students learn the efficiency of them by either implementing them on the free software Risa/Asir and performing numerical experiments or hand calculation based on those algorithms.

2020.5.5 付一部変更
【変更前】Students learn the efficiency of them by implementing them on the free software Risa/Asir and performing numerical experiments.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA179&syllabuslink=1

CA180

Course Title	Special Topics in Information Science 2		
Instructor	Shinohara Naoyuki		
Semester	Fall Semester	Credit	2 Credits
Course Number	MAT3430	Language	Japanese

Course Objectives

Students cultivate a better understanding of integer factorization by the Elliptic Curve Method, to learn about the security evaluations of public key cryptosystems.

Course Contents

The group of rational points of an elliptic curve over a finite field is an important research theme in cryptography and computational number theory, since that group is used for Elliptic Curve Cryptography, integer factorization algorithms, and primality test algorithms. There exist two well-known algorithms to factorize integers, the Number Field Sieve and the Elliptic Curve Method. In this lecture, students mainly learn the Elliptic Curve Method, to understand the difference between those two algorithms. Students implement the Elliptic Curve Method on the free software Risa/Asir and performing numerical experiments.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA180&syllabuslink=1

CA185

Course Title	Special Topics in Applied Mathematics 1		
Instructor	Kojima Shota		
Semester	Spring Semester	Credit	2 Credits
Course Number	MAT3630	Language	Japanese

Course Objectives

This course aims to provide students with basic knowledge about the C++ programming language.

Course Contents

Course Prerequisite: Basic knowledge of C++ programming language.

This course aims to cover basic concepts of object - oriented programming, lambda expression, function overloading, and string functions.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.

<URL>

https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA185&syllabuslink=1

CA186

Course Title	Special Topics in Applied Mathematics 2		
Instructor	Kojima Shota		
Semester	Fall Semester	Credit	2 Credits
Course Number	MAT3630	Language	Japanese

Course Objectives

This course aims to enhance students' knowledge of the C++ programming language and for them to learn about OpenCV.

Course Contents

Course Prerequisite: Basic knowledge of C++ programming language.
This course aims to help students acquire understanding of the computer vision (OpenCV).

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA186&syllabuslink=1

CA187

Course Title	Special Topics in Applied Mathematics 3		
Instructor	Tsuchiya Morimasa		
Semester	Spring Semester	Credit	2 Credits
Course Number	MAT3630	Language	Japanese

Course Objectives

In this course, we will look at graph theory, learning methods, knowledge, and techniques necessary to grasp and solve problems in a finite and discrete manner. Furthermore, through practical examples, students will come to perceive this knowledge as indispensable for solving problems in the mathematical and informational sciences. In doing so, this course aims for students to gain an understanding of various developing subjects within applied mathematics.

Course Contents

First, we will cover the fundamental concept of graph theory, introducing its various results. We intend to introduce specific areas where the course contents appear in our everyday lives whenever possible. Topics of this lecture are traversability (Euler graphs, Hamiltonian graphs), digraphs and intersection graphs such as chordal graphs, interval graph.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA187&syllabuslink=1

CA191

Course Title	Special Topics in Algebra 1		
Instructor	Shibata Kazuki		
Semester	Spring Semester	Credit	2 Credits
Course Number	MAT3130	Language	Japanese

Course Objectives

The purpose of this course is for students to learn the basics of commutative algebra. After students learn the definition and basic properties of commutative rings, the course explains specific examples of graded rings to facilitate students' deeper understanding of commutative algebra.

Course Contents

Commutative algebra has a deep relationship with other fields such as manifolds and combinatorics. The field is actively researched and has produced many recent findings. In its first half, this course aims to lecture on the definition and properties of commutative rings. In its latter half, the course aims to cover combinatorial commutative rings, and their properties are described through concrete examples.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA191&syllabuslink=1

CA192

Course Title	Special Topics in Algebra 2		
Instructor	Shibata Kazuki		
Semester	Fall Semester	Credit	2 Credits
Course Number	MAT3130	Language	Japanese

Course Objectives

The purpose of this course is to teach students about commutative rings, especially graded rings. To deepen students' understanding of graded rings, the course specifically addresses rings with deep connections to combination theory such as Stanley–Reisner rings and Toric rings.

Course Contents

There is a deep relationship between ring-theoretic properties and combinatorial structures of combinatorial commutative rings. In its first half, this course aims to lecture on the basic properties of the Gröbner basis of the ideal and Hilbert ring functions. In its latter half, it explains the relationship between the Gröbner basis and the Hilbert function as well as the combinatorial structure of Stanley–Reisner rings and Toric rings.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA192&syllabuslink=1

Course Title	Special Topics in Mathematics 3		
Instructor	Nakane Michiyo		
Semester	Spring Semester	Credit	2 Credits
Course Number	MAT3030	Language	Japanese

Course Objectives

Because we often regard ancient Greece as the birthplace of mathematics, the purpose of this course is to consider the nature of mathematics by introducing students to Greek mathematics. Through this course, students also obtain fundamental knowledge of the history of mathematics.

Course Contents

This course aims to provide an overview of mathematical products obtained in ancient Greece (400 B.C.–500 A.D.), where mathematicians discussed high-level theories of numbers and geometry via philosophical considerations. Development of Greek ideas until about 1900 are also discussed. The course aims to highlight the history of mathematics required for junior and senior high school teachers.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA211&syllabuslink=1

CA212

Course Title	Special Topics in Mathematics 4		
Instructor	Nakane Michiyo		
Semester	Fall Semester	Credit	2 Credits
Course Number	MAT3030	Language	Japanese

Course Objectives

This course aims to help students realize the importance of mathematical notations and deepen their understanding of negative and complex numbers by overviewing a historical process of solving cubic equations.

Course Contents

This course aims to trace the birth of the theory of quadratic and cubic equations in the Medieval Islamic world, their development in 16th- and 17th-century Europe, the introduction of an original form of Cardano's formula of cubic equations, and the process of completing his formula confirming the mathematical knowledge required for juinior and senior high school teachers.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA212&syllabuslink=1

Course Title	Special Topics in Statistics 1		
Instructor	Koyama Tamio		
Semester	Spring Others	Credit	2 Credits
Course Number	MAT3530	Language	Japanese

Course Objectives

The purposes of this course are for students to (1) understand the monotone convergence theorem and the dominated convergence theorem within the measure theory; (2) understand the laws of large numbers and the central limit theorem that are fundamental results of probability theory.

Course Contents

This course is designed to cover the basic concepts of measure theory and probability theory. In measure theory, the course formulates notions such as area and volume as measures. Also introduced are Sigma-algebra, measurable spaces, and measures, with their basic properties explained. The course introduces the Lebesgue measure, which is the most basic example of a measure, and also defines integrals for measurable functions along with their basic properties. In probability theory, the course explains mathematical treatment of random phenomena such as coin tossing. It also describes that concepts related to probabilities, such as random variables, expected values, and independence, are formulated using notions of the measure theory. The course further covers the Borel-Cantelli's lemma and Kolmogorov's 0-1 law, which are mathematical results described under such a formulation, and, finally, the characteristic functions and convergence of random variables. Ultimately, the purpose of this course is for students to understand the laws of large numbers and the central limit theorem.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA219&syllabuslink=1

CA220

Course Title	Special Topics in Statistics 2		
Instructor	Mano Shuhei		
Semester	Fall Semester	Credit	2 Credits
Course Number	MAT3530	Language	Japanese

Course Objectives

This course is on sampling from discrete stochastic models and their algorithms.

Course Contents

Exemplified with graphical models and integer partitions, algorithms for sampling, such as Markov chain Monte Carlo, will be explained. Then, applications of symmetric functions, coupling of stochastic processes, and computational algebra to them will be introduced.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA220&syllabuslink=1

CA224

Course Title	Elementary Theory of numbers		
Instructor	Kuwata Takayasu		
Semester	Spring Semester	Credit	2 Credits
Course Number	MAT1130	Language	Japanese

Course Objectives

Learn the fundamentals of the Elementary Theory of numbers and become able to use it.

Course Contents

Since Euclid's "Elementa," number theory has been treated as a discipline with a body of theory. Within it, the contents up to the era of Euler is called the Elementary Theory of numbers. This lecture begins with a careful review of the knowledge of integers that students learned up until the end of high school, and accumulates knowledge of the Elementary Theory of numbers. As further applications, several very interesting subjects are dealt with. This lecture provides as many examples as possible.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA224&syllabuslink=1

CA225

Course Title	Intoroduction to Applied Analysis		
Instructor	Saito Yoshihisa		
Semester	Spring Semester	Credit	2 Credits
Course Number	MAT2330	Language	Japanese

Course Objectives

The objective of this class is for students to learn the basic solutions of differential equations and to understand fundamental mathematical theories (such as the existence of solutions and uniqueness). Learn the basic ways of thinking to apply them to the natural sciences and social sciences.

Course Contents

In the natural sciences and social sciences, the most commonly used method of mathematically modeling any kind of phenomena is differential equations. This class starts with methods of solving specific differential equations and explains the mathematical fundamentals of differential equations, including theoretical topics such as the existence of solutions and uniqueness. A typical model will be featured in order to explain the concept of making a mathematical model with differential equations.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA225&syllabuslink=1

CA228

Course Title	Probability Theory and Statistics 1		
Instructor	Ueno Takahiko		
Semester	Spring Semester	Credit	2 Credits
Course Number	MAT2530	Language	Japanese

Course Objectives

Learn about various statistics in your daily life. Most of the information in the world is unreliable and incomplete. If we collect and examine factors that fluctuate by chance, and are able to detect factors that have regularity, it is possible to make an estimate of the overall situation. The methodology for this is Statistics, which is widely applied throughout society. Real examples include election exit surveys, audience ratings surveys, investment decisions, new drug efficacy evaluations and various questionnaire surveys. The objective is for students to learn how those are conducted and used.

Course Contents

In this lecture, the types of data and their summarization methods as well as probability distributions, the concept of statistical hypotheses and multivariate analysis is introduced.
At the beginning of the lecture, students are divided into several parallel groups. They are asked to investigate examples that are applied in reality and present them to the groups. Each time, there will be time provided for discussion.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA228&syllabuslink=1

CA229

Course Title	Probability Theory and Statistics 2		
Instructor	Ueno Takahiko		
Semester	Fall Semester	Credit	2 Credits
Course Number	MAT2530	Language	Japanese

Course Objectives

Learn about the concept of probability. Further objectives include learning about stochastic variables, probability distributions, moment-gathering functions and central limit theorem.

Course Contents

Probability, stochastic variables and probability distributions are mainly introduced. The probabilities defined in Laplace's method and their properties are introduced. In addition, Bayes theorem is introduced, which is the basis of Bayesian statistics which has become popular in recent years. Stochastic variables, probability distributions, moment-gathering functions and the central limit theorem will also be introduced. The second half of the lecture may use multivariate differentials and integrals.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA229&syllabuslink=1

CA230

Course Title	Seminar on Mathematics 3		
Instructor	Jimbo Michio		
Semester	Fall Semester	Credit	2 Credits
Course Number	MAT3030	Language	Japanese

Course Objectives

This course aims for students to acquire the ability to read, understand, and explain contents of technical books, making full use of materials (e.g., calculus, linear algebra) students have previously learned.

Course Contents

Approximately five students read and understand the text and, in turn, present the contents, thereby deepening knowledge they acquired during first-year courses. In each course, one or two students present in their own language and in an understandable manner the subject material they have assimilated earlier. Listeners are required to participate actively by posing questions and making comments. The text provides an introduction to the classical theory of elliptic integrals and elliptic functions. In this course, students learn their concept and properties through basic calculus, without going into complex variables. In addition, students learn applications to problems in physics.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA230&syllabuslink=1

CA231

Course Title	Seminar on Mathematics 4		
Instructor	Kakei Saburou		
Semester	Fall Semester	Credit	2 Credits
Course Number	MAT3030	Language	Japanese

Course Objectives

This course aims to deepen knowledge and to increase the ability to communicate scientifically by reading and discussing books on mathematics.

Course Contents

This course aims to have students read a text in groups of about five. Knowledge acquired in the first year is thus deepened and expanded. Each student prepares and explains in detail a part of the text, while the other students participate by asking questions and commenting about the material.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA231&syllabuslink=1

CA310

Course Title	English for Mathematics 1		
Instructor	Willox,ralph		
Semester	Spring Semester	Credit	2 Credits
Course Number	MAT3033	Language	Others

Course Objectives

The objective of this course is to give an introduction to mathematical writing in English and to help College of Science students acquire sufficient proficiency in written English.

Course Contents

Students study English terminology and idiomatic expressions used in mathematical science papers, by reading textbook excerpts and essays.
The objective is for students to be able to understand mathematical theses in English and to be able to write brief mathematical essays by themselves.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA310&syllabuslink=1

CA311

Course Title	English for Mathematics 2		
Instructor	Willox,ralph		
Semester	Fall Semester	Credit	2 Credits
Course Number	MAT3033	Language	Others

Course Objectives

The objective of this course is for College of Science students to acquire sufficient oral skills in English in relation to mathematical science.

Course Contents

Students study English idioms used in oral presentations related to mathematics, using videos of seminars and lectures. The objective is for students to become accustomed to various presentation styles and to improve their listening abilities and presentation skills in English. If possible, students will be asked to create a brief presentation in the second half of the semester.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA311&syllabuslink=1

CA321

Course Title	Physics for Mathematics Students		
Instructor	Murata Mikio		
Semester	Spring Semester	Credit	2 Credits
Course Number	MAT2630	Language	Japanese

Course Objectives

Learn the ability to consider the basic laws of classical mechanics and their applications using mathematical methods such as differentiation and integration.

Through curriculum planning policies that "Cultivate 'Educated people with scientific specializations,'" students will have general knowledge about fields of science that are adjacent to their specialty, and will be able to see things from a broad perspective. The objective of this course is to cultivate expertise and education in science during its formative years.

This course is part of the "elective 3" subject group.

Course Contents

Consider the basic laws of classical mechanics and their applications using mathematical methods such as calculus and analysis. Lectures are on the fundamentals of physics for a logical and systematic understanding of nature. Keywords include the "Laws of Motion," "Conservation of Momentum," "Two-body Problem," "Rigid Body Motion," "Lagrange equation" and "Canonical Form." The material is considered to be understandable even for those who have not studied physics in high school.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.

<URL>

https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA321&syllabuslink=1

CA322

Course Title	IT Industry		
Instructor	Hamaya Satoshi		
Semester	Fall Semester	Credit	2 Credits
Course Number	MAT2440	Language	Japanese

Course Objectives

Objective is to understand the recent situation of the information industry while touching on historical trends and influences of the ICT.　Target students are subscribers of a Teacher Training Course or those who are interested in employment in the information industry (SE, etc.) or starting a business. Students will be able to understand the relationship between the information industry and society, the economy and industry.　Changes of value creation process in industries and relationship between AI and jobs and skills will be also discussed.

Course Contents

The information industry is widely understood as the industry related to the hardware, software, services and content to collect and process information.　Lectures are on the structure of this industry and its recent situation. Students will learn about new trends such as IoT and AI as well as relationships of information industry and other industries. Programming and the study of programming languages is outside the scope of this class. Depending on the number of participants, lectures by guest lecturers and workshop-style classes may be held. The syllabus may also be partially changed.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA322&syllabuslink=1

CA401

Course Title	Algebra 1		
Instructor	Geisser,thomas H.		
Semester	Spring Semester	Credit	2 Credits
Course Number	MAT3110	Language	Japanese

Course Objectives

In this course we study ring and module theory. Rings can be viewed of as a generalization of the integers and among others we study factorization into primes. One of the main theorems is the structure of finitely generated abelian groups and the Jordan normal form of matrices.

Course Contents

In the first half of this class, the basic concepts of ring theory are explained and module theory are explained together with examples. An important class of rings are principal ideal domains, and we explain
the Structure Theorem for finitely generated abelian groups and the Jordan normal form of matrices. Students are expected to obtain a textbook as soon as possible and prepare for lessons, as the lectures basically follow the textbook. Knowledge of linear algebra and group theory is assumed; review as necessary as the lecture advances.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA401&syllabuslink=1

CA402

Course Title	Exercises in Algebra 1		
Instructor	Geisser,thomas H.		
Semester	Spring Semester	Credit	1 Credit
Course Number	MAT3110	Language	Japanese

Course Objectives

In this course we study ring and module theory. Rings can be viewed of as a generalization of the integers and among others we study factorization into primes. One of the main theorems is the structure of finitely generated abelian groups and the Jordan normal form of matrices.

Course Contents

In the first half of this class, the basic concepts of ring theory are explained and module theory are explained together with examples. An important class of rings are principal ideal domains, and we explain
the Structure Theorem for finitely generated abelian groups and the Jordan normal form of matrices. Students are expected to obtain a textbook as soon as possible and prepare for lessons, as the lectures basically follow the textbook. Knowledge of linear algebra and group theory is assumed; review as necessary as the lecture advances.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA402&syllabuslink=1

Course Title	Algebra 2		
Instructor	Geisser,thomas H.		
Semester	Fall Semester	Credit	2 Credits
Course Number	MAT3110	Language	Japanese

Course Objectives

In this course we discuss the basics of field theory and Galois theory. If time permits we give application to coding theory and solutions of polynomial equations.

Course Contents

The central topic of this lecture is the theory of field extensions. The main result is the main theorem of Galois theory, which translates problems in field theory into problems of groups theory. If time permits we will study finite fields and give applications to solutions of polynomial equations

Students are expected to obtain a textbook as soon as possible and prepare for lessons by reviewing group theory and ring theory as needed, as the lectures basically follow along with the textbook.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.

<URL>

https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA403&syllabuslink=1

Course Title	Exercises in Algebra 2		
Instructor	Geisser,thomas H.		
Semester	Fall Semester	Credit	1 Credit
Course Number	MAT3110	Language	Japanese

Course Objectives

In this course we discuss the basics of field theory and Galois theory. If time permits we give application to coding theory and solutions of polynomial equations.

Course Contents

The central topic of this lecture is the theory of field extensions. The main result is the main theorem of Galois theory, which translates problems in field theory into problems of groups theory. If time permits we will study finite fields and give applications to solutions of polynomial equations

Students are expected to obtain a textbook as soon as possible and prepare for lessons by reviewing group theory and ring theory as needed, as the lectures basically follow along with the textbook.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.

<URL>

https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA404&syllabuslink=1

Course Title	Geometry 1		
Instructor	Sugiyama Kenichi		
Semester	Spring Semester	Credit	2 Credits
Course Number	MAT3210	Language	Japanese

Course Objectives

We will study a way to investigate a curve and a surface by equations. In particular we will explain a curvature which characterize them.

Course Contents

We will discuss a curve and a surface from a view point of analysis. We first treat a curve and study its torsion and curvature. After that we will study a theory of surfaces, especially the first and the second fundamental form. The most fundamental invariant of a surface is the Gauss curvature and we will explain the famous Gauss-Bonnet's formula.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA405&syllabuslink=1

CA406

Course Title	Exercises in Geometry 1		
Instructor	Sugiyama Kenichi		
Semester	Spring Semester	Credit	1 Credit
Course Number	MAT3210	Language	Japanese

Course Objectives

We will study a way to investigate a curve and a surface by equations. In particular we will explain a curvature which characterize them.

Course Contents

We will discuss a curve and a surface from a view point of analysis. We first treat a curve and study its torsion and curvature. After that we will study a theory of surfaces, especially the first and the second fundamental form. The most fundamental invariant of a surface is the Gauss curvature and we will explain the famous Gauss-Bonnet's formula.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA406&syllabuslink=1

Course Title	Geometry 2		
Instructor	Saito Yoshihisa		
Semester	Fall Semester	Credit	2 Credits
Course Number	MAT3210	Language	Japanese

Course Objectives

Study cellular decomposition and homology groups in topological space as a means of perceiving the overall image of the figure represented by a curved surface.

Course Contents

In the first half of this course, after explaining the meaning of the theory of topology, we give lectures on the one-stroke problem (one-dimensional topology) and the classification theorem of closed surfaces (two-dimensional topology).
The main subject of the second half is the theory of the homology groups. First, we give the definition of homology groups, and it is explained how they reflect a global aspect of shapes. Next, topological invariance of homology group is proven, and methods of calculation of them are studied by using typical examples mainly .
Throughout this course, we give reviews on required background knowledge: for example, sets and maps, linear algebra, and the theory of topological spaces.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA407&syllabuslink=1

CA408

Course Title	Exercises in Geometry 2		
Instructor	Saito Yoshihisa		
Semester	Fall Semester	Credit	1 Credit
Course Number	MAT3210	Language	Japanese

Course Objectives

Study cellular decomposition and homology groups in topological space as a means of perceiving the overall image of the figure represented by a curved surface.

Course Contents

Students are prompted to solve practice problems related to the lecture contents of "Geometry 2." In the first half of this course, after explaining the meaning of the theory of topology, we give lectures on the one-stroke problem (one-dimensional topology) and the classification theorem of closed surfaces (two-dimensional topology).
The main subject of the second half is the theory of the homology groups. First, we give the definitionof homology groups, and it is explained how they reflect a global aspect of shapes. Next, by using typical examples mainly, methods of calculation of them are studied.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA408&syllabuslink=1

CA409

Course Title	Analysis 1		
Instructor	Yamada Yuji		
Semester	Spring Semester	Credit	2 Credits
Course Number	MAT3310	Language	Japanese

Course Objectives

Expand your world from real numbers to complex numbers, expand differential integrals, and investigate the properties of (complex) differentiable functions. Many familiar functions (such as trigonometric and exponential functions) can be defined by extending the domain as complex number value functions of complex variables, and many properties established of real variables can be similarly established for their extended functions. Thinking about functions with complex variables reveals properties that have not been seen before, and sometimes relationships can be found between those that were seen independently. The goal of this lecture is to show what the world looks like when we extend it to the world of complex functions.

Course Contents

We start by learning the basic definitions and computation methods of complex numbers, convergence of sequences of complex numbers and complex power series, and for complex function theory, we learn about the very important Cauchy's integral theorem.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA409&syllabuslink=1

Course Title	Exercises in Analysis 1		
Instructor	Yamada Yuji		
Semester	Spring Semester	Credit	1 Credit
Course Number	MAT3310	Language	Japanese

Course Objectives

Expand your world from real numbers to complex numbers, expand differential integrals, and investigate the properties of (complex) differentiable functions. Many familiar functions (such as trigonometric and exponential functions) can be defined by extending the domain as complex number value functions of complex variables, and many properties established of real variables can be similarly established for their extended functions. Thinking about functions with complex variables reveals properties that have not been seen before, and sometimes relationships can be found between those that were seen independently. The goal of this lecture is to show what the world looks like when we extend it to the world of complex functions.

Course Contents

We start by learning the basic definitions and computation methods of complex numbers, convergence of sequences of complex numbers and complex power series, and for complex function theory, we learn about the very important Cauchy's integral theorem.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA410&syllabuslink=1

CA411

Course Title	Analysis 2		
Instructor	Yamada Yuji		
Semester	Fall Semester	Credit	2 Credits
Course Number	MAT3310	Language	Japanese

Course Objectives

Students learn about "Cauchy's integral theorem," which is at the center of complex function theory, and see that the theory develops beautifully from there. How can functions be limited by making strong assumptions of complex differentiable, and what can be said of these strong assertions? The objective is to understand this.

Course Contents

After briefly reviewing the contents of the spring semester, we prove Cauchy's integral theorem. In addition to general complex function theory, students also deal with calculating definite integrals of "real variables" with high computational difficulty as realistic practical examples. In the world of real numbers, certain types of definite integrals that can only be calculated using heuristics and technical methods (those where no primitive function can be found) can be executed from a good perspective using complex function theory.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA411&syllabuslink=1

Course Title	Exercises in Analysis 2		
Instructor	Yamada Yuji		
Semester	Fall Semester	Credit	1 Credit
Course Number	MAT3310	Language	Japanese

Course Objectives

Students learn about "Cauchy's integral theorem," which is at the center of complex function theory, and see that the theory develops beautifully from there. How can functions be limited by making strong assumptions of complex differentiable, and what can be said of these strong assertions? The objective is to understand this.

Course Contents

After briefly reviewing the contents of the spring semester, we prove Cauchy's integral theorem. In addition to general complex function theory, students also deal with calculating definite integrals of "real variables" with high computational difficulty as realistic practical examples. In the world of real numbers, certain types of definite integrals that can only be calculated using heuristics and technical methods (those where no primitive function can be found) can be executed from a good perspective using complex function theory.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA412&syllabuslink=1

CA413

Course Title	Mathematical Information Theory 1		
Instructor	Yasuda Masaya		
Semester	Spring Semester	Credit	2 Credits
Course Number	MAT3410	Language	Japanese

Course Objectives

Following “Introduction to Computer Science 2 and Exercises” and “Electronic Computer 3 and 4,” students learn somewhat more applicable algorithms and numerical calculation methods through programming in the C language.

Course Contents

This class is paired with “Exercises in Mathematical Information Theory 1.” “Mathematical Information Theory 1” contains lectures focused on theory, and in “Exercises in Mathematical Information Theory 1” students conduct practice exercises related to the lecture contents, from programming to report creation. It is assumed that students have just about finished learning the syntax of the C language. Use programming and mathematical theory to learn more sophisticated algorithms and create more advanced programs. Contents include linear algebra, interpolation, numerical integration and numerical solutions of differential equations. Software used in “Exercises in Mathematical Information Theory 1” centers on the C language, but depending on the problem, other languages or formula manipulation software are used.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA413&syllabuslink=1

CA414

Course Title	Exercises in Mathematical Information Theory 1		
Instructor	Yasuda Masaya		
Semester	Spring Semester	Credit	1 Credit
Course Number	MAT3410	Language	Japanese

Course Objectives

Following “Introduction to Computer Science 2 and Exercises” and “Electronic Computer 3 and 4,” students learn somewhat more applicable algorithms and numerical calculation methods through programming in the C language.

Course Contents

This class is paired with “Mathematical Information Theory 1.” “Mathematical Information Theory 1” contains lectures focused on theory, and in “Exercises in Mathematical Information Theory 1” students conduct practice exercises related to the lecture contents, from programming to report creation. It is assumed that students have just about finished learning the syntax of the C language. Use programming and mathematical theory to learn more sophisticated algorithms and create more advanced programs. Contents include linear algebra, interpolation, numerical integration and numerical solutions of differential equations. Software used in “Exercises in Mathematical Information Theory 1” centers on the C language, but depending on the problem, other languages or formula manipulation software are used.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA414&syllabuslink=1

Course Title	Mathematical Information Theory 2		
Instructor	Yasuda Masaya		
Semester	Fall Semester	Credit	2 Credits
Course Number	MAT3410	Language	Japanese

Course Objectives

Following "Introduction to Computer Science 2 and Exercises," "Electronic Computer 3 and 4" and "Mathematical Information Theory 1 and Exercises," students learn somewhat more applicable algorithms and numerical calculation methods through programming in the C language.

Course Contents

This class is paired with "Exercises in Mathematical Information Theory 2." "Mathematical Information Theory 2" contains lectures focused on theory, and in "Exercises in Mathematical Information Theory 2" students practice these contents, from programming to report creation. It is assumed that students have just about finished learning the syntax of the C language. Use programming and mathematical theory to learn more sophisticated algorithms and create more advanced programs. Contents include the basics of discrete Fourier Transforms, solving algebraic equations, calculating eigenvalues and symbolic processing. Software used in "Exercises in Mathematical Information Theory 2" centers on the C language, but depending on the problem, other languages or formula manipulation software are used.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA415&syllabuslink=1

CA416

Course Title	Exercises in Mathematical Information Theory 2		
Instructor	Yasuda Masaya		
Semester	Fall Semester	Credit	1 Credit
Course Number	MAT3410	Language	Japanese

Course Objectives

Following "Introduction to Computer Science 2 and Exercises," "Electronic Computer 3 and 4" and "Mathematical Information Theory 1 and Exercises," students learn somewhat more applicable algorithms and numerical calculation methods through programming in the C language.

Course Contents

This class is paired with "Mathematical Information Theory 2." "Mathematical Information Theory 2" contains lectures focused on theory, and in "Exercises in Mathematical Information Theory 2" students practice these contents, from programming to report creation. It is assumed that students have just about finished learning the syntax of the C language. Use programming and mathematical theory to learn more sophisticated algorithms and create more advanced programs. Contents include the basics of discrete Fourier Transforms, solving algebraic equations, calculating eigenvalues and symbolic processing. Software used in "Exercises in Mathematical Information Theory 2" centers on the C language, but depending on the problem, other languages or formula manipulation software are used.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA416&syllabuslink=1

CA451

Course Title	Algebra 3		
Instructor	Geisser,thomas H.		
Semester	Spring Semester	Credit	2 Credits
Course Number	MAT3120	Language	Japanese

Course Objectives

In the lecture "Algebra 2", field theory and Galois theory was studied in characteristic zero. In "Algebra 3", the goal is (1) to understand field theory and Galois theory in arbitrary characteristic, and (2) to understand the relationship between solutions of polynomial equations and Galois theory.

Course Contents

There are formulas to express solutions of polynomials in degrees at most four. However, it was proved in the 19th century by Abel that there is no algebraic formula for the solutions of a general polynomials in degrees at least five. In this lecture we discuss the solutions of polynomials in degree 3 and 4, and explain the proof of Abel's theorem. After this, the notaion of separable and inseparable extensions will be introduced to develop Galois theory in arbitrary characteristic. Using Galois theory, it will be explained how one can give a criterion for the solutions of polynomial equations in terms of the Galois group.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA451&syllabuslink=1

CA452

Course Title	Geometry 3		
Instructor	Sugiyama Kenichi		
Semester	Spring Semester	Credit	2 Credits
Course Number	MAT3220	Language	Japanese

Course Objectives

Using linear algebra and elementary calculus we will explain an interesting fact of numbers or geometry.

Course Contents

Using linear algebra and elementary calculus, topics of a finite graph, a special value of zeta function and an elliptic integral will be explained. In particular we will discuss arithmetic-geometric mean due to Gauss and Euler. We will also touch a relationship between Riemann zeta function and a distribution of primes.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA452&syllabuslink=1

CA453

Course Title	Analysis 3		
Instructor	Yamada Yuji		
Semester	Fall Semester	Credit	2 Credits
Course Number	MAT3320	Language	Japanese

Course Objectives

The heat equation is a partial differential equation that describes the phenomenon of heat conduction and diffusion. Use your knowledge of calculus and linear algebra to understand the basic characteristics and solutions of the heat equation and the Laplace equation, and learn about Fourier series as a basic tool of analysis.

Course Contents

The heat equation is explained mathematically to describe phenomena such as heat conduction and material diffusion. Particular importance is placed on finding solutions that satisfy additional conditions such as initial conditions and boundary conditions. An introductory explanation of the theory of Fourier series is given, which was conceived for that purpose. A steady state (the state reached after sufficient time) is described with Laplace's differential equation. We will also discuss the properties and solutions of the Laplace equation.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA453&syllabuslink=1

CA454

Course Title	Mathematical Information Theory 3		
Instructor	Yasuda Masaya		
Semester	Fall Semester	Credit	2 Credits
Course Number	MAT3420	Language	Japanese

Course Objectives

The goal is to acquire mathematics and algorithms through solving computational problems related to the lattice theory such as the shortest vector problem.

Course Contents

A lattice is a set of regular infinite mesh intersections, which is mathematically rich in nature, and has recently been applied as a next-generation encryption technology called lattice-based cryptography. In this lecture, we introduce the shortest vector problem that supports the security of lattice-based cryptography, and introduce several lattice basis reduction algorithms, which are an essential tool for solving the problem.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA454&syllabuslink=1

Course Title	Introduction to Modern Mathematics		
Instructor	Kakei Saburou/Yasuda Masaya/Sugiyama Kenichi		
Semester	Fall Semester	Credit	2 Credits
Course Number	MAT3020	Language	Japanese

Course Objectives

Understand the current status of modern mathematical theory and its applications. Learn how mathematical theory develops and is applied to three themes chosen from cutting-edge fields of modern mathematics.

Course Contents

The aim of this course is to explain three selected topics from modern mathematics theory and its applications. This time, the three selected themes are “graphs and matrices”, “lattice problems”, and “Weyl groups and root systems”.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA455&syllabuslink=1

CA601

Course Title	Special Seminar on Mathematics		
Instructor	※		
Semester	Full Year Others	Credit	8 Credits
Course Number	MAT4000	Language	Japanese

Course Objectives

As the culmination of their studies at the Department of Mathematics, students concentrate on a single topic and delve deep into investigation. Learn the ability to deal with, solve and explain the subject to others. Special emphasis is placed on theoretical mathematics research.

Course Contents

Classes are divided into small groups with one faculty member each and held in a seminar format. By making good use of the specialized knowledge acquired over three years, students read and understand advanced specialized books, explain their contents to other members, ask questions and provide answers.
Introduction Phase:
Review and replenish the fundamental knowledge necessary for research. Since the textbook still has relatively easy parts, emphasis is placed on learning how to decipher and explain them.
Development Phase:
As the textbook enters the subject, the explanations are often met with difficulties. Cultivate an attitude of working hard to find solutions with the cooperation of other members and advice from the instructors.
Results Phase:
The objective is to delve deeper into what the student finds particularly interesting from the research and form an independent opinion.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA601&syllabuslink=1

Course Title	Seminar on Applied Mathematics		
Instructor	※		
Semester	Full Year Others	Credit	8 Credits
Course Number	MAT4000	Language	Japanese

Course Objectives

As the culmination of their studies at the Department of Mathematics, students concentrate on a single topic and delve deep into investigation. Learn the skills to deal with, solve and explain the subject to others. Particular emphasis is placed on the application of mathematics to computers.

Course Contents

Classes are divided into small groups with one faculty member each and held in a seminar format. By making good use of the specialized knowledge acquired over three years, students read and understand advanced specialized books, explain their contents to other members, ask questions and provide answers.
Introduction Phase:
Review and replenish the fundamental knowledge necessary for research. Since the textbook still has relatively easy parts, emphasis is placed on learning how to decipher and explain them.
Development Phase:
As the textbook enters the subject, the explanations are often met with difficulties. Cultivate an attitude of working hard to find solutions with the cooperation of other members and advice from the instructors.
Results Phase:
The objective is to delve deeper into what the student finds particularly interesting from the research and form an independent opinion.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CA624&syllabuslink=1

CB035

Course Title	Basic Laboratory Experiments on Physics		
Instructor	Kitamoto Shunji		
Semester	Spring Semester	Credit	2 Credits
Course Number	PHY2700	Language	Japanese

Course Objectives

This course provides an opportunity for physics students to have an intensive laboratory experience of physics experiments. Each student will learn basic knowledge and techniques of experiments and understand the underlying physics via the experiments.

Course Contents

Students will finish nine experiments over this course. Students write a lab report for each experiment and supervisors will review the report and will provide critical comments to students. The experiments are as follows:
(1) Basic training of measurements,
(2) Data analysis techniques with a computer,
(3) Measurement of Young's modulus,
(4) Joule's heating effect of current,
(5) Transistor Characteristics,
(6) Interaction of gamma-rays with matter,
(7) Measurement of the Planck constant,
(8)The Franck-Hertz experiment,
(9) Measurement of impedance,
(10) Interference of Light Waves
An emergency traing is also scheduled.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB035&syllabuslink=1

CB038

Course Title	Classical Mechanics 1		
Instructor	Kurita Kazuyoshi		
Semester	Spring Semester	Credit	2 Credits
Course Number	PHY2100	Language	Japanese

Course Objectives

Classical mechanics is one of the most fundamental subjects in physics. The methods of extracting the laws from phenomena in nature are typically displayed. The fundamental concepts in classical mechanics are often applicable to other fields of physics. The purpose of the class is to understand the meaning of the basic concepts and physical quantities and to apply them to solve problems.

Course Contents

Classical Mechanics 1 mainly deals with the particle mechanics. Starting from the description of the particle motion, the meaning of Newton's second laws of motion is to be understood. The importance of the new concept of potential energy is emphasized and new conservation laws are introduced. The physical setups are basically the same as those learned in high school. However,　differential equations are introduced and the analytical solutions will be obtained. Students need to prepare for the classes by reading and understanding the subjects in the textbook for the week. Homework problems are to be solved as well before coming to the class. Students are required to obtain the physics point of view in discussing and having dialogs on key physics concepts, examples in daily life and the new mathematical methods.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB038&syllabuslink=1

CB040

Course Title	Classical Mechanics 2		
Instructor	Nakano Yuji		
Semester	Fall Semester	Credit	2 Credits
Course Number	PHY2100	Language	Japanese

Course Objectives

The goal of this course is to understand how to apply the fundamental principles of classical mechanics, such as Newton's law and the conservation of mechanical energy, to the complex motion of rigid objects.

Course Contents

The course outline:
・Relative motion of objects (translational motion)
・Relative motion of objects (rotating motion)
・Two-body problems and planetary motion
・Moment of inertia
・Motion of right bodies
There will be a small quiz at the end of every lecture, which will be graded.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB040&syllabuslink=1

CB041

Course Title	Classical Electromagnetism 1		
Instructor	Kitamoto Shunji		
Semester	Spring Semester	Credit	2 Credits
Course Number	PHY2100	Language	Japanese

Course Objectives

In this course, students will learn about laws that govern static electricity and magnetism. Students will understand an example of the physics framework by studying the theory of the electromagnetism.

Course Contents

Students will learn Coulomb's law and Biot-Savar's law as start. Then they study electric and magnetic field. Students will understand Gauss's law and Ampere's law and then apply them to some exercises. Students will understand divergence and rotation of electric and magnetic fields and learn Maxwell's equations in static conditions.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB041&syllabuslink=1

CB042

Course Title	Classical Electromagnetism 2		
Instructor	Kitamoto Shunji		
Semester	Fall Semester	Credit	2 Credits
Course Number	PHY2100	Language	Japanese

Course Objectives

In this course, as a continuance of Electromagnetism I, students will learn about Maxwell's equations and some basic solutions including the electromagnetic waves. Students will also learn a brief overview of the electronic circuit theory and electro-magnetic field in materials.

Course Contents

Students will learn Faraday's law as an induced electric field and displacement current. Then students will understand the complete Maxwell's equations. Students will deduce the electromagnetic waves. Students will then study the energy in electric and magnetic fields and will learn pointing flux. Students will also understand the electric circuit theory and electro-magnetic field in materials.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB042&syllabuslink=1

CB043

Course Title	Mathematics for Physics 1		
Instructor	Hatsuda Yasuyuki		
Semester	Spring Semester	Credit	2 Credits
Course Number	PHY2600	Language	Japanese

Course Objectives

This course is an introduction to vector analysis for physics students. Vector analysis is important in Electromagnetism and Fluid Dynamics.

Course Contents

The main topics are vector product, vector derivative and vector integration. The final goal is to learn Gauss's theorem and Stoke's theorem.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB043&syllabuslink=1

CB044

Course Title	Mathematics for Physics 2		
Instructor	Kimura Masashi		
Semester	Fall Semester	Credit	2 Credits
Course Number	PHY2600	Language	Japanese

Course Objectives

This course　introduces the basics of solving differential equations.

Course Contents

Because most natural phenomena are described by differential equations, solving and understanding differential equations is very important. In this course, we learn various approaches to differential equations.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB044&syllabuslink=1

CB045

Course Title	Exercises in Physics 1		
Instructor	Kimura Masashi		
Semester	Spring Semester	Credit	1 Credit
Course Number	PHY2800	Language	Japanese

Course Objectives

The aim of this course　is that students can solve problems of physics.

Course Contents

We solve problems of electromagnetism 1, mathematical physics 1 and analytical mechanics.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB045&syllabuslink=1

CB046

Course Title	Exercises in Physics 2		
Instructor	※		
Semester	Fall Semester	Credit	1 Credit
Course Number	PHY2800	Language	Japanese

Course Objectives

This course is for exercises on "Electromagnetism II" and on "Mathematics for Physics II".

Course Contents

Students solve problems on "Electromagnetism II" and on "Mathematics for Physics II", alternatively.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB046&syllabuslink=1

CB047

Course Title	Exercises in Physics 3		
Instructor	Hatsuda Yasuyuki		
Semester	Spring Semester	Credit	1 Credit
Course Number	PHY2800	Language	Japanese

Course Objectives

This course is for exercises on "Statistical Mechanics I" and on "Quantum Mechanics I".

Course Contents

Students solve problems on "Statistical Mechanics I" and on "Quantum Mechanics I", alternatively.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB047&syllabuslink=1

CB048

Course Title	Way of Learning Physics		
Instructor	※		
Semester	Spring Semester	Credit	2 Credits
Course Number	-------	Language	※

Course Objectives

This course introduces the “physics in university “ through learning “special relativity” which is good introduction on learning modern physics.

Course Contents

An establishment process of classical mechanics, which is the basis of physics, is reviewed. The preparation for mathematics is explained. The special relativity, which is the foundation of modern physics, is introduced.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB048&syllabuslink=1

CB049

Course Title	Differential and Integral Calculus 1		
Instructor	Ueno Takahiko		
Semester	Spring Semester	Credit	2 Credits
Course Number	PHY2600	Language	Japanese

Course Objectives

The aim of this course is to acquire the basic knowledge and practical computation of differential and integral calculus with a single variable. We develop differential and integral of high school mathematics and acquire the knowledge of series, Taylor expansion, improper integral, etc.

Course Contents

We learn chapter 6, 1, 2 and 3 from the textbook. We develop differential and integral of high school mathematics and acquire new knowledge and ideas of series, Taylor expansion, improper integral, since this knowledge is necessary for learning specialist subjects.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB049&syllabuslink=1

CB050

Course Title	Differential and Integral Calculus 2		
Instructor	Ueno Takahiko		
Semester	Fall Semester	Credit	2 Credits
Course Number	PHY2600	Language	Japanese

Course Objectives

The aim of this course is to acquire the basic knowledge and practical computation of differential and integral calculus with several variables. We acquire the knowledge of limitation, partial and total derivative of a function, extremum, constrained extremum, multiple integral and surface area, etc.

Course Contents

We learn chapter 4 and 5 from the textbook. Basically we treat in two variables. We acquire the basic knowledge and ideas of differential and integral calculus with several variables of limitation, partial and total derivative of a function, Taylor expansion, extremum, constrained extremum, the method of Laglange multiplier, multiple integral, surface area and the relation between the gamma and the beta function, since this knowledge is necessary for learning specialist subjects.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB050&syllabuslink=1

CB055

Course Title	Linear Algebra 1		
Instructor	Kikuchi Tetsuya		
Semester	Spring Semester	Credit	2 Credits
Course Number	PHY2600	Language	Japanese

Course Objectives

The first aim of the course is to be able to compute algebraic operations on vectors, matrices and determinants.The second aim is to understand how these computations can be related to geometric problems. The final aim is to be familiar with the mathematical thinking to prove theorem statements.

Course Contents

First we define some basic operations on vecrors and matrices. Then we learn the method of row reduction for solving systems of linear equations and finding inverse matrices. Finally we discuss the properties of determinants and their applications.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB055&syllabuslink=1

CB056

Course Title	Linear Algebra 2		
Instructor	Kikuchi Tetsuya		
Semester	Fall Semester	Credit	2 Credits
Course Number	PHY2600	Language	Japanese

Course Objectives

The aim of this course is to understand the axiomatic formulation of general vector spaces and mathematical proofs of theorem statements. The second aim is to learn matrix representations of linear transformations and the diagonalization problem for matrices.

Course Contents

First we define abstruct vector spaces, subspaces and linear transformations. Then we discuss matrix representations of linear transformations. Finally, we consider the diagonalization problem for matrices, inner product of vectors, orthogonally diagonalization for symmetric matrix and their applications.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB056&syllabuslink=1

CB057

Course Title	Exercises in Basic Physics 1		
Instructor	Kurita Kazuyoshi		
Semester	Spring Semester	Credit	1 Credit
Course Number	PHY2800	Language	Japanese

Course Objectives

Problem sets on "Classical Mechanics 1". "Introduction of Physics", "Differential and Integral Calculus 1" and "Linear Algebra 1" are given in each class. Students work through them and answer the questions. The purpose of this problem session is to understand the basic concepts fully and to acquire the skills of problem solving.

Course Contents

In each problem sessions, 2~4 problems are given individually. The answer sheets are collected at the end of the sessions. They are marked and returned in the following week. The questions are asked based on the topics being discussed in the recent lectures. Students are divided into three rooms where one teacher and TA are in charge for the support. Basic problems are given and each students need to solve them by themselves. It is encouraged to share ideas how to approach the problems but copying other students' answers may be even harmful and therefore it is prohibited. Students should feel free to ask questions to the teacher and the TAs. Contents discussed in "Classical Mechanics 1". "Introduction of Physics", "Differential and Integral Calculus 1" and "Linear Algebra 1" are covered.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB057&syllabuslink=1

CB058

Course Title	Exercises in Basic Physics 2		
Instructor	Nakano Yuji		
Semester	Fall Semester	Credit	1 Credit
Course Number	PHY2800	Language	Japanese

Course Objectives

The goal of this course is to gain deeper understandings about Classical Mechanics 2, Thermodynamics, Linear Algebra 2, Differential and Integral Calculus 2 through solving physics problems.

Course Contents

The class will be separated inyo several groups. Attendance at the first day of the class is mandatory. Every week students will be given a set of assignments due the next week.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB058&syllabuslink=1

CB059

Course Title	Computer Experiments 2		
Instructor	Murata Jiro		
Semester	Spring Semester	Credit	1 Credit
Course Number	PHY2700	Language	Japanese

Course Objectives

To learn techniques of the numerical calculation using C-language, after being trained on the basic usage of the computers.

Course Contents

A classroom training to become familiar with standard usage of personal computers as a stational tool, numerical calculation techniques using spreadsheet software, and numerical solutions to solve the problems of mathematics and physics.
This course is designed to train the basics of programming technique using C-language and numerical calculation methods.
The teaching materials will be distributed via the Blackboard system. Students will be required to submit reports after solving the exercise shown in there.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB059&syllabuslink=1

CB060

Course Title	Computer Experiments 2		
Instructor	Murata Jiro		
Semester	Fall Semester	Credit	1 Credit
Course Number	PHY2700	Language	Japanese

Course Objectives

To learn how to perform numerical simulations and statistical analysis of experimental data.

Course Contents

Numerical treatments of the differential equations, Monte-Carlo technique using random number generation,
Programming for statistical analysis based on the least-square method, which is necessary for experimental data analysis.
The basic knowledge of how to apply C-language for numerical simulation covered in “Computer Experiments 1” is required.
The teaching materials will be distributed via the Blackboard system. Students will be required to submit reports after solving the exercise shown in there.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB060&syllabuslink=1

CB063

Course Title	Wave Motion and Quantum		
Instructor	Tanaka Hidekazu		
Semester	Fall Semester	Credit	2 Credits
Course Number	PHY2200	Language	Japanese

Course Objectives

As preliminaries for quantum mechanics, this course introduces the basics of waves and quantum mechanics.

Course Contents

In quantum mechanics, we deal with "quanta", which have properties both as waves and particles. We learn how to deal with waves and the basic concept of quantum. This course encourages students to follow the textbook by implementing calculation by themselves.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB063&syllabuslink=1

CB064

Course Title	Quantum Mechanics 1		
Instructor	Nakayama Yu		
Semester	Spring Semester	Credit	2 Credits
Course Number	PHY2200	Language	Japanese

Course Objectives

The aim of this course is to aquire the basic knowledge of quantum mechanics.

Course Contents

Quantum mechanics plays an important role in our understanding of microscopic systems in modern physics. In this course, we learn the uncertainty principle, wavefuncion, basic properties and solutions of Schrodinger equation.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB064&syllabuslink=1

CB065

Course Title	Quantum Mechanics 2		
Instructor	Nakayama Yu		
Semester	Fall Semester	Credit	2 Credits
Course Number	PHY3230	Language	Japanese

Course Objectives

The aim of this course is to aquire the basic knowledge of quantum mechanics.

Course Contents

Quantum mechanics plays an important role in our understanding of microscopic systems in modern phsics. In this course, we learn representation of angular momentum, various approximations, scattering theory and basics of quantum information.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB065&syllabuslink=1

CB066

Course Title	Exercises in Physics 4		
Instructor	Kimura Masashi/Yokokura Ryo/Tanaka Tomo		
Semester	Fall Semester	Credit	1 Credit
Course Number	PHY3830	Language	Japanese

Course Objectives

The aim of this course　is that students can solve problems of physics.

Course Contents

We solve problems of quantum mechanics 2 and statistical mechanics 2.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB066&syllabuslink=1

CB068

Course Title	Statistical Mechanics 1		
Instructor	Harada Tomohiro		
Semester	Spring Semester	Credit	2 Credits
Course Number	PHY2200	Language	Japanese

Course Objectives

This course introduces the basics of statistical mechanics.

Course Contents

After a brief review of thermodynamics, we learn preliminaries for and then the introductory contents of statistical mechanics.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB068&syllabuslink=1

CB069

Course Title	Statistical Mechanics 2		
Instructor	Harada Tomohiro		
Semester	Fall Semester	Credit	2 Credits
Course Number	PHY3230	Language	Japanese

Course Objectives

This course introduces the slightly advanced contents of statistical mechanics.

Course Contents

We learn the slightly advanced contents of statistical mechanics.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB069&syllabuslink=1

CB070

Course Title	Experiments in Physics 1		
Instructor	Hirayama Takato		
Semester	Spring Semester	Credit	4 Credits
Course Number	PHY2700	Language	Japanese

Course Objectives

Students learn techniques and methods used in experimental physics through practice of more advanced experiments than those learned in Basic Laboratory Experiments on Physics in the second grade, and apply the acquired techniques and methods to Experiments in Physics 2 in the fall semester and Thesis 1 and 2 in the fourth grade.

Course Contents

Students study the following six experiment themes:
Computer
Electronic Circuit
Radiation
Semiconductor
Vacuum Technique
Light

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB070&syllabuslink=1

CB071

Course Title	Experiments in Physics 2		
Instructor	Hirayama Takato		
Semester	Fall Semester	Credit	4 Credits
Course Number	PHY2730	Language	Japanese

Course Objectives

Students perform more advanced experiments using the basic techniques and methods learned in Experiments in Physics 1 or before, and aim to cultivate attitude of finding a subject and working to solve it on their own initiative and communication and presentation skills for Thesis 1 and 2 in the fourth grade.

Course Contents

Students choose one from the following six experiment themes and perform it throughout the fall semester:
Computer
Electronic Circuit
Radiation
Semiconductor
Vacuum Technique
Light
Students are encouraged to propose an original theme other than examples proposed by lecturers. Experiments should be scheduled and conducted to be finished within the term.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB071&syllabuslink=1

CB072

Course Title	Introduction to Physics		
Instructor	Yamada Shinya		
Semester	Spring Semester	Credit	2 Credits
Course Number	PHY1000	Language	Japanese

Course Objectives

This course introduces the “physics in university “ through learning “special relativity” which is good introduction on learning modern physics.

Course Contents

An establishment process of classical mechanics, which is the basis of physics, is reviewed. The preparation for mathematics is explained. The special relativity, which is the foundation of modern physics, is introduced.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB072&syllabuslink=1

CB073

Course Title	Thermodynamics		
Instructor	Hirayama Takato		
Semester	Fall Semester	Credit	2 Credits
Course Number	PHY2100	Language	Japanese

Course Objectives

We aim to achieve understanding of thermal phenomena through laws of thermodynamics and thermodynamic potentials.

Course Contents

Macroscopic material consists of a tremendous number of atoms or molecules. Nonetheless, the state of the material can be described with a small number of state variables, such as temperature, pressure, density, energy, and entropy. Only a few fundamental thermodynamics laws can explain surprisingly various phenomena. Basic concepts of thermodynamics are introduced with necessary mathematical tools.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB073&syllabuslink=1

CB074

Course Title	Analytical Mechanics		
Instructor	Kobayashi Tsutomu		
Semester	Spring Semester	Credit	2 Credits
Course Number	PHY2100	Language	Japanese

Course Objectives

Students will study analytical mechanics.

Course Contents

This course introduces analytical mechanics.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB074&syllabuslink=1

CB075

Course Title	Experiments in Chemistry for Physics Students		
Instructor	Tabuchi Mari/Watanabe Eiji		
Semester	Fall Semester 2	Credit	1 Credit
Course Number	PHY2700	Language	Japanese

Course Objectives

This course aims to enable students to learn the fundamental knowledge and experimental methods for overall chemical experimentation and to provide students with experimental sophistication.

Course Contents

In the first class, students will receive initial guidance. In the guidance, experimental guidelines and schedules will be distributed. Important notices and safety information before starting experiments, as well as how to take notes and write reports, will be explained. Class attendance for the guidance is a must. Bring a lab notebook to be used solely for experiments. One must read the experimental guidelines thoroughly and comprehend both its goals and contents before starting the experiment. In order to prevent accidents, it is crucial for students to obey the instructions of the instructor in charge whilst conducting an experiment. A scientific calculator will be necessary to conduct experiments in this course. Each individual is required to bring their own calculator.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB075&syllabuslink=1

CB076

Course Title	Experiments in Biology for Physics Students		
Instructor	Maekawa Shugo/Kasai Taishi/Oda Takashi		
Semester	Fall Semester 1	Credit	1 Credit
Course Number	PHY2700	Language	Japanese

Course Objectives

This course aims to enable students to learn the fundamental knowledge and experimental methods for overall biological experimentation and to provide students with experimental sophistication in biology.

Course Contents

In the beginning of the course, students will receive initial guidance. The Guidelines of Biological Experimentation, which will be the main text book used in this course, will be handed out along with a schedule, lab coats, and name tags. The guidelines for writing reports will also be explained. The class attendance for the guidance is a must.

After the guidance, "Biological Experiments" will be conducted in accordance with the experimental guidelines.

In "Quantitative Analysis of Proteins," the protein content in egg whites will be measured while students learn about various methods of quantitative analysis of proteins.

In "Microscope Observations," students will observe the chromosomes of onion cells undergoing division while learning about somatic cell division.

In "PCR/Electrophoresis," students will assess a person's genotype while gaining a better understanding of the big picture.

In "The Physiological Adaptations of Cells," students will learn about lac operons while gaining an understanding of the physiological adaptation mechanisms of E. Coli.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.

<URL>

https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB076&syllabuslink=1

CB102

Course Title	Electrodynamics		
Instructor	Mutou Tomomi		
Semester	Fall Semester	Credit	2 Credits
Course Number	PHY3110	Language	Japanese

Course Objectives

The aim of this course is to learn phenomenological and theoretical aspects of Maxwell's equations.

Course Contents

Based on Maxewell's equations, we discuss propagation, reflection, refraction, radiation and scattering of electromagnetic waves. We also discuss the relativistic formulation of Maxwell's equations.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB102&syllabuslink=1

CB106

Course Title	Hydrodynamics		
Instructor	Kimura Masashi		
Semester	Fall Semester	Credit	2 Credits
Course Number	PHY2510	Language	Japanese

Course Objectives

The aim of this course is to understand basic ideas of continuum mechanics and fluid mechanics.

Course Contents

In a realistic situation, we need to handle liquid or gas, which is very different from point particles and rigid bodies. In this course, we learn basic ideas of continuum mechanics and fluid mechanics.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB106&syllabuslink=1

CB107

Course Title	Introductory Nuclear Physics		
Instructor	Murata Jiro/Kurita Kazuyoshi		
Semester	Fall Semester	Credit	2 Credits
Course Number	PHY2410	Language	Japanese

Course Objectives

To understand the basic properties of nuclei as the fundamental constitutes of matter and four fundamental interactions.

Course Contents

Nuclei are located at the center of the atom, where electromagnetic, strong and weak interactions play important roles. Together with gravitational interaction, these four interactions have been understood during investigating nuclear properties. In this class, concrete properties of nuclei, together with the general treatment of the fundamental interactions will be introduced, including the unified theories. Also, problems should be solved during the class to improve better understandings.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB107&syllabuslink=1

CB108

Course Title	Introductory Solid State Physics		
Instructor	Hirayama Takato		
Semester	Spring Semester	Credit	2 Credits
Course Number	PHY2510	Language	Japanese

Course Objectives

The purpose is to understand the macroscopic properties of matter as a collection of microscopic atoms and molecules. We also study the quantum mechanical properties appeared in the solid.

Course Contents

First, the basics of quantum mechanics necessary for understanding physical properties are explained, and then the properties of atoms are learned. Next, we outline the bonding mechanism of solids, and show that various properties of metals can be explained using a free electron model. Finally, we learn about the lattice vibration of crystals. Basics of quantum mechanics and statistical mechanics will be lectured in order to understand the physical properties of matter.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB108&syllabuslink=1

CB109

Course Title	Introductory Astrophysics		
Instructor	Hiramatsu Takashi		
Semester	Fall Semester	Credit	2 Credits
Course Number	PHY2310	Language	Japanese

Course Objectives

This course introduces the physical foundations of astrophysics.

Course Contents

This course deals with gravity, fluid mechanics, and other basic physical processes that underlie various astrophysical phenomena.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB109&syllabuslink=1

Course Title	Electronics		
Instructor	Kurita Kazuyoshi		
Semester	Fall Semester	Credit	2 Credits
Course Number	PHY2510	Language	Japanese

Course Objectives

The sensing element of a radiation detector can be considered to be a current source. Small electric signals are amplified and recorded by electronic means. In this course, electronics are dealt with not as a ″black box″ but as applied technologies of electromagnetism. Characteristics of direct current circuits, alternating current circuits, and the frequency response of transistor circuits are reviewed, and students are expected to attain the ability to analyze them.

Course Contents

The basic theory of electronics is electromagnetism. However, a deep understanding of the subject requires full knowledge of physics. The physics curriculum is generally designed to develop the theoretical structure from the building blocks, but the opposite direction of learning is tried out in this class, namely, finding physics laws from phenomena, which is the normal direction of physics discoveries. Intuitive understanding of the laws is favored over mathematically rigorous derivation. Connections with the electronics experiment in ″Experiments in Physics 1″ are also considered.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB110&syllabuslink=1

Course Title	Data Processing		
Instructor	Yoshino Kazuyoshi		
Semester	Fall Semester	Credit	2 Credits
Course Number	PHY2710	Language	Japanese

Course Objectives

The goal of this class is to be able to explain the principle of data analysis used in machine learning and to realize them by computer programs.

Course Contents

This class will explain the basic principles of data analysis methods used in machine learning and how to implement those analysis methods using C language programs. The programming class will explain how to create applications on Windows using Microsoft Visual C++.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB112&syllabuslink=1

Course Title	Methods of Measurement in Physics		
Instructor	Murata Jiro		
Semester	Fall Semester	Credit	2 Credits
Course Number	PHY2910	Language	Japanese

Course Objectives

To learn essential knowledge about the treatment of experimental data and the analytical techniques for students studying physics.

Course Contents

Physics is known as the representative natural science as an empirical science. Correct data treatment is essential to compare data and theoretical models. In this course, treatment of experimental data, especially the technique of how to obtain reliable data considering their error and uncertainties, are focused on. Typical exercises will be shown, to train real data analysis.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB113&syllabuslink=1

CB114

Course Title	Special Lecture in Physics 1		
Instructor	Yamanaka Masanori		
Semester	Fall Semester	Credit	2 Credits
Course Number	PHY3910	Language	Japanese

Course Objectives

We can calculate a partition function and the expectation, which is a foundation of statistical mechanics, as a case with a concrete model (two-level system, harmonic oscillator system, ideal gas) using statistical ensemble.

Course Contents

Statistical mechanics is the study of calculating macroscopic physical quantities from microscopic laws and explaining experiments by using the concept of probability and statistics. In the first half, the basics of this methodology are explained, focusing on canonical ensemble, and in particular for two-level systems, harmonic oscillators, and ideal gases, without omitting the calculations of partition functions and expected values from the basics. We will explain from the extremely basic contents so that those who re-take statistical mechanics 1 and 2 will understand. In the second half, we will systematically explain basics to applications by analytically and numerically treating them using Ising model and gauge model. Though the concept of statistical mechanics can be applied to various fields, we explain how the methodology of statistical mechanics is used in these applications. For example, in applications to biophysics, principal component analysis of DNA molecular computing algorithms and molecular dynamics of proteins, and in applications to graph theory, solutions of staining problems such as four-color problems and condition satisfaction problems are taken as eigenstates We explain about the statistical dynamics system we have. In addition, we will explain the problems that will actually be encountered when actually performing calculations such as computational complexity, NP difficulty, and main memory size of a PC.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB114&syllabuslink=1

Course Title	Special Lecture in Physics 2		
Instructor	Watanabe Masahito		
Semester	Fall Semester	Credit	2 Credits
Course Number	PHY3910	Language	Japanese

Course Objectives

The aim of the course is to understand the physics of semiconductors from the basis of electronic property in the solids, and to learn the mechanisms of solar cells and LEDs.

Course Contents

This course outlines the solar cells as an energy source to replace petroleum from the viewpoint of semiconductor physics. The blue LED which was the subject of the 2014 Nobel Prize in Physics will be also introduced.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB115&syllabuslink=1

CB116

Course Title	Special Topic in Theoretical Physics 1(General Relativity)		
Instructor	Harada Tomohiro		
Semester	Spring Semester	Credit	2 Credits
Course Number	PHY3210	Language	Japanese

Course Objectives

This course introduces the basics of general relativity.

Course Contents

General relativity is a theory of spacetime and gravity that has passed many experimental tests with very high accuracy until now. In modern physics, not only theoretical physicists but also experimental physicists are supposed to know basic concepts in general relativity.　Since this is an introductory course to general relativity designed for beginners, it assumes students from all fields of physics.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB116&syllabuslink=1

CB117

Course Title	Special Topic in Theoretical Physics 2(Particle Physics)		
Instructor	Tanaka Hidekazu		
Semester	Spring Semester 1	Credit	2 Credits
Course Number	PHY3410	Language	Japanese

Course Objectives

The aim of this course is to learn the basics of relativistic quantum mechanics and quantum field theory.

Course Contents

This course deals with the concepts of particles and fields, the Dirac equation and elementary processes by interaction between electrons and photons. Two consecutive lessons will be given in April and May.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB117&syllabuslink=1

CB118

Course Title	Special Topic in Theoretical Physics 3(Cosmology)		
Instructor	Kobayashi Tsutomu		
Semester	Spring Semester	Credit	2 Credits
Course Number	PHY3310	Language	Japanese

Course Objectives

The aim of this course is to help students understand the basic concepts of physical cosmology by reading a textbook written in English.

Course Contents

This course deals with the basic concepts of physical cosmology.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB118&syllabuslink=1

CB120

Course Title	Special Topic in Theoretical Physics 5(Mathematical Physics)		
Instructor	Nakayama Yu		
Semester	Spring Semester 2	Credit	2 Credits
Course Number	PHY3210	Language	Japanese

Course Objectives

The aim of this course is to learn the basics of quantum field theory by using path integral method.

Course Contents

Quantum field theory is the foundation of modern physics. In this course, we attempt to understand the structure of the modern quantum field theory, the final goal of which is to formulate quantum electrodynamics by using the path integral method.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB120&syllabuslink=1

CB121

Course Title	Special Topic in Theoretical Physics 6(Statistical Physics)		
Instructor	Ozeki Masayuki		
Semester	Spring Others	Credit	2 Credits
Course Number	PHY3210	Language	Japanese

Course Objectives

Understanding statistical mechanics as an analytical tool and promoting it as a useful tool.
We test our tools in various problems in information processing.

Course Contents

After reviewing fundamental aspects of statistical mechanics, we learn the detail of spin-glass theory.
Furthermore we learn fundamental parts of quantum annealing after introduction of quantum statistical mechanics.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB121&syllabuslink=1

CB122

Course Title	Special Topic in Nuclear and Radiation Physics 1(Nuclear Physics)		
Instructor	Murata Jiro		
Semester	Spring Semester	Credit	2 Credits
Course Number	PHY3410	Language	Japanese

Course Objectives

To learn basic knowledge of particle and nuclear physics for the accelerator experiments, including training of the numerical calculation required for experiments.

Course Contents

The 20th century's physics has succeeded in establishing the knowledge and understanding of the fundamental origin of matter and force, by using microscopic and chemical techniques.
In this course, basic knowledge of what was known when radioactivity was discovered, properties of particle and nuclei from atomic nuclei to hadrons, quarks, and leptons investigated using natural radioactivity and accelerators will be lectured to understand the underlying common concepts.
The students will be trained to start experimental research, by applying concrete examples together with the lectures.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB122&syllabuslink=1

Course Title	Special Topic in Nuclear and Radiation Physics 2(Nuclear Astrophysics)		
Instructor	Yamaguchi Hidetoshi		
Semester	Spring Semester	Credit	2 Credits
Course Number	PHY3310	Language	Japanese

Course Objectives

The history of the universe and stellar evolution, which are huge-scale phenomena, are related to the world of tiny particles, the atomic nuclei. This lecture is to study the role of atomic nuclei in the universe, including cutting-edge topics, such as nucleosynthesis and stellar explosions.

Course Contents

It was in the middle of 20th century that the atomic nuclei are found to play essential roles in the evolution of the universe and origin of elements. A variety of elements exist in this world have been synthesized through nuclear reactions from hydrogen atoms, which is on going even today. All these synthesis of elements mainly took place at the early universe (100 seconds after Big bang), and in the main sequence stars that have been created and destroyed for 10 billion years. Nuclear reactions are also dominating the stellar evolution process in producing the energy to shine the stars, and eventually could induce a supernova explosion. Challenges have been made to study these nuclear reactions experimentally on the earth. For example, the RI beam factory (RIBF) at RIKEN, they create various nuclides which have never been produced by mankind before, to know the origin of the elements. Our knowledge on the nucleosynthesis is still not complete,e.g., the synthesis of heavy elements was once considered to be well-known, but recent studies revealed some deficit in our understanding. In this lecture, an overview on the role of atomic nuclei in stellar phenomena is given, and the research method to study that is introduced.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB123&syllabuslink=1

CB124

Course Title	Special Topic in Nuclear and Radiation Physics 3(Atomic and Molecular Phys.)		
Instructor	Nakano Yuji		
Semester	Spring Semester	Credit	2 Credits
Course Number	PHY3210	Language	Japanese

Course Objectives

The aim of this course is to understand the basic structure and behavior of atoms and molecules based on quantum mechanics.

Course Contents

The course outline:
・Introduction to atomic, molecular and optical (AMO) physics
・Atomic structure
・Molecular structure
・Atomic and molecular collision
・Interaction with electromagnetic fields
・Experimental methods

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB124&syllabuslink=1

CB126

Course Title	Special Topic in Nuclear and Radiation Physics 5(Hadron Physics)		
Instructor	Kurita Kazuyoshi		
Semester	Spring Semester	Credit	2 Credits
Course Number	PHY3410	Language	Japanese

Course Objectives

Acquiring skills to calculate momenta and threshold energies using relativistic kinematics. Understanding the concepts of the hadron
physics and mastering the order of magnitude estimations of energy, time, momentum and scale of the physics variables.

Course Contents

Characteristics of strongly interacting hadrons are summarized and the
reaction mechanisms are explained based on QCD and the parton model.
Current topics of the field will be also touched upon in the course of
the lecture.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB126&syllabuslink=1

CB134

Course Title	Introduction to Astrophysics and Solar Terrestrial Physics		
Instructor	Kameda Shingo/Kitamoto Shunji/Yamada Shinya		
Semester	Spring Semester	Credit	2 Credits
Course Number	PHY2310	Language	Japanese

Course Objectives

The aim of this course is to understand the structure of the universe and its evolution, high-energy phenomena, black holes, planets (including the earth and moon) and small bodies in the solar system, and exoplanets, based on the latest research results.

Course Contents

This course is composed of 3 parts:
(1) From the large-scale structure of the universe to the solar system, evolution of each celestial body, and the formation and circulation of elements in the universe. Overview of high energetic phenomena related to black holes.
(2) A supermassive black hole that resides in a galaxy, where it is believed to affect the star formation rate and the thermal history of inner galactic gas and to interact with the gas in a cluster of galaxies. Overview of a supermassive black hole, a cluster of galaxies, co-evolution of the galaxy and the black hole, and the latest X-ray observation technologies used for the space mission.
(3) Introduction of Hayabusa2, Martian Moon Exploration mission, and exoplanetary science

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB134&syllabuslink=1

CB135

Course Title	Quantum Optics		
Instructor	Kanai Norikane/Koh Keishin		
Semester	Fall Semester	Credit	2 Credits
Course Number	PHY3510	Language	Japanese

Course Objectives

The aim of the course is to deepen the understanding of the wave nature of light such as interference and diffraction, and the quantum effects of lasers.

Course Contents

The course outlines the basics of wave optics, quantum theory of light, and the principle of laser. Some physical phenomena using the laser with its application will be also introduced.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB135&syllabuslink=1

CB136

Course Title	Introductory Particle Physics		
Instructor	Tanaka Hidekazu		
Semester	Fall Semester	Credit	2 Credits
Course Number	PHY2410	Language	Japanese

Course Objectives

This course is aimed to learn about the properties and phenomena of elementary particles.

Course Contents

What are the constituents of matter?　What is the law governing matter? The problem is one of the themes that humanity has pursued for a long time. The result is the standard model of elementary particles. This course explains quantum mechanics, special relativity, quantum field theory and introduces the phenomena of the elementary particles and the properties of quark, leptons, gauge bosons.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB136&syllabuslink=1

CB137

Course Title	Special Topics on Mathematics for Physics		
Instructor	Hatsuda Yasuyuki		
Semester	Fall Semester	Credit	2 Credits
Course Number	PHY3610	Language	Japanese

Course Objectives

Symmetries are most fundamental in physics. Continuous symmetries are described by Lie algebra. The goal of this course is to learn basics on Lie algebra and relations to physics.

Course Contents

The main topic is Lie algebra in group theory. I first explain some basics on group theory, and proceed to the orthogonal group and the unitary group. The classification of Lie algebra is also discussed.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB137&syllabuslink=1

CB138

Course Title	Special Topic in Astrophysics and Solar Terrestrial Physics 7		
Instructor	Yoshioka Kazuo		
Semester	Spring Others	Credit	2 Credits
Course Number	PHY3310	Language	Japanese

Course Objectives

This course aims for students to understand the formation and dynamics of atmospheres or plasmas around planets.

Course Contents

This course aims to introduce the atmosphere and plasma around the planet based on the latest observation, along with various observation methods. Students engage in the practice by analyzing actual data.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB138&syllabuslink=1

CB140

Course Title	Special Topic in Astrophysics and Solar Terrestrial Physics 9		
Instructor	Yamada Shinya		
Semester	Spring Semester	Credit	2 Credits
Course Number	PHY3310	Language	Japanese

Course Objectives

The aim of this lecture is to understand high-energy astrophysical processes.

Course Contents

The energy range in high energy astrophysics is high so that a photon is treated as a particle. The photon detection and detectors are reviewed. Black holes, cluster of galaxies are used to depend the understanding of the high-energy astrophysics.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB140&syllabuslink=1

CB141

Course Title	Introduction to Astrophysics 1		
Instructor	Kitamoto Shunji/Yamada Shinya		
Semester	Spring Semester	Credit	2 Credits
Course Number	PHY2310	Language	Japanese

Course Objectives

Focusing outside the solar system, students are expected to learn basic concepts about the universe's structure and evolution.

Course Contents

In this course, students learn concepts about the universe's structure and evolution and about how to investigate it. Topics cover stars, our Milky Way Galaxy, galaxies, galaxy clusters, and the expanding universe. Students also learn the origin of elements.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB141&syllabuslink=1

CB143

Course Title	Mathematics for Physics 3		
Instructor	Hiramatsu Takashi		
Semester	Fall Semester	Credit	2 Credits
Course Number	PHY2610	Language	Japanese

Course Objectives

This course is an introduction to complex analysis for physics students.

Course Contents

Complex differentiable functions as known as holomorphic functions have a lot of useful mathematical properties.
We learn some theorems relating to them and their applications to calculate definite integrals of real functions on the real domain.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB143&syllabuslink=1

CB144

Course Title	JAXA Space Science and Technology		
Instructor	Kameda Shingo		
Semester	Fall Semester	Credit	2 Credits
Course Number	PHY2310	Language	Japanese

Course Objectives

This course aims to develop knowledge of space science based on physics through examples of planning, development, and operation in the ongoing space observation project, in addition to the history of space science achievements and technology development by satellites and planetary explorers etc.

Course Contents

Researchers of the Japan Aerospace Exploration Agency (JAXA), who have been conducting solar system exploration and space observation projects, introduce historical background of space missions and basics about the scientific results of the latest space science projects and the technologies.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB144&syllabuslink=1

Course Title	English for Physics 1		
Instructor	Hirayama Takato/Nakagawa Naoko		
Semester	Fall Semester	Credit	2 Credits
Course Number	PHY2923	Language	Others

Course Objectives

This course provides an opportunity for physics students to use their ability to read text or literature written in English and also to hear lectures in English.　Especially, this course provides exercises to understand the technical terms and grammar used in scientific literature.　The skill of writing a scientific report will also be taught.

Course Contents

Students will be divided into two groups. Each group will attend one of either Nakagawa's class or Hirayama's class during the first half of the semester.　In the second half of the semester, the groups will be switched.　The content of the two classes are as follows:

Nakagawa:

I will conduct reading practice combining rough reading and extensive reading, listening practice with speech materials, and speaking practice on the subject of physics. Writing practice by developing an experiment report in English will be also conducted. My class includes some small tests to check comprehension.

Hirayama:

Students will learn the difference between usual English and scientific English. Then students will read a piece of scientific literature to understand terms, phrases and grammar often used in scientific literature.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.

<URL>

https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB310&syllabuslink=1

CB311

Course Title	English for Physics 2		
Instructor	Nakagawa Naoko		
Semester	Spring Semester	Credit	2 Credits
Course Number	PHY2923	Language	Others

Course Objectives

This course is designed to develop the English communication skills for the preparation of student reports and scientific manuscripts for publications.

Course Contents

In this course, reading practice combining rough reading and extensive reading is conducted in various subjects of physics, such as relativity, astrophysics, fluid dynamics, and thermodynamics. Listening practice with speech materials, speaking practice, writing practice, and grammar practice are also included in this course. How to give scientific presentations in English assuming you are presenting at an international conference is also included. This class includes some small tests to check comprehension.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB311&syllabuslink=1

CB322

Course Title	Chemistry for Physics Students		
Instructor	Onuki Hiroyuki		
Semester	Fall Semester	Credit	2 Credits
Course Number	PHY2920	Language	Japanese

Course Objectives

1. The course aims to develop understanding of basic chemical topics that are essential for students' future learning of other scientific subjects and real world experience.
2. The course aims to cultivate a perspective on chemistry essential for students in physics.

Course Contents

1. The essential points learned in high school "basic chemistry" and "chemistry" will be reviewed and supplemented with additional topics from the physics perspective.
2. Intensive topics in addition to high school chemistry will be introduced. In order to develop better understanding, students will be required to attempt exercises in every lesson.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB322&syllabuslink=1

CB323

Course Title	Biology for Physics Students		
Instructor	Taki Keiko		
Semester	Spring Semester	Credit	2 Credits
Course Number	PHY2920	Language	Japanese

Course Objectives

This course is designed to learn basics and concepts of Biology and discover your own viewpoints of interest in Life Science.
This class is also designed to gain the ability to make use of information brought about by the diverse fields in Life Science.

Course Contents

The information brought about by Life Science affects a wide range of fields, and more opportunities using such information are available. In this course, students will learn basic Life Science from some perspectives and discover their viewpoints of interest and get close to Life Science.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB323&syllabuslink=1

CB331

Course Title	Introduction to Medicine		
Instructor	Sasai Keisuke		
Semester	Fall Semester	Credit	2 Credits
Course Number	-------	Language	※

Course Objectives

This course will outline the composite field of medical science,introducing the roles that various sciences and technologies play in medicine.

Course Contents

The medicine is an integrated science based on not only biology and pharmacology, but also other many kinds of sciences, such as chemistry, physics, and even liberal arts. This course will outline the medical science, and introduce the role of technologies and physics in the interdisciplinary approach to health care.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB331&syllabuslink=1

CB490

Course Title	Introductory Seminar on Basic Physics		
Instructor	Kobayashi Tsutomu		
Semester	Spring Semester	Credit	2 Credits
Course Number	PHY1910	Language	Japanese

Course Objectives

Students aim to learn the active attitude required for studying physics in a university and basic knowledge of mathematics and physics. This course supports them to accomplish the goal by themselves. Communication skill is also cultivated through discussion among students, lecturers and teaching assistants.

Course Contents

Students are designated to a problem exercise class (up to 30 students) or a research class according to the result of placement test conducted at the beginning of school year.
Students in the problem exercise class should be aware of their weak point through solving problems of mathematics and physics learned in a high school. They overcome the weakness by themselves and aim to learn basic academic skills required for studying physics in a university.
Students in the research class are divided into subgroups with approximately 10 students and a lecturer. They perform research or read in turn a textbook concerning a theme they choose to reach a goal as scheduled by themselves. They present the result of their research and discuss questions and courses of the research with other participants in the class

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB490&syllabuslink=1

CB501

Course Title	Thesis		
Instructor	※		
Semester	Full Year Others	Credit	8 Credits
Course Number	-------	Language	※

Course Objectives

To perform research in theoretical physics or in experimental physics while learning the latest topics of the given theme.

Course Contents

To perform research in theoretical physics or in experimental physics while learning the latest topics. Students are asked to be active participants of this final course.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB501&syllabuslink=1

CB531

Course Title	Thesis 1		
Instructor	※		
Semester	Spring Others	Credit	4 Credits
Course Number	PHY4000	Language	Japanese

Course Objectives

To perform research in theoretical physics or in experimental physics while learning the latest topics of the given theme.

Course Contents

To perform research in theoretical physics or in experimental physics while learning the latest topics. Students are asked to be active participants of this final course.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB531&syllabuslink=1

CB561

Course Title	Thesis 2		
Instructor	※		
Semester	Fall Others	Credit	4 Credits
Course Number	PHY4000	Language	Japanese

Course Objectives

To perform research in theoretical physics or in experimental physics while learning the latest topics of the given theme.

Course Contents

To perform research in theoretical physics or in experimental physics while learning the latest topics. Students are asked to be active participants of this final course.　It is required to submit the final paper and there is a final aural presentation.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CB561&syllabuslink=1

CC006

Course Title	Organic Chemistry 1		
Instructor	Yamanaka Masahiro		
Semester	Fall Semester	Credit	2 Credits
Course Number	CHE2400	Language	Japanese

Course Objectives

In this course, students will acquire fundamental knowledge necessary to study organic chemistry, while developing their ability to think logically about organic reaction mechanisms.

Course Contents

In the first half of the course, students will acquire knowledge fundamental to the understanding of molecular structure and organic reactions. Lewis dot structure, resonance theory, inductive and resonance effects, and other important concepts will be discussed. In addition, students will acquire how to denote electron movement using curved arrow notation. In the second half of the course, students will acquire knowledge in terms of organic reactions utilizing halogenated alkanes and alkenes based on the basic concepts learned in the first half.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC006&syllabuslink=1

Course Title	Organic Chemistry 2		
Instructor	Minoura Mao		
Semester	Spring Semester	Credit	2 Credits
Course Number	CHE2400	Language	Japanese

Course Objectives

Focusing on the chemical reactions which form the backbone of organic chemistry, this course aims to give students a systematic understanding of the field.

Course Contents

The organic chemistry concepts and reactions traditionally taught in lectures have been systematically condensed into this course. In our university, understanding and uses of various functional groups are discussed in the lectures, which are divided into Organic Chemistry 1 – 3 and other more advanced courses. This course is a continuation of Organic Chemistry 1. The structures and reactions of various classes of organic compounds (aldehydes, ketones, carbonic acid derivatives, and aromatic compounds) will be discussed with the mechanistic approach. The characteristic properties of carbonyl and amino groups will be discussed along with the reactions of organic compounds containing them. This lecture will build upon concepts fundamental to organic chemistry (hybridized orbitals, resonance effects, and induction effects).

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC014&syllabuslink=1

Course Title	Biology for Chemistry Students		
Instructor	Taki Keiko		
Semester	Fall Semester	Credit	2 Credits
Course Number	CHE2910	Language	Japanese

Course Objectives

This course is designed to learn common mechanisms of living organisms and to gain the ability to explain the mechanisms in their own words.

Course Contents

In this course, student will learn basic biology and gain systematic knowledge for Life Science.
Student will also understand practical applications brought about by Life Science.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC025&syllabuslink=1

CC034

Course Title	Physics 1		
Instructor	Sato Hirohiko		
Semester	Fall Semester	Credit	2 Credits
Course Number	CHE2900	Language	Japanese

Course Objectives

One could say that all natural phenomena are governed by the laws of physics. This class deals with the physics governing objects on the macro-scale. In other words, the fundamentals of classical mechanics will be discussed in this class. Thus, in taking this course, students will gain the ability to quantitatively describe the motion of an object. In addition, they will learn methods for predicting an object's motion and trajectory. Furthermore, students will learn the fundamental concepts necessary to study quantum mechanics, the laws which govern atoms and molecules at the microscopic level.

Course Contents

Utilizing differential calculus, students will learn how to accurately express the movement of an object. Next, while solving real-world problems, students will learn about mass and force. Furthermore, students will learn the general concept of energy in order to better comprehend the big picture painted by the laws of motion. Finally, students will learn about momentum and angular momentum. In this class, the basics of electromagnetism are also scheduled to be touched upon.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC034&syllabuslink=1

CC035

Course Title	Physics 2		
Instructor	Sato Hirohiko		
Semester	Spring Semester	Credit	2 Credits
Course Number	CHE2910	Language	Japanese

Course Objectives

The microscopic world of atoms and molecules is governed by the physics of quantum mechanics. In this class, students will learn the fundamentals of quantum mechanics. This course was specifically designed with students majoring in chemistry in mind. Essential concepts necessary to understand the nature of atoms will be emphasized. Within quantum mechanics, many phenomena exist that are very abnormal compared to what one sees in their daily life. While it takes time to familiarize oneself with these foreign concepts, students will surely find it to be a very interesting subject, even among the pure sciences.

Course Contents

To start the course, the limits of classical mechanics will be discussed, followed by a simple introduction to the details surrounding the discovery of quantum mechanics. Following this, the Schrodinger equation, which forms the basis for quantum mechanics, will be introduced, followed by an explanation of the significance of the wave function. By solving some simple cases of the Schrodinger equation, students will cultivate a deeper understanding of eigenvalues and eigenfunctions. Finally, by using the Schrodinger equation in three dimensions and applying it to central force potential problems, students will be able to understand the current state of electrons within an atom.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC035&syllabuslink=1

CC073

Course Title	Introduction to Physical Chemistry		
Instructor	Mitsui Masaaki		
Semester	Spring Semester	Credit	2 Credits
Course Number	CHE1200	Language	Japanese

Course Objectives

In this course, students will learn the basics of physical chemistry necessary for studying chemistry at the collegiate level.

Course Contents

Basic physics concepts necessary to study physical chemistry (momentum, energy, etc.) will be explained in this course. Building upon these ideas, quantum theory concepts essential to understanding the structure of atoms and molecules will be discussed. Wave functions, and the Schrodinger equation that is used to derive them will be discussed. Using that as a base, atomic structure and the nature of chemical bonds will be explained.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC073&syllabuslink=1

CC074

Course Title	Introduction to Analytical Chemistry		
Instructor	Miyabe Kanji		
Semester	Spring Semester	Credit	2 Credits
Course Number	CHE1300	Language	Japanese

Course Objectives

This course aims to teach students the fundamentals of analytical chemistry as well as quantitative analysis methods grounded in stoichiometric chemical equilibrium.

Course Contents

The goal of analytical chemistry is the identification of all of a substance's components (qualitative) and concentrations (quantitative). The methodology employed to do so can be divided into chemical methods (volumetric methods, gravimetric methods, etc.) and physical methods (instrumental analysis). Analytical chemistry is a discipline that forms the foundation of chemical analysis from both a theoretical and experimental standpoint.
In this lecture, students will receive the complete picture of the important areas of analytical chemistry (units, how to deal with varying means of expressing concentration and quantity of a substance, etc.). Following this, students will be shown how to deal with chemical equilibrium in solution from a thermodynamic perspective. Afterwards, using acid-base equilibrium as a concrete example, stoichiometric analysis procedures will be explained together with related topics. After this, the common ion effect will be discussed along with how to treat the dissociation of polyprotic acids from a stoichiometric perspective. At the end, the course's contents will be solidified with a review of the fundamentals of analytical chemistry and stoichiometric calculations.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC074&syllabuslink=1

CC075

Course Title	Introduction to Organic Chemistry		
Instructor	Minoura Mao/Yamanaka Masahiro/Morimoto Masakazu		
Semester	Spring Semester	Credit	2 Credits
Course Number	CHE1400	Language	Japanese

Course Objectives

This course aims to give students an understanding of resonance effects as well as the nature and structure of the bonds between atoms in organic molecules. Additionally, it aims to show students how to denote the flow of electrons using curved-arrow notation, gaining a clearer understanding of how reactions occur between organic molecules.

Course Contents

By gaining a firm understanding of the chemical bonds that make up organic compounds and the flow of electrons that dictates the organic reactions, students will learn the fundamentals of organic chemistry that govern life itself. This is a course that connects the high school chemistry courses with the organic chemistry learned at the collegiate level.
Students will learn how to properly write Lewis dot structures and understand the causes and effects of resonance structures. By learning how to denote the flow of electrons and the breaking and formation of chemical bonds with curved-arrow notation, students will learn the fundamentals of organic chemistry with reaction mechanisms.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC075&syllabuslink=1

CC076

Course Title	Introduction to Inorganic Chemistry		
Instructor	Matsushita Nobuyuki		
Semester	Spring Semester	Credit	2 Credits
Course Number	CHE1500	Language	Japanese

Course Objectives

As an introduction into inorganic chemistry, this course aims to give students an understanding of the fundamental nature of elements, atomic structure, periodicity of elements and the periodic table. As basics of composition of substances, an understanding of chemical bonds, molecular structure, and crystal structures is also aim.

Course Contents

Inorganic chemistry chiefly deals with inorganic substances, however it is impossible to pull all types of inorganic compounds, each with their own unique properties and characteristics, under a single comprehensive umbrella. In this field, one gains an understanding of an element's characteristics via the periodic table, allowing one to systematically understand the properties and reactions for various inorganic substances.
In this course, the aim is to lay the groundwork for students to gain a systematic understanding of various elements and substances through the periodic table.
To that end, students will first learn atomic structure, the origins of periodic law, and the periodicity of various properties of elements.
Next, students will learn the characteristics of molecular structure and bonds as well as what information one can infer regarding them from the periodic table.
Following this, students will learn crystal structures commonly seen in inorganic substances, which adapt solid states in many cases. The relation of these crystal structures to chemical bonds will be discussed, in addition to periodic trends.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC076&syllabuslink=1

Course Title	Mathematics for Chemistry Students		
Instructor	Mochizuki Yuji		
Semester	Spring Semester	Credit	2 Credits
Course Number	CHE1900	Language	Japanese

Course Objectives

This course covers the fundamental mathematics required to study physical chemistry and computational chemistry in this department.

Course Contents

Students will learn the fundamentals of number sequences, calculus, linear algebra, and statistics. Mathematical ability and understanding should be necessary in physical chemistry and computational chemistry. Thus, this course will serve as a preparation of base for those subjects.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC077&syllabuslink=1

CC078

Course Title	Basic Experiments in Chemistry		
Instructor	Mochizuki Yuji		
Semester	Spring Semester	Credit	2 Credits
Course Number	CHE1100	Language	Japanese

Course Objectives

As an introduction phase in "Academic Learning Methods," this discipline teaches students the fundamental experimental techniques, calculations, and information science knowledge required from one who wishes to conduct chemical research. At the same time, students will learn the proper mental attitude, ethics, conduct, safety management skills, and information literacy required by those wishing to go into research.

Course Contents

This discipline is laboratory based, and consists of the following three categories: (1) information science, (2) synthesis experiments, and (3) measurement experiments. (1) In the information science, students will learn the fundamental information necessary to appropriately interact with the sudden changes brought about by the internet and mobile devices. (2) In the synthesis, students will synthesize simple organic compounds, familiarizing themselves with the fundamental skills of weighing and filtering reagents. (3) In the measurement experiment, students will perform a neutralization titration, learning about the theory and techniques employed while dealing with acids, bases, pH measurement, and titrations. Additionally, students will learn about how to process the data they gather.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC078&syllabuslink=1

CC079

Course Title	Physical Chemistry 1		
Instructor	Edamoto Kazuyuki		
Semester	Fall Semester	Credit	2 Credits
Course Number	CHE2200	Language	Japanese

Course Objectives

Physical and chemical changes are accompanied by a net increase in entropy. This lecture aims to provide insight into the concept of entropy, which is necessary to thoroughly understand the nature of spontaneous change and equilibrium.

Course Contents

The First Law of Thermodynamics (Energy Conservation Law) will be explained. The concept of a state function will be introduced, and Hess's Law, which is critical to the understanding of thermochemistry, will be discussed.

The Second Law of Thermodynamics (Principle of Increase of Entropy) will be explained. Entropy will be defined as a state function, and through various exercises, students will come to learn that spontaneous changes are accompanied by an increase in entropy.

The concept of Gibbs energy will be introduced, enabling students to gain a unified understanding of phase and chemical equilibrium.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.

<URL>

https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC079&syllabuslink=1

CC080

Course Title	Analytical Chemistry 1		
Instructor	Sasaki Naoki		
Semester	Fall Semester	Credit	2 Credits
Course Number	CHE2300	Language	Japanese

Course Objectives

By gaining a fundamental understanding of the principles and theory behind various instrumental analysis techniques, the groundwork will be laid for students to apply both qualitative and quantitative analysis methods as well as structural and state analysis methods to practical problems. This course aims to teach students fundamental instrumental analysis techniques.

Course Contents

A wide variety of instrumental analysis methods are used in order to gain qualitative and quantitative data on various analytes. Additionally, instruments can be used for structural analysis, state analysis, and the determination of an analyte's physical properties, among many other things. In this lecture, the fundamental ideas behind highly versatile spectroscopic analysis methods and separation analysis methods will be discussed.
First, the general ideas behind spectroscopy will be introduced, after which the fundamentals behind various individual spectroscopic analysis methods will be explained. Next, the general ideas behind separation analysis will be introduced, after which the fundamentals behind various individual separation analysis methods will be explained.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC080&syllabuslink=1

CC081

Course Title	Inorganic Chemistry 1		
Instructor	Matsushita Nobuyuki		
Semester	Fall Semester	Credit	2 Credits
Course Number	CHE2500	Language	Japanese

Course Objectives

This course aims to give students an understanding of acid-base reactions and oxidation-reduction reactions as basics of inorganic chemistry. Furthermore, an understanding of metal coordination compounds from the standpoint of acid-base reactions and d-orbital bonds is aim. Additionally, an understanding of hydrogen, in terms of elemental science, and hydrogen compounds is also aim.

Course Contents

Inorganic chemistry chiefly deals with inorganic substances, however it is impossible to pull all types of inorganic compounds, each with their own unique properties and characteristics, under a single comprehensive umbrella. In this field, students will gain an understanding of an element's characteristics via the periodic table, allowing them to systematically understand the properties and reactions for various inorganic substances.
In this course, students will first learn acid-base and oxidation-reduction reactions as fundamental and important chemical reactions in inorganic chemistry, based on an understanding in high school.
Next, students will learn about metal coordination compounds, which were not thoroughly covered in high school, from the perspective of acid-base reactions and d-orbital bonds.
Lastly, students will learn about hydrogen as the first element of the periodic table in terms of elemental science. This course will give in detail properties and bonds of hydrogen atom, hydrogen molecule and hydrogen compounds, while considering about the relationship with other elements.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC081&syllabuslink=1

CC082

Course Title	Standard Experiments in Chemistry A		
Instructor	Mitsui Masaaki		
Semester	Fall Semester	Credit	2 Credits
Course Number	CHE2100	Language	Japanese

Course Objectives

By conducting experiments in the major fields of chemistry, physical chemistry, inorganic chemistry, organic chemistry, and analytical chemistry, this course aims to teach students how to manage experiments, analyze data, and write summary reports. Through conducting actual experiments, students will deepen their understanding of the concepts discussed in the lectures.

Course Contents

The experiments to be conducted are listed as follows. In physical chemistry: “Determining the Heat of Solvation and the Temperature Dependence of the Solubility of Oxalic Acid.” In organic chemistry: “Synthesis of Methyl Benzoate.” In inorganic chemistry: “Synthesis and Identification of Metal Complexes.” In analytical chemistry: “Analysis of an Acid Titration Curve and End Point Detection Mechanisms.” Before each experiment, the relevant theory will be thoroughly discussed along with data analysis and processing methods, how to create the necessary charts and graphs, and how to create the experimental report. After each experiment, one-on-one or small group interview will be conducted to ensure that students completely understand the experiment, and to help them write better reports.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC082&syllabuslink=1

CC083

Course Title	Physical Chemistry 2		
Instructor	Mitsui Masaaki		
Semester	Spring Semester	Credit	2 Credits
Course Number	CHE2200	Language	Japanese

Course Objectives

This course aims to teach students the fundamentals of the mechanics that are used to describe the state and behavior of matter on the atomic level (quantum theory).

Course Contents

The course will begin with an explanation of the birth of quantum theory (early quantum theory), and continue with an explanation of the Schrodinger equation and fundamental concepts related to it (wave functions, existence probability, quantum operators, eigenvalues, expected values, etc.). Next, the Schrodinger equation will be applied to translational, rotational, and oscillatory movements, culminating in a derivation of the orbitals and energy of the hydrogen atom. The results will be used to cultivate an understanding of the behavior of electrons in atoms containing more than one electron.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC083&syllabuslink=1

Course Title	Standard Experiments in Chemistry B		
Instructor	Minoura Mao		
Semester	Spring Semester	Credit	4 Credits
Course Number	CHE2100	Language	Japanese

Course Objectives

Students will conduct synthesis experiments (organic and inorganic chemistry) as well as calculation/measurement experiments (physical, analytical, and computational chemistry) in order to improve their skills at managing experiments, analyzing data, and writing reports. Through conducting actual experiments, students will deepen their understanding of the concepts discussed in the lectures. In addition, students will learn the proper ethics, conduct, and safety skills that are required when they conduct responsible experiments and research activities.

Course Contents

Students will conduct synthetic experiments (organic and inorganic chemistry) as well as calculation/measurement experiments (physical, analytical, and computational chemistry). Students will build upon the data analysis and processing methods, as well as the graphing/table-making skills learned in “Basic Experiments in Chemistry” and “Standard Experiments in Chemistry A.” After each experiment, one-on-one or slightly larger meetings will be conducted to ensure that students completely understand the experiment, and to help them write better reports.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC084&syllabuslink=1

CC085

Course Title	Standard Experiments in Chemistry C		
Instructor	Matsushita Nobuyuki		
Semester	Fall Semester	Credit	4 Credits
Course Number	CHE2100	Language	Japanese

Course Objectives

The aims of this experimental class are to learn experimental techniques, data analyses, and report-writings through synthesis experiments (organic and inorganic chemistry) and calculation/measurement experiments (physical, analytical, and computational chemistry). Through conducting actual experiments, students will raise their experimental skills and deepen their understanding of the concepts discussed in the lectures.

Course Contents

Students will conduct synthetic experiments (organic and inorganic chemistry) and calculation/measurement experiments (physical, analytical, and computational chemistry). Students will prepare experimental reports based on the data analysis and processing methods, as well as the graphing/table-making skills learned in "Basic Experiments in Chemistry," "Standard Experiments in Chemistry A," and "Standard Experiments in Chemistry B." After each experiment, a one-on-one interview or a group interview will be conducted to ensure that students completely understand the experiment, and to help them write better reports.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC085&syllabuslink=1

CC086

Course Title	English for Chemistry Students		
Instructor	Miyamoto Keiko/Nakagawa Naoko		
Semester	Fall Semester	Credit	2 Credits
Course Number	CHE2903	Language	Others

Course Objectives

This course provides an opportunity for physics students to use their ability to read text or literature written in English and also to hear lectures in English.　Especially, this course provides exercises to understand the technical terms and grammar used in scientific literature.　The skill of writing a scientific report will also be taught.

Course Contents

Students, divided into two groups, will attend classes given by Miyamoto and Nakagawa, respectively.
Miyamoto Class:
What is Chemical English? How is it different from "ordinary" English?　Students will learn chemistry-specific grammar and perform listening and reading exercises.
Nakagawa Class:
Students will perform intensive and extensive reading exercises based on chemical topics, listening exercises using recorded sounds, writing exercises, comprising writing an experiment report, and speaking exercises. Several comprehension tests will be given.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC086&syllabuslink=1

Course Title	Molecular Dynamics Theory		
Instructor	Komeiji Yuuto		
Semester	Fall Semester	Credit	2 Credits
Course Number	CHE3610	Language	Japanese

Course Objectives

This course will discuss molecular dynamics simulation, an important computational method of determining a molecule's structure, properties, and functions. On top of how to conduct a molecular dynamics simulation, the theory behind them and their potential applications will also be discussed.

Course Contents

The molecular dynamics (MD) method is a computational method to simulate molecules. In MD, the forces acting upon component atoms of molecules are calculated and used to calculate their motion in real time. The MD method is applied to a wide variety of substances including water, liquid crystals, proteins, DNA, and so on, to give conjectures as to their dynamic structure and their energy state. In this class, students will be taught how to perform MD simulation. In addition, the theory and algorithms behind it, as well as its practical applications, will be discussed. This lecture will mostly focus on the classical MD method, which is based on classical mechanics; however, the ab initio MD method based on quantum mechanics will also be introduced briefly.　During the lectures, simulation calculations will often be run. Practice makes perfect in this subject; as such, good attendance and punctual report submissions are a must. Students will be required to take a test to gauge their level of understanding at the end.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC106&syllabuslink=1

Course Title	Organic Chemistry 3		
Instructor	Morimoto Masakazu		
Semester	Fall Semester	Credit	2 Credits
Course Number	CHE2410	Language	Japanese

Course Objectives

A degree from the College of Science is a result of much hard work and study, and is meant to show that a student "understands the fundamental principles, laws, and theory in [their] chosen field, and can apply them as necessary." In order to make such a statement true, students need to learn about the structure and reactions of polycyclic aromatic compounds and heterocyclic aromatic compounds. They will also need to learn about radical reactions, rearrangement reactions, and pericyclic reactions in order to deepen their understanding of the practical applications of organic chemistry.

Course Contents

Polycyclic aromatic compounds and heterocyclic aromatic compounds have important uses in pharmaceuticals and various biological processes, and are often used in certain industries as functional materials. In the first half of this course, students will build upon the fundamental organic chemistry concepts learned in Organic Chemistry 1 and 2 to learn about the structure, reactions, and synthesis of polycyclic and heterocyclic aromatic compounds. For example, the reactivity and selectivity in their electrophilic and nucleophilic substitution reactions will be compared to what students have previously learned about benzene. This will be discussed from the point of view of their electronic structures and the stability of reaction intermediates. In the second half of the course, radical reactions, rearrangement reactions, and pericyclic reactions (Diels-Alder reactions and electrocyclic reactions) will be lectured.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC113&syllabuslink=1

Course Title	Spectrometric Identification of Organic Compounds		
Instructor	Morimoto Masakazu		
Semester	Spring Semester	Credit	2 Credits
Course Number	CHE2400	Language	Japanese

Course Objectives

A degree from the College of Science is a result of much hard work and study, and is meant to show that a student "understands the fundamental principles, laws, and theory in [their] chosen field, and can apply them as necessary." In order to make such a statement true, students need to learn the theory behind nuclear magnetic resonance (NMR) spectroscopy, mass spectrometry (MS), infrared spectroscopy (IR), as well as other instrumental analysis methods. Students will need to learn spectral analysis methods, and be able to apply this knowledge to identify the chemical structure of organic compounds from spectral data.

Course Contents

In organic chemistry research, being able to determine the chemical structure of reaction products is essential. In this lecture, students will learn the theory behind NMR, MS, IR, and other instrumental analysis methods, as well as how to interpret the spectral data.
After explaining the phenomenon of nuclear magnetic resonance, the necessary information on chemical shifts, integration intensities, spin-spin coupling, and chemical equivalence required to analyze a 1H NMR spectrum will be explained. Students will then practice how to determine a chemical structure from NMR spectra. 13C NMR will also be discussed, paying particular attention to its similarities and differences compared to 1H NMR, as well as how it can be used as a compliment to 1H NMR.
Following this, the theory behind various ionization methods and ion separation methods will be discussed. Students will then be taught how to interpret mass spectrometry data based on electron-impact ionization.
The course will then move on to IR, whereupon molecular vibrational modes and selection rules will be discussed. Students will then be taught the absorption wavenumbers of various functional groups through real examples, whereupon it will be explained how to interpret IR spectra.
Finally, students will practice identifying the structure of unknown compounds through interpretation of NMR, MS, and IR data.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC114&syllabuslink=1

Course Title	Organic Chemistry of Natural Products		
Instructor	Funasaki Mariko		
Semester	Spring Semester	Credit	2 Credits
Course Number	CHE3410	Language	Japanese

Course Objectives

The aim of this course is to help students acquire an understanding of the naturally occurring organic compounds familiar to us.

Course Contents

This course deals with the structure and properties of natural products, focusing on sugars, amino acids, aromatic compounds, terpenoids and alkaloids. It covers from the review of high school to the latest findings of the research. Structure determination and biological activity of natural products used in research are also discussed.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC115&syllabuslink=1

Course Title	Organic Synthetic Chemistry		
Instructor	Minoura Mao		
Semester	Fall Semester	Credit	2 Credits
Course Number	CHE3410	Language	Japanese

Course Objectives

Using students' fundamental knowledge of the various properties of organic compounds as a basis, this course aims to deepen their understanding of the fundamentals whilst enabling them to cultivate a systematic understanding of common synthesis methods.

Course Contents

This course will discuss the fundamental reaction types and reagents encountered in organic synthesis. While gaining a systematic understanding of the fundamentals, students will practice using reaction mechanisms to analyze the outcomes of a reaction. Lectures will be mainly conducted on the blackboard, but important explanations and practice problems will be handed out in class. In order to ensure that students have completely understood the material covered in the lectures, three exams will be conducted (includes the final exam).

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC116&syllabuslink=1

CC148

Course Title	Seminar on Chemistry		
Instructor	Tabuchi Mari		
Semester	Fall Semester	Credit	2 Credits
Course Number	CHE2010	Language	Japanese

Course Objectives

In order to cultivate a broad outlook with regards to the field of chemistry, students will sharpen their problem-solving abilities through independent study of a topic of their choice.

Course Contents

Each instructor will be in charge of a few students, who will each choose a subject within the field of chemistry to independently investigate. Students will consult with their assigned instructor to determine the specific contents of their independent study. At the end, students will give an oral presentation of their findings. Students will need to take an active approach towards the investigation of their chosen subject and make steady progress, as frequent discussions with their assigned instructor will play a large part in determining the quality of their final presentation. Students will learn how to reference information found in texts as well as on the internet for use in their investigations. While creating their presentation and reports, students will need to use Word and PowerPoint.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC148&syllabuslink=1

CC167

Course Title	Reaction Kinetics		
Instructor	Nagano Shusaku		
Semester	Spring Semester	Credit	2 Credits
Course Number	CHE2200	Language	Japanese

Course Objectives

In this course, students study empirical chemical kinetics for analysis of chemical reactions, as well as how to make predictions about reaction mechanisms based on the rate of reaction.

Course Contents

Chemical reaction theory is a field in which one examines how the chemical composition of a substance changes as a function of time. The course will start by defining the reaction rate and using this definition to discuss the kinetics of various chemical reactions. Students will learn why reaction rates vary from reaction to reaction, and why they change as a result of certain reaction conditions such as temperature and pressure. Additionally, the relation between a reaction's rate equation and its mechanism will be discussed along with research methods that make use of reaction rate theory.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC167&syllabuslink=1

Course Title	Solid Materials Science		
Instructor	Ozawa Kenichi		
Semester	Spring Semester	Credit	2 Credits
Course Number	CHE3210	Language	Japanese

Course Objectives

1. Participants are expected to understand electronic band structures and photon band structures of crystals.
2. Participants are expected to be able to write simple band structures.
3. Participants are expected to have an ability to deduce information on properties of solid materials from band structures.

Course Contents

One of key factors to understand solid physicochemical properties is to understand relations between energies and wavenumbers, i.e., dispersion relations. An electron energy band, which describes the electron energy and the wavenumber, and a photon band, which shows a relation between the lattice vibration and the wavenumber, are typical dispersion relations. The participants learn how to read and write these band structures and how to deduce physicochemical information from the band structures. At the end of the term, the participants are expected to have knowledge in the mechanisms behind electrical, thermal, optical, mechanical properties of solid materials.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC173&syllabuslink=1

Course Title	Inorganic Chemistry 2		
Instructor	Matsushita Nobuyuki		
Semester	Spring Semester	Credit	2 Credits
Course Number	CHE2510	Language	Japanese

Course Objectives

This course aims to give students an understanding of properties and characteristics of substances of the s-block and p-block elements of the periodic table, standing on "the elements", while taking account of the similarities and systematic changes depending on "groups" and "periods".

Course Contents

Inorganic chemistry is a field that deals with all elements found on the periodic table. Characters of diverse elements, and properties and bonds of compounds formed by combination of the elements can be logically understood based on atomic and molecular orbitals.
In this lecture, students will learn about s-block and p-block elements and the properties and bonds of their compounds, while paying particular attention to the groups and periods of the periodic table. The course will not consist of memorizing the properties of each element one-by-one, but rather understanding the similarities and differences of each group of elements systematically.
Continuing from Inorganic Chemistry 1, where students learned about hydrogen, the course will first cover oxygen, which forms compounds with almost of all elements. Students will learn about the character of oxygen as the element, and the properties and bonds of the compounds (oxides).
Afterwards, students will learn about the similarities and differences exhibited by elements within each group on the periodic table. Trends of element's periodicity within and across groups will be discussed.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC175&syllabuslink=1

Course Title	Analytical Chemistry 2		
Instructor	Miyabe Kanji		
Semester	Spring Semester	Credit	2 Credits
Course Number	CHE2310	Language	Japanese

Course Objectives

This course aims to teach students the fundamental principles of quantitative chemical analysis, which forms the backbone of analytical chemistry. Students will pick up the necessary knowledge required to perform actual analysis (experiments, research).

Course Contents

Analytical chemistry is critical to research conducted in the physical sciences, pharmaceutical sciences, medical sciences, agricultural sciences, and engineering. On top of this, it is used in the QA/QC of industrial goods, environmental surveys, medical diagnoses, criminal investigations, and food safety evaluations, among other things closely related to our everyday lives. Analytical chemistry is made up of two fundamental components: qualitative analysis and quantitative analysis. The former analysis takes a sample (solid, liquid, gas, or multi-phase) and determines exactly what kind of chemical substance(s) it contains. The latter determines how much of the substance is present in the sample, or what its concentration is. Quantitative analysis also helps deepen one's understanding of chemical reactions. In this lecture, students will review the basics of quantitative analysis learned in Introduction to Analytical Chemistry. The applications of this knowledge will be discussed, including but not limited to: complex-forming reactions and chelatometric titrations, precipitation reactions and precipitation titrations, gravimetric analysis, oxidation-reduction reactions and titrations as well as partition equilibria.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC176&syllabuslink=1

Course Title	Physical Chemistry 3		
Instructor	Nagano Shusaku		
Semester	Fall Semester	Credit	2 Credits
Course Number	CHE2210	Language	Japanese

Course Objectives

In this class, students study the basic concept of the molecular orbital method and understand the molecular structure and electronic state of molecules. Moreover, students also study basic spectroscopy, magnetic resonance, and X-ray scattering on how to evaluate molecular structure based on quantum chemistry and structural chemistry.

Course Contents

To understand the molecular structure from quantum theory is necessary for structural analysis and studies on optical and electronic molecular properties. In this lecture, students study the basic concept and physical meaning of the molecular orbital method and understand the molecular structure and molecular electronic state. Students also study on spectroscopy, which analyzes molecular and electronic structures from the interaction between light and molecules. Students understand vibrational and rotational spectra and electronic spectra. Besides, students learn the basics of magnetic resonance and X-ray scattering for the structural analysis methods in chemistry.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC179&syllabuslink=1

Course Title	Molecular Orbital Theory		
Instructor	Mochizuki Yuji		
Semester	Spring Semester	Credit	2 Credits
Course Number	CHE3610	Language	Japanese

Course Objectives

Students will learn the fundamentals of molecular orbital calculations available with such as the GAUSSIAN program.

Course Contents

The Hartree-Fock (HF) method is considered as a starting point toward more sophisticated molecular orbital methods providing numerical solutions of the Schrodinger equation for electrons. The HF wavefunction is of single determinant type, and the electron-electron interactions are approximated in an averaged way with self-consistency. In this course, the fundamental concept and associated mathematical representations of HF are briefed, and then the protocols for computational processing to obtain the HF solution are described. Furthermore, several topics of electron correlated treatment, density functional theories, geometry optimization, and even quantum computer will be addressed as well. As a general statement, this course will be beneficial as a suitable review of theoretical backgrounds in the practices using the GAUSSIAN program in the course of Chemistry experiments B and C.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC180&syllabuslink=1

Course Title	Polymer Chemistry		
Instructor	Tezuka Yasuyuki		
Semester	Spring Semester	Credit	2 Credits
Course Number	CHE3410	Language	Japanese

Course Objectives

This course will cover the fundamentals of polymer chemistry, specifically focusing on the nature and properties of high-molecular compounds and materials. The fundamentals of polymer synthesis will also be discussed in order to develop an understanding of organic chemistry as it relates to polymers.

Course Contents

Polymers have many important uses in biological processes necessary for life and many key applications in various industries critical for modern society. In this course, the nature and properties of polymers will be discussed, paying close attention to how they differ from smaller molecules. In addition, students will learn what chemical reactions are used to synthesize various useful polymeric materials. More specifically, students will learn about chemical reactions that convert monomers into polymers with high efficiency (polymerization reactions) together with their mechanisms. Moreover, students will learn about cutting-edge research in the field of polymer chemistry, along with the current state and future outlook of high-performance polymeric materials used in electronics, photonics, biomedicals, and other fields.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC182&syllabuslink=1

Course Title	Physical Properties of Polymers		
Instructor	Nojima Shuichi		
Semester	Fall Semester	Credit	2 Credits
Course Number	CHE3210	Language	Japanese

Course Objectives

The purpose of this course is for students to gain a deeper understanding of the structure and properties characteristic of polymers. They will learn about the shape and behavior of isolated polymer chains, the nature of polymer solutions, and the structure and functions of polymer aggregates, along with the various general properties of polymeric materials.

Course Contents

This course will cover the shape and behavior of isolated polymer chains (single polymer chains), the properties of dilute and concentrated polymer solutions, as well as the structure and properties of polymer blends. Furthermore, the formation and structure of polymer aggregates will be discussed along with the various general properties of polymeric materials. With this knowledge, this course aims to show students how to relate the macroscopic properties exhibited by polymers to their microscopic structure and behavior. Lastly, the various structures formed within polymer aggregates and the methods to elucidate them will be discussed.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC183&syllabuslink=1

Course Title	Frontier of Chemistry		
Instructor	Minoura Mao		
Semester	Fall Semester	Credit	2 Credits
Course Number	CHE2010	Language	Japanese

Course Objectives

By hearing about the contents of the latest research in various specialized fields, students will learn exactly what research is and what it entails.

Course Contents

Each professor will discuss the latest research in their respective fields of specialization, including the background information and related research. This course is related to “Research Experiments,” and as such, those who wish to take that course in the future are urged to register for this course. In addition, this course is related to the Graduation Research, thus students who plan to register for that course should optimally take this course as well.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC187&syllabuslink=1

Course Title	Exercises in Organic Chemistry		
Instructor	Tsutsumi Ryosuke/Kobayashi Junji		
Semester	Fall Semester	Credit	2 Credits
Course Number	CHE2410	Language	Japanese

Course Objectives

In this course, students will learn the fundamentals of organic chemistry through various practice problems and exercises.

Course Contents

Students will gain a deeper understanding of the knowledge acquired from Organic Chemistry 1 and 2, solidifying it through the act of problem solving. They will gain a deeper understanding of the basic principles that drive organic reactions through various practice exercises focusing on reaction mechanisms.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC191&syllabuslink=1

CC192

Course Title	Exercises in Physical Chemistry		
Instructor	Mitsui Masaaki/Niihori Yoshiki/Maejima Naoyuki		
Semester	Fall Semester	Credit	2 Credits
Course Number	CHE2210	Language	Japanese

Course Objectives

This course aims to deepen students' understanding of the fundamentals of physical chemistry learned in Introduction to Physical Chemistry, Physical Chemistry 1 and 2, and Reaction Kinetics (quantum theory, thermodynamics, reaction kinetics) through problem solving.

Course Contents

Lectures 1-5 will cover the material learned in Physical Chemistry 1 (first and second laws of thermodynamics, Gibbs free energy, chemical potential, etc.). Lectures 6-10 will discuss material learned in Reaction Kinetics (first and second order reactions, equilibrium reactions, steady state approximations, etc.). Lastly, lectures 11-14 will cover material learned in Physical Chemistry 2 (operators, Schrodinger equation, wave functions, etc.). Students will solve problems related to these topics in order to deepen their understanding of the subject.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC192&syllabuslink=1

Course Title	Basic Physics		
Instructor	Shimano Masahiro		
Semester	Spring Semester	Credit	2 Credits
Course Number	CHE1910	Language	Japanese

Course Objectives

This course aims to teach students the fundamental physics knowledge necessary to study chemistry at the collegiate level.

Course Contents

In order to understand the nature of matter, chemical reactions, or even biological phenomena at the molecular and atomic level, students will need a solid grounding in physics.
In this course, students will acquire the fundamentals physics knowledge necessary to study chemistry at the collegiate level. Primarily focusing on classical mechanics and electromagnetism, this course bridges the gap between the physics learned in high school and first year university physics.
This course is essential to students who did not take physics in high school. Also, students who doubt their understanding of high school level physics classes (Physics Fundamentals, Physics) should ideally take this course. Students will solve practice problems during the lecture a few times throughout the duration of the course.
Additionally, various tips and pointers aimed at incoming students on how to pass this course will be given during the lectures. Following these pieces of advice will be beneficial to one's success in this course.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC196&syllabuslink=1

CC202

Course Title	Computer and Information Science for Chemistry Students		
Instructor	Mochizuki Yuji		
Semester	Spring Semester	Credit	2 Credits
Course Number	CHE2610	Language	Japanese

Course Objectives

This course will give an outline of modern-day computer science and computer programming techniques.

Course Contents

The importance of data processing has risen sharply in all fields, and terms like artificial intelligence (AI) and internet of things (IoT) have become very familiar. In this course, students will learn fundamental knowledge related to data processing (information literacy), as well as various computer programming technologies.
Programming refers to writing a computer program, namely a discrete list of data processing commands for the computer to follow. Computer programming has become a central part of data processing. Even in chemistry research, programs like Gaussian, GAMESS, and Amber are used to run large molecular computations. Two programming languages are taught in this class: Fortran and Python. Fortran has a lengthy history (created in 1957) and has been used to perform arithmetic operations in a wide variety of fields. In contrast, Python is a relatively new language (created in 1991). It is extremely versatile and is particularly essential to the research of natural language (human languages) and AI. Using these two fairly different languages, students will learn the basics of computer programming. Furthermore, fundamentals of the so-called chemoinfomatics are addressed.
They learn the fundamental data processing knowledge and techniques that will pay dividends throughout the rest of their time in school and will surely prove useful in the working world. This course consists primarily of hands-on practice, and hence it is important to attend every lecture. (Note: The syllabus is subject to change based on the needs of the class.)

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC202&syllabuslink=1

CC203

Course Title	Coordination Chemistry 1		
Instructor	Miyazato Yuji		
Semester	Fall Semester	Credit	2 Credits
Course Number	CHE2510	Language	Japanese

Course Objectives

This course aims to give students a logical and systematic understanding of transition metal complexes. Through the use of crystal field theory and ligand field theory, students will learn of the relation between the structure of transition metal complexes and their electronic state. Photochemical properties of transition meta complexes and the theory of electronic absorption and vibration spectra will also be discussed.

Course Contents

Metal complexes are compounds consisting of a central metal ion with molecules or other ions bonded to it as ligands. Compounds with the same metal ion can exhibit very different properties depending on the type and arrangement of the ligands attached to it. In industry, transition metal complexes are widely used as catalysts in various synthesis methods; they also can function as sensors in some contexts. In addition, many enzymes in the body contain transition metal complexes as their reaction active sites. These diverse functionalities arise from the interactions between the central metal ion and the ligands. It is possible to express a desired functionality by the precise design of complex molecules.

This course aims to give students a systematic and logical understanding of the relation between electronic and physical structures of transition metal complexes. The two theories crucial to understanding the nature of metal complexes will be discussed: crystal field theory and ligand field theory. Using these theories, students will learn about the properties of metal complexes, particularly their photochemical properties (electron absorption and vibration spectra).

This course covers the theory necessary to understand Standard Experiments in Chemistry C: Inorganic Chemistry Experiments. As such, it is recommended to be proactive in attending this course.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.

<URL>

https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC203&syllabuslink=1

Course Title	Analytical Chemistry 3		
Instructor	Tabuchi Mari		
Semester	Fall Semester	Credit	2 Credits
Course Number	CHE2310	Language	Japanese

Course Objectives

This course aims to teach students the fundamental theory, characteristics, and applications of various instrumental analysis methods. Relevant data processing techniques will also be covered.

Course Contents

A wide variety of instrumental analysis methods are used in order to gain qualitative and quantitative data on various analytes. Additionally, instruments can be used for structural analysis, state analysis, and the determination of an analyte's physical properties, among many other things. In this course, students will learn the theory and characteristics of various important instrumental analysis methods. In addition, they will learn how to treat data as well as how to calculate measurement error. Furthermore, students will learn about the diverse applications of various instrumental analysis methods, gaining insight into how analytical chemistry is actually used in the real world. By solving practice problems, students will deepen their understanding of the material (each student must bring a scientific calculator).

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC204&syllabuslink=1

Course Title	Photophysical Chemistry		
Instructor	Mitsui Masaaki/Niihori Yoshiki		
Semester	Spring Semester	Credit	2 Credits
Course Number	CHE3210	Language	Japanese

Course Objectives

This course aims to teach students about the nature of light (electromagnetic waves) and the interactions between molecules and light. Furthermore, it aims to explain the nature of electrons in excited energy states as well as their relaxation mechanisms.

Course Contents

Electronic excited states play a major role in photosynthesis and bioluminescence and are also practically used in fiber optics, lasers, optoelectronics, solar cells, and photocatalysts. In this course, students will begin by learning the fundamental nature of light (electromagnetic waves). The course will proceed by answering the questions of why molecules interact with light as well as what happens when electronic excited states of molecules are formed by absorbing photons.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC205&syllabuslink=1

Course Title	Coordination Chemistry 2		
Instructor	Nakazono Takashi		
Semester	Spring Semester	Credit	2 Credits
Course Number	CHE3510	Language	Japanese

Course Objectives

In this course, students will gain a better understanding of the reactivity of transition metal complexes through the use of crystal field theory and ligand field theory. Furthermore, students will acquire important knowledge concerning the synthesis and reactivity of organic metal complexes.

Course Contents

In this lecture, reactivity of transition metal complexes will be discussed. Transition metal complexes are not only used as catalysts in organic synthesis reactions, but are also found in the active sites of many enzymes in the human body. They are widely understood to be materials with a broad range of diverse uses. In coordination chemistry, organic chemistry, biochemistry, and many other fields, understanding the reactivity of transition metal complexes is critical. In the first half of the course, students will learn substitution reactions, oxidation-reduction reactions, and photochemical reactions from the viewpoint of coordination chemistry. In the latter half, basic reactions involving organic metal complexes, which contain at least one metal-carbon bond, will be discussed. Catalytic reactions using metal complexes will also be covered. The concepts taught in this course are grounded in crystal field theory and ligand field theory.　It is desireble for students who take this class to be familiar with the material covered in Transition Element Chemistry and Complex Chemistry 1.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC207&syllabuslink=1

Course Title	Experiments in Physics for Chemistry Students		
Instructor	Nakano Yuji/Shiina Yoko		
Semester	Fall Semester 1	Credit	1 Credit
Course Number	CHE3110	Language	Japanese

Course Objectives

The goal is to acquire basic knowledge and learn experimental methods spanning across the entirety of physics experiments in order to obtain a sturdy foundation for experiments.

Course Contents

I will be providing a guidance initially. Students will need to attend this guidance session, as I will distribute guidelines for experiments, the schedule, etc., and explain about precautions for experiments , reports, and other similar things.
Students should also prepare a dedicated notebook for experiments. They should read the experiment guidelines carefully before each experiment so that they can understand the purpose and the contents of each experiment. To prevent an accident from occurring, always follow the instructions of the teacher when performing an experiment.
Depending on the experiment, graph paper, a scientific calculator, etc., may be required, so be sure to bring the appropriate items to each experiment.
Some experiments will also require statistical processing of errors.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC208&syllabuslink=1

Course Title	Experiments in Biology for Chemistry Students		
Instructor	Mukai Takahito/Akabane Shiori/Yoro Emiko		
Semester	Fall Semester 2	Credit	1 Credit
Course Number	CHE3110	Language	Japanese

Course Objectives

This course aims to enable students to learn the fundamental knowledge and experimental methods for overall biological experimentation and to provide students with experimental sophistication in biology.

Course Contents

In the beginning of the course, students will receive firm guidance. The Guidelines of Biological Experimentation, which will be the main text used in this course, will be handed out along with a schedule and name tags. The guidelines for writing reports will also be explained, so attendance during this part of the course is required.

From there on after, various “Biological Experiments” will be conducted using the course text as a reference.

In “Animal Dissection,” students will dissect a frog and learn about its internal organs.

In “Microscope Observations,” students will observe the chromosomes of onion cells undergoing division while learning about somatic cell division.

In “PCR/Electrophoresis,” students will assess a person’s genotype while gaining a better understanding of the big picture.

In “The Physiological Adaptations of Cells,” students will learn about the lac operon while gaining an understanding of the physiological adaptation
mechanisms of E. coli.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC209&syllabuslink=1

Course Title	Research Experiments 1		
Instructor	※		
Semester	Spring Semester	Credit	2 Credits
Course Number	CHE3110	Language	Japanese

Course Objectives

In this course, students will conduct experiments related to each laboratory's specialization and learn from their respective experimental techniques. While reading literature related to their experiments, students will understand the background and significance of their research. Through understanding the fundamental principles, laws, and theories at play, students will gain insight into the mindset needed to conduct and make progress in chemical research.

Course Contents

In Standard Experiments in Chemistry A-C, the experiments conducted always had a pre-planned "answer," so to speak. That is, if students conducted the experiments exactly as directed, it was a "class" where they would always be able to attain the desired end result. However, during their 4th year Graduation Research, students will be required to conduct "research," where there is no pre-planned answer awaiting them. The goal of Research Experiments 1 is to bridge the gap between the lab courses students have taken thus far and the Graduation Research. Students will conduct experiments according to the research theme and guidance provided by the instructor. Through discussions with the instructor, the goal is not only for the students to manage their own experiments, but for them to understand their background and significance as well. Furthermore, students will analyze and organize their experimental results, cultivating the ability to accurately and concisely report the results of their research.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC210&syllabuslink=1

Course Title	Research Experiments 2		
Instructor	※		
Semester	Fall Semester	Credit	2 Credits
Course Number	CHE3110	Language	Japanese

Course Objectives

In this course, students will conduct experiments related to each laboratory's specialization and learn from their respective experimental techniques. While reading literature related to their experiments, students will understand the background and significance of their research. Through understanding the fundamental principles, laws, and theories at play, students will gain insight into the mindset needed to conduct and make progress in chemical research.

Course Contents

In Standard Experiments in Chemistry A-C, the experiments conducted always had a pre-planned "answer," so to speak. That is, if students conducted the experiments exactly as directed, it was a "class" where they would always be able to attain the desired end result. However, during their 4th year Graduation Research, students will be required to conduct "research," where there is no pre-planned answer awaiting them. The goal of Research Experiments 2 is to bridge the gap between the lab courses students have taken thus far and the Graduation Research. Students will conduct experiments according to the research theme and guidance provided by the instructor. Through discussions with the instructor, the goal is not only for the students to manage their own experiments, but for them to understand their background and significance as well. Furthermore, students will analyze and organize their experimental results, cultivating the ability to accurately and concisely report the results of their research.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC230&syllabuslink=1

CC301

Course Title	Colloquium		
Instructor	※		
Semester	Full Year Others	Credit	2 Credits
Course Number	CHE4900	Language	Japanese

Course Objectives

In this course, students will intensely study literature related to the field of their Graduation Research and present the information they have learned. In addition to acquiring the knowledge necessary to complete their Graduation Research, this course aims to help students sharpen their literature reading comprehension skills along with their presentation skills.

Course Contents

In this course, students will intensely study literature (specialized publications and academic papers) related to the field of their Graduation Research. Students will present the information they have learned along with progress updates on their research project. Through lively group discussions with the instructor and other lab members, students will acquire knowledge in various fields of research while sharpening their presentation skills and cultivating a logical way of thinking.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC301&syllabuslink=1

Course Title	Research Experiments		
Instructor	※		
Semester	Full Year Others	Credit	8 Credits
Course Number	CHE4100	Language	Japanese

Course Objectives

Each student will draft their own research plan relating to their topic, proceeding independently using trial and error. Furthermore, through analyzing and organizing their own research results, this course aims to endow students with the mindset, problem-solving abilities, and logical way of thinking needed to conduct research.

Course Contents

Students will belong a laboratory and independently tackle their own research theme under guidance from their supervisor. Research is to delve into uncharted territory untouched by textbooks and their research themes are often on the reading edge of the research field. It is important for students to proceed the research independently through the trial and error attempts from comprehending their research background to consideration of results, with cooperation of their supervisor and lab members. Students will give an oral presentation of their results at the Interim Meeting and the Year End Meeting. Furthermore, they will prepare and submit a graduation thesis. As a compilation of all of the student's efforts thus far, we hope that they will have fulfilling research life.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CC351&syllabuslink=1

CD004

Course Title	Fundamental Chemistry		
Instructor	Hanai Ryo		
Semester	Spring Semester	Credit	2 Credits
Course Number	LFS2200	Language	Japanese

Course Objectives

In this course, students are expected to learn major chemical concepts and the properties of biological molecules (particularly those of low molecular weight) to prepare for more advanced biochemistry.

Course Contents

This course offers lectures on covalent bonding and chemical equilibrium and on properties of selected biological molecules, as understood on the bases of these concepts.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD004&syllabuslink=1

CD005

Course Title	Biochemistry 1		
Instructor	Matsuyama Shinichi		
Semester	Fall Semester	Credit	2 Credits
Course Number	LFS2200	Language	Japanese

Course Objectives

In this course, students will learn about the structures of biological macromolecules along with their chemical properties and biological roles. They will also gain an understanding of their biosynthesis mechanisms as they acquire the fundamental knowledge required to understand life at the molecular level.

Course Contents

All life, from bacteria to humans, is constructed from a mere six elements: hydrogen, carbon, nitrogen, oxygen, phosphorus, and sulfur. From these elements, amino acids, nucleotides, fatty acids, and simple sugars are constructed. These molecules are the building blocks of biological macromolecules like proteins, nucleic acids, lipids, and polysaccharides. Cells are formed from these classes of macromolecules, and multicellular organisms take shape as these cells specialize and organize based on their function.

In order to understand life at the molecular level, students will learn about the structures and components of these macromolecules along with their chemical properties, biological roles, and biosynthesis mechanisms. This course is one of the essentials that provides important fundamental information upon which many of the other lectures and labs offered by the Department of Life Science are built.

The lectures will be conducted using PowerPoint. Copies of the PowerPoints will be handed out in the lectures for students to use to take notes. Practice problems will also be handed out and solved, which will help students review the material. This course contains fundamental knowledge necessary to students studying the life sciences. In the event that one does not learn the information presented in this course, it will likely cause difficulties in their studies from their second year and onward.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.

<URL>

https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD005&syllabuslink=1

CD006

Course Title	Biophysics 1		
Instructor	Yamada Yasuyuki		
Semester	Fall Semester	Credit	2 Credits
Course Number	LFS2200	Language	Japanese

Course Objectives

In this course, students will learn the concept of energy, the flow of energy in biological systems, as well as how energy is acquired and expended. Students will gain an understanding regarding what conditions must be fulfilled for a reaction to occur. Reaction rate will also be discussed.

Course Contents

To begin the course, the concepts of energy and work will be introduced, and The Law of Energy Conservation (The First Law of Thermodynamics) will be explained.
Next, the concept of entropy will be introduced (The Second Law of Thermodynamics).
The goal is to enable students to determine which direction chemical reactions are likely to proceed and to find out how much energy they expend or produce (net change in Gibbs energy).
Utilizing this way of thinking, the energy acquisitions and expenditures resulting from various biological reactions will be discussed.
Next, the concept of electrochemical potential difference of ions will be discussed, which is one of the key concepts of bioenergetics.
Students will also learn about the rates of chemical reactions as well as the enzyme reactions.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD006&syllabuslink=1

CD007

Course Title	Molecular Biology 1		
Instructor	Kasai Taishi		
Semester	Fall Semester	Credit	2 Credits
Course Number	LFS2100	Language	Japanese

Course Objectives

In this course, students are expected to learn about gene structure and mechanisms for gene expression. The purpose of this course is for students to understand the most fundamental principles and concepts necessary for studying life science.

Course Contents

This course aims to provide students understanding of basic principles and concepts that constitute molecular biology. Specifically, students learn about gene structure, mechanisms for gene expression, and replication of genetic materials at the molecular level. At the beginning, students are introduced to genes' concept and structure. Next, the structure of DNA and RNA is discussed, using mainly prokaryotes and bacteriophages as models. Students learn about transcription and replication of genes and genomic DNA, as well as mechanisms that regulate these processes. The course refers to molecular biology's historical background and enables students to cultivate deeper understanding of phenomena studied by the field as a whole. The course uses Molecular Biology of the Gene by Watson et al. as a reference.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD007&syllabuslink=1

CD008

Course Title	Molecular Biology 1		
Instructor	Takemoto Norihiko		
Semester	Spring Semester	Credit	2 Credits
Course Number	LFS2100	Language	Japanese

Course Objectives

In this course, students will learn about the structure of genes and mechanisms for the gene expression. The goal of this course is for students to gain an understanding of the most fundamental principles and concepts necessary to studying the life science.

Course Contents

This course will give students an understanding of the basic principles and concepts that make up the field ″Molecular Biology″. Specifically, students will learn about the structure of genes and mechanisms for gene expression and replication of genetic materials on the molecular level. To begin the course, students will be introduced to the concept and structure of genes. Next, the structure of DNA and RNA will be discussed, using mainly prokaryotes and bacteriophages as a model. Students will learn about the transcription and the replication of gene and genomic DNA, as well the mechanisms that regulate these processes. The course will make references to the historical background of molecular biology, and enable students to cultivate a deeper understanding of the phenomena studied by the field as a whole. This course will proceed using “Molecular Biology of the Gene,” by Watson et al. as a reference.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD008&syllabuslink=1

CD009

Course Title	Molecular Biology 2		
Instructor	Sekine Yasuhiko		
Semester	Fall Semester	Credit	2 Credits
Course Number	LFS2100	Language	Japanese

Course Objectives

In this course, students will learn the fundamental concepts, principles, and approach necessary to the study of molecular biology. Furthermore, through the approach learned in this course, students will be able to cultivate a deeper understanding of biological phenomena.

Course Contents

Molecular biology aims to explain biological phenomena through the various molecules involved. How do individual molecules behave within cells, and, as a result, what biological phenomena does occur? How is a delicate system like a living organism created and maintained by the cooperation of these various molecules? This course will build upon the material students learned in Molecular Biology 1, and will cover protein synthesis mechanisms and DNA repair mechanisms, focusing on examples found in bacteria.
Rather than simply listing fact after fact, this course will place importance on understanding the fundamental concepts and principles at play. Students should come prepared to not merely copy what is written on the blackboard, but to use their heads to proactively grapple with the concepts discussed in the lecture. Various phenomena will be covered that are difficult to comprehend simply through reading the textbook. Thorough explanations of these phenomena will be given during the lectures, so attendance is essential.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD009&syllabuslink=1

CD010

Course Title	Biochemistry 2		
Instructor	Suetsugu Masayuki		
Semester	Spring Semester	Credit	2 Credits
Course Number	LFS2200	Language	Japanese

Course Objectives

Cells produce energy through metabolic reactions, using it to assemble or disassemble various molecules used in biological processes. This course will teach students how this process works.

Course Contents

A cell's metabolism is a dynamic network of chemical reactions that occur in all living cells. From bacteria all the way to humans, all types of life share this fundamental process. Through their metabolism, cells produce energy, enabling them to both assemble and disassemble various biological macromolecules. Just how do cells manage to pull off such a sophisticated array of processes?

Students will learn the answer to this question through the study of the following topics: 1. The mechanism of how cells metabolize sugars, producing the energy they need to sustain life.

2. The mechanism of photosynthesis, through which plant cells produce energy.

3. The mechanisms through which cells assemble and disassemble various biological molecules, such as lipids, amino acids, and nucleotides.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.

<URL>

https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD010&syllabuslink=1

CD011

Course Title	Biophysics 2		
Instructor	Hanai Ryo		
Semester	Fall Semester	Credit	2 Credits
Course Number	LFS3210	Language	Japanese

Course Objectives

The objective of this course is to provide students with a Structural Biological framework to understand the functions of proteins and nucleic acids, the central actors who play out biological activities: the functions of these biological macromolecules are attained by their three-dimensional structures through various physicochemical "forces."

Course Contents

Case studies on the structure-function relationship of proteins and nucleic acids. Systems that students have already learned in Molecular Biology are taken up and quantitatively re-explained in terms of such inter-molecular forces as ionic bond, hydrogen bond and van der Waals force, and hydrophobic effect. These interactions are also delineated. It is emphasized that living organisms have evolved to today's form within the bounds of physics and chemistry.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD011&syllabuslink=1

CD014

Course Title	Bioethics		
Instructor	Mizoguchi Hajime		
Semester	Fall Semester	Credit	2 Credits
Course Number	LFS2020	Language	Japanese

Course Objectives

The goals of this course are as follows. One is to allow students to concretely imagine the effects of human-related life science knowledge and medical technology on modern society. The other is to have students acquire basic knowledge, understanding basic issues and the scientific background of bioethics from the viewpoint of human biology, therefore allowing them to express their own thoughts and ideas in discussions.

Course Contents

In this lecture-based class, the lecturer will explain how biological knowledge is related to medicine and medical care, where the natural scientific basis of advanced medical technology is placed, etc. Some examples of topics this touches on include reproductive biology, developmental biology, cell biology and infertility treatments, regenerative medicine, human cloning, genetics, genomics, evolutionary biology and gene therapy, eugenics, neurobiology, immunology and pain therapy, organ transplants. The fact will be highlighted that scientific knowledge rapidly permeates throughout modern society, which has social impacts beyond what researchers may expect. Additionally, even if you are a natural science researcher or engineer, in some cases as a citizen you will have to face bioethics, whether that be related to the physical condition of yourself or a family member, ethical dilemmas, etc. In such cases you will need to know the specifics regarding the differences between research level and clinical level. The aim is to provide the materials that will lead to you thinking on your own in the context of bioethics and hope that will create opportunities leading to a review of how you perceive life, and more specifically, human life. Depending on the number of students, discussions and free talks will also be held. We will discuss the following topics.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD014&syllabuslink=1

CD019

Course Title	Molecular Biology 3		
Instructor	Goto Satoshi		
Semester	Spring Semester	Credit	2 Credits
Course Number	LFS3100	Language	Japanese

Course Objectives

In recent years, it has become very difficult to fully understand cutting edge advancements in medicine and biology if one lacks basic fundamental knowledge of molecular biology. The aim of this course is to understand this fundamental mechanisms of gene expression in eukaryotes.

Course Contents

The aim of this course is to understand the fundamental mechanisms underlying gene expression such as transcriptional and translational regulation in eukaryotes. Non-coding RNA-mediated control of gene expression and development will be lectured as well.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD019&syllabuslink=1

CD021

Course Title	Botany 2		
Instructor	Nakayama Hokuto		
Semester	Spring Semester	Credit	2 Credits
Course Number	LFS3210	Language	Japanese

Course Objectives

Plants show various kinds of characteristics. This class aims to provide an understanding of those plant characteristics at the genome, individual, and cellular levels.

Course Contents

The evolution of plants was a crucial event in Earth's history that had major consequences for the biotic regulation of the global environment. It is considered that this environmental change led to the sequence of events that made up the transition from aquatic to terrestrial habitats in animals. Additionally, plants have an important role to maintain the environment and to feed us. In this course, we will learn about the characteristics of plants from various aspects to understand how plants achieve their roles.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD021&syllabuslink=1

CD022

Course Title	Introductory Informatics		
Instructor	Yamada Yasuyuki/Mashima Keisuke		
Semester	Spring Semester	Credit	2 Credits
Course Number	LFS1000	Language	Japanese

Course Objectives

In this course, students will learn how to use the computer software used in the life sciences. This knowledge will enable them to better organize and present experimental data and so on.

Course Contents

In order to solve various problems in the life sciences, the assistance of data processing applications is indispensable.
In this course, students will acquire knowledge and skills necessary in their future specialized coursework through getting hands-on experience using various kinds of software.
Specifically, students will use programs for e-mail, document writing, and spreadsheet calculations (Excel) in a Windows environment.
Additionally, students will use PowerPoint to create and give presentations. Furthermore, students will learn how to use software to visualize 3D structures of proteins and DNA using PDB data.
Following lectures, students will complete various exercises related to the material covered, on which they will then write and submit a report. Report submissions and questions will all be handled via Blackboard system. In the class, students will have as much practice time with an actual computer as possible.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD022&syllabuslink=1

CD028

Course Title	Laboratory Experiments in Life Science 1		
Instructor	Sekine Yasuhiko		
Semester	Fall Semester	Credit	5 Credits
Course Number	LFS2400	Language	Japanese

Course Objectives

DNA and RNA manipulation have a wide variety of uses in a diverse array of fields. They play an important role in medicine, agricultural science, pharmaceuticals, and engineering, among other fields. In this course, students will learn the fundamental techniques necessary to manage experiments with DNA and RNA. In addition, they will learn how to interpret data and write reports.

Course Contents

Focusing on DNA and RNA extraction and purification, reactions of nucleic acids with various enzymes, and analysis via agarose gel electrophoresis, students will conduct fundamental experiments in molecular biology and molecular genetics, applying the knowledge they have acquired from their lecture courses.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD028&syllabuslink=1

CD029

Course Title	Laboratory Experiments in Life Science 2		
Instructor	Matsuyama Shinichi		
Semester	Full Year	Credit	10 Credits
Course Number	-------	Language	※

Course Objectives

In this course, students will learn fundamental techniques used in life science research, while sharpening their data analysis and report writing skills. Furthermore, through conducting experiments, they will build upon the theoretical background knowledge they have acquired in their lecture courses.

Course Contents

Following Laboratory Experiments in Life Science 1, this course aims to teach students fundamental techniques commonly used in life science research. Students will conduct experiments in biochemistry and biophysics, more specifically:
(1) Biochemistry: Protein purification methods, DNA topology and topoisomerase, Protein-protein interactions,
(2) Biophysics: Single-molecule observation of the rotation of F1-ATPase and kinetics analyses.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD029&syllabuslink=1

CD031

Course Title	Introduction to Life Science		
Instructor	Kinoshita Tsutomu/Sakakibara Keiko		
Semester	Spring Semester	Credit	2 Credits
Course Number	LFS1000	Language	Japanese

Course Objectives

Students will learn the outline of life science, what is the cell, the basic unit of life, as a starting point and how multicellular organisms have developed.

Course Contents

In the present day, knowledge of biological phenomena at the molecular level has been rapidly accumulated. The curriculum in Department of Life Science at this university offer a wide variety of courses that cover from the basics to the special knowledge to understand the biological phenomena at the molecular level. Students will learn the basic knowledge of cells, the basic unit of life, enough to understand our curriculum through the lecture. In the first half of this lecture, chapters 1-4 in "Essential Cell Biology" will be covered, focusing on the basic structure and functions of a cell. In the latter half, chapters 7 and 8 will be covered, along with the outline how multicellular organisms have developed.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD031&syllabuslink=1

CD032

Course Title	Basic Experiments in Life Science		
Instructor	Yamada Yasuyuki		
Semester	Spring Semester	Credit	2 Credits
Course Number	LFS1400	Language	Japanese

Course Objectives

In this course, students will learn basic techniques for the experiments in the life sciences while becoming familiar with living things.

Course Contents

Through performing basic experiments using actual living things, students will learn the correct frame of mind necessary to carry out experiments while sharpening their observation skills.
Specifically, students will conduct the following experiments; animal dissections, microscopic observation of plant and animal cells, tissue, and chromosomes, DNA analysis by using restriction enzyme and electrophoresis, PCR, thin layer chromatography ,protein quantitation, the physiological adaptations of cells, and the genetics of plants.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD032&syllabuslink=1

CD033

Course Title	Molecular Cytology 1		
Instructor	Horiguchi Gorou		
Semester	Fall Semester	Credit	2 Credits
Course Number	LFS2300	Language	Japanese

Course Objectives

The genetic material possessed by living things is passed on via mitosis and reproduction. This course aims to teach students about these processes on the molecular level.

Course Contents

Building on the material taught in Introduction to Biology and Introduction to Life Science in the spring semester, students will learn exactly how genes in the form of DNA are passed from parent to child. First, the lecture will review why DNA molecules alone are sufficient as a means of storing genetic information. Next, students will learn about DNA replication and repair, along with cellular reproduction and cell death. Particular attention will be given to the proteins and cytoskeletons that regulate these processes. Furthermore, Mendel's Laws of Heredity will be discussed along with the principles behind them. The lecture will also cover how living things reproduce as well as how organisms cope with reproduction. In addition, inheritance of organelles that does not follow Mendel's Laws will be introduced.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD033&syllabuslink=1

CD034

Course Title	Fundamental Chemistry 1		
Instructor	Kamada Katsuhiko		
Semester	Fall Semester	Credit	2 Credits
Course Number	LFS2200	Language	Japanese

Course Objectives

Even complex biological phenomena are made up of microscopic organic compounds and continuous reactions, all of which follow the laws of chemistry and physics. By understanding the laws of reaction for organic chemistry, you can establish a basis for learning the characteristics of biomolecules and their complex and diverse reactionary systems.

Course Contents

Organisms can be regarded as a collection of organic molecules. Complex life phenomena in the organisms are achieved through the actions of countless organic compounds. In order to truly understand life, we must dive down to the molecular level and learn about the characteristics of organic compounds and the chemical reactions weaved by those compounds.
The first half of these lectures will focus on the basics of organic chemistry necessary to explain biochemical reactions. By acquiring these basics, we can logically explain the characteristics of biological components and their chemical reactions. The second half will introduce the basics of biochemistry that will be followed upon in the next semester, applying those chemical reactions we learned about in the first half while discussing familiar biological topics.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD034&syllabuslink=1

CD035

Course Title	Fundamental Chemistry 2		
Instructor	Hanai Ryo		
Semester	Spring Semester	Credit	2 Credits
Course Number	LFS2200	Language	Japanese

Course Objectives

This course aims to get students to understand principles of physical chemistry, especially those necessary to understand and analyze biochemical reactions and the properties of biological molecules.

Course Contents

On the macroscopic level: chemical equilibrium, acid and base, energy (including electrostatic interaction and electromagnetic wave), and thermo-chemistry. On the microscopic level: orbital, covalent bond (including coordination bond), resonance, aromaticity, and redox reaction. Time is set aside for chapter problems, to which students are encouraged to provide answers.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD035&syllabuslink=1

CD036

Course Title	Molecular Cytology 2		
Instructor	Oka Toshihiko		
Semester	Spring Semester	Credit	2 Credits
Course Number	LFS2300	Language	Japanese

Course Objectives

To gain an understanding of the molecular basis of cell structure and organellar functions.

Course Contents

Lectures in this class will focus on the following three items.
1. The structure of biological membrane.
2. The mechanism underlying transport of ions and other substances across biological membranes.
3. The roles of intracellular compartments, called organelles, and the molecular mechanism of transport of proteins and lipids between organelles.
The lectures will focus on the following content found in Chapters 11,12, and 15 of the textbook "Essential Cell Biology". It will be explained that the structure of the biological membranes that make up cells and the role of transporting substances across membranes. Through these lectures, my hope is that you will learn about the ingenuity and fine details with which cells are structured, as well as the precisely controlled functions that keep them operating. Diagrams and tables used in the lectures will be distributed as PDF files.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD036&syllabuslink=1

CD037

Course Title	Experiments in Physics for Life Science Students		
Instructor	Nakano Yuji		
Semester	Fall Semester 2	Credit	1 Credit
Course Number	LFS2400	Language	Japanese

Course Objectives

The goal is to acquire basic knowledge and learn experimental methods spanning across the entirety of physics experiments in order to obtain a sturdy foundation for experiments.

Course Contents

I will be providing a guidance initially. Students will need to attend this guidance session, as I will distribute guidelines for experiments, the schedule, etc., and explain about precautions for experiments , reports, and other similar things.
Students should also prepare a dedicated notebook for experiments. They should read the experiment guidelines carefully before each experiment so that they can understand the purpose and the contents of each experiment. To prevent an accident from occurring, always follow the instructions of the teacher when performing an experiment.
Depending on the experiment, graph paper, a scientific calculator, etc., may be required, so be sure to bring the appropriate items to each experiment.
Some experiments will also require statistical processing of errors.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD037&syllabuslink=1

CD038

Course Title	Experiments in Chemistry for Life Science Students		
Instructor	Tabuchi Mari/Watanabe Eiji		
Semester	Fall Semester 1	Credit	1 Credit
Course Number	LFS2400	Language	Japanese

Course Objectives

This course aims to enable students to learn the fundamental knowledge and experimental methods for overall chemical experimentation and to provide students with experimental sophistication.

Course Contents

In the first class, students will receive initial guidance. In the guidance, experimental guidelines and schedules will be distributed. Important notices and safety information before starting experiments, as well as how to take notes and write reports, will be explained. Class attendance for the guidance is a must. Bring a lab notebook to be used solely for experiments. One must read the experimental guidelines thoroughly and comprehend both its goals and contents before starting the experiment. In order to prevent accidents, it is crucial for students to obey the instructions of the instructor in charge whilst conducting an experiment. A scientific calculator will be necessary to conduct experiments in this course. Each individual is required to bring their own calculator.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD038&syllabuslink=1

CD039

Course Title	Laboratory Experiments in Life Science 2A		
Instructor	Matsuyama Shinichi		
Semester	Spring Semester	Credit	5 Credits
Course Number	LFS3400	Language	Japanese

Course Objectives

In this course, students will learn fundamental techniques used in life science research, while sharpening their data analysis and report writing skills. Furthermore, through conducting experiments, they will build upon the theoretical background knowledge they have acquired in their lecture courses.

Course Contents

Following Laboratory Experiments in Life Science 1, this course aims to teach students fundamental techniques commonly used in life science research. Students will conduct experiments in biochemistry and biophysics, more specifically:
(1) Biochemistry: Protein purification methods, DNA topology and topoisomerase, Protein-protein interactions,
(2) Biophysics: Single-molecule observation of the rotation of F1-ATPase and kinetics analyses.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD039&syllabuslink=1

CD040

Course Title	Laboratory Experiments in Life Science 2B		
Instructor	Horiguchi Gorou		
Semester	Fall Semester	Credit	5 Credits
Course Number	LFS3400	Language	Japanese

Course Objectives

Molecular cell biology is a field that aims to understand cellular functions at the molecular level and their roles in the context of tissues, organs, and organisms. Students will learn various experimental techniques commonly used in cell biology in addition to those learned in Laboratory Experiments in Life Science 1 and 2A. They will hone their skills in data handling and interpretation, logical reasoning, and report writing. They will also deepen their understanding of the theoretical background learned in lecture courses.

Course Contents

Students will learn new experimental techniques and apply them, in addition to those learned previously, to the cell-biology analyses of model organisms and cultured cells. More specifically,

1. Analysis of protein-protein interactions
2. Roles of protein phosphorylation on autophagy in yeast
3. Developmental genetics using Arabidopsis thaliana

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.

<URL>

https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD040&syllabuslink=1

CD051

Course Title	Colloquium		
Instructor	※		
Semester	Full Year Others	Credit	2 Credits
Course Number	LFS4800	Language	Japanese

Course Objectives

In this course, students will engage in intensive reading of the literature of specific fields of research, which is relate to their own Graduation Research, while giving reports on the progress of their Graduation Research. In doing so, they will sharpen their presentation skills while deepening their knowledge of various fields.

Course Contents

This course should be taken in one's final year studying in the Department of Life Science, and is supposed to be taken in conjunction with one's Graduation Research. During this course, students are to obtain knowledge from various fields necessary to complete their Graduation Research while honing their ability to think in a logical manner. Students will also be able to sharpen their presentation skills. Each individual will be given a plan of study from a supervisor, which they are to follow over the course of the year.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD051&syllabuslink=1

CD053

Course Title	Colloquium		
Instructor	※		
Semester	Full Year Others	Credit	2 Credits
Course Number	LFS4800	Language	Japanese

Course Objectives

In this course, students will engage in intensive reading of the literature of specific fields of research, which is relate to their own Graduation Research, while giving reports on the progress of their Graduation Research. In doing so, they will sharpen their presentation skills while deepening their knowledge of various fields.

Course Contents

This course should be taken in one's final year studying in the Department of Life Science, and is supposed to be taken in conjunction with one's Graduation Research. During this course, students are to obtain knowledge from various fields necessary to complete their Graduation Research while honing their ability to think in a logical manner. Students will also be able to sharpen their presentation skills. Each individual will be given a plan of study from a supervisor, which they are to follow over the course of the year.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD053&syllabuslink=1

CD055

Course Title	Colloquium		
Instructor	※		
Semester	Full Year Others	Credit	2 Credits
Course Number	LFS4800	Language	Japanese

Course Objectives

In this course, students will engage in intensive reading of the literature of specific fields of research, which is relate to their own Graduation Research, while giving reports on the progress of their Graduation Research. In doing so, they will sharpen their presentation skills while deepening their knowledge of various fields.

Course Contents

This course should be taken in one's final year studying in the Department of Life Science, and is supposed to be taken in conjunction with one's Graduation Research. During this course, students are to obtain knowledge from various fields necessary to complete their Graduation Research while honing their ability to think in a logical manner. Students will also be able to sharpen their presentation skills. Each individual will be given a plan of study from a supervisor, which they are to follow over the course of the year.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD055&syllabuslink=1

CD056

Course Title	Colloquium		
Instructor	※		
Semester	Full Year Others	Credit	2 Credits
Course Number	LFS4800	Language	Japanese

Course Objectives

In this course, students will engage in intensive reading of the literature of specific fields of research, which is relate to their own Graduation Research, while giving reports on the progress of their Graduation Research. In doing so, they will sharpen their presentation skills while deepening their knowledge of various fields.

Course Contents

This course should be taken in one's final year studying in the Department of Life Science, and is supposed to be taken in conjunction with one's Graduation Research. During this course, students are to obtain knowledge from various fields necessary to complete their Graduation Research while honing their ability to think in a logical manner. Students will also be able to sharpen their presentation skills. Each individual will be given a plan of study from a supervisor, which they are to follow over the course of the year.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD056&syllabuslink=1

CD057

Course Title	Colloquium		
Instructor	※		
Semester	Full Year Others	Credit	2 Credits
Course Number	LFS4800	Language	Japanese

Course Objectives

In this course, students will engage in intensive reading of the literature of specific fields of research, which is relate to their own Graduation Research, while giving reports on the progress of their Graduation Research. In doing so, they will sharpen their presentation skills while deepening their knowledge of various fields.

Course Contents

This course should be taken in one's final year studying in the Department of Life Science, and is supposed to be taken in conjunction with one's Graduation Research. During this course, students are to obtain knowledge from various fields necessary to complete their Graduation Research while honing their ability to think in a logical manner. Students will also be able to sharpen their presentation skills. Each individual will be given a plan of study from a supervisor, which they are to follow over the course of the year.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD057&syllabuslink=1

CD059

Course Title	Colloquium		
Instructor	※		
Semester	Full Year Others	Credit	2 Credits
Course Number	LFS4800	Language	Japanese

Course Objectives

In this course, students will engage in intensive reading of the literature of specific fields of research, which is relate to their own Graduation Research, while giving reports on the progress of their Graduation Research. In doing so, they will sharpen their presentation skills while deepening their knowledge of various fields.

Course Contents

This course should be taken in one's final year studying in the Department of Life Science, and is supposed to be taken in conjunction with one's Graduation Research. During this course, students are to obtain knowledge from various fields necessary to complete their Graduation Research while honing their ability to think in a logical manner. Students will also be able to sharpen their presentation skills. Each individual will be given a plan of study from a supervisor, which they are to follow over the course of the year.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD059&syllabuslink=1

CD060

Course Title	Colloquium		
Instructor	※		
Semester	Full Year Others	Credit	2 Credits
Course Number	LFS4800	Language	Japanese

Course Objectives

In this course, students will engage in intensive reading of the literature of specific fields of research, which is relate to their own Graduation Research, while giving reports on the progress of their Graduation Research. In doing so, they will sharpen their presentation skills while deepening their knowledge of various fields.

Course Contents

This course should be taken in one's final year studying in the Department of Life Science, and is supposed to be taken in conjunction with one's Graduation Research. During this course, students are to obtain knowledge from various fields necessary to complete their Graduation Research while honing their ability to think in a logical manner. Students will also be able to sharpen their presentation skills. Each individual will be given a plan of study from a supervisor, which they are to follow over the course of the year.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD060&syllabuslink=1

CD061

Course Title	Colloquium		
Instructor	※		
Semester	Full Year Others	Credit	2 Credits
Course Number	LFS4800	Language	Japanese

Course Objectives

In this course, students will engage in intensive reading of the literature of specific fields of research, which is relate to their own Graduation Research, while giving reports on the progress of their Graduation Research. In doing so, they will sharpen their presentation skills while deepening their knowledge of various fields.

Course Contents

This course should be taken in one's final year studying in the Department of Life Science, and is supposed to be taken in conjunction with one's Graduation Research. During this course, students are to obtain knowledge from various fields necessary to complete their Graduation Research while honing their ability to think in a logical manner. Students will also be able to sharpen their presentation skills. Each individual will be given a plan of study from a supervisor, which they are to follow over the course of the year.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD061&syllabuslink=1

CD062

Course Title	Colloquium		
Instructor	※		
Semester	Full Year Others	Credit	2 Credits
Course Number	LFS4800	Language	Japanese

Course Objectives

In this course, students will engage in intensive reading of the literature of specific fields of research, which is relate to their own Graduation Research, while giving reports on the progress of their Graduation Research. In doing so, they will sharpen their presentation skills while deepening their knowledge of various fields.

Course Contents

This course should be taken in one's final year studying in the Department of Life Science, and is supposed to be taken in conjunction with one's Graduation Research. During this course, students are to obtain knowledge from various fields necessary to complete their Graduation Research while honing their ability to think in a logical manner. Students will also be able to sharpen their presentation skills. Each individual will be given a plan of study from a supervisor, which they are to follow over the course of the year.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD062&syllabuslink=1

CD071

Course Title	Research Experiments		
Instructor	※		
Semester	Full Year Others	Credit	8 Credits
Course Number	LFS4800	Language	Japanese

Course Objectives

Students will join the lab of their supervisor, conducting research on an assigned topic over the course of the year. They will present their findings in the form of a graduation thesis, deepening their understanding of what it means to conduct research in the natural sciences, which aims to discover yet unknown phenomenon.

Course Contents

The Graduation Research serves as the culmination of one's time studying in the Department of Life Science. The final results of the research, presented as a graduation thesis, represent a completely new discovery that cannot be found in any textbook or any webpage; knowledge unknown even to the supervisor. For that reason, completing the Graduation Research will enable students to learn various methods of conducting research and managing experiments, while sharpening their ability to think logically and solve complex problems. As such, the Graduation Research is an indispensable part of each student's education. Thus, it is important for each student to actively and independently grapple with their research over the course of the year. The hope is for students to experience great intellectual stimulation as they collaborate with their supervisor to uncover a fragment of one of the many mysteries of life.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD071&syllabuslink=1

Course Title	Biotechnology		
Instructor	Oka Toshihiko		
Semester	Spring Semester	Credit	2 Credits
Course Number	LFS3020	Language	Japanese

Course Objectives

This course provides students with an opportunity to hear about cutting-edge biotechnologies from specialists working in industry; thereby, it aims to get them to understand that these technologies are based on the sciences they are currently studying at school and also to provide information useful in considering future careers in biotech industries.

Course Contents

Topics include: pharmaceuticals, cosmetics, protein engineering, fermentation technology, microbial gene engineering, microbial metabolic engineering, biologic prospecting, and biological analytics.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD109&syllabuslink=1

Course Title	Biology of Diversity		
Instructor	Dobata Shigeto		
Semester	Spring Others	Credit	2 Credits
Course Number	LFS2020	Language	Japanese

Course Objectives

To make a general view of various aspects of biodiversity and to understand the universal laws behind them

Course Contents

Life on Earth is characterized by its tremendous diversity. What kind of universality have our sciences found behind biodiversity?　This lecture will cover a wide range of aspects of biodiversity, from genetic- to community-levels, and will introduce the universal mechanisms that generate the diversity. The latest research methods and results will be introduced.
Due to the intensive-course style, please note that the time spent on each content will not be equal.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD113&syllabuslink=1

CD120

Course Title	Botany1		
Instructor	Horiguchi Gorou		
Semester	Spring Semester	Credit	2 Credits
Course Number	LFS2310	Language	Japanese

Course Objectives

Through examining the characteristics of plants at the level of genes, proteins, cells, organs, organisms, and environment, this course will give students an understanding of how plants live.

Course Contents

Plants have evolved to possess structures and systems that differ greatly from those found in animals, enabling them to thrive. Preservation of the current global environment is a major problem currently facing humanity; however the environment exists as it does in the first place largely due to the work of plants. Furthermore, for the sake of agricultural production, understanding plants and their effective uses is a subject of great importance. Plants carry out carbon assimilation in the form of photosynthesis, have cells that are immobile, and possess a flexible physical structure that adapts to its environment. They also have a few distinct characteristics regarding their interactions with other forms of life. With the advent of molecular biology, these characteristics are now able to be understood at both the genetic and molecular level. In this course, students will learn about how plants are organized on the level of their cells, tissue, and organs. With this foundation, the roles of the various structures and systems found in plants will be reexamined from the point of view of evolution, adaptation, environmental response, development, and differentiation. They will also be examined in the context of how plants interact with other living things. Specific examples which are already well understood on the molecular level will be discussed, and results of the latest research in the field will be touched upon. Lastly, genetic recombination techniques in plants will be discussed.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD120&syllabuslink=1

CD123

Course Title	Bioinformatics		
Instructor	Uchikoga Nobuyuki		
Semester	Spring Semester	Credit	2 Credits
Course Number	LFS3020	Language	Japanese

Course Objectives

Today's life science is producing massive data on various phenomena. Making out the biology of these data requires some experience of information processing. Bioinformatics is a multi-diciplinary field combining biology and informatics, as the name suggests, and it has already become essential to the development of life science. The course deals with the very basics of bioinformatics; however, the knowledge and experience gained in this course should prepare students for more advanced stages of the field and let them know what bioinfomatics can offer in their future scientific persuit.

Course Contents

In this course, students will learn basic techniques to organize and analyze information on genes, genomes, proteins, etc, that constitute living organisms through using analysis tools on the Internet. It is recommended that students also run applications described in hand-outs outside class

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD123&syllabuslink=1

CD124

Course Title	Molecular Neurobiology		
Instructor	Toriumi Kazuya		
Semester	Fall Semester	Credit	2 Credits
Course Number	LFS3310	Language	Japanese

Course Objectives

The goal of this course is to understand the functioning of our brain at the levels of molecule, cell, tissue, organism, and society.

Course Contents

The course will cover topics from the organization and the molecular mechanisms of the nervous system to the expression of higher-order functions of the brain, such as our perception of and resposes to the outside world, sometimes referring to latest findings. It will also discuss the molecular mechanisms and research methodologies of psychiatric and neuro-degenerative disorders.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD124&syllabuslink=1

Course Title	Molecular Immunology		
Instructor	Kato Hidehito		
Semester	Spring Semester	Credit	2 Credits
Course Number	LFS3310	Language	Japanese

Course Objectives

When we define confusion as disease, immunity is to restore confusion. By learning the immune system that excludes non-self, we can gain an understanding of the mysteries of life, the importance of harmony in relationships with other life, and even the meaning of life.

Course Contents

Immunity is a system that eliminates non-self. This method of elimination is killing. The mother recognizes her child as non-self and starts to excluded soon after she conceives, so why is the fetus not excluded? Differentiation is discrimination. I think that war or bullying may be caused by a system that eliminates non-self. Additionally, while type O red blood cells can be transfused to people of any blood type, type AB red blood cells can't be transfused to anyone without type AB blood. This is due to the presence of antibodies in a person's blood that attack other type than one's own blood type. But why are antibodies present even though there has been no transfusion in the past? These kinds of own questions are presented, and we dive down to the molecular level to find the answer. I'll explain how that knowledge is useful for the treatment of illnesses while sharing recent findings (such as the achievements of Dr. Honjo, who has received a Nobel prize).
If you gain a deep understanding of the mechanisms of immunity, maybe you can find a way to eliminate war and bullying as well.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD125&syllabuslink=1

Course Title	Molecular Developmental Biology		
Instructor	Kinoshita Tsutomu		
Semester	Fall Semester	Credit	2 Credits
Course Number	LFS3310	Language	Japanese

Course Objectives

This course aims to teach students the molecular mechanism of animal development; specifically, the processes which regulate embryogenesis, organ formation, and tissue regeneration in animals on the molecular level.

Course Contents

Animal bodies are initially formed from a single fertilized egg, which gives raise to various somatic cells through cell proliferation and differentiation. Throughout this process, various mechanisms play a role as body plan. One mechanism triggers phase transition from cell division to cell differentiation. Another mechanism establishes the body orientation with anterior-posterior, left-right and dorsal-ventral axes. Cell to cell communication and signal transduction mechanism induce specific organs under spatiotemporal regulation. As organ formation progresses, the number of unspecialized cells decreases, while multipotent stem cells are preserved within various tissues. The stem cells fulfill the roles of repairing lost tissue and replacing old cells. They serve the purpose of ensuring that multicellular organisms can remain durable and fresh throughout their entire lifetime. This course will discuss organ formation and tissue maintenance from the standpoint of cellular and molecular biology.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD126&syllabuslink=1

CD130

Course Title	Zoology		
Instructor	Goto Satoshi		
Semester	Fall Semester	Credit	2 Credits
Course Number	LFS2310	Language	Japanese

Course Objectives

The aim of this course is to understand the structures and functions of the tissues and organs in animals, and laboratory animals that are widely used for scientific researches.

Course Contents

Animals are multicellular organisms that consist of various types of tissues and organs. This course aims to deepen students' understandings of the structures of these tissues and organs, as well as their physiological functions. Furthermore, the different types of model animals and experimental methods used in research will be discussed.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD130&syllabuslink=1

Course Title	Microbiology		
Instructor	Matsuyama Shinichi/Sekine Yasuhiko/Watanabe Satoru		
Semester	Fall Semester	Credit	2 Credits
Course Number	LFS2110	Language	Japanese

Course Objectives

Living things can be classified by the following three categories: animals, plants, and microbes. This course aims to teach students about the makeup, features, physiology, and ecology of microbes. Through doing so, students will understand their various similarities and differences with respect to plants and animals.

Course Contents

Microbes can be broken up into prokaryotes and eukaryotes, however this course will primarily deal with prokaryotes (bacteria). Students will learn about the structure, features, and biosynthesis mechanisms of prokaryotic cells, and how they differ from those of eukaryotic cells. Through understanding these differences, students will ponder the mechanism by which antibiotics operate on prokaryotes. Students will learn about how prokaryotic cells propagate,
as well as how temperature, pH, osmotic pressure, and other environmental changes affect their propagation.
Chromosome translocation by both bacteriophage and conjugation will be discussed. Students will also learn about transposons and genetic modification, deepening their understandings of microbial genetics. Genetic engineering will be introduced through discussing the applications of these concepts.
The lecture will also discuss the evolution and diversity of prokaryotes. Students will understand the ways that prokaryotes evolve, and realize their stunning diversity through the variations in their metabolisms and ecologies. Industrial uses of microbes will be introduced from the standpoint of practical microbiology.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD131&syllabuslink=1

CD132

Course Title	Molecular Cytology 3		
Instructor	Mashima Keisuke		
Semester	Spring Semester	Credit	2 Credits
Course Number	LFS3300	Language	Japanese

Course Objectives

This course aims to teach students about the nature of the signal transduction, tissue, and cancer at the molecular level.

Course Contents

In order to understand diverse biological phenomena, it is necessary to understand cells, which contribute these biological phenomena. Cells consist of a wide variety of molecules, and these molecules make cooperatively a system and execute cellular functions. Therefore, we introduce cellular molecules involved in cell signaling and tissue construction. The diverse function of these molecules will be discussed.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD132&syllabuslink=1

CD133

Course Title	Methodology for Life Science		
Instructor	Hanai Ryo		
Semester	Fall Semester	Credit	2 Credits
Course Number	LFS3010	Language	Japanese

Course Objectives

Students will learn various experimental methods in life-science research. The goal of this course is to help students understand that the methods have their bases in molecular biology and biochemistry, thereby preparing students for future technological advances.

Course Contents

Lectures on various experimental methods used in molecular biology, cell biology, and biochemistry.

1. Common generic techniques
2. Protein purification and identification
3. Phenotype analysis on the nano-, micro-, and macro-scales.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.

<URL>

https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD133&syllabuslink=1

CD134

Course Title	Seminar in Life Science 1		
Instructor	Yamada Yasuyuki		
Semester	Spring Semester	Credit	2 Credits
Course Number	LFS1520	Language	Japanese

Course Objectives

In this course, students will learn the fundamentals necessary to study life science in small groups, ensuring their education in the Department of Life Science proceeds smoothly.

Course Contents

This course is to be taken concurrently with Basic Experiments in Life Science. Before each experiment, students will learn the relevant theory, methods, and safety information in detail so that they can conduct each experiment with confidence.
After each experiment, students will discuss the significance of the results they have obtained, cultivating a better understanding of the subject and honing their ability to think critically. Additionally, advice on how to write reports and how to handle each experiment topic will be given.

As the need arises, various subjects relating to students' studies at the Department of Life Science will be discussed.

Students taking this course will be divided into four groups, with a different instructor being in charge of each group.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD134&syllabuslink=1

CD135

Course Title	Seminar in Life Science 2		
Instructor	Kasai Taishi		
Semester	Spring Semester	Credit	2 Credits
Course Number	LFS2520	Language	Japanese

Course Objectives

In order to deepen their understanding of the fundamental coursework offered by the Department of Life Science, students will attend seminars related to various life science fields. Furthermore, students will create and give presentations regarding the results of each seminar, allowing them to hone their presentation skills.

Course Contents

Students will attend various seminars related to the fundamental coursework offered by the Department of Life Science as well as subjects based upon them.
The instructor in charge will designate the field and choose the topics to be discussed during the seminar. Students will investigate the subject they are given and present their findings, discussing the subject with the rest of the class.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD135&syllabuslink=1

CD136

Course Title	Elementary Biology		
Instructor	Kubo Yuuichirou		
Semester	Spring Semester	Credit	2 Credits
Course Number	LFS1000	Language	Japanese

Course Objectives

Our goal in this course is to gain the academic ability of "biology" necessary to study life science at university.

Course Contents

As the goal of this course is to gain an understanding of basic life phenomena, lectures will focus on identifying the most important matters. Each lecture will be a lesson based around a single theme, with the items on the right being considered as the themes for this year. It is also important for students to read the texts both before and after the lecture, as there will be quizzes for each subject.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD136&syllabuslink=1

CD137

Course Title	Elementary Chemistry		
Instructor	Tsushima Takashi		
Semester	Spring Semester	Credit	2 Credits
Course Number	LFS1000	Language	Japanese

Course Objectives

Our goal in this course is to gain the power of "chemistry" necessary to study life science in university. This is preparation for "Basic Chemistry 1" taught in the fall semester of a student's first year.

Course Contents

Knowledge of chemistry is essential in learning life science. However, the current situation is that, due to curriculum and examination subjects, many students entering college do so without having learned a lot of chemistry. That is why this class focuses on acquiring the knowledge of chemistry necessary for learning in the field of life science. We will touch not only on high school chemistry, but also on thermodynamics such as electron orbits for atoms and molecules, and entropy and enthalpy. We will try to fit as many actual exercises into class as possible, allowing us to not only gain knowledge but put that knowledge to use.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD137&syllabuslink=1

CD138

Course Title	Advanced Lectures on Life Science		
Instructor	Sekine Yasuhiko		
Semester	Fall Semester	Credit	2 Credits
Course Number	LFS3020	Language	Japanese

Course Objectives

This course aims to teach students about the frontiers of the life sciences, which progress with each passing day.

Course Contents

Using the research being conducted in each full-time faculty member's laboratory and related subjects as a focal point, this course will discuss the cutting-edge research taking place in various life science fields. The life sciences consist of a diverse array of fields. Research progresses at a rapid pace, and as a result, it is essential to keep up with what is being found at the frontiers of discovery. The fundamental knowledge students have learned thus far is also necessary for comprehending the latest life science research. Through taking this course, students will deepen their understanding of the research being conducted by each laboratory in the department. This understanding will prove useful when it comes time to select a lab to join for one's Graduation Research.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD138&syllabuslink=1

CD139

Course Title	Special Exercises in Life Science 1		
Instructor	Sekine Yasuhiko		
Semester	Spring Semester	Credit	1 Credit
Course Number	LFS3820	Language	Japanese

Course Objectives

This course is aimed at third-year students with a strong thirst for knowledge. By providing an early opportunity research and learn, this course aims to deepen students' interest and understanding of the life sciences.

Course Contents

This is a special training course in which each faculty member will be assigned only 1-2 students. The contents will vary depending on the faculty member, but students will research thier own original theme. Students will be expected to participate in round-table discussions with the laboratory members and to present their data.

Depending on each student's state of progress and individual needs, they will receive guidance in the following areas:

1. Understanding research contents
2. Drafting a research plan
3. Learning experimental methods
4. Investigation and analysis of experimental results
5. Reporting research results
6. Discussions of English papers related to the research topic

Each faculty member's research topic is listed below.

Sekine: Dynamic state mechanism of bacterial genomes; Function analysis of non-coding RNA
Goto: Organelle zones regulating development, nervous system and immunity.
Oka: Controlling mitochondrial morphogenesis; Analysis of the physiological roles of organelle quality control
Yamada: Mechanisms of ATP synthase activity regulation
Horiguchi: Analysis of molecular mechanisms of plant morphogenesis
Sakakibara: Developmental Evolutional research of land plants
Shiomi: Analysis of moleular mechanisms of bacterial cell division and morphogenesis
Suetsugu: Synthetic biological analysis of bacterial genomes

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD139&syllabuslink=1

CD140

Course Title	Special Exercises in Life Science 2		
Instructor	Sekine Yasuhiko		
Semester	Fall Semester	Credit	1 Credit
Course Number	LFS3820	Language	Japanese

Course Objectives

This course is aimed at third-year students with a strong thirst for knowledge. By providing an early opportunity research and learn, this course aims to deepen students' interest and understanding of the life sciences.

Course Contents

This is a special training course in which each faculty member will be assigned only 1-2 students. The contents will vary depending on the faculty member, but students will research thier own original theme. Students will be expected to participate in round-table discussions with the laboratory members and to present their data.

Depending on each student's state of progress and individual needs, they will receive guidance in the following areas:

1. Understanding research contents
2. Drafting a research plan
3. Learning experimental methods
4. Investigation and analysis of experimental results
5. Reporting research results
6. Discussions of English papers related to the research topic

Each faculty member's research topic is listed below.

Sekine: Dynamic state mechanism of bacterial genomes; Function analysis of non-coding RNA
Goto: Organelle zones regulating development, nervous system and immunity.
Oka: Controlling mitochondrial morphogenesis; Analysis of the physiological roles of organelle quality control
Yamada: Mechanisms of ATP synthase activity regulation
Horiguchi: Analysis of molecular mechanisms of plant morphogenesis
Sakakibara: Developmental evolutionary study of land plants using bryophytes
Shiomi: Analysis of moleular mechanisms of bacterial cell division and morphogenesis
Suetsugu: Synthetic biological analysis of bacterial genomes

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD140&syllabuslink=1

CD141

Course Title	Physics 1		
Instructor	Togano Yasuhiro		
Semester	Fall Semester	Credit	2 Credits
Course Number	LFS2920	Language	Japanese

Course Objectives

The aim of the natural sciences is to discover and understand phenomena governed by natural law. Classical mechanics and electromagnetism in physics are typical examples of the natural sciences. The goal of this course is to acquire the basics of scientific thinking by learning classical mechanics and electromagnetism.

Course Contents

In this course, we will learn kinematics, equation of motion, energy, and momentum from classical mechanics. The motion of charged particles in electric fields and magnetic fields will also be learned from electromagnetism. It is better if students know the basics of vector and differential and integral calculus, since they will be used to describe motions.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD141&syllabuslink=1

Course Title	Biostatistics		
Instructor	Yamaguchi Seiichi		
Semester	Spring Semester	Credit	2 Credits
Course Number	LFS3010	Language	Japanese

Course Objectives

In this course, students will learn fundamental statistics concepts commonly used in experiments and investigations. They will learn frequently used statistical methods and fundamental knowledge while acquiring practical analysis abilities.

Course Contents

Data is being continuously generated in large quantities to the point that the term “big data” is gradually permeating the vocabulary of general society. As a result of this, general societal interest in statistics has risen, and the need for people who can make decisions after interpreting data has increased. Nevertheless, there is still a distinct shortage of individuals capable practically applying data.

Applied uses of statistics exist in a wide variety of fields, not just disciplines related to the life sciences. Depending on one’s goals, one must be able to correctly collect data and select and appropriate method for analyzing it.

The lecture will begin with basic statistics, whereupon students will come to understand data trends and scatter plots. The course will also outline various research methods encountered in statistics, including survey methods, experimental methods, and observation research. For example, students will learn methods for dealing with situations where there are two variables, like height and weight. Descriptive statistics methods will be covered in the first half of the course. From then on, the course will cover inferential statistics methods, in which one infers things about the nature of the whole after seeing a small part of it. First, students will be introduced to the basics of inferential statistics: random variables and the relationship between populations and samples. Students will then learn the important concept of sampling distribution. Next, students will learn about a critical part of inferential statistics: estimations. Particular focus will be placed on interval estimations. Following this, the idea of a hypothesis test will be introduced. The lecture will proceed with the aim of enabling students to learn how to conduct various types of hypothesis testing, such as analysis of variance.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.

<URL>

https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD142&syllabuslink=1

CD310

Course Title	English for Life Science 1		
Instructor	Oka Toshihiko/Miyamoto Keiko		
Semester	Spring Semester	Credit	2 Credits
Course Number	LFS2610	Language	Japanese

Course Objectives

This course is designed to prepare students for reading scientific books and publications, and for listening to scientific oral presentations. Students should note that this is an English class, not a life-science class given in English.

Course Contents

The course mainly deals with English grammar in general and terminology in molecular biology. It consists of two parts.
Part I: Students will learn science-specific English and perform reading, listening and speaking exercises.
Part II: Students will learn terminology and specialized expression in molecular biology through intensive reading of excerpts from "Essential Molecular Biology."

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD310&syllabuslink=1

Course Title	English for Life Science 2		
Instructor	Sekine Yasuhiko/Nakagawa Naoko		
Semester	Spring Semester	Credit	2 Credits
Course Number	LFS3620	Language	Japanese

Course Objectives

The goal of this course is for students to be able to roughly comprehend biological literature and scientific texts in English. Additionally, this course aims to foster the ability of students to give basic presentations of their scientific research in English.

Course Contents

The course consists of two parts.

Part I: Lectures will primarily focus on English used when presenting at international conferences; students will participate in presentation exercises. Furthermore, students will participate in various science-themed reading, speaking, and grammar exercises. Listening exercises using voice recordings will also be performed. A few short tests will be held to determine level of comprehension.

Part II: Students will read scientific essays (or textbooks) related to molecular biology and learn how essays are structured, as well as how to summarize scientific literature and experimental methods. Students will learn how to organize data in a logical fashion. A few short tests will be held to determine level of comprehension.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CD311&syllabuslink=1

CK001

Course Title	Career paths in science and technology(SAL1)		
Instructor	Furusawa Kiyoshi/Yamada Yuji/Murata Jiro/Matsushita Nobuyuki/Sekine Yasuhiko		
Semester	Spring Semester	Credit	2 Credits
Course Number	SCI1220	Language	Japanese

Course Objectives

Students are expected to obtain ideas toward their future career plans through talks of guest speakers and faculty members will share Information on job markets and career. The skill goal of this course for the students is to be careful listeners through the presentations.

Course Contents

This course aims to support students to visualize their possible future plans. Alumni and faculty members will share their experiences with their skills and knowledge from the training in their own areas of science. Students will be expected to nurture the active skill of listening through the presentations of alumni and other speakers on the broad areas of careers after graduation from the College of Science.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CK001&syllabuslink=1

CK003

Course Title	Science Education Planning(SAL3)		
Instructor	Furusawa Kiyoshi/Komori Yasushi/Hirayama Takato/Yamanaka Masahiro/Mashima Keisuke		
Semester	Spring Semester	Credit	2 Credits
Course Number	SCI3220	Language	Japanese

Course Objectives

The course focuses on designing and delivering skills of educational material in mathematics and science.

Course Contents

Students are expected to draft a short science/mathematics course plan of high school level with support of faculty members. The task may require off-classroom work. Students are also expected to give presentations about their course design.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CK003&syllabuslink=1

Course Title	History of Science		
Instructor	Uchida Masao		
Semester	Fall Semester	Credit	2 Credits
Course Number	SCI2110	Language	Japanese

Course Objectives

We are living in a society that surrounds us with science and technology. Science and technology have much effect on the production and consumption of goods, and even our way of thinking and sense of morals. For matters ranging from simple daily life to future policy decisions, adequate knowledge and judgement concerning science and technology is a must for everyone. To that end, we will study the basics of the history of science and technology, a discipline that considers what science and technology are from a historical viewpoint. This course is recommended for students studying the various branches of modern science in the College of Science.

Course Contents

From the early 17th to the later 19th century, during which period Western world developed modern science and technology, Japan was isolated from that culture for more than two hundred years. After one hundred years of "Rangaku" studies Japanese government introduced modern science and technology in haste and assimilated and developed them. This process shaped a specific character of science and technology in this country in the course of the age of war and the age of high economic growth after 1950s. We trace this history to consider the present state and the desirable situation of the development of science and technology in the future.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CK004&syllabuslink=1

CK005

Course Title	History of Mathematics		
Instructor	Nakane Michiyo		
Semester	Spring Semester	Credit	2 Credits
Course Number	SCI2110	Language	Japanese

Course Objectives

For the purpose of providing further consideration of nature of mathematics to students, this course teaches its history. Historical knowledge will also help them to teach mathematics to junior and senior high school students.

Course Contents

Why (−1)×(−1)=1?　Why do cubic equations have three roots?　Can you answer to these questions?　Presumably your teachers also cannot give answers that convince you. In junior and senior high school, we have such natural mathematical questions which teachers cannot clearly answer. In this class we learn the history of mathematics and find precise answers to such kind of questions.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CK005&syllabuslink=1

CK006

Course Title	Ethics in Science		
Instructor	Mizoguchi Hajime		
Semester	Fall Semester	Credit	2 Credits
Course Number	SCI2210	Language	Japanese

Course Objectives

The goals of this course are as follows. One is to allow students to concretely imagine the influence of science knowledge and medical technology on modern society. The other is to have students acquire basic knowledge, understanding basic issues and the scientific background of sciene ethics from the viewpoint of human activities, therefore allowing them to express their own thoughts and ideas in discussions.

Course Contents

In this lecture-based class, the lecturer will explain how scientific knowledge is related to scientificmodern world, where the natural scientific basis of advanced medical technology is placed, etc. Some examples of topics this touches on include priority dispute, eugenic movement, development of nuclear wepons, geneti engineering bioethics ando so on. The fact will be highlighted that scientific knowledge rapidly permeates throughout modern society, which has social impacts beyond what researchers may expect. Additionally, even if you are a natural science researcher or engineer, in some cases as a citizen you will have to face ethical problems, In such cases you will need to know the specifics regarding the differences between research level and sociall level. The aim is to provide the materials that will lead to you thinking on your own in the context of science ethics and hope that will create opportunities leading to a review of how you perceive life, and more specifically, human life. Depending on the number of students, discussions and free talks will also be held. We will discuss the following topics.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CK006&syllabuslink=1

CK007

Course Title	Intellectual Property Right		
Instructor	Okada Hiroyuki		
Semester	Spring Semester	Credit	2 Credits
Course Number	SCI2210	Language	Japanese

Course Objectives

In this course, students will acquire fundamental knowledge about intellectual property rights while gaining an understanding as to how to actually obtain and apply such rights. While a legal understanding is certainly essential, this course will aim to teach students practical knowledge about intellectual property.

Course Contents

In this course, students will learn what intellectual property rights are and what they protect. We will provide an outline of intellectual property rights, with explanations focusing mostly on patents. Specifically, students will learn about the legal proceedings required to obtain a patent for an invention, as well as things to be cautious of throughout the process. In addition, students will learn the practical applications made possible after a patent is obtained. Other forms of intellectual property rights will be explained through comparison to patent rights. Relevant examples in the form of court cases and newspaper articles will be introduced and discussed. Furthermore, as a form of study to be conducted outside of class, students will draw up mock patent applications and perform mock patent examinations.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CK007&syllabuslink=1

CK008

Course Title	Introduction to Science Communication(SAL2)		
Instructor	Furusawa Kiyoshi		
Semester	Spring Semester	Credit	2 Credits
Course Number	SCI2220	Language	Japanese

Course Objectives

In this course, students will learn about fundamental Science Communication methods as well as their applications.

Course Contents

Science communication is a critical part of implementing research and development projects related to science and technology from a social standpoint. The flow of information between scientists is indispensable to the progression of research, and enables people from different fields including the public to come together to make good decisions, which is a necessity in our exceedingly interconnected society. In this course, we will start with the basics. First, students will learn what science communication is as a general concept. Then, students will use this knowledge and apply it to an example of science communication language. Following this, students will make a project plan and have a presentation about scientific topics. And students will hear from various individuals who deal with science communication in different contexts regarding the mental attitude and skills required.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CK008&syllabuslink=1

CK009

Course Title	Introduction to Geology		
Instructor	Seike Kazuma		
Semester	Spring Semester	Credit	2 Credits
Course Number	SCI2110	Language	Japanese

Course Objectives

This course aims to give students a basic understanding of general geology. Students will learn the meanings of various terminology commonly used in Earth and Planetary Sciences, cultivating an understanding that will enable them to accurately explain them to others. The hope is that by acquiring some basic knowledge of geology, students will cultivate an interest and be able to better understand in geologic science news you encounter in their daily life.

Course Contents

Whether it be the daily weather, earthquakes and volcanos, or news/newspaper articles regarding mineral resources, topics related to Earth and Planetary Sciences are very close for your life. For that very reason, you can expect receiving a basic grounding in the fundamentals of geology to rapidly expand your outlook. This course aims to give students the basic knowledge necessary to understand the history of the Earth as well as important topics related to the Earth sciences such as the formation of rocks and the mechanisms of earthquakes. This course will proceed with assuming students had not taken Earth Scicence course in high school. The course will be conducted in the classroom in lecture format using Power Point presentations. Handouts related to the contents of the PP presentations will be distributed at every lecture. Every student regardless of attendance or absence will be assigned the task of writing a simple summary of each lecture. Submitted tasks will also be added to each students score. Additionally, there will be a final examination.

Others

※Please refer to the ″Syllabus & Class Schedule Search System″ for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CK009&syllabuslink=1

Course Title	Geological Experiments (General)		
Instructor	Seike Kazuma		
Semester	Fall Semester	Credit	1 Credit
Course Number	SCI2120	Language	Japanese

Course Objectives

This course aims to give students the skills of reading topographic and geological maps, and understanding various geological phenomena through experimental practice. Students will put in effort to learn how to teach various topics related to geology, as well as how to use teaching materials and contents of a natural history museum, practically. This course will also teach techniques for leading geological excursion.

Course Contents

In order to gain a deep understanding about geology, practical experiments and geological excursions are indispensable things. In this course, students will conduct various representative experiments related to earth science and a field trip in Chichibu and/or Jogashima-Island. The course will be conducted in the classroom in lecture/practice format using Power Point presentations and various handouts, and will be also practiced hands-on training outdoors or at another location. Students will be evaluated by the practice exercises they will turn in every lecture, as well as the geological observing report about field trip.
It is optimal for you to take this course only if they already took course of Introduction to Geology (spring semester).
Precautions regarding registering for this course should be noted along with the other items.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CK010&syllabuslink=1

CK012

Course Title	Science and Business Leadership(BL4)		
Instructor	Tateno Yoshikazu/Uda Takefumi		
Semester	Spring Semester	Credit	2 Credits
Course Number	SCI3220	Language	Japanese

Course Objectives

Enhance problem-solving ability based on logical thinking and leadership which are necessary to play an active role in society through problem solving of a client company,

Course Contents

By creating teams with members with different backgrounds, conduct classes to bridge to society in a state close to the real world.

Improve problem-solving skills and leadership by providing a standard problem-solving process and learning it in classes. In addition, enhance logical thinking skills through opportunities to think alone.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.

<URL>

https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CK012&syllabuslink=1

CK014

Course Title	LAESProject Seminar 1		
Instructor	Furusawa Kiyoshi		
Semester	Spring Semester	Credit	2 Credits
Course Number	SCI4220	Language	Japanese

Course Objectives

Students are expected to obtain practical skills for Science Communication and aim for applying an experiential learning cycle and a practical cycle.

Course Contents

How can we create opportunities to communicate science and to think about science for our society together? In this course, students will implement planning Science Communication project, carrying out the plan and reflecting, analyzing, evaluating it. And students aim for applying an experiential learning cycle and a practical cycle of Science Communication by using the result of the reflection. The theme and schedule will be decided by the discussion with students.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CK014&syllabuslink=1

CK015

Course Title	LAESProject Seminar 2		
Instructor	Furusawa Kiyoshi		
Semester	Fall Semester	Credit	2 Credits
Course Number	SCI4220	Language	Japanese

Course Objectives

Students are expected to obtain practical skills for Science Communication and aim for applying an experiential learning cycle and a practical cycle.

Course Contents

How can we create opportunities to communicate science and to think about science for our society together? In this course, students will implement planning Science Communication project, carrying out the plan and reflecting, analyzing, evaluating it. And students aim for applying an experiential learning cycle and a practical cycle of Science Communication by using the result of the reflection. The theme and schedule will be decided by the discussion with students.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CK015&syllabuslink=1

CK016

Course Title	Introduction to Medicine		
Instructor	Sasai Keisuke		
Semester	Fall Semester	Credit	2 Credits
Course Number	SCI2110	Language	Japanese

Course Objectives

This course will outline the composite field of medical science,introducing the roles that various sciences and technologies play in medicine.

Course Contents

The medicine is an integrated science based on not only biology and pharmacology, but also other many kinds of sciences, such as chemistry, physics, and even liberal arts. This course will outline the medical science, and introduce the role of technologies and physics in the interdisciplinary approach to health care.

Others

※Please refer to the "Syllabus & Class Schedule Search System" for details including course schedule, evaluations, textbooks and others.
<URL>
https://sy.rikkyo.ac.jp/timetable/slbssbdr.do?clearAccessData=true&risyunen=2020&semekikn=1&kougicd=CK016&syllabuslink=1

RIKKYO UNIVERSITY
MDCCCLXXIV